3.2 AIR QUALITY

Environmental impacts to air quality may arise from atmospheric discharges of pollutants produced by sources involved in facility construction and operation. A significant air quality impact would occur if emissions of criteria pollutants or ozone (O_3) precursors resulted in an increase in ambient air concentrations of regulated pollutants, or if sensitive receptors would be exposed to other emissions such as toxic air contaminants or those characterized by a visible dust plume or noxious odors. Sources of emissions involved in construction activities include heavy-duty off-road equipment, fugitive dust and vapors, and on-road vehicle trips. Construction of near-term improvements have potential to result in exceedance of applicable thresholds for NOx; however, mitigation requiring use of construction equipment equipped with Tier 4 engines would reduce emissions to a less than significant. Operational emissions would be predominantly attributed to mobile source vehicle trips by employees and patrons, and additional emissions associated with facility maintenance vehicles and equipment and other energy and area sources. Net increases in pollutant emissions generated from operation of the Project would not exceed applicable thresholds. Impacts to air quality from construction and operations would be less than significant.

This section analyzes the potential for implementation (i.e., construction and operation) of the Los Angeles Zoo and Botanical Gardens (Zoo) Vision Plan (Vision Plan; Project) to generate emissions of air pollutants of sufficient nature and magnitude to cause significant impacts to the environment pertaining to public health and nuisance, and implementation of the Air Quality Management Plan (AQMP).

3.2.1 Topical Background

In the United States (U.S.), air quality is primarily characterized by ambient ground-level concentrations of seven specific pollutants identified by the U.S. Environmental Protection Agency (USEPA) to be of concern with respect to health and welfare of the public. These specific pollutants—known as "criteria air pollutants"—are 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 ambient concentration criteria are known as the National Ambient Air Quality Standards (NAAQS), and the California ambient concentration criteria are referred to as the California Ambient Air Quality Standards (CAAQS). Federal criteria air pollutants include ground-level ozone (O_3), nitrogen dioxide (NO2), carbon monoxide (CO), sulfur dioxide (SO2), respirable particulate matter ten microns or less in diameter (PM_{10}), fine particulate matter 2.5 microns or less in diameter ($PM_{2.5}$), and lead (Pb). Table 3.2-1 shows the CAAQS and NAAQS concentrations for the criteria air pollutants with the corresponding averaging times. The following descriptions of

each criteria air pollutant and their health effects are based on information provided by the South Coast Air Quality Management District (SCAQMD) (2012).

Table 3.2-1. Criteria Air Pollutant Standards

Pollutant	Averaging Period	California (CAAQS)	Federal (NAAQS)
Ozone (O_3)	1-Hour Average	0.09 ppm (180 µg/m^3)	--
	8-Hour Average	0.070 ppm (137 µg/m^3)	0.070 ppm (137 µg/m^3)
Carbon Monoxide (CO)	1-Hour Average	20 ppm (23 µg/m^3)	35.0 ppm (40 mg/m^3)
	8-Hour Average	9.0 ppm (10 mg/m^3)	9.0 ppm (10 mg/m^3)
Nitrogen Dioxide (NO_2)	1-Hour Average	0.18 ppm (338 µg/m^3)	0.10 ppm (188 µg/m^3)
	Annual Arithmetic Mean	0.03 ppm (57 µg/m^3)	0.053 ppm (100 µg/m^3)
Sulfur Dioxide (SO_2)	1-Hour Average	0.25 ppm (655 µg/m^3)	0.075 ppm (196 µg/m^3)
	24-Hour Average	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)
	Annual Arithmetic Mean	--	0.030 ppm (80 µg/m^3)
Respirable Particulate Matter (PM_{10})	24-Hour Average	50 µg/m^3	150 µg/m^3
	Annual Arithmetic Mean	20 µg/m^3	--
Fine Particulate Matter ($PM_{2.5}$)	24-Hour Average	--	35 µg/m^3
	Annual Arithmetic Mean	12 µg/m^3	12.0 µg/m^3
Lead (Pb)	30-day Average	1.5 µg/m^3	--
	Calendar Quarter	--	1.5 µg/m^3
	Rolling 3-Month Average	--	0.15 µg/m^3
Sulfates	24-Hour Average	25 µg/m^3	No Federal Standards
Hydrogen Sulfide	1-Hour Average	0.03 ppm (42 µg/m^3)	
Vinyl Chloride	24-Hour Average	0.01 ppm (26 µg/m^3)	

Source: CARB 2020.
Notes: ppm = parts per million; µg/m^3 = micrograms per cubic meter.

Federal and State Criteria Air Pollutants

Ozone (O_3) is a colorless gas with a sharp odor, is a highly reactive form of oxygen. High O_3 concentrations exist naturally in the stratosphere. However, it is also formed in the atmosphere when volatile organic compounds (VOC) and nitrogen oxides (NO_X) react in the presence of ultraviolet sunlight (also known as smog). The primary sources of VOC and NO_X,

the components of O_3, are automobile exhaust and industrial sources. Some mixing of stratospheric O_3 downward through the troposphere to the earth's surface does occur; however, the extent of O_3 transport is limited.

The propensity of O_3 for reacting with organic materials causes it to be damaging to living cells and cause health effects. O_3 enters the human body primarily through the respiratory tract and causes respiratory irritation and discomfort, makes breathing more difficult during exercise, and reduces the respiratory system's ability to remove inhaled particles and fight infection. Individuals exercising outdoors, children and people with preexisting lung disease, such as asthma and chronic pulmonary lung disease, are considered to be the most susceptible subgroups for O_3 effects.

Particulate matter (PM_{10} and $PM_{2.5}$) refers to particles small enough to be inhaled into the deepest parts of the lung, which are of great concern to public health. 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. Emissions of $PM_{2.5}$ result from fuel combustion (e.g., motor vehicles, power generation and industrial facilities), residential fireplaces and wood stoves. In addition, $PM_{2.5}$ can be formed in the atmosphere from gases such as SO_2, NO_X, and VOC.

Respirable particles (particles less than 10 microns in diameter, denoted as PM_{10}) can accumulate in the respiratory system and aggravate health problems such as asthma, bronchitis, and other lung diseases. Children, the elderly, exercising adults, and those suffering from asthma are especially vulnerable to adverse health effects of PM. A consistent correlation between elevated ambient fine particulate matter (particles less than 10 microns in diameter, denoted as $PM_{2.5}$) levels and an increase in mortality rates, respiratory infections, number and severity of asthma attacks and the number of hospital admissions has been observed in different parts of the U.S. and various areas around the world. Studies have reported an association between long-term exposure to air pollution dominated by $PM_{2.5}$ and increased mortality, reduction in lifespan, and an increased mortality from lung cancer.

Daily fluctuations in $PM_{2.5}$ concentration levels have also been related to hospital admissions for acute respiratory conditions, to school and kindergarten absences, to a decrease in respiratory function in normal children and to increased medication use in children and adults with asthma. Studies have also shown lung function growth in children is reduced with long-term exposure to PM. In addition to children, the elderly, and people with pre-existing respiratory and/or cardiovascular disease appear to be more susceptible to the effects of PM_{10} and $PM_{2.5}$.

Carbon Monoxide (CO) is a colorless, odorless, relatively inert gas. It is a trace constituent in the unpolluted troposphere and is produced by both natural processes and human activities. In remote areas far from human habitation, CO occurs in the atmosphere at an

average background concentration of 0.04 ppm, primarily as a result of natural processes such as forest fires and the oxidation of methane. Global atmospheric mixing of CO from urban and industrial sources creates higher background concentrations (up to 0.20 ppm) near urban areas. The major source of CO in urban areas is incomplete combustion of carbon-containing fuels, mainly gasoline.

Individuals with a deficient blood supply to the heart are the most susceptible to the adverse effects of CO exposure. The effects observed include earlier onset of chest pain with exercise, and electrocardiograph changes indicative of worsening oxygen supply to the heart. Inhaled CO has no direct toxic effect on the lungs but exerts its effect on tissues by interfering with oxygen transport by competing with oxygen to combine with hemoglobin present in the blood to form carboxyhemoglobin. Hence, conditions with an increased demand for oxygen supply can be adversely affected by exposure to CO. Individuals most at risk include patients with diseases involving heart and blood vessels, fetuses (unborn babies), and patients with chronic hypoxemia (oxygen deficiency) as seen in high altitudes.

Nitrogen dioxide (NO_2) is a reddish-brown gas with a bleach-like odor and is responsible for the brownish tinge of polluted air. Nitric oxide (NO) is a colorless gas, formed from nitrogen (N_2) and oxygen (O_3) under conditions of high temperature and pressure which are generally present during combustion of fuels (e.g., motor vehicles); NO reacts rapidly with the oxygen in air to form NO_2. The two gases, NO and NO_2, are referred to collectively as NO_X. In the presence of sunlight, atmospheric NO_2 reacts and splits to form a NO molecule and an oxygen atom. The oxygen atom can react further to form O_3, via a complex series of chemical reactions involving hydrocarbons.

Population-based studies suggest that an increase in acute respiratory illness, including infections and respiratory symptoms in children (not infants), is associated with long-term exposures to NO_2 at levels found in homes with gas stoves, which are higher than ambient levels found in Southern California (fewer or no stoves). In healthy subjects, increase in resistance to air flow and airway contraction is observed after short-term exposure to NO_2. Larger decreases in lung functions are observed in individuals with asthma and/or chronic obstructive pulmonary disease (e.g., chronic bronchitis, emphysema) than in healthy individuals, indicating a greater susceptibility of these sub-groups. More recent studies have found associations between NO_2 exposures and cardiopulmonary mortality, decreased lung function, respiratory symptoms, and emergency room asthma visits.

Sulfur Dioxide (SO_2) is a colorless gas with a sharp odor. It reacts in air to form sulfuric acid, which contributes to acid precipitation, and sulfates, which are components of particulate matter. Main sources of SO_2 include coal and oil used in power plants and industries. Exposure of a few minutes to low levels of SO_2 can result in airway constriction in some asthmatics. All asthmatics are sensitive to the effects of SO_2. In asthmatics, increase in resistance to air flow, as well as reduction in breathing capacity leading to severe breathing

difficulties, is observed after acute higher exposure to SO_2. In contrast, healthy individuals do not exhibit similar acute responses, even after exposure to higher concentrations of SO_2.

Lead (Pb) in the atmosphere is present as a mixture of a number of lead compounds. Leaded gasoline and lead smelters have been the main sources of lead emitted into the air. Due to the phasing out of leaded gasoline, there was a dramatic reduction in atmospheric Pb over the past three decades. Exposure to low levels of Pb can adversely affect the development and function of the central nervous system, leading to learning disorders, distractibility, inability to follow simple commands, and lower intelligence quotient. Fetuses, infants, and children are more sensitive than others to the adverse effects of Pb exposure. In adults, increased Pb levels are associated with increased blood pressure. Pb poisoning can cause anemia, lethargy, seizures, and death. There is no evidence to suggest that there are direct effects of Pb on the respiratory system.

California Criteria Air Pollutants

The California Environmental Protection Agency (CalEPA) establishes statewide standards and the California Air Resources Board (CARB) establishes local standards for the six common air pollutants identified above. In addition, CARB has established standards for the following four additional pollutants.

Visibility-reducing particles are a byproduct of various processes and activities involved in land use development. Deterioration of visibility is one of the most obvious manifestations of air pollution and plays a major role in the public's perception of air quality. Visibility reduction from air pollution is often due to the presence of sulfur and NO_X, as well as PM.

Sulfates (X-SO_4^{2-}) are chemical compounds which contain the sulfate ion (SO_4^{2-}) and are part of the mixture of solid materials that comprise PM_{10}. Most of SO_X in the atmosphere are produced by oxidation of SO_2. Oxidation of SO_2 yields sulfur trioxide, which reacts with water to form sulfuric acid, which contributes to acid deposition. The reaction of sulfuric acid with basic substances such as ammonia yields SO_4^{2-}, a component of PM_{10} and $PM_{2.5}$. Both mortality and morbidity effects have been observed with an increase in ambient SO_4^{2-} concentrations. However, studies to separate the effects of SO_4^{2-} from the effects of other pollutants have generally not been successful. Clinical studies of asthmatics exposed to sulfuric acid suggest that adolescent asthmatics are possibly a subgroup susceptible to acid aerosol exposure.

Hydrogen Sulfide (H_2S) is a colorless, flammable, poisonous compound having a characteristic rotten-egg odor. It is used as a reagent and as an intermediate in the preparation of other reduced sulfur compounds. It is also a by-product of the desulfurization processes in the oil and gas industries and rayon production, sewage treatment, and leather tanning. Geothermal power plants, petroleum production and refining, and sewer gas are specific sources of H_2S in California. High H_2S exposure has been documented as a cause of sudden death in the workplace.

Vinyl Chloride (C_2H_3Cl) is a colorless, flammable gas at ambient temperature and pressure. It is also highly toxic and is classified as a known carcinogen by the American Conference of Governmental Industrial Hygienists and the International Agency for Research on Cancer. At room temperature, vinyl chloride is a gas with a sickly-sweet odor that is easily condensed. However, it is stored at cooler temperatures as a liquid. Due to the hazardous nature of vinyl chloride to human health, there are no end products that use vinyl chloride in its monomer form. Vinyl chloride is a chemical intermediate, not a final product.

Vinyl chloride is an important industrial chemical chiefly used to produce polyvinyl chloride (PVC). The process involves vinyl chloride liquid fed to polymerization reactors where it is converted from a monomer to a polymer PVC. The final product of the polymerization process is PVC in either a flake or pellet form. From its flake or pellet form, PVC is sold to companies that heat and mold the PVC into end products such as PVC pipe and bottles. Vinyl chloride is not only used to make PVC products, but it is also a natural degradation product of chlorinated industrial solvents (e.g., perchloroethylene, trichloroethene, etc.). Vinyl chloride emissions are historically associated primarily with landfills and sites contaminated with chlorinated solvents.

Toxic Air Contaminants (TACs) are generally defined as those contaminants that are known or suspected to cause serious health problems, but do not have a corresponding ambient air quality standard. Air toxics are also defined as an air pollutant that may increase a person's risk of developing cancer and/or other serious health effects; however, the emission of a toxic chemical does not automatically create a health hazard. Air toxics include metals, other particles, gases absorbed by particles, and certain vapors from fuels and other sources. The majority of the estimated health risks from air toxics can be attributed to relatively few compounds, the most important being PM from the exhaust of diesel-fueled engines (diesel PM). Diesel PM differs from other air toxics in that it is a complex mixture of hundreds of substances rather than a single substance.

Common stationary sources of TAC emissions include gasoline stations, dry cleaners, and diesel backup generators, which are subject to local air district permit requirements. The other, often more significant, sources of TAC emissions are motor vehicles on freeways, high-volume roadways, or other areas with high numbers of diesel vehicles, such as distribution centers. Off-road mobile sources are also major contributors of TAC emissions and include construction equipment, ships, and trains.

TACs can be separated into carcinogens and non-carcinogens based on the nature of the effects associated with exposure to the pollutant. For regulatory purposes, carcinogens are assumed to have no safe threshold below which health impacts would not occur. Any exposure to a carcinogen poses some risk of contracting cancer. Non-carcinogens differ in that there is generally assumed to be a safe level of exposure below which no negative health impact is believed to occur. These levels are determined on a pollutant-by-pollutant basis.

Acute exposure to diesel exhaust may cause irritation to the eyes, nose, throat and lungs, and some neurological effects, such as lightheadedness. Acute exposure may also elicit a cough or nausea, as well as exacerbate asthma. Chronic exposure to diesel PM in experimental animal inhalation studies has shown a range of dose-dependent lung inflammation and cellular changes in the lung and immunological effects. Based upon human and laboratory studies, there is considerable evidence that diesel PM is a likely carcinogen. Human epidemiological studies have demonstrated an association between diesel PM exposure and increased lung cancer rates in occupational settings.

Other types of air pollutant emissions associated with greenhouse gas (GHG) emissions are addressed in Section 3.8, *Greenhouse Gas Emissions*.

3.2.2 Environmental Setting

Regulatory Setting

Federal, state, and local laws and regulations have been enacted that address concentrations of air pollutants and other metrics of air quality conditions. Provision of the federal Clean Air Act (CAA) govern air quality in the U.S. and control sources of emissions. In addition to being subject to the requirements of CAA, air quality management in California is also administered by more stringent regulations under the California Clean Air Act (CCAA). At the federal level, the CAA is administered by the USEPA, and in California the CCAA is administered by CARB at the state level and by the air quality management districts and air pollution control districts at the regional and local levels.

Federal Regulations

The CAA governs air quality at the national level and the USEPA is responsible for enforcing the regulations provided in the CAA. Under the CAA, the USEPA is authorized to establish NAAQS that set protective limits on concentrations of air pollutants in ambient air. Enforcement of the NAAQS is required under the 1977 CAA and subsequent amendments. As required by the CAA, NAAQS have been established for the seven criteria air pollutants: O_3, NO_2, CO, SO_2, PM_{10}, $PM_{2.5}$, and Pb. These pollutants are common byproducts of human activities and have been documented through scientific research to cause adverse health effects. The CAA grants the USEPA authority to designate areas as attainment, nonattainment, or maintenance (previously nonattainment and currently attainment) for each criteria pollutant based on whether the NAAQS concentrations have been met on a regional scale relying upon air monitoring data from the most recent three-year period.

As part of its enforcement responsibilities, the USEPA requires each state with nonattainment areas to prepare and submit a State Implementation Plan that demonstrates the means to attain the federal standards. The State Implementation Plan must integrate federal, state, and local plan components and regulations to identify specific measures to reduce pollution, using

a combination of performance standards and market-based programs within the timeframe identified in the State Implementation Plan.

In addition to the criteria pollutants, the air toxics provisions of the CAA require the USEPA to develop and enforce regulations to protect the public from exposure to airborne contaminants that are known to be hazardous to human health. In accordance with Section 112 of the CAA, the USEPA establishes National Emission Standards for Hazardous Air Pollutants. The list of Hazardous Air Pollutants or air toxics includes specific compounds that are known or suspected to cause cancer or other serious health effects.

On September 27, 2019, the USEPA and the National Highway Traffic Safety Administration published the "Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule Part One: One National Program" (84 Fed. Reg. 51,310 [September 27, 2019]). The Part One Rule revokes California's authority to set its own GHG emissions standards and set zero-emission vehicle (ZEV) mandates in California. Both the GHG emission standards and the ZEV sales standards reduce criteria pollutants; as a result of the loss of ZEV sales requirements, there may be fewer ZEVs sold and thus additional gasoline-fueled vehicles sold in future years. Emissions of hydrocarbons, NO_X, carbon monoxide, and particular matter would increase as a result of each additional gasoline-fueled vehicle. California expects Part Two of these regulations to be adopted in 2020, and it is anticipated that the federal government may adopt revised GHG emission standards and fuel efficiency standards.

State Regulations

State Implementation Plan

Air quality in California is also governed by more stringent regulations under the CCAA. The CCAA is administered by the CARB at the state level and by the air quality management districts at the regional and local levels. Under the CCAA, regional jurisdictions of the state are required to develop plans to achieve and maintain the CAAQS by the earliest feasible date, which is determined in the most recent State Implementation Plan based on existing emissions and reasonably foreseeable control measures that will be implemented in the future. California is divided into 35 regions with local air quality agencies that determine the degree of reductions needed to lower concentrations of pollutants under the applicable air quality standards and improve protection for public health. The 1977 Lewis Air Quality Management Act established the SCAQMD in order to coordinate air quality planning efforts throughout Southern California.

Toxic Air Contaminants

CARB also controls emissions of TACs throughout the state. Particulate exhaust emissions from diesel-fueled engines (diesel PM) were identified as a TAC by CARB in 1998. State efforts to reduce diesel PM emissions have focused on the use of improved fuels, adding particulate filters to engines, and requiring the production of new technology engines that emit fewer exhaust particulates. TACs in California are regulated primarily through the Tanner Air

Toxics Act (Chapter 1047, Statutes of 1983) and the Air Toxics Hot Spots Information and Assessment Act (Chapter 1252, Statutes of 1987). Assembly Bill 1807 sets forth a formal procedure for CARB to designate substances as TACs. Research, public participation, and scientific peer review must occur before CARB can designate a substance as a TAC. The Air Toxics Hot Spots Information and Assessment Act requires that TAC emissions from stationary sources be quantified and compiled into an inventory according to criteria and guidelines developed by CARB. Under Airborne Toxic Control Measure 2485, all diesel-fueled commercial trucks are subject to a strict limit on idling of no more than five minutes at any location within 100 feet of sensitive receptors.

CARB Gasoline Vehicle Emissions Adjustment Factors

The CARB developed the mobile source emissions model EMFAC2017 as the preferred tool for estimating air pollutant emissions from on-road vehicle travel for land use development and transportation projects in California. The September 2019 federal revocation of the statewide authority to set GHG emissions standards and set ZEV mandates compromised the validity of emission factors contained within the EMFAC2017 model, as fewer ZEVs may be sold in future years thereby indirectly increasing emissions from gasoline-fueled vehicles. To account for the potential reduction in market share of ZEVs in future years, the CARB published *EMFAC Off-Model Adjustment Factors to Account for the SAFE Vehicle Rule Part One* (CARB 2019b) that were approved by the USEPA in March 2020. The CARB guidance includes multipliers for EMFAC2017 output rates that apply to emissions of NO_X, total organic gases and reactive organic gases/volatile organic compounds (ROG/VOC), particulate matter (PM_{10} and $PM_{2.5}$), and CO from gasoline fueled light and medium duty vehicles.

California Code of Regulations (CCR) – Asbestos and Lead

The CCR regulate potential asbestos exposure in construction when construction, alteration, repair, maintenance, renovation or demolition of structures, substrates, or portions thereof contain asbestos [8 CCR §1529 (a)(1)(C)]. Additionally, in California, materials containing greater than one-tenth of one percent (>0.1%) asbestos by weight are regulated as asbestos-containing material.

The CCR Title 17, Division 1, and Chapter 8 (Title 17) pertains to all public and residential buildings in California. Pursuant to Title 17 and USEPA regulations, lead-based paint (LBP) is defined as paint or other surface coatings containing an amount of lead equal to or greater than one milligram per square centimeter (1.0 mg/cm^2) or more than half of one percent [>0.5% or 5,000 parts per million(ppm)] by weight. Title 17 also defines a lead hazard as deteriorated LBP, disturbance of LBP or presumed LBP without containment, or any other nuisances which may result in persistent or quantifiable lead exposure. Additionally, worker exposure to materials containing lead during construction work is regulated by CCR Title 8 §1532.1(a). These regulations require worker protection during construction "where lead or materials containing lead are present."

Regional and Local Regulations

South Coast Air Quality Management District (SCAQMD)

The SCAQMD has jurisdiction over a total area of 10,743 square miles, consisting of the South Coast Air Basin (SCAB)—which comprises 6,745 square miles, including Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino counties—and the Riverside County portion of the Salton Sea and Mojave Desert Air Basins. The Project site is located in the City of Los Angeles (City), which is situated in the SCAB portion of Los Angeles County and is within the jurisdiction of the SCAQMD.

The SCAQMD is tasked with preparing regional programs and policies designed to improve air quality within the SCAB, which are assessed and published in the form of the AQMP. The AQMP is updated every four years to evaluate the effectiveness of the adopted programs and policies and to forecast attainment dates for nonattainment pollutants to support the State Implementation Plan based on measured regional air quality and anticipated implementation of new technologies and emissions reductions. The most recent publication is the 2016 AQMP, which is intended to serve as a regional blueprint for achieving the federal air quality standards and healthful air.

The 2016 AQMP represents a thorough analysis of existing and potential regulatory control options, and includes available, proven, and cost-effective strategies to pursue multiple goals in promoting reductions in GHG emissions and toxic risk, as well as efficiencies in energy use, transportation, and goods movement. The 2016 AQMP focuses on demonstrating NAAQS attainment dates for the 2008 8-hour O_3 standard, the 2012 annual $PM_{2.5}$ standard, and the 2006 24-hour $PM_{2.5}$ standard. The 2016 AQMP acknowledged that the most significant air quality challenge in the SCAB is the reduction of NO_X emissions sufficient to meet the upcoming O_3 standard deadlines. The 2016 AQMP includes both stationary and mobile source strategies to ensure that rapidly approaching attainment deadlines are met, that public health is protected to the maximum extent feasible, and that the region is not faced with burdensome sanctions if the NAAQS are not met by the established date.

The 2016 AQMP includes an element that is related to transportation and sustainable communities planning. Pursuant to California Health and Safety Code Section 40450, the Southern California Association of Governments (SCAG), the Metropolitan Planning Organization for Southern California, has the responsibility of preparing and approving the portions of the 2016 AQMP relating to regional demographic projections and integrated regional land use, housing, employment, and transportation programs, measures, and strategies. The analysis incorporated into the 2016 AQMP is based on the forecasts contained within the SCAG 2016–2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). Land use strategies outlined in the 2016–2040 RTP/SCS that will contribute to regional air quality improvements include: focusing new growth around transit/high quality transit areas, planning for growth around livable corridors, providing more options for short trips/neighborhood mobility areas, and supporting local sustainability

planning. SCAG published the *Proposed Final Connect SoCal* 2020-2045 RTP/SCS in early 2020, which is expected to be adopted by the regional council on May 7, 2020. The *Connect SoCal* 2020-2045 RTP/SCS has not been adopted by SCAG at the time this Report was prepared, and details are not included as they may change during the final approval process.

The SCAQMD has also established various rules to manage and improve air quality in the SCAB. The Project proponent shall comply with all applicable SCAQMD Rules and Regulations pertaining to construction activities, including, but not limited to:

- Rule 401 (Visible Emissions) prohibits discharges of any pollutant into the atmosphere from any single source of emissions that is as dark or darker in shade as that designated No. 1 on the Ringelmann chart (opacity equal to or greater than 20 percent) for up to or more than three minutes in any one hour.
- Rule 402 (Nuisance) states that a person should not emit air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property.
- Rule 403 (Fugitive Dust) controls fugitive dust through various requirements including, but not limited to, applying water in sufficient quantities to prevent the generation of visible dust plumes, applying soil binders to uncovered areas, reestablishing ground cover as quickly as possible, utilizing a wheel washing system to remove bulk material from tires and vehicle undercarriages before vehicles exit the project site, limiting vehicle speeds on unpaved roads to 15 miles per hour, and maintaining effective cover over exposed areas. Rule 403 also prohibits the release of fugitive dust emissions from any active operation, open storage piles, or disturbed surface area beyond the property line of the emission source and prohibits particulate matter deposits on public roadways.
- Rule 1113 (Architectural Coatings) establishes limits on the VOC content of specific architectural coating applications. Non-residential building envelope coatings are required to have VOC content less than 50 grams per liter.
- Regulation XIII (New Source Review) authorizes the SCAQMD to deny any Permit to Construct for any new or modified source which results in an emission increase of any nonattainment air contaminant, any ozone depleting compound, or ammonia, unless Best Available Control Technology is employed (Rule 1303) and it can be demonstrated through emissions modeling that the source would not cause or contribute to air quality violations.

City of Los Angeles General Plan

The City General Plan Air Quality Element sets forth the goals, objectives, and policies that guide the city in the implementation of its air quality improvement programs and strategies. The Air Quality Element was reviewed for applicability to the proposed Project. Goal AQ-1 of the Air Quality Element is to provide "good air quality and mobility in an environment of continued population growth and healthy economic structure." Goal AQ-4 is to ensure, "minimal impact of existing land use patterns and future land use development on air quality by addressing the relationship between land use, transportation, and air quality."

Existing Air Quality Conditions

Topographical Influence

The Project site is situated in the portion of Los Angeles County within the SCAB. The SCAB includes all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties. SCAB is bounded by the Pacific Ocean to the west; the San Gabriel, San Bernardino and San Jacinto Mountains to the north and east; and the San Diego County line to the south. SCAB is in an area of high air pollution potential due to its climate and topography. The general region lies in the semi-permanent high-pressure zone of the eastern Pacific Ocean, resulting in a mild climate tempered by cool sea breezes with light average wind speeds. SCAB experiences warm summers, mild winters, infrequent rainfalls, light winds, and moderate humidity. This usually mild climatological pattern is interrupted infrequently by periods of extremely hot weather, winter storms, or Santa Ana winds. SCAB is a coastal plain with connecting broad valleys and low hills, bounded by the Pacific Ocean to the west and high mountains around the rest of its perimeter.

SCAB experiences frequent temperature inversions. Temperature typically decreases with height. However, under inversion conditions, temperature increases as altitude increases, thereby preventing air close to the ground from mixing with the air above it. As a result, air pollutants are trapped near the ground. During the summer, air quality problems are created due to the interaction between the ocean surface and the lower layer of the atmosphere. This interaction creates a moist marine layer. An upper layer of warm air mass forms over the cool marine layer, preventing air pollutants from dispersing upward. Additionally, hydrocarbons and NO_2 react under strong sunlight, creating smog.

Light, daytime winds, predominantly from the west, further aggravate the condition by driving air pollutants inland, toward the mountains. During the fall and winter, air quality problems are created due to CO and NO_2 emissions. CO concentrations are generally worse in the morning and late evening (around 10:00 p.m.). In the morning, CO levels are relatively high due to cold temperatures and the large number of cars traveling. High CO levels during the late evenings are a result of stagnant atmospheric conditions trapping CO in the area. Since CO emissions are produced almost entirely from automobiles, the highest CO concentrations in SCAB are associated with heavy traffic. NO_2 concentrations are also generally higher during fall and winter days.

Local Climatology

The mountains and hills within the SCAB contribute to the variation of rainfall, temperature, and winds throughout the region. The nearest meteorological station that collects data describing local climate conditions in the Project area is at the University of Southern California (USC) campus, approximately 8.5 miles to the south. The USC campus meteorological station continuously measures and records temperature and precipitation levels throughout the year. The annual average temperature in the Project area is 65.4 degrees Fahrenheit (°F). The Project site and surrounding area experience a mean winter temperature of 58.9 °F and a mean summer temperature of 72.6 °F. Within the Project site and its vicinity, the average wind speed is approximately 2.8 miles per hour from the west.

Precipitation in the San Fernando Valley ranges from 15 to 23 inches per year and averages about 17 inches (California Department of Water Resources [DWR] 2004). Annual average precipitation for the City, excluding mountain areas, is 15 inches but has ranged between 4 and 40 inches since record keeping began in 1880. Mountain areas experience higher rainfall levels than the valley bottoms during the same storm event. The annual rainfall between 2013 and 2019 ranges from 5.34 inches to 18.92 inches and has an average annual rainfall for those seven years of 10.12 inches (Los Angeles Almanac 2019). According to the USC campus meteorological station data, total precipitation in the Project area averages approximately 14.9 inches annually. Precipitation occurs mostly during the winter and relatively infrequently during the summer. Precipitation averages 2.8 inches during the winter, 0.75 inches during the spring, 1.0 inch during the fall, and less than 0.1 inch during the summer.

Regional Attainment Status

The state and federal environmental protection agencies assign an attainment designation for each criteria pollutant. The attainment designation identifies if the regional criteria air pollutant concentrations meet the health-based standards defined in the CAAQS and NAAQS. If the air quality in a geographic area meets or is cleaner than the national standard, it is called an attainment area (designated unclassifiable/attainment); areas that do not meet the national standard are called nonattainment areas. In some cases, the USEPA is not able to determine an area's status after evaluating the available information. Those areas are designated unclassifiable. As shown in Table 3.2-2, under the federal standards, Los Angeles County is currently designated Nonattainment (Extreme) for eight-hour average O_3 concentrations and Nonattainment (Moderate) for 24-hour average $PM_{2.5}$ concentrations. Los Angeles County is a maintenance area for PM_{10}, CO, and NO_2 under the NAAQS. For the more stringent CAAQS, Los Angeles County is designated Nonattainment for O_3, PM_{10}, and $PM_{2.5}$, and is in attainment of all other state standards.

Table 3.2-2. State and Federal Attainment Status

Pollutant	State Attainment Status	Federal Attainment Status
Ozone (O_3)	Nonattainment	Nonattainment (Extreme – 1-hour and 8-hour)
Respirable Particulate Matter (PM_{10})	Nonattainment	Attainment – Maintenance (Serious)
Fine Particulate Matter ($PM_{2.5}$)	Nonattainment	Nonattainment (Moderate – 24-hour)
Carbon Monoxide (CO)	Attainment	Attainment – Maintenance (Serious)
Nitrogen Dioxide (NO_2)	Attainment	Attainment – Maintenance (Primary)
Sulfur Dioxide (SO_2)	Attainment	Attainment – Unclassified
Lead (Pb)	Attainment	Nonattainment (Partial)
Visibility-Reducing Particles	Attainment	N/A
Sulfates	Attainment	N/A
Hydrogen Sulfide	Unclassified	N/A
Vinyl Chloride	N/A	N/A

Source: CARB 2020; USEPA 2020.

Local Air Monitoring Data

The SCAQMD monitors air quality conditions at 37 locations throughout the SCAB. Each monitoring station measures concentrations of air pollutants that are considered representative of the air quality in the respective subregion of the SCAB, referred to as the Source Receptor Area (SRA). The Project site is located in SRA 1 – Central Los Angeles County. The monitoring station that collects ambient air quality data in SRA 1 is the Los Angeles-North Main Street Monitoring Station located at 1630 North Main Street in the City.

Table 3.2-3 displays measured pollutant concentrations, the state and federal standards, and the annual frequencies of concentrations recorded above the standards during the three-year period from 2016 to 2018. The SCAQMD has suspended monitoring of CO and SO_2 in the SCAB due to continued demonstration of attainment status in recent years. Concentrations of O_3, PM_{10}, and $PM_{2.5}$ exceeded applicable standards at various times throughout the most recent three-year period. The monitored concentrations are consistent with the attainment status designations for the SCAB.

Table 3.2-3. Ambient Air Quality Data

Pollutant	Statistics and Standards	Annual Maximum Concentrations and Exceeded Standard Frequencies		
		2016	2017	2018
Ozone (O_3)	Maximum 1-hr Concentration (ppm)	0.103	0.116	0.098
	Days > 0.09 ppm (State 1-hr Standard)	2	6	2
	Maximum 8-hr Concentration (ppm)	0.078	0.086	0.073
	Days > 0.070 ppm (State 8-hr Standard)	4	14	4
	Days > 0.070 ppm (National 8-hr standard)	4	16	4
Nitrogen Dioxide (NO_2)	Maximum 1-hr Concentration (ppm)	0.067	0.081	0.070
	Days > 0.18 ppm (State 1-hr Standard)	0	0	0
	Days > 0.100 ppm (National 1-hr Standard)	0	0	0
Respirable Particulate Matter (PM_{10})	Maximum 24-hr Concentration (µg/m3)	74.6	96.2	81.2
	Days > 50 µg/m3 (State 24-hr Standard)	21	40	31
	Days > 150 µg/m3 (Federal 24-hr Standard)	0	0	0
	Annual Concentration (µg/m3)	30	27	34
	Exceed State Annual Standard (20 µg/m3)	Yes	Yes	Yes
Fine Particulate Matter ($PM_{2.5}$)	Maximum 24-hr Concentration (µg/m3)	49.4	61.7	65.3
	Days > 35 µg/m3 (National 24-hr Standard)	2	6	6
	Annual Concentration (µg/m3)	12.0	16.3	16.0
	Exceed State Annual Standard (12 µg/m3)	Yes	Yes	Yes
	Exceed Federal Annual Standard (12.0 µg/m3)	Yes	Yes	Yes

Source: CARB 2019a; 2020; SCAQMD 2019.
Notes: ppm = parts per million; µg/m^3 = micrograms per cubic meter.

Project Site Emissions

The Zoo is developed with approximately 1,259,930 square feet (sf) of animal care and exhibit spaces, visitor-serving facilities, food and beverage facilities, retail, administration buildings, service buildings (refer to Table 2-2). These facilities are managed by 570 full- and part-time employees, and the Zoo is visited by over 1.7 million people annually. Operation of the Zoo, as well as vehicle trips generated by employees and visitors generates criteria pollutant emissions. As discussed in Section 3.15, *Transportation,* operation of the Zoo generates an estimated and 69,638,350 annual vehicle miles traveled (VMT). The estimated annual operational air emissions associated with existing Zoo operations have been calculated utilizing the California Emissions Estimator Model (CalEEMod Version 2016.3.2) as recommended by the SCAQMD and are shown in Table 3.2-4.

Table 3.2-4. Estimated Operational Emissions for the Existing Project Site

Air Pollutant	SCAQMD Thresholds[2]	Operational Emissions[1] (pounds/day)				
		Maintenance Sources	Energy Sources	Fugitive Area Sources	Mobile	Total
VOC	55	8.7	<0.1	4.8	8.1	21.6
NOx	55	3.0	1.4	-	21.1	25.5
CO	550	55.0	0.6	-	265.0	320.6
SOx	150	<0.1	<0.1	-	0.7	0.7
PM_{10}	150	0.4	<0.1	-	9.6	9.9
$PM_{2.5}$	55	0.3	<0.1	-	4.1	4.4

[1] Refer to Appendix D for CalEEMod output sheets; overall = emissions based on rounded totals.
[2] SCAQMD Thresholds discussed in Section 3.2.3, *Impact Assessment and Methodology*.

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. The CARB has identified the following groups who are most likely to experience adverse health effects due to exposure to air pollution: children less than 14 years of age, the elderly over 65 years of age, athletes, and people with cardiovascular and chronic respiratory diseases (CARB 2005). According to the SCAQMD, land uses that constitute sensitive receptors include residences, schools, playgrounds, childcare centers, athletic facilities, long-term health care facilities, rehabilitation centers, convalescent centers, and retirement homes. SCAQMD guidance for assessed localized air quality impacts requires the identification of sensitive receptors within 500 meters (1,640 feet) of emission sources (SCAQMD 2005).

Sensitive receptors within 500 meters of the Project site include the parks and recreational facilities surrounding the Zoo within Griffith Park, including John Ferraro Athletic Fields (approximately 0.3 miles northwest of the Project site) and Mineral Wells Picnic Area (just west of the Gottlieb Animal Health and Conservation Center, approximately 75 feet from the Project site boundary), and the Zoo Magnet Center located on the Project site in the southern parking lot. Within the Zoo, sensitive receptors to air pollution are Zoo visitors, including children, as well as resident animal species that may be sensitive to pollutant emissions; however, it is noted that captive animal species may have a unique sensitivity to the air quality setting of an urban environment.

3.2.3 Impact Assessment Methodology

Significance Thresholds

According to Appendix G of the CEQA Guidelines, the Project would have a potentially significant effect on air quality if it would:

a. Conflict with or obstruct implementation of the applicable air quality plan.
b. 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.
c. Expose sensitive receptors to substantial pollutant concentrations.
d. Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

For local thresholds of significance, the SCAQMD published its CEQA Air Quality Handbook to guide air quality assessments for CEQA projects within its jurisdiction (SCAQMD 2003), and supplemental updates have been published to the agency website as air quality impacts assessment procedures evolved over time. To assist in the impact assessment of air pollutant emissions, the SCAQMD established mass daily threshold screening values for air pollutant emissions from CEQA projects within the SCAB (SCAQMD 2019b). The mass daily thresholds were derived using regional emissions modeling techniques to prevent the occurrence of air quality violations that would obstruct implementation of the regional AQMP and hinder efforts to improve regional air quality and are discussed in greater detail below.

Methodology

The methodology used in this assessment focuses on characterizing daily air pollutant emissions that would be generated by Project-related activities during construction and future operations. As described in Section 2.0, *Project Description* and Section 3.0, *Introduction to the Environmental Impact Analysis*, Project improvements have been separated into near-term improvements occurring within the first 10 years of the Vision Plan (2020–2030) and long-term improvements that would occur during the latter 10 years of the Vision Plan (2030–2040). The near-term improvements are separated into three phases and summarized in Table 2-22, and the long-term improvements are separated into four phases and summarized in Table 2-23.

As described in Section 3.0, *Introduction to the Environmental Impact Analysis*, the Vision Plan represents a programmatic plan for redevelopment of the Zoo over the next 20 years. Though more detail is provided for near-term improvements, such as those anticipated to occur in the near-term Phases 1 through 3, sufficient detail necessary to perform a detailed estimate of air emissions from construction and operation is not feasible. Given the lack of detail regarding specific improvements and their associated emissions rates, the following analysis of Project impacts reflects a programmatic approach based on growth projections and new development areas, estimating reasonable worst-case emissions for peak construction activity and ongoing Zoo operation. As such, the construction activities assessment characterizes the daily emissions that would occur during each activity involved in the three near-term phases, and the operational assessment characterizes daily air pollutant emissions that would be generated by source activity in the interim development

years of 2025, 2027, 2030, as well as the ultimate completion year of 2040, as further detailed below.

Construction Emissions Estimates

Air pollutant emissions that would be generated by the near-term construction activities involved in Phases 1 through 3 and summarized in Table 2-22 were quantified using CalEEMod, Version 2016.3.2. CalEEMod is the preferred emissions estimation model for land use development projects in California. Long-term activities involved in Phases 4 through 7 and summarized in Table 2-23 are evaluated qualitatively, as detailed information describing their implementation is not available at the time of CEQA document preparation. Construction would adhere to a schedule such that each phase would be completed prior to the commencement of the subsequent phase construction, eliminating the possibility of overlapping emissions between phases of the Vision Plan. Each phase under the Vision Plan is assumed to begin immediately following completion of the prior phase, resulting in a continuous 20-year long construction schedule. Generally, each phase of construction activities would involve demolition, grading and excavation, site preparation including installation of utilities and stormwater infrastructure, construction and paving, and architectural coating and finishing. The equipment inventories and maximum daily activities would be consistent between Phases 1 through 3.

CalEEMod produces estimates of daily air pollutant emissions from sources including off-road equipment exhaust, on-road vehicle trips, and area source emissions including fugitive dust particulate matter and evaporative emissions from paving and architectural coating activities. Practical equipment inventory combinations were populated for each of the activities described in Table 2-22 using information contained in Section 2.0, *Project Description* and the general equipment list provided in Table 2-24. Detailed equipment and vehicle inventories for each activity outlined in Table 2-22 can be found in the Air Quality Emissions Modeling files in Appendix D. Assumptions for equipment quantities, duration of operation, number of truck trips per day, and number of construction employees were estimated based on a level of reasonableness for typical and similar types of construction. Table 3.2-5 provides a general summary of the input parameters for CalEEMod.

Table 3.2-5. Summary of Near-Term Construction Emissions Input Parameters

Near-Term Improvements Schedule and Daily Activities			
Parameter	**Phase 1**	**Phase 2**	**Phase 3**
Start and End Dates	2020–2025	2025–2027	2027–2030
Approx. Redevelopment Area (Acres)	40	25	25
Demolition Max. Equipment Count	8	8	8
Demolition Max. Truckloads/Day	40	40	40
Demolition Maximum Crew Size	50	50	50
Grading Max. Equipment Count	10	10	10
Grading Excavation (Approx. Cubic Yards)	74,000	-	-
Grading Fill Import (Approx. Cubic Yards)	-	-	10,000
Grading Max. Truckloads/Day	40	-	20
Grading Maximum Crew Size	50	40	40
Site Prep Max. Equipment Count	8	8	8
Site Prep Max. Vendor Deliveries/Day	20	20	20
Site Prep Maximum Crew Size	50	50	50
Bldg. Construction Max. Equip. Ct.	12	12	12
Bldg. Construction Max Vendor Deliveries/Day	40	40	40
Bldg. Construction Maximum Crew Size	50	50	50
Approx. Paving Area (Acres)	11	1	1
Paving Max. Equipment Count	8	8	8
Paving Max. Material Trucks/Day	20	20	20
Paving Maximum Crew Size	20	20	20
Architectural Coating Max. Equipment Count	8	8	8
Architectural Coating Maximum Crew Size	20	20	20

In addition to characterizing emissions from the individual stages of redevelopment within each phase of construction, the air quality analysis assessed a scenario involving maximum potential emissions source activity on a single day. The parameters presented in Table 3.2-5 represent conservative inventories of the equipment and vehicle fleets that would be employed to complete each stage of redevelopment involved in project construction. On a daily basis, active sources of emissions—such as the number of equipment in operation, hours of equipment use, construction crew size, and daily truck trips—would be variable throughout the 10-year near term improvements, and several facility components would be under construction concurrently at various times during each of the first three phases. Based on the site configuration and the size of the redevelopment areas, the maximum potential daily construction activity would occur during the early stages of Phase 1 and comprise a combination of:

- Realigning Western Heritage Way around the perimeter of the southern parking lot;
- Improving and repaving the intersection of Zoo Drive and Western Heritage way;

- Redesigning the southern parking lot at the North Hollywood High School Zoo Magnet Center;
- Blasting and excavating to expand Condor Canyon and exporting displaced material;
- Limited grading of hillsides within California Planning Area for pedestrian pathways;
- Demolition and regrading of the Zoo Entry and Sea Lion Exhibit; and
- Excavation of soils for stormwater infrastructure installation within the Zoo Entry

Table 3.2-6 below presents the emission source inventory for Phase 1 combined activity. In accordance with SCAQMD guidance, air pollutant emissions that would be generated by sources involved in construction of the Project are analyzed on both regional and localized scales, and are evaluated in the context of the corresponding SCAQMD Air Quality Significance Thresholds for mass daily emissions.

Table 3.2-6. Phase 1 Emissions Source Inventory – Maximum Daily Activity Scenario

Equipment and Vehicle Fleets for Simultaneous Phase 1 Improvements			
Activity Description	**Equipment (#) Type [Hr/Day]**	**Crew Trips (Workers/Day)**	**Haul Trucks (Rd. Trips/Day)**
Roadway Realignments	(1) Backhoe [8] (1) Compactor [8] (1) Dozer [8] (1) Paver [8]	10	10
Intersection Improvements	(1) Crane [4] (1) Backhoe [8] (1) Paver [8] (1) Boom Lift [8]	10	10
Southern Parking Lot Redesign	(1) Compressor [6] (1) Backhoe [8]	5	-
Condor Canyon Excavation	(1) Tractor [8] (2) Excavator [8] (2) Loader [8] (1) Pile Driver	10	20
California Hillside Grading	(1) Grader [8] (1) Dozer [8] (1) Compactor [8]	5	10
Zoo Entry Demo & Regrading	(1) Excavator [8] (1) Backhoe [8] (1) Dozer [8]	10	20
Stormwater System Installation	(1) Excavator [8] (2) Forklift [8]	10	10
Totals	**25**	**60**	**80**

Regional emissions refer to air pollutant emissions that would be generated by all sources involved in construction of the Project, including sources located on the Project site (equipment and area sources) as well as remote emissions associated with mobile on-road vehicle trips. The regional mass daily thresholds were derived as screening metrics for average daily emissions associated with temporary construction-related sources. Daily pollutant emissions were estimated for each construction activity during Phase 1 through Phase 3, and the maximum daily emissions were determined and compared to the SCAQMD regional mass daily thresholds are shown below in Table 3.2-7.

Table 3.2-7. SCAQMD Air Quality Significance Thresholds – Construction

Mass Daily Thresholds (lbs/day)						
Scale	**VOC**	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
Regional	75	100	550	150	150	55
Localized	-	134	1,454	-	12	6

In addition to total daily regional emissions, SCAQMD recommends that daily emissions of air pollutants generated by sources exclusively situated on a project site be evaluated to ensure that substantial localized pollutant concentrations would not materialize at sensitive receptor locations in close proximity to the construction activities. Based on local ambient air quality data obtained from the nearest air monitoring station, SCAQMD derived localized significance threshold (LST) screening values applicable only to those emissions produced by sources on the Project site, namely equipment exhaust and fugitive area sources. The SCAQMD jurisdiction is divided into 38 SRAs based on locations of air monitoring stations. The Project site is located in SRA 1 – Central Los Angeles County. SCAQMD's *Final Localized Significance Threshold Methodology* (SCAQMD 2008) and LST screening approach is intended to apply only to project sites smaller than 5 acres and with sensitive receptors located within 500 feet of the site. As previously described, the Project site encompasses an area of 142 acres, with a maximum single construction area of 40 acres during Phase 1 (see Table 3.2-5). Given these conditions, SCAQMD's LST screening approach would not normally apply; however, this assessment presents an analysis of the Project's estimated construction emissions and the SCAQMD's LST screening approach as a conservative assessment to aid in the determination of impacts associated with the potential exposure of sensitive receptors to criteria pollutant concentrations.

For the purposes of this analysis, the appropriate LST values were determined using the *Mass Rate Lookup Tables* included as *Appendix C* to the *Final Localized Significance Threshold Methodology* (SCAQMD 2008), the SCAQMD guidance contained in the *Fact Sheet for Applying CalEEMod to Localized Significance Thresholds* (SCAQMD 2013), and the Project-specific equipment inventories. The applicable localized significance thresholds are summarized in Table 3.2-7 for a four-acre construction site within SRA 1. Though the nearest sensitive receptor to the Project site (Mineral Wells Picnic Area) is located approximately 75 feet west of the Project site, the localized significance thresholds applied for this analysis

utilize a distance of only 25 feet from construction emissions sources in the attempt to present a conservative assessment.

The potential significance of air quality impacts related to the magnitude of emissions resulting from construction activities was determined by the comparison of daily pollutant emissions to applicable regional mass daily thresholds and LST values. SCAQMD guidance states that if regional and localized emissions remain below the corresponding thresholds, construction emissions would not result in a significant air quality impact. The emissions comparison is used to determine the potential significance of air quality impacts in the context of the criteria outlined in the Environmental Checklist Form included as Appendix G to the CEQA Guidelines. The emissions were evaluated for consistency with the applicable air quality management plan and whether a public nuisance may be consequential.

Operational Emissions Estimates

Operational emissions were analyzed in the interim near-term improvement years of 2025, 2027, and 2030, as well as ultimate buildout in 2040. Future operational air pollutant emissions would be predominantly attributed to new on-road vehicle trips by new Zoo employees and visitors. Additional minor area and energy source emissions would be generated by chemically formulated products use (i.e., cleaners and solvents), landscaping, and reapplication of architectural coatings, and natural gas combustion, respectively. Operational mobile source emissions from on-road vehicle travel were estimated using the results of trip generation and VMT data produced by the *Los Angeles Zoo Vision Plan Transportation Assessment* (Fehr & Peers 2020), included as Appendix N of this EIR. Daily VMT under Existing Conditions and in 2025, 2027, 2030, and 2040 were multiplied by corresponding air pollutant emission factors produced by the CARB mobile source emissions model EMFAC2017, which are provided in units of grams of pollutant emitted per VMT. The default regional vehicle fleet mix was used.

Operational emissions attributed to consumer products use, landscaping, reapplication of architectural coatings, and natural gas combustion were estimated using the recommended methodologies contained in the *CalEEMod User's Guide – Appendix A Calculation Details for CalEEMod*. The consumer products and architectural coating reapplication emissions are estimated based on the building square footage and applicable CalEEMod emissions factors. Existing and future natural gas use was estimated using CalEEMod utility factors in conjunction with estimates of existing and proposed Zoo facilities. The incremental difference in daily operational emissions between Existing Conditions and each interim and ultimate analysis year were compared to the applicable SCAQMD regional significance thresholds for operations presented in Table 3.2-8. The air quality significance determination for operational emissions assessment focuses on operational emissions that would be present under full buildout of the Project in 2040 and evaluates them in the context of the Existing Plus Project condition in 2019 relative to Existing Conditions.

Table 3.2-8. SCAQMD Air Quality Significance Thresholds – Operation

Mass Daily Thresholds (lbs/day)						
Scale	**VOC**	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
Regional	55	55	550	150	150	55

Construction or operation of the Project may result in a significant air quality impact if daily pollutant emissions exceed the regional air quality significance thresholds from the SCAQMD Air Quality Handbook presented in Table 3.2-7 and Table 3.2-8, or if daily emissions resulted in incremental increases in localized criteria pollutant concentrations exceeding CEQA air quality standards derived from SCAQMD Rule 1303 (Table A-2) and Rule 403 for particulate matter:

- NO_2 and CO: significant impacts occur if CAAQS or NAAQS are exceeded.
- PM_{10} and $PM_{2.5}$: significant impacts occur if emissions cause incremental increase in 24-hour average concentrations of 10.4 µg/m^3 (construction) or 2.5 µg/m^3 (operation).

The impact assessment also considers Project emissions on a cumulative scale and the potential for public nuisances related to dust and odors to arise during construction and operations.

3.2.4 Environmental Impacts Analysis

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

The applicable air quality plan is the SCAQMD 2016 AQMP, which in part is based on underlying growth projections within the SCAG 2016–2040 RTP/SCS. Although the SCAG has published the Proposed Final 2020-2045 RTP/SCS, it has not been formally adopted by SCAG and is therefore not considered in this analysis. In accordance with the procedures established in the SCAQMD's CEQA Air Quality Handbook, the impact discussion addresses the following criteria to determine whether the Project is consistent with applicable planning objectives:

- Would the Project result in any of the following?
  - An increase in the frequency or severity of existing air quality violations;
  - Causing or contributing to new air quality violations; or
  - Delaying timely attainment of air quality standards or the interim emission reductions specified in the AQMP.
- And, would the Project exceed the assumptions utilized in preparing the AQMP?
  - Is the project consistent with the population and employment growth projections upon which AQMP forecasted emission levels are based;
  - Does the project include air quality mitigation measures; or
  - To what extent is project development consistent with the AQMP land use policies?

Air quality violations occur when facilities are out of compliance with applicable SCAQMD rule requirements, permit conditions or legal requirements, or with applicable state or federal air pollution regulations. The regional and localized air quality significance thresholds were designed as a screening tool to avoid the potential occurrence and exacerbation of air quality violations resulting from construction and operation of individual CEQA projects based on the designation of emissions sources warranting advanced permitting and regulation. The second indicator of AQMP consistency is assessed by determining potential effects of permanent facility operations on population, housing, and employment assumptions that were used in the development of the AQMP and the RTP/SCS. If implementation of the Project would render the assumptions invalid, a significant air quality impact may occur.

As discussed in further detail below, the proposed Project would generate temporary employment opportunities during construction and approximately 531 new long-term employment opportunities as a result of expanded Zoo operations and facilities. Most of these new employees are expected to come from the existing City or regional workforce and would not increase regional population. This negligible increase in the regional population would be consistent with adopted City growth forecasts, which informs regional population estimates for SCAG and the 2016 AQMP. Therefore, the proposed Project would not exceed the 2016 AQMP's population forecast.

Construction

Construction activities would not introduce population or employment growth to the SCAG region and would have no impact related to underlying assumptions factored into the AQMP inventories. The assessment of consistency with the AQMP focuses on the potential for construction of the proposed Project to create or contribute to air quality violations and possibly delay air quality standards attainment. As described above in Section 3.2.3, *Impact Assessment Methodology*, sources of air pollutant emissions that would be involved in construction activities include off-road equipment exhaust, on-site ground disturbance and material displacement creating area source fugitive dust, evaporative emissions from architectural coating and paving, and on-road trips by the crew and hauling vehicle fleet.

As discussed in detail in Section 2.0, *Project Description*, construction of the proposed Project facilities will be separated into near-term improvements to be completed by 2030 (Phase 1 through Phase 3) and long-term improvements (Phase 4 through Phase 7) to be developed between 2030 and 2040. Given the scope of work to be completed in each phase—and acknowledging that construction equipment and vehicle emissions will decrease on average in future years as more stringent emissions standards and newer fleets are introduced—it is anticipated that daily emissions would be higher during the near-term improvements than during the latter 10 years of the Vision Plan. Furthermore, a greater degree of detail regarding the schedule of improvements and required construction inventories is available for Phase 1 through Phase 3. Therefore, daily emissions were estimated using CalEEMod for activities comprising Phase 1, Phase 2, and Phase 3 construction described in Table 3.2-5. Additionally,

maximum daily emissions from potentially concurrent site facility improvements during Phase 1 characterized in Table 3.2-6 were estimated in CalEEMod and evaluated in the context of the SCAQMD mass daily thresholds of significance under CEQA.

Phase 1 improvements would occur between approximately 2020 and 2025 and would be completed prior to construction of Phase 2. Table 3.2-9 presents the daily emissions that would be generated by sources during each of the individual activities involved in Phase 1 improvements, as well as the applicable SCAQMD mass daily thresholds for construction. The emissions correspond to the maximum crew size and equipment inventory that would be needed to complete each activity. All construction activities would be subject to the provisions of SCAQMD Rules 401 (Visible Emissions), 402 (Nuisance), and 403 (Fugitive Dust). Best management practices for fugitive dust control include application of at least three times daily to disturbed surface areas and open storage piles, as well as demolition debris and material stockpile stabilization. Application of water to disturbed surface areas and open storage piles reduces fugitive dust by 61 percent. The emissions modeling of Project construction activities includes consideration of these existing regulations.

Table 3.2-9 lists the maximum daily emissions by each construction activity phase during Phase I improvements, assuming that each activity phase (i.e., demolition, grading, site preparation, building construction, etc.) would occur independently and sequentially. When evaluated independently, the construction activities comprising Phase 1 improvements would not generate emissions of air pollutants in excess of any applicable SCAQMD regional or localized threshold.

Phase 2 improvements would occur between approximately 2025 and 2027 and would be completed prior to construction of Phase 3. Generally, the equipment inventories would be similar to Phase 1 for each Phase 2 activity. Table 3.2-10 presents the daily emissions that would be generated by sources during each of the individual activity phases involved in Phase 2 improvements, as well as the applicable SCAQMD mass daily thresholds for construction. All construction activities would be subject to the provisions of SCAQMD Rules 401 (Visible Emissions), 402 (Nuisance), and 403 (Fugitive Dust). As shown in Table 3.2-10, when evaluated independently, the construction activities comprising Phase 2 improvements would not generate emissions of air pollutants in excess of any applicable SCAQMD regional or localized threshold.

Phase 3 improvements would occur between approximately 2027 and 2030. Table 3.2-11 presents the daily emissions that would be generated by sources during each of the individual activity phases involved in Phase 3 improvements, as well as the applicable SCAQMD mass daily thresholds for construction. All construction activities would be subject to the provisions of SCAQMD Rules 401 (Visible Emissions), 402 (Nuisance), and 403 (Fugitive Dust). As shown in Table 3.2-11, when evaluated independently, the construction activities comprising Phase 3 improvements would not generate emissions of air pollutants in excess of any applicable SCAQMD regional or localized threshold.

Table 3.2-9. Phase 1 Improvements Daily Construction Emissions

Estimated Daily Pollutant Emissions by Activity – Phase 1						
Activity Phase and Source Location	**Daily Emissions (Pounds Per Day)**					
	VOC	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
DEMOLITION						
On-Site Emissions	3.9	38.3	26.7	<0.1	2.4	1.9
Off-Site Emissions	1.2	23.7	9.4	<0.1	3.4	0.9
Total	***5.1***	***62.0***	***36.2***	***<0.1***	***5.8***	***2.9***
GRADING						
On-Site Emissions	5.7	63.3	36.7	<0.1	8.7	5.2
Off-Site Emissions	1.2	22.0	9.0	<0.1	3.0	0.9
Total	***6.9***	***85.3***	***45.7***	***<0.1***	***11.7***	***6.1***
SITE PREPARATION						
On-Site Emissions	2.6	28.3	19.2	<0.1	6.0	3.8
Off-Site Emissions	0.7	7.7	5.5	<0.1	1.7	0.5
Total	***3.3***	***35.9***	***24.7***	***<0.1***	***7.6***	***4.2***
BUILDING CONSTRUCTION						
On-Site Emissions	1.4	16.6	22.1	<0.1	0.7	0.6
Off-Site Emissions	0.6	5.8	5.0	<0.1	1.6	0.5
Total	***2.0***	***22.5***	***27.1***	***<0.1***	***2.3***	***1.1***
PAVING						
On-Site Emissions	1.5	12.4	19.1	<0.1	0.6	0.6
Off-Site Emissions	0.2	2.9	2.1	<0.1	0.7	0.2
Total	***1.7***	***15.3***	***21.2***	***<0.1***	***1.3***	***0.8***
ARCHITECTURAL COATING						
On-Site Emissions	18.8	8.2	14.0	<0.1	0.3	0.3
Off-Site Emissions	0.2	0.1	1.1	<0.1	0.5	0.1
Total	***19.0***	***8.3***	***15.1***	***<0.1***	***0.8***	***0.4***
REGIONAL ANALYSIS						
Maximum Regional (On-Site and Off-Site) Emissions for Activity Phase	**19.0**	**85.3**	**45.7**	**<0.1**	**11.7**	**6.1**
Regional Significance Threshold	75	100	550	150	150	55
Exceed Regional Threshold?	**No**	**No**	**No**	**No**	**No**	**No**
LOCALIZED ANALYSIS						
Maximum Localized (On-Site) Emissions	--	**63.3**	**36.7**	--	**8.7**	**5.2**
Localized Significance Threshold	--	134	1,454	--	12	6
Exceed Localized Threshold?	--	**No**	**No**	--	**No**	**No**

Source: Appendix D, CalEEMod Estimate Worksheets

Table 3.2-10. Phase 2 Improvements Daily Construction Emissions

Estimated Daily Pollutant Emissions by Activity – Phase 2						
Activity Phase and Source Location	**Daily Emissions (Pounds Per Day)**					
	VOC	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
DEMOLITION						
On-Site Emissions	2.5	22.9	24.3	<0.1	1.5	1.0
Off-Site Emissions	0.8	13.2	7.5	<0.1	2.5	0.7
Total	***3.3***	***36.1***	***31.8***	***<0.1***	***4.0***	***1.7***
GRADING						
On-Site Emissions	3.9	38.0	30.9	<0.1	7.5	4.1
Off-Site Emissions	0.4	0.2	2.7	<0.1	1.1	0.3
Total	***4.2***	***38.3***	***33.6***	***<0.1***	***8.6***	***4.4***
SITE PREPARATION						
On-Site Emissions	2.1	22.0	17.9	<0.1	5.6	3.4
Off-Site Emissions	0.5	5.7	4.3	<0.1	1.6	0.5
Total	***2.7***	***27.6***	***22.2***	***<0.1***	***7.2***	***3.9***
BUILDING CONSTRUCTION						
On-Site Emissions	1.3	14.7	22.0	<0.1	0.5	0.5
Off-Site Emissions	0.5	5.6	4.1	<0.1	2.2	0.9
Total	***1.8***	***20.3***	***26.1***	***<0.1***	***2.2***	***0.9***
PAVING						
On-Site Emissions	1.2	11.3	19.0	<0.1	0.5	0.5
Off-Site Emissions	0.2	2.8	1.8	<0.1	0.7	0.2
Total	***1.4***	***14.0***	***20.8***	***<0.1***	***1.2***	***0.7***
ARCHITECTURAL COATING						
On-Site Emissions	10.0	8.2	14.0	<0.1	0.3	0.3
Off-Site Emissions	0.1	0.1	0.9	<0.1	0.5	0.1
Total	***10.1***	***8.3***	***14.9***	***<0.1***	***0.7***	***0.4***
REGIONAL ANALYSIS						
Maximum Regional (On-Site and Off-Site) Emissions for Activity Phase	**10.1**	**38.3**	**33.6**	**<0.1**	**8.6**	**4.4**
Regional Significance Threshold	75	100	550	150	150	55
Exceed Regional Threshold?	**No**	**No**	**No**	**No**	**No**	**No**
LOCALIZED ANALYSIS						
Maximum Localized (On-Site) Emissions	--	**38.0**	**30.9**	--	**7.5**	**4.1**
Localized Significance Threshold	--	134	1,454	--	12	6
Exceed Localized Threshold?	--	**No**	**No**	--	**No**	**No**

Source: Appendix D, CalEEMod Estimate Worksheets

Table 3.2-11. Phase 3 Improvements Daily Construction Emissions

Estimated Daily Pollutant Emissions by Activity – Phase 3						
Activity Phase and Source Location	**Daily Emissions (Pounds Per Day)**					
	VOC	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
DEMOLITION						
On-Site Emissions	2.5	22.9	24.3	<0.1	1.2	1.0
Off-Site Emissions	0.8	12.8	7.2	<0.1	9.2	2.4
Total	***3.3***	***35.7***	***31.5***	***<0.1***	***10.4***	***3.4***
GRADING						
On-Site Emissions	3.9	38.0	30.9	<0.1	7.5	4.1
Off-Site Emissions	0.5	6.4	4.7	<0.1	2.1	0.6
Total	***4.4***	***44.4***	***35.6***	***<0.1***	***9.6***	***4.7***
SITE PREPARATION						
On-Site Emissions	2.1	22.0	17.9	<0.1	5.6	3.4
Off-Site Emissions	0.5	5.5	3.8	<0.1	1.6	0.5
Total	***2.6***	***27.4***	***21.7***	***<0.1***	***7.2***	***3.9***
BUILDING CONSTRUCTION						
On-Site Emissions	1.3	14.7	22.0	<0.1	0.5	0.5
Off-Site Emissions	0.5	5.5	3.8	<0.1	1.6	0.5
Total	***1.8***	***20.2***	***25.7***	***<0.1***	***2.2***	***0.9***
PAVING						
On-Site Emissions	1.8	9.2	20.5	<0.1	0.4	0.4
Off-Site Emissions	0.2	2.7	1.6	<0.1	0.7	0.2
Total	***2.0***	***11.9***	***22.1***	***<0.1***	***1.1***	***0.6***
ARCHITECTURAL COATING						
On-Site Emissions	14.4	6.9	14.8	<0.1	0.2	0.2
Off-Site Emissions	0.2	2.7	1.6	<0.1	0.7	0.2
Total	***14.6***	***9.6***	***16.4***	***<0.1***	***0.9***	***0.4***
REGIONAL ANALYSIS						
Maximum Regional (On-Site and Off-Site) Emissions for Activity Phase	**14.6**	**44.4**	**35.6**	**<0.1**	**9.6**	**4.7**
Regional Significance Threshold	75	100	550	150	150	55
Exceed Regional Threshold?	**No**	**No**	**No**	**No**	**No**	**No**
LOCALIZED ANALYSIS						
Maximum Localized (On-Site) Emissions	**--**	**38.0**	**30.9**	**--**	**7.5**	**4.1**
Localized Significance Threshold	--	134	1,454	**--**	12	6
Exceed Localized Threshold?	**--**	**No**	**No**	**--**	**No**	**No**

Source: Appendix D, CalEEMod Estimate Worksheets

The near-term improvements emissions modeling demonstrates that if construction activity phases within each planning Phase were completed sequentially, daily pollutant emissions would not exceed any applicable SCAQMD regional or localized threshold. However, it is anticipated that improvements would be developed at several sites across the Zoo property simultaneously during each planning Phase, and daily activity would fluctuate throughout the course of each activity phase. For example, during Phase 1, construction activities would occur within the Zoo to redevelop the Zoo Entry and expand into the California planning area, overlapped with exterior improvements to realign Western Heritage Way/Crystal Springs Drive, install a signalized intersection at Zoo Drive, and raze the south parking lot to accommodate 300 additional spaces and provide low impact development (LID; e.g., bioswales, permeable paving, etc.). Based on preliminary scheduling and site feasibility constraints, maximum daily activities were determined to occur during Phase 1, as it involves a greater number of individual improvements and more intensive construction activities, and would be characterized by the emissions source inventory presented in Table 3.2-6, above. Since the maximum daily construction activities were determined to occur during Phase 1, this represents the maximum daily emissions that would be generated during all of the proposed near-term improvements. Table 3.2-12 presents the maximum daily emissions that would be generated by simultaneous improvements during Phase 1 construction. The results of the maximum daily emissions modeling demonstrate that construction of Phase 1 with an overlap in construction activity phases could potentially result in a significant air quality impact related to emissions of NO_X, as emissions would exceed the applicable regional threshold value.

Table 3.2-12. Phase 1 Maximum Daily Emissions - Unmitigated

Proposed Project Construction Estimated Maximum Daily Pollutant Emissions						
	Daily Emissions (Pounds Per Day)					
Proposed Project Source	**VOC**	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
On-Site Off-Road Equipment	8.0	84.5	61.6	0.1	3.9	3.6
On-Site Fugitive Area Sources	52.1	-	-	-	4.9	1.6
Off-Site Mobile Vehicle Trips	1.9	43.8	15.1	0.1	4.3	1.3
REGIONAL ANALYSIS						
Maximum Regional Emissions	**62.0**	**128.3**	**76.7**	**0.3**	**13.1**	**6.5**
Regional Significance Threshold	75	100	550	150	150	55
Exceed Regional Threshold?	**No**	**Yes**	**No**	**No**	**No**	**No**
LOCALIZED ANALYSIS						
Maximum Localized Emissions	--	**84.5**	**61.6**	--	**8.8**	**5.2**
Localized Significance Threshold	--	134	1,454	--	12	6
Exceed Localized Threshold?	--	**No**	**No**	--	**No**	**No**

Source: Appendix D, CalEEMod Estimate Worksheets

NOx emissions are most closely associated with diesel engines in off-road equipment. To address these potentially significant emissions, **MM AQ-1** would reduce air pollutant

emissions from off-road equipment during construction of the proposed Project. **MM AQ-1** would require that all diesel-powered construction equipment with engines greater than 50 horsepower (hp) shall meet, at a minimum, Tier 4 Final emissions standards. Tier 4 standards were introduced in 2004 and have been phased in from 2008 through 2015. As a result of gradual replacement of equipment with outdated emissions technologies with equipment meeting Tier 4 standards, equipment fleets with engines meeting these standards are widely available in the commercial sector, and utilization of a full fleet of Tier 4 equipment is considered feasible for the Project. Table 3.2-13 presents the estimated maximum daily emissions during construction with implementation of this mitigation. The emissions presented therein demonstrate the effectiveness of **MM AQ-1** in reducing emissions of air pollutants from off-road construction equipment. Thus, with implementation of **MM AQ-1**, maximum daily emissions during the entirety of Vision Plan construction would remain below applicable SCAQMD mass daily thresholds of significance at both the regional and localized scales.

Table 3.2-13. Phases 1 Maximum Daily Emissions - Mitigated

Proposed Project Construction Estimated Maximum Daily Pollutant Emissions						
	Daily Emissions (Pounds Per Day)					
Proposed Project Source	**VOC**	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
On-Site Off-Road Equipment	1.5	7.2	72.5	0.1	0.2	0.2
On-Site Fugitive Area Sources	52.1	-	-	-	4.9	1.6
Off-Site Mobile Vehicle Trips	1.9	43.8	15.1	0.1	4.3	1.3
REGIONAL ANALYSIS						
Maximum Regional Emissions	**55.5**	**51.0**	**87.6**	**0.3**	**9.3**	**3.1**
Regional Significance Threshold	75	100	550	150	150	55
Exceed Regional Threshold?	**No**	**No**	**No**	**No**	**No**	**No**
LOCALIZED ANALYSIS						
Maximum Localized Emissions	--	**7.2**	**72.5**	--	**5.1**	**2.2**
Localized Significance Threshold	--	134	1,454	--	12	6
Exceed Localized Threshold?	--	**No**	**No**	--	**No**	**No**

Source: Appendix D, CalEEMod Estimate Worksheets

The mitigated emissions would not have the potential to conflict with or obstruct implementation of the 2016 AQMP by exacerbating air quality violations or delaying attainment of the air quality standards. Therefore, proposed Project impacts related to the applicable air quality plan would be *less than significant with mitigation*.

Operation

Implementation of the Vision Plan would expand Zoo capacity and accommodate more attendance over the next 20 years. Operation of the proposed Project would create new jobs in the City but would not directly introduce new population or housing growth to the region.

Under existing conditions, Zoo operations employ a total of 570 full- and part-time employees, generating approximately 524 to 652 daily employee vehicle trips depending on the day of the week. By 2040, the daily employees and associated vehicle trips at Zoo facilities are anticipated to nearly double with implementation of the Vision Plan to between 1,012 to 1,259 daily employee vehicle trips depending on the day of the week (see Section 3.15, *Transportation*). According to SCAG projections, employment within the City is anticipated to increase by approximately 472,700 between 2012 and 2040, to which the increase in employment under the Project (531 new employees) would represent only 0.1 percent. The approximate doubling of daily Zoo employment under the Vision Plan and corresponding increase in daily vehicle trips and vehicle miles traveled would not introduce sufficient new growth to the area to render the SCAG employment growth projections for the City invalid in the underlying assumptions for the AQMP.

Operation of the Zoo facilities would expand incrementally over time with implementation of the Vision Plan. Phase 1 would be completed in 2025, Phase 2 in 2027, Phase 3 in 2030, and all long-term improvements would be completed in 2040. Operational emissions associated with the incremental improvement of the Zoo facilities were estimated for the three interim years and 2040 to determine potential air quality impacts related to exacerbation of air quality violations and air quality standards attainment. Operational emissions are predominantly generated by on-road vehicle trips. Datasets of daily vehicle trips and VMT associated with employee and patron trips were provided by Fehr & Peers for existing conditions and operational conditions in 2025, 2027, 2030, and 2040 (see Appendix N). The highest combined daily VMT for employee and Zoo patron trips occurs on Saturdays and Sundays; therefore, operational emissions account for weekend daily emissions as a reasonable worst-case scenario. Additional operational emissions are associated with facilities maintenance, natural gas use, and consumer products use.

In 2025, total VMT associated with implementation of Phase 1 of the Vision Plan would increase maximum daily VMT generated by both employees and visitors by approximately 27 percent relative to existing conditions. Phase 1 improvements would redevelop the Zoo Entry, expand the California planning area, and reconfigure circulation, providing additional visitor center, restaurant, gift shop, and administrative/service facilities, as well as expanding animal exhibit space and landscaped areas. Air pollutant emissions from maintenance, natural gas, and fugitive area sources were estimated based on the land use buildout assumptions and estimated using extrapolation. Table 3.2-14 presents daily operational emissions in 2025 and analyzes the change from existing conditions.

Table 3.2-14. Proposed Project Operational Emissions – 2025 Analysis

Proposed Project Operation Estimated Daily Pollutant Emissions						
	Daily Emissions (Pounds Per Day)					
Source	**VOC**	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
On-Site Maintenance Sources	10.9	3.1	68.1	<0.1	0.4	0.4
On-Site Energy Sources	<0.1	2.2	1.0	<0.1	<0.1	<0.1
On-Site Fugitive Area Sources	7.3	-	-	-	-	-
Off-Site Mobile Vehicle Trips	10.3	26.9	339.3	0.8	12.3	5.2
Total	***28.5***	***32.2***	***408.4***	***0.8***	***12.7***	***5.6***
Existing Conditions						
On-Site Maintenance Sources	8.7	3.0	55.0	<0.1	0.4	0.3
On-Site Energy Sources	<0.1	2.2	1	<0.1	<0.1	<0.1
On-Site Fugitive Area Sources	4.8	-	-	-	-	-
Off-Site Mobile Vehicle Trips	8.1	21.1	265.0	0.7	9.6	4.1
Total	***21.6***	***25.5***	***320.6***	***0.7***	***9.9***	***4.4***
Regional Analysis						
Net Operational Emissions	**6.9**	**6.7**	**87.8**	**0.2**	**2.7**	**1.2**
Regional Significance Threshold	55	55	550	150	150	55
Exceed Regional Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

Source: Appendix D, CalEEMod Estimate Worksheets

As shown in Table 3.2-14, the incremental change in operational emissions with implementation of Phase 1 improvements would not exceed any applicable SCAQMD mass daily threshold of significance. Operation of Phase 1 would not have the potential to exacerbate air quality violations in the SCAB or possibly delay attainment of the air quality standards as set forth in the 2016 AQMP. Furthermore, operation of the proposed Project after Phase 1 implementation would not expand Zoo facilities beyond the existing site boundary and would not conflict with land use policies promulgated by SCAQMD and SCAG.

In 2027, total ADT and VMT associated with implementation of Phase 2 of the Vision Plan would increase maximum daily VMT by approximately 40 percent relative to existing conditions. Phase 2 improvements would expand the Asia planning area and develop the Rainforest and Nature Play Park, providing additional animal exhibit space, landscaping area, visitor center and amenities space, retail, and security and administrative buildings. Air pollutant emissions from maintenance, natural gas, and fugitive area sources were estimated based on the land use buildout assumptions and estimated using extrapolation. Table 3.2-15 presents daily operational emissions in 2027 and analyzes the change from existing conditions.

Table 3.2-15. Proposed Project Operational Emissions – 2027 Analysis

Phase 2 Operation Estimated Daily Pollutant Emissions						
	Daily Emissions (Pounds Per Day)					
Source	VOC	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
On-Site Maintenance Sources	13.0	3.2	81.2	<0.1	0.5	0.4
On-Site Energy Sources	<0.1	2.4	1.1	<0.1	<0.1	<0.1
On-Site Fugitive Area Sources	8.0	-	-	-	-	-
Off-Site Mobile Vehicle Trips	11.3	29.6	374.4	0.9	13.5	5.7
Total	***32.3***	***35.2***	***456.7***	***0.9***	***14.0***	***6.1***
Existing Conditions						
On-Site Maintenance Sources	8.7	3.0	55.0	<0.1	0.4	0.3
On-Site Energy Sources	<0.1	1.4	0.6	<0.1	<0.1	<0.1
On-Site Fugitive Area Sources	4.8	-	-	-	-	-
Off-Site Mobile Vehicle Trips	8.1	21.1	265.0	0.7	9.6	4.1
Total	***21.6***	***25.5***	***320.6***	***0.7***	***9.9***	***4.4***
Regional Analysis						
Net Operational Emissions	**10.7**	**9.7**	**136.1**	**0.3**	**4.1**	**1.7**
Regional Significance Threshold	55	55	550	150	150	55
Exceed Regional Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

Source: Appendix D, CalEEMod Estimate Worksheets

As shown in Table 3.2-15, the incremental change in operational emissions with implementation of Phase 2 improvements would not exceed any applicable SCAQMD mass daily threshold of significance. Operation of Phase 2 would not have the potential to exacerbate air quality violations in the SCAB or possibly delay attainment of the air quality standards as set forth in the 2016 AQMP. Furthermore, operation of the proposed Project after Phase 2 implementation would not expand Zoo facilities beyond the existing site boundary and would not conflict with land use policies promulgated by SCAQMD and SCAG.

In 2030, total ADT and VMT associated with implementation of Phase 3 of the vision plan would increase maximum daily VMT by approximately 65 percent relative to existing conditions. Phase 3 improvements would expand the Africa planning area including additional visitor center, meeting rooms, retail, and administrative space. Animal space and landscaped areas would be improved and enlarged, and additional 56 parking spaces would be provided. Air pollutant emissions from maintenance, natural gas, and fugitive area sources were estimated based on the land use buildout assumptions and estimated using extrapolation. Table 3.2-16 presents daily operational emissions in 2027 and analyzes the change from existing conditions.

Table 3.2-16. Proposed Project Operational Emissions – 2030 Analysis

Phase 3 Operation Estimated Daily Pollutant Emissions						
	Daily Emissions (Pounds Per Day)					
Source	VOC	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
On-Site Maintenance Sources	15.1	3.3	94.3	<0.1	0.5	0.5
On-Site Energy Sources	<0.1	2.7	1.2	<0.1	<0.1	<0.1
On-Site Fugitive Area Sources	8.9	-	-	-	-	-
Off-Site Mobile Vehicle Trips	13.2	34.5	437.2	1.1	15.8	6.7
Total	***37.2***	***40.5***	***532.7***	***1.1***	***16.3***	***7.2***
						Existing Conditions
On-Site Maintenance Sources	8.7	3.0	55.0	<0.1	0.4	0.3
On-Site Energy Sources	<0.1	1.4	0.6	<0.1	<0.1	<0.1
On-Site Fugitive Area Sources	4.8	-	-	-	-	-
Off-Site Mobile Vehicle Trips	8.1	21.1	265.0	0.7	9.6	4.1
Total	***21.6***	***25.5***	***320.6***	***0.7***	***9.9***	***4.4***
Regional Analysis						
Net Operational Emissions	**15.6**	**14.9**	**212.0**	**0.4**	**6.3**	**2.8**
Regional Significance Threshold	55	55	550	150	150	55
Exceed Regional Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

Source: Appendix D, CalEEMod Estimate Worksheets

As shown in Table 3.2-16, the incremental change in operational emissions with implementation of Phase 3 improvements would not exceed any applicable SCAQMD mass daily threshold of significance. Operation of Phase 3 would not have the potential to exacerbate air quality violations in the SCAB or possibly delay attainment of the air quality standards as set forth in the 2016 AQMP. Furthermore, operation of the proposed Project after Phase 3 implementation would not expand Zoo facilities beyond the existing site boundary and would not conflict with land use policies promulgated by SCAQMD and SCAG.

In 2040, total ADT and VMT associated with implementation of the long-term Vision Plan improvements would increase maximum daily VMT by approximately 74 percent relative to existing conditions. Long-term Vision Plan improvements would expand the World Aviary planning area, implement bird show and animal programs, expand service areas, and renovate the Islands area. Additionally, a new administration building would be constructed, and a 2,000-space parking structure would be built in the north lot. Air pollutant emissions from maintenance, natural gas, and fugitive area sources were estimated based on the land use buildout assumptions and estimated using extrapolation. Table 3.2-17 presents daily operational emissions in 2027 and analyzes the change from existing conditions.

Table 3.2-17. Proposed Project Operational Emissions – 2040 Analysis

Complete Vision Plan Operation Estimated Daily Pollutant Emissions						
	Daily Emissions (Pounds Per Day)					
Proposed Project Source	**VOC**	**NO_X**	**CO**	**SO_X**	**PM_{10}**	**$PM_{2.5}$**
On-Site Maintenance Sources	17.2	3.5	107.4	<0.1	0.6	0.5
On-Site Energy Sources	<0.1	2.7	1.2	<0.1	<0.1	<0.1
On-Site Fugitive Area Sources	9.0	-	-	-	-	-
Off-Site Mobile Vehicle Trips	14.2	37.2	475.0	1.2	17.2	7.3
Total	***40.4***	***43.4***	***583.6***	***1.2***	***17.8***	***7.8***
Existing Conditions						
On-Site Maintenance Sources	8.7	3.0	55.0	<0.1	0.4	0.3
On-Site Energy Sources	<0.1	1.4	0.6	<0.1	<0.1	<0.1
On-Site Fugitive Area Sources	4.8	-	-	-	-	-
Off-Site Mobile Vehicle Trips	8.1	21.1	265.0	0.7	9.6	4.1
Total	***21.6***	***25.5***	***320.6***	***0.7***	***9.9***	***4.4***
Regional Analysis						
Net Operational Emissions	**18.8**	**17.9**	**263.0**	**0.5**	**7.8**	**3.4**
Regional Significance Threshold	55	55	550	150	150	55
Exceed Regional Threshold?	**No**	**No**	**No**	**No**	**No**	**No**

Source: Appendix D, CalEEMod Estimate Worksheets

As shown in Table 3.2-17, the incremental change in operational emissions with implementation of long-term improvements would not exceed any applicable SCAQMD mass daily threshold of significance. Operation of the Vision Plan would not have the potential to exacerbate air quality violations in the SCAB or possibly delay attainment of the air quality standards as set forth in the 2016 AQMP. Furthermore, operation of the proposed Project after Phase 3 implementation would not expand Zoo facilities beyond the existing site boundary and would not conflict with land use policies promulgated by SCAQMD and SCAG. As iterated above, incremental increases in employment and associated vehicle trips and VMT would not result in an induction of growth that would render the underlying assumptions of the 2016 AQMP invalid. All operational emissions would remain below applicable thresholds without mitigation. Therefore, operational emissions would be *less than significant*.

AQ-2: Would the proposed 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?

The Los Angeles County portion of the SCAB is currently designated nonattainment of the NAAQS for eight-hour average O_3 and 24-hour average $PM_{2.5}$ and the CAAQS for O3, PM_{10}, and $PM_{2.5}$. A significant air quality impact may occur if construction or operation of the proposed Project would generate emissions exceeding applicable SCAQMD air quality significance thresholds. The SCAQMD has promulgated guidance that if daily emissions

generated by construction or operation of a project remain below the regional mass daily thresholds, those emissions would not result in a significant air quality impact either at the project level or under regionally cumulative considerations. Conversely, if construction or operation of the project would generate emissions exceeding the project-level mass daily thresholds, and would remain above the thresholds with mitigation, those emissions would be considered cumulatively significant in addition to being significant at the project level.

Construction

Without mitigation, construction of the proposed Project would generate emissions of NO_X, an O_3 precursor, in excess of the applicable SCAQMD regional mass daily threshold. As shown in Table 3.2-13, mitigated emissions of pollutants generated by construction activities would not generate emissions of pollutants exceeding project-level significance thresholds. Implementation of mitigation measure **MM AQ-1** would ensure that maximum daily pollutant emissions generated by construction of the proposed Project would not result in a significant increase in emissions of O_3 precursors or particulate matter at either the regional or local assessment scale. Therefore, impacts related to cumulatively considerable net increases in nonattainment pollutants would be *less than significant with mitigation*.

Operation

Air pollutant emissions that would be generated by incremental improvement of the project site under the Vision Plan were quantified and analyzed in the previous impact analyses. Although operational of the proposed Project would increase daily vehicle trips and corresponding emissions, as well as emissions from sources located on the project site, the incremental increases in daily air pollutant emissions during all stages of operations throughout Vision Plan improvements would remain below applicable SCAQMD mass daily thresholds of significances. In accordance with SCAQMD guidance, operational emissions of O_3 precursors and particulate matter would be below project-level thresholds and would not result in a cumulatively considerable net increase of any criteria pollutants for which Los Angeles County is currently designated nonattainment. Operational impacts to air quality related to cumulatively considerable emissions of nonattainment pollutants would be *less than significant*.

AQ-3:	Would the proposed Project expose sensitive receptors to substantial pollutant concentrations?

Zoo operations would continue during improvements associated with implementation of the Vision Plan. The sensitive receptors with greatest susceptibility to air quality impacts from implementation of the proposed Project would be visitors and employees of the Zoo, as well as receptors at the North Hollywood High School Magnet Center located in the southern parking lot on the Project site. Substantial pollutant concentrations would be those of sufficient level to warrant health concerns related to exposure, or any occurrence of pollutant

concentrations meeting or exceeding ambient air quality standards as a result of Project-related emissions.

Construction

Source of pollutant emissions involved in construction activities would at times be in close proximity to Zoo visitors and employees, as Zoo operations would continue throughout implementation of the Vision Plan. The proposed Project components that would be implemented in the immediate vicinity of the North Hollywood High School Magnet Center are the circulation and parking improvements and Zoo Entry renovation in Phase 1. The propensity for substantial pollutant concentrations resulting from construction activities to occur at sensitive receptor locations is generally driven by the source magnitude, receptor proximity, and exposure duration. The nature of construction activities involved in Vision Plan improvements would spread equipment out across the 142-acre Project site, reducing the likelihood that elevated pollutant concentrations would occur. Construction activities would be conducted in accordance with the California Code of Regulations related to lead and asbestos exposure in the event that materials potentially containing these contaminants are encountered during demolition or renovation activities.

The SCAQMD derived the LST screening values as a tool for determining whether construction site emissions in close proximity to sensitive receptors would create significant incremental increases in localized pollutant concentrations. As discussed previously, the LST screening values consider the magnitude of emissions, receptor proximity, and the size of the area from which the emissions are emanating. As shown in Tables 3.2-9 through 3.2-12, at no time during construction of the proposed Project would maximum daily emissions from sources located on the site meet or exceed applicable LST screening values. Furthermore, implementation of mitigation measure **MM AQ-1** would substantially reduce on-site emissions of NO_X and diesel particulate matter from off-road equipment. Requiring that construction equipment meet Tier 4 Final emissions standards, as well as ensuring compliance with the best management practices outlined in SCAQMD Rule 403 (Fugitive Dust), would ensure that construction of the proposed Project would not expose sensitive receptors to substantial pollutant concentrations. Impacts related to sensitive receptor exposures would be *less than significant with mitigation*.

Operation

After construction is complete and the heavy equipment is removed from the Project site, the operational emissions sources on the Project site would be similar to existing conditions. There would be no substantial stationary source of air pollutant emissions associated with operation of the proposed Project. Increases in landscaped and building areas would primarily produce minor increases in VOC, NO_X, and CO emissions from maintenance sources and consumer products use that would be spread throughout the 142-acre Project site. Operation of the proposed Project would not result in a land use change or alteration to the site that would place sensitive receptors in closer proximity to substantial sources of air

pollutant emissions. Therefore, operational impacts related to exposure of sensitive receptors to substantial pollutant concentrations would be *less than significant*.

Effects of Construction Emissions on Zoo Animals

As further analyzed in Section 3.3, *Biological Resources*, air pollutant emissions generated by construction may also be disruptive to Zoo animals. The Zoo is dedicated to the health and wellbeing of all its animals. Zookeepers and animal caretakers are trained in the monitoring of the Zoo's animals and implement measures appropriate for each individual species to ensure their safety and wellbeing in accordance with the Animal Welfare Act (AWA)and the American Zoological Association (AZA), which governs the care, handling, and transport of zoo animals. As the Zoo has done in the past during construction of prior improvements, measures to protect these animals may include their temporary relocation away from construction activities, closure of exhibits, or even the transfer of animals to other zoos. Accommodations specific to each animal would be developed during the planning process for each phase and details would be included in final construction plans. The Zoo is accredited by the AZA and is an active member of many Species Survival Plans. As a result, the Zoo is part of a large consortium of accredited zoos that can provide alternative housing for the Zoo's residents if necessary during construction. With continued management of each species of animal exhibited or rehabilitated at the Zoo and required compliance with the AWA, there would be no adverse effects on Zoo animals from air pollutant emissions generated during construction of the Vision Plan.

AQ-4: Would the proposed Project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

Construction

Potential sources that may produce objectionable odors during construction activities include equipment exhaust, application of asphalt and architectural coatings, and other interior and exterior finishes. Odors from these sources would be localized and generally confined to the immediate area surrounding the project site and would be temporary in nature and would not persist beyond the termination of construction activities. The proposed Project would utilize standard construction techniques, and the odors would be typical of most construction sites and temporary in nature. In addition, as construction-related emissions dissipate away from the construction area, the odors associated with these emissions would also decrease and would be quickly diluted. LADWP will ensure that activities comply with SCAQMD Rules 402 (Nuisance) and 401 (Visible Emissions) to prevent the occurrence of public nuisances and visible dust plumes traveling off-site. Therefore, air quality impacts related to construction odors and dust would be *less than significant*.

Operation

Facilities existing at the Zoo include animal habitats characterized by natural odors. With the exception of expansion of animal habitats and development of new animal exhibits and enclosures, implementation of the Vision Plan would not substantially change any land use designation or facility operations under existing conditions and would not introduce a new substantial source of odors onto the Project site. Currently, Zoo operations generate approximately 1,310 tons of solid waste annually that are directed to the local landfill. The Zoo engages in composting for green waste and herbivore animal wastes in Griffith Park. Recycling is sorted and picked up by the Bureau of Sanitation. The effective waste management system and landfill diversion program endeavored by the Zoo minimizes the presences of sources of noxious odors and other potential nuisances during facility operations. Implementation of the Vision plan would not place sensitive receptors in closer proximity to sources of odors or other emissions that could create nuisance conditions. Therefore, impacts related to other emissions would be *less than significant*.

3.2.5 Mitigation Measures

MM AQ-1 Off-Road Construction Equipment Meeting Tier 4 Final Emissions Standards

All off-road diesel-powered construction equipment greater than 50 horsepower used for Project construction shall meet, at a minimum, Tier 4 Final off-road emissions standards. Construction contractors shall ensure that all off-road equipment meet the standards prior to deployment at the Project site and the Zoo shall demonstrate compliance with this measure to the City Bureau of Engineering prior to the start of construction. The City Bureau of Engineering shall monitor for continual compliance with these requirements throughout the course of construction.

3.2.6 Impacts Summary

With implementation of mitigation measures **MM AQ-1**, impacts to air quality would be *less than significant*. Therefore, significant unavoidable adverse impacts to air quality would not occur.