APPENDIX B

AIR QUALITY IMPACT ANALYSIS AND AIR QUALITY AND GREENHOUSE GAS METHODOLOGY MEMORANDUM

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AIR QUALITY IMPACT ANALYSIS

DRAFT

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LAND USE AND URBAN DESIGN ELEMENTS

CITY OF LONG BEACH

COUNTY OF LOS ANGELES, CALIFORNIA

LSA

June 2016

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DRAFT

AIR QUALITY IMPACT ANALYSIS

LAND USE AND URBAN DESIGN ELEMENTS

CITY OF LONG BEACH

COUNTY OF LOS ANGELES, CALIFORNIA

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LIST OF ACRONYMS AND ABBREVIATIONS

1992 CO Plan	1992 Federal Attainment Plan for Carbon Monoxide
°C	degrees Celsius
°F	degrees Fahrenheit
$\mu g/m^3$	micrograms per cubic meter
AAQS	ambient air quality standards
AB	Assembly Bill
ABAU	adjusted business-as-usual
ADT	average daily trips
afy	acre-feet per year
AQIA	Air Quality Impact Analysis
AQMP	Air Quality Management Plan
ARB	California Air Resources Board
ARB Handbook	California Air Resources Board Air Quality and Land Use Handbook
BAAQMD	Bay Area Air Quality Management District
Basin	South Coast Air Basin
BAU	business-as-usual
BC	Black Carbon
BMPs	Best Management Practices
C_2F_6	hexafluoromethane
CAA	Clean Air Act
CAAQS	California ambient air quality standards
CAFÉ	Corporate Average Fuel Economy
CalEPA	California Environmental Protection Agency
CALGreen	California Green Building Standards
CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CAP	Climate Action Plan
CAT	Climate Action Team
CCAA	California Clean Air Act
CCR	California Code of Regulations
CCST	California Council on Science and Technology
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CF_6	tetrafluoromethane
CH4	methane
City	City of Long Beach
CNG	compressed natural gas
CO	carbon monoxide

CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CPUC	California Public Utilities Commission
DPM	diesel particulate matter
EO	Executive Order
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration
ft	foot/feet
GHG	greenhouse gas
GPS	global positioning system
GWP	Global Warming Potential
HFCs	hydrofluorocarbons
HRA	Health Risk Assessment
I-405	Interstate 405
I-710	Interstate 710
IPCC	Intergovernmental Panel on Climate Change
LCFS	Low Carbon Fuel Standard
LGOP	Local Government Operations Protocol
LOS	level of service
LSA	LSA Associates, Inc.
LST	localized significance threshold
LUE	Land Use Element
LUE/UDE	Land Use Element/Urban Design Element
MATES	Multiple Air Toxics Exposure Study
MMLOS	Multimodal Level of Service
MMT	million metric tons
MMT CO_2e	million metric tons of carbon dioxide equivalent
MOG	Mobility of Goods
MOP	Mobility of People
mpg	miles per gallon
mph	miles per hour
MPO	Metropolitan Planning Organization
MT CO_2e/yr	metric tons of carbon dioxide equivalent per year
MT CO_2e/yr/SP	metric tons of carbon dioxide equivalent per year per service population
MWh	megawatt hours
MWh/yr	megawatt hours per year
N/A	Not Applicable
N_2O	nitrous oxide
NAAQS	national ambient air quality standards
NHTSA	National Highway Traffic Safety Administration
NO_2	nitrogen dioxide

NO_X	nitrogen oxides
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
OPR	Office of Planning and Research
Pb	lead
PFCs	perfluorocarbons
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in size
$PM_{2.5}$	particulate matter less than 2.5 microns in size
ppb	parts per billion
ppm	parts per million
PRC	Public Resources Code
RCP	Regional Comprehensive Plan
ROCs	reactive organic compounds
ROGs	reactive organic gases
RPS	Renewable Portfolio Standard
RTIP	Regional Transportation Improvement Program
RTP	Regional Transportation Plan
SB	Senate Bill
SCAG	Southern California Association of Governments
SCAP	Sustainable City Action Plan
SCAQMD	South Coast Air Quality Management District
SCS	Sustainable Communities Strategy
SELAC	Southeast Los Angeles County
SF_6	sulfur hexafluoride
SIP	State Implementation Plan
SO_2	sulfur dioxide
SoCal Gas	Southern California Gas Company
SO_X	sulfur oxides
SP	service population
SRE	Scenic Routes Element
TAC	toxic air contaminant
TAZ	Traffic Analysis Zones
T-BACTs	best available control technologies for toxics
TDM	transportation demand management
TIA	Traffic Impact Analysis
TOD	transit-oriented development
tpd	tons per day
UDE	Urban Design Element
UWMP	Urban Water Management Plan

VMT	vehicle miles traveled
VOCs	volatile organic compounds
Working Group	GHG CEQA Significance Threshold Working Group
WRCC	Western Regional Climate Center

1.0 INTRODUCTION

LSA has completed an Air Quality Impact Analysis (AQIA) for the proposed General Plan Land Use and Urban Design Elements (proposed project) in the City of Long Beach (City) in the County of Los Angeles. Figure 1 shows the project location and a detailed vicinity map.

This AQIA has been prepared using methods and assumptions recommended in the *CEQA Air Quality Handbook* of the South Coast Air Quality Management District (SCAQMD). In keeping with these guidelines, this analysis describes existing air quality and potential impacts generated by the implementation of the proposed project related to generated criteria air pollutants and greenhouse gas (GHG) emissions. Mitigation measures to reduce or eliminate significant air quality impacts are identified, where appropriate.

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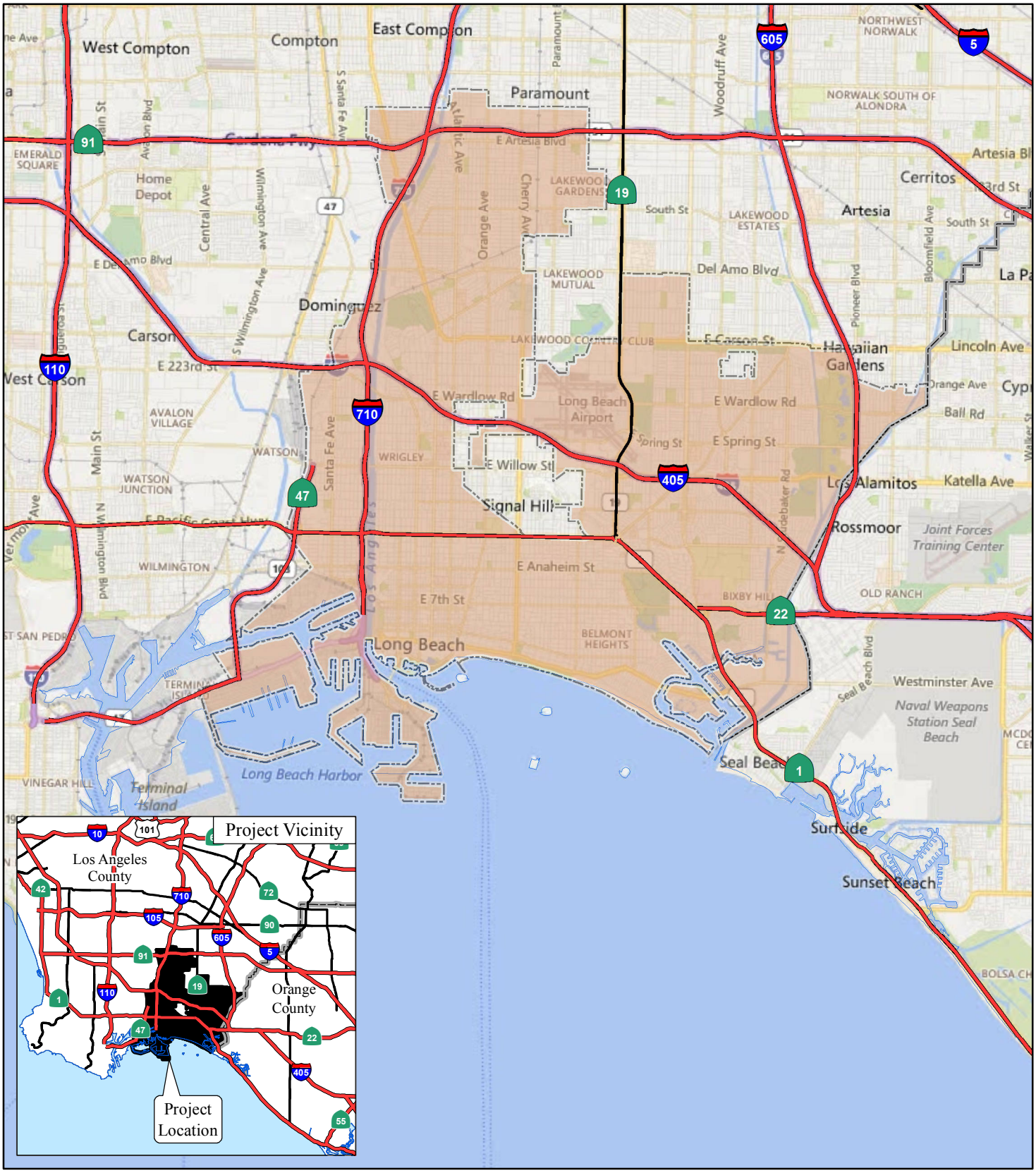

LSA

LEGEND

Project Location - City of Long Beach

FIGURE 1

0 1 2
MILES

SOURCE: Bing Maps (c. 2014); Esri (2014)

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Long Beach General Plan
Land Use and Urban Design Elements

Project Location

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2.0 PROJECT DESCRIPTION

The proposed project is an update to the City's General Plan and is intended to guide growth and future development through the year 2040. Specifically, the project proposes to update the City's current 1989 Land Use Element (LUE) and adopt an entirely new Urban Design Element (UDE) into its General Plan. The updated LUE would work to implement sustainable planning and development practices; stimulate continuous economic development and job growth; accommodate strategic growth and change; support neighborhood preservation and enhancement; diversify housing opportunities; ensure fair and equitable land use; provide reliable public facilities and infrastructure; increase access to green and open space; and preserve, restore, and reconnect with natural resources.

Additionally, the City is proposing to adopt a new UDE as part of its General Plan to replace its existing Scenic Routes Element (SRE). The UDE would work toward shaping the continued evolution of the urban environment in Long Beach while also allowing for a balance between the existing natural environment and new development.

As presented in the LUE, the City is looking to target future growth in a few specific transit-rich corridors and districts to increase job density in commercial and industrial areas, improve the corridors, and maintain and improve the existing established neighborhoods. The LUE will replace land use designations with Place Types that are more flexible and comprehensive, and will lead to a subsequent comprehensive zoning code update. The UDE will provide minimum design standards for the Place Types and their respective component development types and patterns.

The LUE and UDE will propose higher densities along the corridors that provide more robust transit and mobility options, using smart growth concepts and Senate Bill (SB) 226 urban infill guidelines. In the LUE, these districts are indicated as "Major Areas of Change." These two General Plan Elements are collectively referred to as the "proposed project" throughout this AQIA.

For the purpose of this analysis, it is important to note that, per the requirements of California Environmental Quality Act (CEQA), this analysis is based on a comparison of the proposed LUE/UDE to existing land uses and not to the changes in population and employment associated with the potential developments under the current General Plan. The analysis in this report is based on the available citywide population and employment information provided by the City, vehicle miles traveled (VMT) provided by LSA Associates, Inc. (LSA), and natural gas use data provided by the Southern California Gas Report. A ratio of the land uses associated with the Major Areas of Change and land uses associated with the citywide area was used to determine the population and employment data for the Major Areas of Change.

3.0 BACKGROUND

This section provides background information on air pollutants and their health effects. It also provides information the California Air Resources Board's Air Quality and Land Use Handbook[1] (ARB Handbook), a description of the general health risks of toxics, and the significance criteria for project evaluation.

3.1 AIR POLLUTANTS AND HEALTH EFFECTS

Both State and Federal governments have established health-based Ambient Air Quality Standards for six criteria air pollutants:[2] carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), and suspended particulate matter (PM). In addition, the State has set standards for sulfates, hydrogen sulfide, vinyl chloride and visibility-reducing particles. These standards are designed to protect the health and welfare of the populace with a reasonable margin of safety. Long-term exposure to elevated levels of criteria pollutants may result in adverse health effects. However, emission thresholds established by an air district are used to manage total regional emissions within an air basin based on the air basin's attainment status for criteria pollutants. These emission thresholds were established for individual projects that would contribute to regional emissions and pollutant concentrations and could adversely affect or delay the projected attainment target year for certain criteria pollutants.

Because of the conservative nature of the thresholds and the basin-wide context of individual project emissions, there is no direct correlation between a single project and localized air quality-related health effects. One individual project that generates emissions exceeding a threshold does not necessarily result in adverse health effects for residents in the project vicinity. This condition is especially true when the criteria pollutants exceeding thresholds are those with regional effects, such as ozone precursors like nitrogen oxides (NO_X) and reactive organic gases (ROG).

Occupants of facilities such as schools, daycare centers, parks and playgrounds, hospitals, and nursing and convalescent homes are considered to be more sensitive than the general public to air pollutants because these population groups have increased susceptibility to respiratory disease. Persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality. Residential areas are considered more sensitive to air quality conditions, compared to commercial and industrial areas, because people generally spend longer periods of time at their residences, with greater associated exposure to ambient air quality conditions. Recreational uses are also considered sensitive compared to commercial and industrial uses due to greater exposure to ambient air quality conditions associated with exercise.

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1 California Air Resources Board (ARB), 2005. *Air Quality and Land Use Handbook: A Community Health Perspective.* April.

2 United States Environmental Protection Agency (EPA), 2014. Criteria pollutants are defined as those pollutants for which the Federal and State governments have established ambient air quality standards, or criteria, for outdoor concentrations in order to protect public health.

3.1.1 Ozone

Rather than being directly emitted, ozone (smog) is formed by photochemical reactions between NO_X and ROG. Ozone is a pungent, colorless gas. Elevated ozone concentrations result in reduced lung function, particularly during vigorous physical activity. This health problem is particularly acute in sensitive receptors such as the sick, elderly, and young children. Ozone levels peak during the summer and early fall months.

3.1.2 Carbon Monoxide

CO is formed by the incomplete combustion of fossil fuels, almost entirely from automobiles. It is a colorless, odorless gas that can cause dizziness, fatigue, and impairments to central nervous system functions. CO passes through the lungs into the bloodstream, where it interferes with the transfer of oxygen to body tissues.

3.1.3 Particulate Matter

Particulate matter is the term used for a mixture of solid particles and liquid droplets found in the air. Coarse particles are those that are 10 microns or less in diameter, or PM_{10}. Fine, suspended particulate matter with an aerodynamic diameter of 2.5 microns or less, or $PM_{2.5}$, is not readily filtered out by the lungs. Nitrates, sulfates, dust, and combustion particulates are major components of PM_{10} and $PM_{2.5}$. These small particles can be directly emitted into the atmosphere as byproducts of fuel combustion; through abrasion, such as tire or brake lining wear; or through fugitive dust (wind or mechanical erosion of soil). They can also be formed in the atmosphere through chemical reactions. Particulates may transport carcinogens and other toxic compounds that adhere to the particle surfaces and can enter the human body through the lungs.

3.1.4 Nitrogen Dioxide

NO_2 is a reddish brown gas that is a byproduct of combustion processes. Automobiles and industrial operations are the main sources of NO_2. Aside from its contribution to ozone formation, NO_2 also contributes to other pollution problems, including a high concentration of fine particulate matter, poor visibility, and acid deposition. NO_2 may be visible as a coloring component on high pollution days, especially in conjunction with high ozone levels. NO_2 decreases lung function and may reduce resistance to infection.

3.1.5 Sulfur Dioxide

SO_2 is a colorless, irritating gas formed primarily from incomplete combustion of fuels containing sulfur. Industrial facilities also contribute to gaseous SO_2 levels in the region. SO_2 irritates the respiratory tract, can injure lung tissue when combined with fine particulate matter, and reduces visibility and the level of sunlight.

3.1.6 Lead

Leaded gasoline (phased out in the United States beginning in 1973), paint (on older houses and cars), smelters (metal refineries), and the manufacture of lead storage batteries have been the primary sources of lead released into the atmosphere. Lead has multiple adverse neurotoxic health effects, and children are at special risk. Some lead-containing chemicals cause cancer in animals. Lead levels in the air have decreased substantially since leaded gasoline was eliminated. Ambient lead concentrations are only monitored on an as-warranted, site-specific basis in California. On October 15, 2008, the United States Environmental Protection Agency (EPA) strengthened the national ambient air quality standard for lead by lowering it from 1.5 to 0.15 micrograms per cubic meter ($\mu g/m^3$). The EPA revised the monitoring requirements for lead in December 2010. These requirements focus on airports and large urban areas, resulting in an increase in 76 monitors nationally.

3.1.7 Toxic Air Contaminants

In addition to the criteria pollutants discussed above, toxic air contaminants (TACs) are another group of pollutants of concern. TACs are injurious in small quantities and are regulated by the EPA and the California Air Resources Board (ARB). Some examples of TACs include benzene, butadiene, formaldehyde, and hydrogen sulfide. The identification, regulation, and monitoring of TACs is relatively recent compared to that for criteria pollutants.

TACs do not have ambient air quality standards, but are regulated by the EPA, ARB, and the SCAQMD. In 1998, the ARB identified particulate matter from diesel-fueled engines as a TAC. The ARB has completed a risk management process that identified potential cancer risks for a range of activities using diesel-fueled engines.[1] High-volume freeways, stationary diesel engines, and facilities attracting heavy and constant diesel vehicle traffic (e.g., distribution centers and truck stops) were identified as posing the highest risk to adjacent receptors. Other facilities associated with increased risk include warehouse distribution centers, large retail or industrial facilities, high-volume transit centers, and schools with a high volume of bus traffic. Health risks from TACs are a function of both concentration and duration of exposure.

Unlike TACs emitted from industrial and other stationary sources noted above, most diesel particulate matter is emitted from mobile sources—primarily “off-road” sources such as construction and mining equipment, agricultural equipment, and truck-mounted refrigeration units, as well as trucks and buses traveling on freeways and local roadways.

Although not specifically monitored, recent studies indicate that exposure to diesel particulate matter may contribute significantly to a cancer risk (a risk of approximately 500 to 700 in 1,000,000) that is greater than all other measured TACs combined.[2] The technology for reducing diesel particulate matter emissions from heavy-duty trucks is well established, and both State and Federal agencies are moving aggressively to regulate engines and emission control systems to reduce and remediate diesel

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1 ARB, 2000. Stationary Source Division and Mobile Source Control Division. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles.* October.

2 Ibid.

emissions. The ARB anticipates that by 2020, average statewide diesel particulate matter concentrations will decrease by 85 percent from levels in 2000 with full implementation of the ARB's Diesel Risk Reduction Plan,[1] meaning that the statewide health risk from diesel particulate matter is expected to decrease from 540 cancer cases in 1,000,000 to 21.5 cancer cases in 1,000,000.

Table A summarizes the sources and health effects of air pollutants discussed in this section. Table B presents a summary of State and Federal ambient air quality standards (AAQS).

3.2 GREENHOUSE GASES AND GLOBAL CLIMATE CHANGE

Global climate change is the observed increase in the average temperature of the Earth's atmosphere and oceans in recent decades. The Earth's average near-surface atmospheric temperature rose 0.6 ±0.2 degrees Celsius (°C) or 1.1 ±0.4 degrees Fahrenheit (°F) in the 20th century. The prevailing scientific opinion on climate change is that most of the warming observed over the last 50 years is attributable to human activities. The increased amounts of carbon dioxide (CO_2) and GHGs are the primary causes of the human-induced component of warming. GHGs are released by the burning of fossil fuels, land clearing, agriculture, and other activities, and lead to an increase in the greenhouse effect.[2] GHGs are present in the atmosphere naturally, are released by natural sources, or are formed from secondary reactions taking place in the atmosphere. The gases that are widely seen as the principal contributors to human-induced global climate change are:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous oxide (N_2O)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)
- Sulfur Hexafluoride (SF_6)

Over the last 200 years, humans have caused substantial quantities of GHGs to be released into the atmosphere. These extra emissions are increasing GHG concentrations in the atmosphere, and enhancing the natural greenhouse effect, which is believed to be causing global warming. While manmade GHGs include naturally-occurring GHGs such as CO_2, CH_4, and N_2O, some gases, like HFCs, PFCs, and SF_6 are completely new to the atmosphere.

Table A: Sources and Health Effects of Air Pollutants

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1 ARB, 2000. Stationary Source Division and Mobile Source Control Division. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles.* October.

2 The temperature on Earth is regulated by a system commonly known as the "greenhouse effect." Just as the glass in a greenhouse lets heat from sunlight in and reduces the heat escaping, greenhouse gases like carbon dioxide, methane, and nitrous oxide in the atmosphere keep the Earth at a relatively even temperature. Without the greenhouse effect, the Earth would be a frozen globe; thus, although an excess of greenhouse gas results in global warming, the *naturally occurring* greenhouse effect is necessary to keep our planet at a comfortable temperature.

Pollutants	Sources	Primary Effects
Carbon Monoxide (CO)	• Incomplete combustion of fuels and other carbon-containing substances, such as motor exhaust. • Natural events, such as decomposition of organic matter.	• Reduced tolerance for exercise. • Impairment of mental function. • Impairment of fetal development. • Death at high levels of exposure. • Aggravation of some heart diseases (angina).
Nitrogen Dioxide (NO_2)	• Motor vehicle exhaust. • High temperature stationary combustion. • Atmospheric reactions.	• Aggravation of respiratory illness. • Reduced visibility. • Reduced plant growth. • Formation of acid rain.
Ozone (O_3)	• Atmospheric reaction of organic gases with nitrogen oxides in sunlight.	• Aggravation of respiratory and cardiovascular diseases. • Irritation of eyes. • Impairment of cardiopulmonary function. • Plant leaf injury.
Lead (Pb)	• Contaminated soil.	• Impairment of blood functions and nerve construction. • Behavioral and hearing problems in children.
Suspended Particulate Matter ($PM_{2.5}$ and PM_{10})	• Stationary combustion of solid fuels. • Construction activities. • Industrial processes. • Atmospheric chemical reactions.	• Reduced lung function. • Aggravation of the effects of gaseous pollutants. • Aggravation of respiratory and cardiorespiratory diseases. • Increased cough and chest discomfort. • Soiling. • Reduced visibility.
Sulfur Dioxide (SO_2)	• Combustion of sulfur-containing fossil fuels. • Smelting of sulfur-bearing metal ores. • Industrial processes.	• Aggravation of respiratory diseases (asthma, emphysema). • Reduced lung function. • Irritation of eyes. • Reduced visibility. • Plant injury. • Deterioration of metals, textiles, leather, finishes, coatings, etc.

Source: California Air Resources Board (2015a).

Table B: State and Federal Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards[1]		Federal Standards[2]		
		Concentration[3]	Method[4]	Primary[3,5]	Secondary[3,6]	Method[7]
Ozone (O_3)[8]	1-Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	–	Same as Primary Standard	Ultraviolet Photometry
	8-Hour	0.07 ppm (137 µg/m^3)		0.070 ppm (137 µg/m^3)		
Respirable Particulate Matter (PM_{10})[9]	24-Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		–		
Fine Particulate Matter ($PM_{2.5}$)[9]	24-Hour	–	–	35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	12 µg/m^3	15 µg/m^3	
Carbon Monoxide (CO)	1-Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	–	Non-Dispersive Infrared Photometry (NDIR)
	8-Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	–	
	8-Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		–	–	
Nitrogen Dioxide (NO_2)[10]	1-Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 µg/m^3)	–	Gas Phase Chemi-luminescence
	Annual Arithmetic Mean	0.03 ppm (57 µg/m^3)		53 ppb (100 µg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[11]	1-Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	–	Ultraviolet Fluorescence; Spectro-photometry (Pararosaniline Method)
	3-Hour	–		–	0.5 ppm (1300 µg/m^3)	
	24-Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (for certain areas)[11]	–	
	Annual Arithmetic Mean	–		0.030 ppm (for certain areas)[11]	–	
Lead (Pb)[l12,13]	30-Day Average	1.5 µg/m^3	Atomic Absorption	–	–	High-Volume Sampler and Atomic Absorption
	Calendar Quarter	–		1.5 µg/m^3 (for certain areas)[13]	Same as Primary Standard	
	Rolling 3-Month Average[i]	–		0.15 µg/m^3		
Visibility-Reducing Particles[14]	8-Hour	See Footnote 14.	Beta Attenuation and Transmittance through Filter Tape	No Federal Standards		
Sulfates	24-Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1-Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24-Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

Source: California Air Resources Board, Ambient Air Quality Standards (2015a).

Table footnotes are provided on the following page.

[1] California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1- and 24-hour), nitrogen dioxide, and particulate matter (PM_{10}, $PM_{2.5}$, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[2] National standards (other than ozone, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than 1. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact the EPA for further clarification and current Federal policies.

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

[4] Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

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

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

[7] Reference method as described by the EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the EPA.

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

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

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

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

Note that the 1-hour national standard is in units of ppb. California standards are in units of ppm. To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

[12] The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

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

[14] In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

°C = degrees Celsius
ARB = California Air Resources Board
ppb = parts per billion
ppm = parts per million
mg/m^3 = milligrams per cubic meter
$\mu g/m^3$ = micrograms per cubic meter
EPA = United States Environmental Protection Agency

Certain gases, such as water vapor, are short-lived in the atmosphere. Others remain in the atmosphere for significant periods of time, contributing to climate change in the long term. Water vapor is excluded from the list of GHGs above because it is short-lived in the atmosphere and its atmospheric concentrations are largely determined by natural processes, such as oceanic evaporation. For the purposes of this air quality analysis, the term "GHGs" will refer collectively to the gases listed above only.

These gases vary considerably in terms of Global Warming Potential (GWP), which is a concept developed to compare the ability of each greenhouse gas to trap heat in the atmosphere relative to another gas. The global warming potential is based on several factors, including the relative effectiveness of a gas to absorb infrared radiation and length of time that the gas remains in the atmosphere ("atmospheric lifetime"). The GWP of each gas is measured relative to carbon dioxide, the most abundant GHG; the definition of GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to the ratio of heat trapped by one unit mass of CO_2 over a specified time period. GHG emissions are typically measured in terms of pounds or tons of "CO_2 equivalents" (CO_2e). Table C shows the GWP for each type of GHG. For example, SF_6 is 22,800 times more potent at contributing to global warming than CO_2.

Table C: Global Warming Potential of Greenhouse Gases

Gas	Atmospheric Lifetime (Years)	Global Warming Potential (100-Year Time Horizon)
Carbon Dioxide (CO_2)	50–200	1
Methane (CH_4)	12	25
Nitrous Oxide (N_2O)	114	298
HFC-23	270	14,800
HFC-134a	14	1,430
HFC-152a	1.4	124
PFC: Tetrafluoromethane (CF_4)	50,000	7,390
PFC: Hexafluoromethane (C_2F_6)	10,000	12,200
Sulfur Hexafluoride (SF_6)	3,200	22,800

Source: Intergovernmental Panel on Climate Change (2007). *Climate Change 2007: The Physical Science Basis*. Contribution of Working Group I to the Fourth Assessment Report of the IPCC.

The following discussion summarizes the characteristics of the six GHGs.

3.2.1 Carbon Dioxide (CO_2)

In the atmosphere, carbon generally exists in its oxidized form, as CO_2. Natural sources of CO_2 include the respiration (breathing) of humans, animals and plants, volcanic out gassing, decomposition of organic matter and evaporation from the oceans. Human-caused sources of CO_2 include the combustion of fossil fuels and wood, waste incineration, mineral production, and deforestation. Natural sources release approximately 150 billion tons of CO_2 each year, far outweighing the 7 billion tons of man-made emissions of CO_2 each year. Nevertheless, natural removal processes, such as photosynthesis by land- and ocean-dwelling plant species, cannot keep pace with this extra input of man-made CO_2, and consequently, the gas is building up in the atmosphere.

In 2002, CO_2 emissions from fossil fuel combustion accounted for approximately 98 percent of man-made CO_2 emissions and approximately 84 percent of California's overall GHG emissions (CO_2e). The transportation sector accounted for California's largest portion of CO_2 emissions, with gasoline consumption making up the greatest portion of these emissions. Electricity generation was California's second largest category of GHG emissions.

3.2.2 Methane (CH_4)

Methane is produced when organic matter decomposes in environments lacking sufficient oxygen. Natural sources include wetlands, termites, and oceans. Decomposition occurring in landfills accounts for the majority of human-generated CH_4 emissions in California and in the United States as a whole. Agricultural processes such as intestinal fermentation, manure management, and rice cultivation are also significant sources of CH_4 in California. Methane accounted for approximately 6 percent of gross climate change emissions (CO_2e) in California in 2002.

Total annual emissions of methane are approximately 500 million tons, with manmade emissions accounting for the majority. As with CO_2, the major removal process of atmospheric methane—a chemical breakdown in the atmosphere—cannot keep pace with source emissions, and methane concentrations in the atmosphere are increasing.

3.2.3 Nitrous Oxide (N_2O)

Nitrous oxide is produced naturally by a wide variety of biological sources, particularly microbial action in soils and water. Tropical soils and oceans account for the majority of natural source emissions. Nitrous oxide is a product of the reaction that occurs between nitrogen and oxygen during fuel combustion. Both mobile and stationary combustion emit N_2O, and the quantity emitted varies according to the type of fuel, technology, and pollution control device used, as well as maintenance and operating practices. Agricultural soil management and fossil fuel combustion are the primary sources of human-generated N_2O emissions in California. Nitrous oxide emissions accounted for nearly 7 percent of man-made GHG emissions (CO_2e) in California in 2002.

3.2.4 Hydrofluorocarbons, Perfluorocarbons, and Sulfur Hexafluoride

HFCs are primarily used as substitutes for ozone-depleting substances regulated under the Montreal Protocol.[1] PFCs and SF_6 are emitted from various industrial processes, including aluminum smelting, semiconductor manufacturing, electric power transmission and distribution, and magnesium casting. There is no aluminum or magnesium production in California; however, the rapid growth in the semiconductor industry leads to greater use of PFCs. HFCs, PFCs, and SF_6 accounted for about 3.5 percent of man-made GHG emissions in California in 2002.

[1] The Montreal Protocol is an international treaty that was approved on January 1, 1989, and was designated to protect the ozone layer by phasing out the production of several groups of halogenated hydrocarbons believed to be responsible for ozone depletion.

3.2.5 Black Carbon

Black Carbon (BC) is the most strongly light-absorbing component of PM formed by burning fossil fuels such as coal, diesel, and biomass. BC is emitted directly into the atmosphere in the form of $PM_{2.5}$ and is the most effective form of PM, by mass, at absorbing solar energy. Per unit of mass in the atmosphere, BC can absorb a million times more energy than CO_2.[1] BC contributes to climate change both directly, such as absorbing sunlight, and indirectly, such as affecting cloud formation. However, because BC is short-lived in the atmosphere, it can be difficult to quantify its effect on global-warming.

Most U.S. emissions of BC come from mobile sources (52 percent), especially diesel engines and vehicles. The other major source is open biomass burning, including wildfires, although residential heating and industry also contribute. The ARB estimates that the annual BC emissions in California have decreased approximately 70 percent between 1990 and 2010 and are expected to continue to decline significantly due to controls on mobile diesel emissions.

3.3 AIR QUALITY REGULATORY SETTING

The EPA and the ARB regulate direct emissions from motor vehicles. The SCAQMD is the regional agency primarily responsible for regulating air pollution emissions from stationary sources (e.g., factories) and indirect sources (e.g., traffic associated with new development), as well as monitoring ambient pollutant concentrations.

3.3.1 Federal Clean Air Act

The 1970 Federal Clean Air Act (CAA) authorized the establishment of national health-based air quality standards and also set deadlines for their attainment. The Federal Clean Air Act Amendments of 1990 changed deadlines for attaining national standards as well as the remedial actions required of areas of the nation that exceed the standards. Under the CAA, State and local agencies in areas that exceed the national standards are required to develop State Implementation Plans to demonstrate how they will achieve the national standards by specified dates.

3.3.2 California Clean Air Act

In 1988, the California Clean Air Act (CCAA) required that all air districts in the State endeavor to achieve and maintain California ambient air quality standards (CAAQS) for CO, O_3, SO_2, and NO_2 by the earliest practical date. The CCAA provides districts with authority to regulate indirect sources and mandates that air quality districts focus particular attention on reducing emissions from transportation and area-wide emission sources. Each nonattainment district is required to adopt a plan to achieve a 5 percent annual reduction, averaged over consecutive 3-year periods, in district-wide emissions of each nonattainment pollutant or its precursors. An Air Quality Management Plan (AQMP) shows how

[1] EPA, 2015. *Black Carbon*. September. Website: http://www3.epa.gov/blackcarbon/basic.html (accessed on September 17, 2015).

a district would reduce emissions to achieve air quality standards. Generally, the State standards for these pollutants are more stringent than the national standards.

3.3.3 California Air Resources Board Handbook

The ARB has developed an *Air Quality and Land Use Handbook*,[1] which is intended to serve as a general reference guide for evaluating and reducing air pollution impacts associated with new projects that go through the land use decision-making process. According to the ARB Handbook, recent air pollution studies have shown an association between respiratory and other non-cancer health effects and proximity to high-traffic roadways. Other studies have shown that diesel exhaust and other cancer-causing chemicals emitted from cars and trucks are responsible for much of the overall cancer risk from airborne toxics in California. The ARB Handbook recommends that planning agencies strongly consider proximity to these sources when finding new locations for "sensitive" land uses such as homes, medical facilities, daycare centers, schools, and playgrounds.

Air pollution sources of concern include freeways, rail yards, ports, refineries, distribution centers, chrome plating facilities, dry cleaners, and large gasoline service stations. Key recommendations in the ARB Handbook include taking steps to avoid siting new, sensitive land uses:

- Within 500 feet (ft) of a freeway, urban roads with 100,000 vehicles/day, or rural roads with 50,000 vehicles/day.
- Within 1,000 ft of a major service and maintenance rail yard.
- Immediately downwind of ports (in the most heavily affected zones) and petroleum refineries.
- Within 300 ft of any dry cleaning operation (for operations with two or more machines, provide 500 ft).
- Within 300 ft of a large gas station (defined as a facility with a throughput of 3.6 million gallons per year or greater).

The ARB Handbook specifically states that its recommendations are advisory and acknowledges land use agencies have to balance other considerations, including housing and transportation needs, economic development priorities, and other quality of life issues.

The recommendations are generalized and do not consider site-specific meteorology, freeway truck percentages, or other factors that influence risk for a particular project site. The purpose of this analysis is to further examine project sites for actual health risk associated with the location of new sensitive land uses.

3.3.4 South Coast Air Quality Management District

The SCAQMD has jurisdiction over most air quality matters in the South Coast Air Basin (Basin). This area includes all of Orange County, Los Angeles County except for the Antelope Valley, the

[1] ARB, 2005. *Air Quality and Land Use Handbook: A Community Health Perspective.* April.

non-desert portion of western San Bernardino County, and the western and Coachella Valley portions of Riverside County. Los Angeles County is a subregion of the SCAQMD jurisdiction. The SCAQMD is the agency principally responsible for comprehensive air pollution control in the Basin and is tasked with implementing certain programs and regulations required by the CAA and the CCAA. The SCAQMD prepares plans to attain State and national ambient air quality standards (NAAQS). SCAQMD is directly responsible for reducing emissions from stationary (area and point) sources. The SCAQMD develops rules and regulations, establishes permitting requirements, inspects emissions sources, and enforces such measures though educational programs or fines, when necessary.

The proposed project could be subject to the following SCAQMD rules and regulations:

- **Regulation IV – Prohibitions:** This regulation sets forth the restrictions for visible emissions, odor nuisance, fugitive dust, various air pollutant emissions, fuel contaminants, start-up/shutdown exemptions and breakdown events.
    - **Rule 402 – Nuisance:** This rule restricts the discharge of any contaminant in quantities that cause or have a natural ability to cause injury, damage, nuisance, or annoyance to businesses, property or the public. The proposed project does not plan on discharging any contaminants in quantities that would cause injury to the public or property. Future development resulting from approval of the project will comply with Rule 402.
    - **Rule 403 – Fugitive Dust:** This rule requires the prevention, reduction or mitigation fugitive dust emissions from a project site. Rule 403 restricts visible fugitive dust to a project property line, restricts the net PM_{10} emissions to less than 50 $\mu g/m^3$ and restricts the tracking out of bulk materials onto public roads. Additionally, Rule 403 requires an applicant to utilize one or more of the best available control measures (identified in the tables within the rule). Mitigation measures may include adding freeboard to haul vehicles, covering loose material on haul vehicles, watering, using chemical stabilizers, and/or ceasing all activities. Finally, Rule 403 requires that a contingency plan be prepared if so determined by the EPA. Future development resulting from approval of the project will comply with Rule 403.
- **Regulation XI – Source Specific Standards:** Regulation XI sets emissions standards for different sources.
    - Rule 1113 – Architectural Coatings: This rule limits the amount of volatile organic compounds (VOCs) from architectural coatings and solvents, which lowers the emissions of odorous compounds.

The SCAQMD is responsible for demonstrating regional compliance with ambient air quality standards but has limited indirect involvement in reducing emissions from fugitive, mobile, and natural sources. To that end, the SCAQMD works cooperatively with the California ARB, the Southern California Association of Governments (SCAG), county transportation commissions, local governments, and other Federal and State government agencies. It has responded to this requirement by preparing a series of AQMPs to meet the CAAQS and NAAQS. The SCAQMD and the SCAG are responsible for formulating and implementing the AQMP, which has a 20-year horizon for the Basin. The SCAQMD and SCAG must update the AQMP every three years. The current regional air quality plan is the Final 2012 Air Quality Management Plan (AQMP) adopted by the SCAQMD on December 7, 2012.

The AQMP is the region's Clean Air Plan, which guides the region's air quality planning efforts to attain the CAAQS. The SCAQMD's 2012 AQMP contains district-wide control measures to reduce ozone precursor emissions (i.e., ROG and NO_X), particulate matter, and GHG emissions. At the end of the 2012 AQMP process, the SCAQMD initiated the 2016 AQMP shortly after the adoption of the 2012 AQMP. The SCAQMD has developed the 2016 AQMP (SCAQMD 2016), which incorporates the latest scientific and technological information and planning assumptions, including the 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS), and updated emission inventory methodologies for various source categories.

SCAQMD is required to submit its AQMP to the ARB for review and approval. Once approved, the ARB would incorporate the South Coast AQMP updates (and other air quality conformity plans from other air basins) into the California State Implementation Plan (SIP). The SIP is then submitted to the EPA for its review and approval. The 2012 South Coast AQMP was included in California's SIP and submitted to the EPA. The EPA approved the South Coast AQMP portion of the California SIP in July 2013.

The upcoming 2016 AQMP will develop integrated strategies and measures to meet the following NAAQS:

- 8-hour O_3 (75 parts per billion [ppb]) by 2032
- Annual $PM_{2.5}$ (12 $\mu g/m^3$) by 2021–2025
- 8-hour O_3 (80 ppb) by 2024 (updated from the 2007 and 2012 AQMPs)
- 1-hour O_3 (120 ppb) by 2023 (updated from the 2012 AQMP)
- 24-hour $PM_{2.5}$ (35 $\mu g/m^3$) by 2019 (updated from the 2012 AQMP)

The 2016 AQMP will also take an initial look at the new 2015 Federal 8-hour O_3 standard (70 ppb), as well as incorporate energy, climate, transportation, goods movement, infrastructure and other planning efforts that affect future air quality. The most significant air quality challenge in the Basin is to reduce NO_X emissions sufficiently to meet the upcoming ozone standard deadlines. Based on preliminary analyses, the approximately 580 tons per day (tpd) of total Basin NO_X emissions are projected to drop to *approximately* 300 tpd and 250 tpd in the attainment years of 2023 and 2031, respectively, due to continued implementation of already adopted control measures.

The primary challenge is that mobile sources currently contribute about 88 percent of the region's total NO_X emissions, and SCAQMD has limited authority to regulate mobile sources. SCAQMD is working closely with the ARB and EPA, which have primary authority over mobile sources to ensure mobile sources do their fair share of pollution reduction.

Since NO_X emissions also lead to the formation of $PM_{2.5}$, the NO_X reductions needed to meet the ozone standards will lead to significant improvements in $PM_{2.5}$ levels. The 2016 AQMP will include $PM_{2.5}$ control strategies as needed to ensure that the $PM_{2.5}$ NAAQS will also be met on time.
The SCAQMD adopted land use planning guidelines in the May 2005 "Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning" which, like the Handbook, also consider impacts to sensitive receptors from facilities that emit TACs. The SCAQMD's distance

recommendations are the same as those provided by the ARB (e.g., the same siting criteria for distribution centers and dry cleaning facilities). The SCAQMD's document introduces land use-related policies that rely on design and distance parameters to manage potential health risk. These guidelines are voluntary initiatives recommended for consideration by local planning agencies.

3.3.5 Southern California Association of Governments

SCAG is a council of governments for Los Angeles, Orange, Riverside, San Bernardino, Imperial, and Ventura Counties. It is a regional planning agency and serves as a forum for regional issues relating to transportation, the economy and community development, and the environment. SCAG is the federally designated Metropolitan Planning Organization (MPO) for the majority of the southern California region and is the largest MPO in the nation. With regard to air quality planning, SCAG prepares the RTP and Regional Transportation Improvement Program (RTIP), which address regional development and growth forecasts and form the basis for the land use and transportation control portions of the AQMP and are utilized in the preparation of the air quality forecasts and consistency analysis included in the AQMP. The RTP, RTIP, and AQMP are based on projections originating within local jurisdictions.

Although SCAG is not an air quality management agency, it is responsible for developing transportation, land use, and energy conservation measures that affect air quality. SCAG's Regional Comprehensive Plan (RCP) provides growth forecasts that are used in the development of air quality–related land use and transportation control strategies by the SCAQMD. The RCP is a framework for decision-making for local governments, assisting them in meeting Federal and State mandates for growth management, mobility, and environmental standards, while maintaining consistency with regional goals regarding growth and changes through the year 2015, and beyond. Policies within the RCP include consideration of air quality, land use, transportation, and economic relationships by all levels of government.

On April 7, 2016, SCAG adopted the 2016–2040 RTP/SCS. Using growth forecasts and economic trends, the RTP provides a vision for transportation throughout the region for the next 20 years. It considers the role of transportation in the broader context of economic, environmental, and quality-of-life goals for the future, identifying regional transportation strategies to address mobility needs. The SCS is a newly required element of the RTP, which integrates land use and transportation strategies to achieve ARB emissions reduction targets. The inclusion of the SCS is required by SB 375, which was enacted to reduce GHG emissions from automobiles and light trucks through integrated transportation, land use, housing, and environmental planning. The RTP/SCS would successfully achieve and exceed the GHG emission-reduction targets set by the ARB by achieving an 8 percent reduction by 2020, an 18 percent reduction by 2035, and a 21 percent reduction by 2040 compared to the 2005 level on a per capita basis. This RTP/SCS also meets criteria pollutant emission budgets set by the EPA.

The 2016–2040 RTP/SCS includes a strong commitment to reduce emissions from transportation sources to comply with SB 375, improve public health, and meet the NAAQS as set forth by the CAA. Even with ongoing aggressive control strategies, ever more stringent national O_3 standards require further NO_X emission reductions in the SCAG region. In the Basin, for example, it is estimated that NO_X emissions will need to be reduced by approximately 50 percent in 2023 and an additional 15 percent NO_X reduction beyond 2023 levels by 2031. Most sources of NO_X emissions,

cars and factories, are already controlled by over 90 percent. The level of emission reduction required is so significant that 2030 emissions forecast from just three sources—ships, trains, and aircraft—would lead to O_3 levels near the Federal standard. To accomplish the reduction required to meet O_3 standards, the 2016–2040 RTP/SCS contains a regional commitment for the broad deployment of zero- and near-zero emission transportation technologies in the 2023–2040 time frame and clear steps to move toward this objective.

SCAG submits a list of transportation-related projects (in the RTP/SCS) for potential funding by the Federal Highway Administration (FHWA). The FHWA will review and approve either portions of, or all of, the list of transportation projects. This review will include a determination regarding whether the Federal agency's actions on these transportation projects would conform with the California SIP. SCAQMD incorporates the SCAG RTP/SCS emission budget for mobile sources into the AQMP emissions inventory analysis for all sources of emissions (including stationary, area, and mobile). Conformity analysis and the EPA review and approval actions are not subject to CEQA review.

3.3.6 City of Long Beach General Plan Air Quality Element

The City of Long Beach General Plan addresses air quality in the Air Quality Element.[1] The Air Quality Element contains goals, policies, and actions in relation to government organization roles and responsibilities, ground transportation, air transportation, land use, particulate emission, energy conservation, and education. The following goals and policies from the City of Long Beach General Plan Air Quality Element are applicable to the proposed project.

- **Goal 1:** Effective coordination of air quality improvement efforts in the South Coast Air Basin, the Southeast Los Angeles County (SELAC) subregion of SCAG, and other agencies.
  - **Policy 1.1: Establish a Coordinated Approach.** Coordinate with other jurisdictions in the South Coast Air Basin a continuation of the consortium to establish air quality plans and implementation programs where practical.
  - **Policy 1.2: Encourage Community Participation.** Involve environmental groups, the business community, special interests, and the general public in the formulation and implementation of programs that effectively reduce airborne pollutants.
- **Goal 2:** A diverse and efficient ground transportation system that minimizes air pollutant emissions.
  - **Policy 2.1.1: Reduce Vehicle Trips.** Use incentives, regulations, and transportation demand management techniques, in cooperation with other jurisdictions in the South Coast Air Basin to eliminate vehicle trips that would otherwise occur.
  - **Policy 2.1.2: Reduce Vehicle Miles Traveled.** Use incentives, regulations, and transportation demand management in cooperation with other jurisdictions in the South Coast Air Basin, to reduce vehicle miles traveled.

[1] Long Beach, City of, 1996. *Long Beach General Plan*. December.

- **Policy 2.1.3: Increase Cost-Effectiveness of Transportation and Parking Systems.** Make cost-effective improvements to transportation and parking systems that will reduce traffic congestion and resulting emissions.
- **Policy 2.2.1: Modify Work Schedules.** Promote and establish modified work schedules that reduce peak period auto travel.
- **Policy 2.3.1: Expand Transit in the City and the Region.** Cooperate in efforts to expand all forms of mass transit within the City and the South Coast Air Basin.
- **Policy 2.4.1: Promote Non-Motorized Transportation.** Promote convenient and continuous bicycle paths and pleasant pedestrian environments that will encourage non-motorized travel within the City.
- **Policy 2.5.1: Manage the Parking Supply.** Manage the City's parking supply to inhibit auto use, while ensuring that economic development goals are not sacrificed.
- **Policy 2.6.1: Support Legislation.** Participate with other local governments in seeking State and Federal legislation to improve vehicle/transportation technology and establish a direct link between the true cost of emissions and the sources of pollution.
- **Policy 2.6.2: Fleet Conversion to Clean Fuels.** Play a leadership role in the conversion to clean fuels by promoting the increased use of compressed natural gas (CNG), electric vehicles, and other alternative fuels.

- **Goal 3:** Minimum feasible emissions from Long Beach Airport.
  - **Policy 3.1: Promote Improved Technology.** Promote the use of the best available technology to reduce emissions from aircraft frequenting the Long Beach Airport.
- **Goal 4:** Minimum feasible emissions from the Ports of Long Beach and Los Angeles.
  - **Policy 4.1:** Minimize emissions from ships.
  - **Policy 4.2:** Reduce the impacts of rail-related emissions on Long Beach neighborhoods and the downtown.
  - **Policy 4.3:** Monitor particulate pollution at the Ports and locations downwind, and pursue methods of reducing emissions while accommodating needed growth.
- **Goal 5:** A pattern of land uses that can be efficiently served by a diversified transportation system and that directly and indirectly minimizes air pollutants.
  - **Policy 5.1: Manage Growth.** Regulate land use and promote development in a manner that will support established transit services and reduce the need for the automobile.
  - **Policy 5.2: Balance Growth.** Improve the balance between jobs and housing to create a more efficient urban form.
- **Goal 6:** Minimize particulate emissions from the construction and operation of roads and buildings, from mobile sources, and from the transportation, handling and storage of materials.
  - **Policy 6.1: Control Dust.** Further reduce particulate emissions from roads, parking lots, construction sites, unpaved alleys, and port operations and related uses.

- **Goal 7:** Reduce emissions through reduced energy consumption.
  - **Policy 7.1: Energy Conservation.** Reduce energy consumption through conservation improvements and requirements.
  - **Policy 7.2: Recycle Wastes.** Promote local recycling of wastes and the use of recycled materials.
- **Goal 8:** Education of City residents concerning air quality, energy, and congestion issues, and the need to modify present travel behavior and energy consumption patterns.
  - **Policy 8.1:** Promote public education programs at the local, subregional, and regional level to encourage residents to modify their behavior to reduce automobile trips. Coordinate with the Long Beach Unified School District, the Long Beach City College, California State University Long Beach, the American Lung Association, other jurisdictions and agencies, and environmental groups in the development of programs and campaigns to increase awareness of, and the number of stakeholders in, air quality, energy, and congestion issues.

3.3.7 City of Long Beach General Plan Mobility Element

The Mobility Element[1] of the City of Long Beach General Plan aims at creating a safe, efficient, balanced, and multimodal mobility network that maintains and enhances air, ground, and water transportation capacity, and leads the region by example with innovative and experimental practices, including goals, policies, and actions that help reduce air pollutants and GHG emissions through more efficient transportation. The following goals, strategies, and policies from the City of Long Beach General Plan Mobility Element are applicable to the proposed project and will reduce air pollutant emissions including GHG emissions:

- **Goal 1:** Create a safe, efficient, balanced, and multimodal mobility network.
  - **Strategy 1:** Establish a network of complete streets that complements the related street type.
    - **Mobility of People (MOP) Policy 1-9:** Increase mode shift of transit, pedestrians, and bicycles.
    - **MOP Policy 1-12:** Encourage large employers to provide transit subsidies, bicycle facilities, alternative work schedules, ridesharing, telecommuting and work-at-home programs, employee education, and preferential parking for carpools/vanpools.
    - **MOP Policy 1-17:** Develop land use policies that focus development potential in locations best served by transit.
  - **Strategy 2:** Reconfigure streets to emphasize their modal priorities.
    - **MOP Policy 2-17:** Ensure safe, convenient, and adequate on- and off-street bicycle parking facilities to accommodate and encourage residents to cycle for commuting and daily needs.

[1] Long Beach, City of, 2013. *Long Beach General Plan*. October.

- **Strategy 3:** Strategically improve congested intersections and corridors.
  - **MOP Policy 4-3:** Develop a new Multimodal Level of Service (MMLOS) methodology that includes the following components:
    - Emphasis on pedestrian and bicycle access and circulation.
    - Maintenance of appropriate emergency vehicle access and response time.
    - Support for reduced vehicle miles traveled.
    - Considers, but does not deem, auto congestion in Downtown or Long Beach Boulevard transit-oriented development (TOD) district to be an impact.
- **Strategy 5:** Reduce the environmental impacts of the transportation system.
  - **MOP Policy 5-2:** Reduce vehicle miles traveled (VMT) and vehicle trips through the use of alternative modes of transportation and Transportation Demand Management (TDM).
  - **MOP Policy 5-3:** Encourage the use of low- or no-emission vehicles to reduce pollution.
  - **MOP Policy 5-4:** Promote car-sharing and Neighborhood Electric Vehicle ownership as an important means to reduce traffic congestion.
  - **MOP Policy 5-5:** Sustain the recent improvements in air quality and achieve further significant progress in such improvements to meet State and Federal mandates.
- **Strategy 6:** Manage the supply of parking.
  - **MOP Policy 6-3:** Where appropriate, encourage the conversion of on-street parking space for expanded sidewalk widths or landscaping.
  - **MOP Policy 6-7:** Support using parking supply and pricing as a strategy to encourage use of non-automobile modes where feasible.
  - **MOP Policy 6-8:** Where applicable, encourage users to park once to meet all of their travel needs within the City.
  - **MOP Policy 6-11:** Encourage the use of transit, carpooling, and walking to reduce the need for parking.
  - **MOP Policy 6-12:** Promote transit-oriented development with reduced parking requirements around appropriate transit hubs and stations to facilitate the use of available transit services.
  - **MOP Policy 6-13:** Consider reducing parking requirements for mixed-use developments, for developments providing shared parking or a comprehensive TDM Program, or developments located near major transit hubs.
  - **MOP Policy 6-15:** Encourage and provide incentives for commercial, office, and industrial development to provide preferred parking for carpools, vanpools, electric vehicles, and flex cars.

- **Goal 3:** Lead the region by example with innovative and experimental practices.
  - **Strategy 10:** Be a leader in regional cooperation on transportation issues.

- **Strategy 11:** Adapt mobility strategies and programs based on new concepts and technologies that reduce environmental impacts and increase quality of life.
- **Strategy 12:** Develop freight-related improvements consistent with the regional transportation network.
  - **Mobility of Goods (MOG) Policy 13-2:** Reduce truck congestion and parking impacts on city streets.
- **Strategy 14:** Reduce the air quality impacts of freight transportation and port-related traffic.
  - **MOG Policy 14-1:** Provide for the efficient, clean, and safe movement of goods to support commerce and industry.
  - **MOG Policy 14-2:** Adopt and enforce truck routes to minimize the impacts of truck emissions on the community.
  - **MOG Policy 14-3:** Reduce congestion on freeways and designated truck routes.
  - **MOG Policy 14-4:** Encourage ridesharing activities within the Harbor District to reduce vehicle miles traveled (VMT) and parking space requirements in compliance with the South Coast Air Quality Management District requirements.

3.3.8 City of Long Beach Sustainable City Action Plan

The City of Long Beach's Sustainable City Action Plan (SCAP) was adopted in February 2010.[1] The SCAP is intended to guide operational, policy, and financial decisions to create a more sustainable Long Beach. The SCAP includes initiatives, goals and actions that will move Long Beach toward becoming a sustainable city. These goals and actions included in the SCAP relate to the following:

- Buildings & Neighborhoods
- Energy
- Green Economy & Lifestyle
- Transportation
- Urban Nature
- Waste Reduction
- Water

3.4 GLOBAL CLIMATE CHANGE REGULATION

3.4.1 Federal Regulations

The United States has historically had a voluntary approach to reducing GHG emissions. However, on April 2, 2007, the United States Supreme Court ruled that the EPA has the authority to regulate CO_2 emissions under the CAA. While there currently are no adopted Federal regulations for the

[1] Long Beach, City of, 2010. *City of Long Beach Sustainably City Action Plan*. February.

control or reduction of GHG emissions, the EPA commenced several actions in 2009 to implement a regulatory approach to global climate change, including the ones described below.

On September 22, 2009, the EPA issued a final rule for mandatory reporting of GHGs from large GHG emission sources in the United States. In general, this national reporting requirement will provide the EPA with accurate and timely GHG emissions data from facilities that emit 25,000 metric tons or more of CO_2 per year. This publicly available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost-effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial GHGs, along with vehicle and engine manufacturers, will report at the corporate level. An estimated 85 percent of the total United States GHG emissions, from approximately 10,000 facilities, are covered by this rule.

On December 7, 2009, the EPA Administrator signed a final action under the CAA, finding that six GHGs (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) constitute a threat to public health and welfare, and that the combined emissions from motor vehicles cause and contribute to global climate change. This EPA action does not impose any requirements on industry or other entities. However, the findings are a prerequisite to finalizing the GHG emission standards for light-duty vehicles mentioned below. The EPA received 10 petitions challenging this determination. On July 29, 2010, the EPA denied these petitions.

On April 1, 2010, the EPA and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) announced a final joint rule to establish a national program consisting of new standards for model year 2012 through 2016 light-duty vehicles that will reduce GHG emissions and improve fuel economy. The EPA is finalizing the first-ever national GHG emissions standards under the CAA, and NHTSA is finalizing Corporate Average Fuel Economy (CAFE) standards under the Energy Policy and Conservation Act. The EPA GHG standards require light-duty vehicles to meet an estimated combined average emissions level of 250 grams of CO_2 per mile in model year 2016, equivalent to 35.5 miles per gallon (mpg).

In December 2010, the EPA issued its plan for establishing GHG pollution standards under the CAA in 2011. The agency looked at a number of sectors and is moving forward on GHG standards for fossil fuel power plants and petroleum refineries, two of the largest industrial sources, representing nearly 40 percent of the GHG pollution in the United States.[1]

The EPA and the NHTSA also established standards to reduce GHG emissions and improve the fuel efficiency of heavy-duty trucks and buses.

3.4.2 State Regulations

The ARB is the lead agency for implementing climate change regulations in California. Since its formation, the ARB has worked with the public, the business sector, and local governments to find solutions to California's air pollution problems. Key efforts by the State are described below.

[1] EPA, 2010. Press Release. December 23.

Executive Order S-3-05 (2005). Governor Arnold Schwarzenegger signed Executive Order (EO) S-3-05 on June 1, 2005, which proclaimed that California is vulnerable to the impacts of climate change. The executive order declared that increased temperatures could reduce snowpack in the Sierra Nevada Mountains, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the executive order established California's GHG emissions reduction targets, which established the following goals:

- GHG emissions should be reduced to 2000 levels by 2010.
- GHG emissions should be reduced to 1990 levels by 2020.
- GHG emissions should be reduced to 80 percent below 1990 levels by 2050.

The Secretary of the California Environmental Protection Agency (CalEPA) is required to coordinate efforts of various State agencies in order to collectively and efficiently reduce GHGs. A biannual progress report must be submitted to the Governor and State Legislature disclosing the progress made toward GHG emission reduction targets. In addition, another biannual report must be submitted illustrating the impacts of global warming on California's water supply, public health, agriculture, the coastline, and forestry, and report possible mitigation and adaptation plans to address these impacts.

The Secretary of CalEPA leads this Climate Action Team (CAT) made up of representatives from State agencies as well as numerous other boards and departments. The CAT members work to coordinate statewide efforts to implement global warming emission reduction programs and the State's Climate Adaptation Strategy. The CAT is also responsible for reporting on the progress made toward meeting the statewide GHG targets that were established in the Executive Order and further defined under AB 32, the "Global Warming Solutions Act of 2006." The first CAT Report to the Governor and the Legislature was released in March 2006, which it laid out 46 specific emission reduction strategies for reducing GHG emissions and reaching the targets established in the Executive Order. The CAT Report to the Governor and Legislature and will be updated and issued every 2 years thereafter; the most recent was released in 2013.

AB 32 (2006), California Global Warming Solutions Act. California's major initiative for reducing GHG emissions is AB 32, passed by the State legislature on August 31, 2006. This effort aims at reducing GHG emissions to 1990 levels by 2020. The ARB has established the level of GHG emissions in 1990 at 427 million metric tons (MMT) of CO_2e. The emissions target of 427 MMT requires the reduction of 169 MMT from the State's projected business-as-usual (BAU) 2020 emissions of 596 MMT. AB 32 requires the ARB to prepare a Scoping Plan that outlines the main State strategies for meeting the 2020 deadline and to reduce GHGs that contribute to global climate change. The Scoping Plan was approved by the ARB on December 11, 2008, and includes measures to address GHG emission reduction strategies related to energy efficiency, water use, and recycling and solid waste, among other measures.[1] The Scoping Plan includes a range of GHG reduction actions that may include direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system. The Scoping Plan, even after ARB approval, remains a recommendation. The measures in the

[1] ARB, 2008. *Climate Change Scoping Plan: a framework for change*. December.

Scoping Plan will not be binding until after they are adopted through the normal rulemaking process. The ARB rulemaking process includes preparation and release of each of the draft measures, public input through workshops, and a public comment period, followed by an ARB hearing and rule adoption.

In addition to reducing GHG emissions to 1990 levels by 2020, AB 32 directed the ARB and the newly created CAT to identify a list of "discrete early action GHG reduction measures" that could be adopted and made enforceable by January 1, 2010. On January 18, 2007, Governor Schwarzenegger signed EO S-1-07, further solidifying California's dedication to reducing GHGs by setting a new Low Carbon Fuel Standard (LCFS). The Executive Order sets a target to reduce the carbon intensity of California transportation fuels by at least 10 percent by 2020 and directs the ARB to consider the LCFS as a discrete early action measure.

In June 2007, the ARB approved a list of 37 early action measures, including three discrete early action measures (LCFS, Restrictions on GWP Refrigerants, and Landfill CH_4 Capture).[1] Discrete early action measures are measures that were required to be adopted as regulations and made effective no later than January 1, 2010, the date established by Health and Safety Code Section 38560.5. The ARB adopted additional early action measures in October 2007 that tripled the number of discrete early action measures. These measures relate to truck efficiency, port electrification, reduction of PFCs from the semiconductor industry, reduction of propellants in consumer products, proper tire inflation, and SF_6 reductions from the non-electricity sector. The combination of early action measures is estimated to reduce statewide GHG emissions by nearly 16 MMT.[2]

In December 2008, the ARB adopted its Climate Change Scoping Plan, which contains the main strategies California will implement to achieve reduction of approximately 169 MMT CO_2e, or approximately 30 percent from the State's projected 2020 emission level of 596 MMT CO_2e under a BAU scenario (this is a reduction of 42 MMT CO_2e, or almost 10 percent from 2002–2004 average emissions). The Scoping Plan also includes ARB-recommended GHG reductions for each emissions sector of the State's GHG inventory. The Scoping Plan calls for the largest reductions in GHG emissions to be achieved by implementing the following measures and standards:

- Improved emissions standards for light-duty vehicles (estimated reductions of 31.7 MMT CO_2e)
- The Low-Carbon Fuel Standard (15.0 MMT CO_2e)
- Energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems (26.3 MMT CO_2e)
- A renewable portfolio standard for electricity production (21.3 MMT CO_2e)

The Scoping Plan identifies 18 emissions reduction measures that address cap-and-trade programs, vehicle gas standards, energy efficiency, low carbon fuel standards, renewable energy, regional transportation-related GHG targets, vehicle efficiency measures, goods movement, solar roof

1 ARB, 2007a. *Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California Recommended for Board Consideration*. October.

2 ARB, 2007b. "ARB approves tripling of early action measures required under AB 32" News Release 07-46. Website: www.arb.ca.gov/newsrel/nr102507.htm. October 25.

programs, industrial emissions, high-speed rail, green building strategies, recycling, sustainable forests, water, and air. The measures would result in a total reduction of 174 MMT CO_2e by 2020.

On August 24, 2011, the ARB unanimously approved both the ARB's new supplemental assessment and re-approved its Scoping Plan, which provides the overall roadmap and rule measures to carry out AB 32. The ARB also approved a more robust CEQA-equivalent document supporting the supplemental analysis of the cap-and-trade program. The ARB also announced that it would be delaying the date that entities would be required to comply with its cap-and-trade program until 2013.

The ARB has not yet determined what amount of GHG reductions it recommends from local government operations; however, the Scoping Plan does state that land use planning and urban growth decisions will play an important role in the State's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate population growth and the changing needs of their jurisdictions (meanwhile, the ARB is also developing an additional protocols for community emissions). The ARB further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. The Scoping Plan states that the ultimate GHG reduction assignment to local government operations is to be determined. With regard to land use planning, the Scoping Plan expects approximately 5.0 MMT CO_2e will be achieved associated with implementation of SB 375.

Senate Bill 97 (2007). SB 97, signed by the Governor in August 2007 (Chapter 185, Statutes of 2007; Public Resources Code [PRC], Sections 21083.05 and 21097), acknowledges climate change is a prominent environmental issue that requires analysis under CEQA. This bill directed the OPR to prepare, develop, and transmit to the California Natural Resources Agency guidelines for mitigating GHG emissions or the effects of GHG emissions, as required by CEQA. The California Natural Resources Agency adopted the amendments to the *CEQA Guidelines* in January 2010, which went into effect in March 2010. The amendments do not identify a threshold of significance for GHG emission, nor do they prescribe assessment methodologies or specific mitigation measures.

Executive Order B-30-15. EO B-30-15, signed April 29, 2015, sets a goal of reducing GHG emissions within the State to 40 percent of 1990 levels by year 2030. EO B-30-15 also directs ARB to update the Scoping Plan to quantify the 2030 GHG reduction goal for the State and requires state agencies to implement measures to meet the interim 2030 goal of EO B-30-15 as well as the long-term goal for 2050 in EO S-03-5. It also requires the Natural Resources Agency to conduct triennial updates the California adaption strategy, Safeguarding California, in order to ensure climate change is accounted for in State planning and investment decisions.

Senate Bill 375 (2008). SB 375, the Sustainable Communities and Climate Protection Act, which establishes mechanisms for the development of regional targets for reducing passenger vehicle GHG emissions, was adopted by the State on September 30, 2008. On September 23, 2010, the ARB adopted the vehicular GHG emissions reduction targets that had been developed in consultation with the MPOs; the targets require a 7 to 8 percent reduction by 2020 and between 13 to 16 percent reduction by 2035 for each MPO. SB 375 recognizes the importance of achieving significant GHG

reductions by working with cities and counties to change land use patterns and improve transportation alternatives. Through the SB 375 process, MPOs such as SCAG will work with local jurisdictions in the development of SCSs designed to integrate development patterns and the transportation network in a way that reduces GHG emissions while meeting housing needs and other regional planning objectives. Pursuant to SB 375, the SCAG reduction targets for per capita vehicular emissions are 8 percent by 2020 and 13 percent by 2035.[1]

Title 24, Building Standards Code and CALGreen Code. In November 2008, the California Building Standards Commission established the California Green Building Standards (CALGreen) Code, which sets performance standards for residential and nonresidential development to reduce environmental impacts and encourage sustainable construction practices. The CALGreen Code addresses energy efficiency, water conservation, material conservation, planning and design, and overall environmental quality. The CALGreen Code was most recently updated in 2016 to include new mandatory measures for residential as well as nonresidential uses; the new measures take effect on January 1, 2017.

[1] ARB. 2010. Resolution 10-31: Regional Greenhouse Gas Emissions Reduction Targets Pursuant to SB 375. September 23.

4.0 SETTING

4.1 ATTAINMENT STATUS

The ARB is required to designate areas of the state as attainment, nonattainment, or unclassified for all State standards. An *attainment* designation for an area signifies that pollutant concentrations did not violate the standard for that pollutant in that area. A *nonattainment* designation indicates that a pollutant concentration violated the standard at least once, excluding those occasions when a violation was caused by an exceptional event, as defined in the criteria. An *unclassified* designation signifies that data do not support either an attainment or nonattainment status. The CCAA divides districts into moderate, serious, and severe air pollution categories, with increasingly stringent control requirements mandated for each category.

The EPA designates areas for O_3, CO, and NO_2 as either does not meet the primary standards, or cannot be classified, or better than national standards. For SO_2, areas are designated as does not meet the primary standards, does not meet the secondary standards, cannot be classified, or better than national standards.

Table D provides a summary of the attainment status for the Basin with respect to NAAQS and CAAQS.

Table D: Attainment Status of Criteria Pollutants in the South Coast Air Basin

Pollutant	State	Federal
O_3 1-hour	Nonattainment	N/A
O_3 8-hour	Nonattainment	Extreme Nonattainment
PM_{10}	Nonattainment	Attainment/Maintenance
$PM_{2.5}$	Nonattainment	Nonattainment
CO	Attainment	Attainment/Maintenance
NO_2	Nonattainment	Attainment/Maintenance
SO_2	Attainment	Attainment
Lead	Attainment	Attainment[1]
All others	Attainment/Unclassified	Attainment/Unclassified

Source: California Air Resources Board (2014).
[1] Except in Los Angeles County.
ARB = California Air Resources Board
CO = carbon monoxide
N/A = not applicable
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
SO_2 = sulfur dioxide

4.2 EXISTING CLIMATE AND AIR QUALITY

Air quality in Long Beach is affected by various emission sources (e.g., mobile and industry) as well as atmospheric conditions (e.g., wind speed, wind direction, temperature, and rainfall). The combination of topography, low mixing height, abundant sunshine, and emissions form the second

largest urban area in the United States gives the Basin some of the highest pollutant concentrations in the country.

The annual average temperature various throughout the Basin, ranging from the low- to middle-60s, measured in °F. With a more pronounced oceanic influence, coastal areas, including the City of Long Beach, show less variability in annual minimum and maximum temperatures than inland areas. The monthly average maximum temperature in Long Beach ranges from 65.2°F in January to 80.7°F in August. The monthly average minimum temperature ranges from 44.8°F in January to 62.1°F in August.[1] January is typically the coldest month, and July and August are typically the warmest months in this area of the Basin.

The majority of annual rainfall in the Basin occurs between November and April. Summer rainfall is minimal and is generally limited to scattered thunderstorms in coastal regions and slightly heavier showers in the eastern portion of the Basin and along the coastal side of the mountains. The monthly average rainfall in Long Beach typically varies from 2.88 inches in January to 0.03 inch in August with an annual total of 12.72 inches. Patterns in monthly and yearly rainfall totals are unpredictable due to fluctuations in the weather.

The Basin experiences a persistent temperature inversion (increasing temperature with increasing altitude) as a result of the Pacific high, which is the semi-permanent high-pressure area of the north Pacific Ocean and is the dominating factor in California weather. This inversion limits the vertical dispersion of air contaminants, holding them relatively near the ground. As the sun warms the ground and the lower air layer, the temperature of the lower air layer approaches the temperature of the base of the inversion (upper) layer until the inversion layer finally breaks, allowing vertical mixing with the lower layer. This phenomenon is observed in mid-afternoon to late afternoon on hot summer days, when the smog appears to clear up suddenly. Winter inversions frequently break by midmorning.

Winds in Long Beach blow predominantly from the west–northwest, with relatively low velocities.[2] Wind speeds in Long Beach average between 7 miles per hour (mph) and 4 mph. Summer wind speeds average slightly higher than winter wind speeds. Low average wind speeds, together with a persistent temperature inversion, limit the vertical dispersion of air pollutants throughout the Basin. Strong, dry, north or northeasterly winds, known as Santa Ana winds, occur during the fall and winter months and disperse air contaminants. The Santa Ana conditions tend to last for several days at a time.[3]

The combination of stagnant wind conditions and low inversions produces the greatest pollutant concentrations. On days of no inversion or high wind speeds, ambient air pollution concentrations are the lowest. During periods of low inversions and low wind speeds, air pollutants generated in urbanized areas are transported predominantly onshore into Riverside and San Bernardino Counties. In the winter, the greatest pollution problems are CO and NO_X because of extremely low inversions and air stagnation during the night and early morning hours. In the summer, the longer daylight hours

1 Western Regional Climate Center, 2015.
2 Ibid.
3 Ibid.

and the brighter sunshine combine to cause a reaction between hydrocarbons and NO_X to form photochemical smog or ozone.

4.3 AIR QUALITY MONITORING RESULTS

Air quality monitoring stations are located throughout the nation and are maintained by the local air pollution control district and State air quality regulating agencies. The SCAQMD, together with the ARB, maintains ambient air quality monitoring stations in the Basin. The air quality monitoring station closest to the site is the 2425 Webster Street ambient air quality monitoring station in Long Beach, because it monitors the most air pollutant data in the City. The air quality trends from this station are used to represent the ambient air quality in Long Beach.

Pollutant monitoring results for the years 2012 to 2014 at the 2425 Webster Street ambient air quality monitoring station in Long Beach, shown in Table E, indicate that air quality in the vicinity of the City has generally been good. As indicated in the monitoring results, no violations of the State PM_{10} standard occurred during the 3-year period and no violations of the Federal PM_{10} standard were recorded. $PM_{2.5}$ levels exceeded the Federal standard twice in 2014, twice in 2013, and four times in 2012. Neither State nor Federal 1-hour ozone standards were exceeded in the 3-year period. The State 8-hour ozone standard was exceeded in 2014, but not in 2013 or 2012. The CO, SO_2, and NO_2 standards were also not exceeded in this area during the 3-year period.

4.4 EXISTING SETTING

The project site is currently developed and consists of a mix of residential, commercial, medical, institutional, and open space and recreation uses. These uses currently generate criteria air pollutants from natural gas use for energy, heating and cooking, vehicle trips associated with each land use, and area sources such as landscaping equipment and consumer cleaning products.

4.4.1 Existing City of Long Beach Criteria Air Pollutant Emissions Inventory

Table F identifies the existing criteria air pollutant emissions inventory of the City of Long Beach using emission rates for year 2012 (existing conditions) and year 2040 (future conditions). The inventories are based on existing land uses in the proposed LUE/UDE Major Areas of Change. The year 2012 inventory represents the estimated emissions generated by the existing land uses using the baseline year 2012 emission factors for on-road vehicles. The year 2040 inventory represents the projected emissions that the existing land uses would generate in the future utilizing year 2040 emission factors for on-road vehicles.

Criteria air pollutant emissions generated within the City-proposed LUE/UDE Major Areas of Change were estimated using EMFAC2014, NONROAD, and data provided by Southern California Gas Company (SoCal Gas) for natural gas use. Emissions within the City of Long Beach come from the following sources:

Table E: Ambient Air Quality Monitored at the Long Beach–2425 Webster Street Station

Pollutant	Standard	2012	2013	2014
Carbon Monoxide (CO)				
Maximum 1-hour concentration (ppm)		4.2	4.1	3.7
Number of days exceeded:	State: > 20 ppm	0	0	0
	Federal: > 35 ppm	0	0	0
Maximum 8-hour concentration (ppm)		2.6	2.6	2.6
Number of days exceeded:	State: > 9 ppm	0	0	0
	Federal: > 9 ppm	0	0	0
Ozone (O_3)				
Maximum 1-hour concentration (ppm)		0.080	0.090	0.087
Number of days exceeded:	State: > 0.09 ppm	0	0	0
Maximum 8-hour concentration (ppm)		0.067	0.070	0.072
Number of days exceeded:	State: > 0.070 ppm	0	0	1
	Federal: > 0.075 ppm	0	0	0
Coarse Particulates (PM_{10})				
Maximum 24-hour concentration (µg/m^3)		45.0[1]	37.0[1]	84.0
Number of days exceeded:	State: > 50 µg/m^3	0	0	ND
	Federal: > 150 µg/m^3	0	0	0
Annual arithmetic average concentration (µg/m^3)		23.2[1]	24[1]	ND
Exceeded for the year:	State: > 20 µg/m^3	Yes	Yes	ND
	Federal: > 50 µg/m^3	No	No	ND
Fine Particulates ($PM_{2.5}$)				
Maximum 24-hour concentration (µg/m^3)		58.6[1]	51.7[1]	51.5[1]
Number of days exceeded:	Federal: > 35 µg/m^3	4	2	2
Annual arithmetic average concentration (µg/m^3)		10.4[1]	11.3[1]	11.4[1]
Exceeded for the year:	State: > 12 µg/m^3	No	No	No
	Federal: > 15 µg/m^3	No	No	No
Nitrogen Dioxide (NO_2)				
Maximum 1-hour concentration (ppm)		0.098	0.081	0.136
Number of days exceeded:	State: > 0.25 ppm	0	0	0
Annual arithmetic average concentration (ppm)		0.025	0.021	0.020
Exceeded for the year:	Federal/State: > 0.053 ppm	No	No	No
Sulfur Dioxide (SO_2)				
Maximum 24-hour concentration (ppm)		0.004	0.004	ND
Number of days exceeded:	State: > 0.04 ppm	0	0	ND
	Federal: > 0.14 ppm	0	0	ND
Annual arithmetic average concentration (ppm)		ND	ND	ND
Exceeded for the year:	Federal: > 0.030 ppm	ND	ND	ND

Source: ARB (2015b) and EPA (2015).
[1] Data from the 3648 Long Beach Boulevard monitoring site.
µg/m^3 = micrograms per cubic meter
ARB = California Air Resources Board
EPA = United States Environmental Protection Agency
ND = No data. There was insufficient (or no) data to determine the value.
ppm = parts per million

Table F: Existing City of Long Beach Regional Criteria Air Pollutant Emissions Inventory

Sector	Criteria Air Pollutant Emissions (lbs/day)					
	VOC	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Existing Condition Year 2012						
Transportation (2012 emission factors)[1]	4,265.95	9,090.11	36,209.28	52.23	188.98	179.54
Energy, Residential (natural gas use)[2]	0.12	10.48	4.46	0.07	0.85	0.85
Energy, Commercial + Industrial (natural gas use)[2]	1.05	9.59	8.06	0.06	0.73	0.73
Area, Landscaping/Consumer Products[3]	0.51	0.31	8.08	0.00	0.04	0.04
Existing Land Uses Total	**4,267.64**	**9,110.50**	**36,229.88**	**52.36**	**190.60**	**181.16**
Existing General Plan Year 2040						
Transportation (2040 emission factors)[1]	932.54	1,707.34	6,564.44	33.75	16.03	14.91
Energy, Residential (natural gas use)[2]	1.54	13.19	5.61	0.08	1.07	1.07
Energy, Commercial + Industrial (natural gas use)[2]	1.06	9.65	8.11	0.06	0.73	0.73
Area, Landscaping/Consumer Products[3]	0.55	0.36	8.82	0.00	0.04	0.04
Existing General Plan Year 2040 Emission Total	**935.69**	**1,730.53**	**6,586.98**	**33.89**	**17.87**	**16.75**

Source: Compiled by LSA Associates, Inc. (April 2016).

[1] EMFAC2014 based on daily vehicle miles traveled (VMT) provided by LSA Associates, Inc. Transportation sector includes the full trip length for internal-internal trips and 50 percent trip length for external-internal/internal-external trips. VMT per year based on a conversion of VMT × 347 days per year to account for less travel on weekend, consistent with ARB statewide GHG emissions inventory methodology (ARB 2008).

[2] Natural gas usage data provided by City of Long Beach Oil and Gas.

[3] NONROAD emissions estimated based on population for landscaping emissions and employment estimates for light commercial equipment. Estimates were based on population and employment data calculated using a percentage reflective of the City of Long Beach included in the Los Angeles County data included in the SCAG 2016 RTP/SCS. Excludes fugitive emissions from paved and unpaved surfaces and wood-burning fireplaces. Various industrial and commercial processes (e.g., manufacturing, dry cleaning) allowed under the Land Use Element would require permitting and would be subject to further study pursuant to SCAQMD Regulation XIII, New Source Review. Because the nature of those emissions cannot be determined at this time and are subject to further regulation and permitting, they are not considered for purposes of this analysis.

ARB = California Air Resources Board
CO = carbon monoxide
GHG = greenhouse gas
lbs/day = pounds per day
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
RTP = Regional Transportation Plan
SCAG = Southern California Association of Governments
SCAQMD = South Coast Air Quality Management District
SCS = Sustainable Communities Strategy
SO_X = sulfur oxides
VOC = volatile organic compound

- **Transportation:** Based on the Traffic Impact Analysis (TIA) (LSA 2016), the existing 2012 vehicle traffic within the Major Areas of Change is approximately 321,662 average daily trips (ADT). These trips are associated with the existing residential development, commercial facilities, and industrial facilities within the Major Areas of Change. Based on the information in the existing General Plan and 2012 SCAG RTP/SCS transportation forecast, the traffic is estimated to increase to a total of 345,672 ADTs in year 2040 (i.e., without the proposed project). Emissions from vehicle trips beginning and ending within the City (i.e., internal/internal vehicle trips) and from trips that either begin or end within the City, but not both (i.e., external/internal vehicle trips).

Criteria air pollutant emissions generated within the City-proposed LUE/UDE Major Areas of Change were estimated using EMFAC2014, NONROAD, and data provided by Southern California Gas Company (SoCal Gas) for natural gas use. Emissions within the City of Long Beach come from the following sources:

- **Transportation:** Based on the Traffic Impact Analysis (TIA) (LSA 2016), the existing 2012 vehicle traffic within the Major Areas of Change is approximately 321,662 average daily trips (ADT). These trips are associated with the existing residential development, commercial facilities, and industrial facilities within the Major Areas of Change. Based on the information in the existing General Plan and 2012 SCAG RTP/SCS transportation forecast, the traffic is estimated to increase to a total of 345,672 ADTs in year 2040 (i.e., without the proposed project). Emissions from vehicle trips beginning and ending within the City (i.e., internal/internal vehicle trips) and from trips that either begin or end within the City, but not both (i.e., external/internal vehicle trips).
- **Area Sources:** Emissions from lawn and garden equipment use, and commercial equipment use.
- **Energy:** Emissions generated from natural gas consumption used for cooking and heating in the City.

4.4.2 Multiple Air Toxics Exposure Study IV

The Multiple Air Toxics Exposure Study (MATES) is a monitoring and evaluation study on ambient concentrations of TACs and estimated the potential health risks from air toxics in the Basin. The MATES was aimed at estimating the cancer risk from toxic air pollutant emissions throughout the Basin by conducting a comprehensive monitoring program, an updated emissions inventory of toxic air contaminants, and a modeling effort to fully characterize health risks for those living in the Basin. In 2008, the SCAQMD conducted its third update to the MATES (MATES III). The study concluded that the average carcinogenic risk from air pollution in the Basin is approximately 1,200 in one million. Mobile sources (e.g., cars, trucks, trains, ships, and aircraft) represent the greatest contributors. Approximately 85 percent of the risk is attributed to diesel particulate emissions, approximately 10 percent to other toxics associated with mobile sources (including benzene, butadiene, and formaldehyde), and approximately 5 percent of all carcinogenic risk is attributed to stationary sources (which include industries and other businesses, such as dry cleaners and chrome plating operations).

In May 2015, the SCAQMD released the final report of the fourth update (MATES IV). The results showed that the overall monitored risk for excess cancer from a lifetime exposure to ambient levels of air toxics decreased to approximately 418 in one million. Compared to the previous update released in 2008 (MATES III), monitored excess cancer risks decreased by approximately 65 percent. Approximately 90 percent of the risk is attributed to mobile sources while 10 percent is attributed to TACs from stationary sources, such as refineries, metal processing facilities, gas stations, and chrome plating facilities. The largest contributor to this risk was diesel exhaust, accounting for approximately 68 percent of the air toxics risk. Compared to MATES III, MATES IV found substantial improvement in air quality and associated decrease in air toxics exposure. As a result, the estimated basin-wide population-weighted risk decreased by approximately 57 percent compared to the analysis done for the MATES III time period. For Los Angeles County, MATES III's estimated population-weighted average risk was 951 per million while MATES IV's estimated population-weighted average risk was 415 per million (SCAQMD 2015a). In the project vicinity of Long Beach, the MATES IV interactive map identifies risk to range from 1,150 per million to 2,235 per million (SCAQMD 2015b).
It should be noted that the Office of Environmental Health Hazard Assessment (OEHHA) has updated the methods for estimating cancer risks. The new method includes utilizing higher estimates

of cancer potency during early life exposures. There are also differences in the assumptions on breathing rates and length of residential exposures. When combined, the SCAQMD estimates that risks for a given inhalation exposure level will be about 2.7 times higher using the proposed updated methods identified in MATES IV (SCAQMD 2015a).

4.4.3 Sensitive Receptors

Some land uses are considered more sensitive to air pollution than others due to the types of population groups or activities involved. Sensitive population groups include children, the elderly, the acutely ill, and the chronically ill, especially those with cardiorespiratory diseases.

Residential areas are also considered sensitive to air pollution because residents (including children and the elderly) tend to be at home for extended periods of time, resulting in sustained exposure to any pollutants present. Other sensitive receptors include retirement facilities, hospitals, and schools. Recreational land uses are considered moderately sensitive to air pollution. Although exposure periods are generally short, exercise places a high demand on respiratory functions, which can be impaired by air pollution. In addition, noticeable air pollution can detract from the enjoyment of recreation. Industrial, commercial, retail, and office areas are considered the least sensitive to air pollution. Exposure periods are relatively short and intermittent, because the majority of the workers tend to stay indoors most of the time. In addition, the workforce is generally the healthiest segment of the population.

5.0 METHODOLOGY AND THRESHOLDS

5.1 METHODOLOGY

A number of modeling tools are available to assess air quality impacts of projects. In addition, certain air districts, such as the SCAQMD, have created guidelines and requirements to conduct air quality analysis. SCAQMD's current guidelines, *CEQA Air Quality Handbook*, (SCAQMD 1993) were followed in the assessment of air quality impacts for the proposed project. The air quality models identified in the document (including an older version of the URBEMIS model) are outdated; therefore, the current reference materials in CalEEMod Version 2013.2.2 model are used to estimate project-related mobile and stationary sources emissions. CalEEMod was developed by the California Air Pollution Control Officers Association for use in estimating emissions from land use development projects. This AQIA includes estimated emissions associated with implementation of the proposed project. Criteria pollutants with regional impacts would be emitted by increased vehicle trips, as well as by emissions associated with area sources. Localized air quality impacts, such as higher CO concentrations (CO hot spots) near intersections or roadway segments affected by future development facilitated by approval of the proposed project, would be small and less than significant due to the generally low ambient CO concentrations.

The net increase in pollutant emissions determines the significance and impact on regional air quality as a result of implementation of the proposed project. The results also allow the local government to determine whether the new development under the proposed project will deter the region from achieving the goal of reducing pollutants in accordance with the AQMP in order to comply with NAAQS and CAAQS.

5.1.1 Operational Emissions

This AQIA includes an estimate of emissions associated with long-term operation of the proposed project. Criteria pollutants with regional impacts would be emitted by mobile (indirect) sources associated with the proposed project. Consistent with SCAQMD guidance for estimating emissions associated with land use development projects, emission factors, inventory data information, and references from CalEEMod were used to calculate the long-term operational emissions associated with the project. The criteria air pollutant emissions inventory includes the following sectors:

- **Transportation:** Transportation emissions forecasts were modeled for vehicle trips beginning and ending within the City of Long Beach and from external/internal vehicle trips (i.e., trips that either begin or end within the City) using the ARB's EMFAC2014-EI. The estimated traffic from the proposed project Major Areas of Change was addressed in the TIA. Based on the TIA (LSA 2016), the existing 2012 vehicle traffic within the Major Areas of Change is approximately 321,662 ADT. These trips are associated with the existing residential development, commercial facilities, and industrial facilities within the Major Areas of Change. Within the proposed project Major Areas of Change, the growth in traffic is estimated to increase with an additional 111,574 ADTs, or a total of 433,236 ADTs in year 2040. For conservative purposes, trip lengths were estimated using the information from Table A9 and Table A10 of the Highway and Arterial

Appendix of the SCAG 2016–2040 RTP/SCS (SCAG 2016), where it assumed 13.28 miles for the median home-based work trip length and 7.71 miles median non-work trip length within Los Angeles County. Commuting distances would likely be reduced for a portion of those trips due to the design of the proposed project with mixed uses. The VMT provided, per SCAG 2016 RTP/SCS average trip length data for Los Angeles County and ADT data from the TIA for Major Areas of Change, includes the full trip length for land uses in the County (origin-destination approach) and a 50 percent reduction in the trip length for external/internal trips. Forecasts are adjusted for increases in population in the City. Adjusted daily VMT was multiplied by 347 days per year to account for reduced traffic on weekends and holidays to estimate annual emissions. The EMFAC2014 emission program was used to estimate emissions associated with project-generated traffic. The EMFAC2014 model is the latest version of the emission factor model for on-road traffic. Emission factors representing the vehicle mix for 2012 and 2040 for Los Angeles County were used to estimate emissions. Based on the results of the EMFAC2014 model for subsequent years, emissions would decrease on an annual basis from 2015 onward due to phase out of higher polluting vehicles and implementation of more stringent emission standards that are taken into account in the EMFAC2014 model.

- **Energy:** Natural gas use for residential and nonresidential land uses in the City was modeled using annual gas supply data of 24.4 million cubic feet per year for the City of Long Beach provided by the Long Beach Gas & Oil Department available in the 2014 SoCal Gas Report for existing year 2012. The unit of measure for the natural gas was then converted from cubic feet to therms (i.e., 244,000 therms per year for the entire City). Based on the service population ratio between the Major Areas of Change and the entire City (i.e., approximately 17 percent), the estimated amount of natural gas consumption for the proposed project Major Areas of Change is approximately 41,980 therms per year. The emission factors for the natural gas consumption were obtained from the CalEEMOD model, which is further referenced in the EPA AP-42 Emission Factor Estimation document. Forecasts for the project buildout year are adjusted for projected increases in population and employment (i.e., service population) in the City-proposed LUE/UDE Major Areas of Change.
- **Area Sources:** NONROAD and OFFROAD 2011 emission factors were used to estimate criteria air pollutant emissions from landscaping equipment and light commercial equipment in the City. NONROAD and OFFROAD contain a database of equipment use and associated emissions for each county compiled by the ARB. Annual emissions were compiled using NONROAD and OFFROAD for the County of Los Angeles for year 2012. Landscaping and light commercial equipment is estimated based on population (Landscaping) and employment (Light Commercial Equipment) for the City of Long Beach as a percentage of Los Angeles County. Forecasts are adjusted for increases in population and employment (i.e., service population) in the City-proposed LUE/UDE Major Areas of Change, with the exception of construction activities, which assume that construction emissions for the forecast year would be similar to historical levels. Area sources exclude emissions from fireplaces and consumer products in the City.

5.1.2 Greenhouse Gas Emissions

Greenhouse gas emissions associated with implementation of the proposed project would occur over the short term from construction activities, consisting primarily of emissions from equipment exhaust. There would also be minimal long-term greenhouse gas emissions associated with project-related vehicular trips. Recognizing that the field of global climate change analysis is rapidly evolving, the

approaches advocated most recently indicate that lead agencies should calculate, or estimate, emissions from vehicular traffic, energy consumption, water conveyance and treatment, waste generation, construction activities, and any other significant source of emissions within the planning area. The GHG emissions inventory includes the following sectors:

- **Transportation:** Transportation emissions forecasts were modeled for vehicle trips beginning and ending within the City of Long Beach and from external/internal vehicle trips (i.e., trips that either begin or end within the City) using the ARB's EMFAC2014-EI. As previously described, the EMFAC2014 model runs were based on VMT data and emission factors for 2012 (existing) and forecast 2040 emission rates. The GHG emission assumption is consistent with the ARB's methodology within the Climate Change Scoping Plan Measure Documentation Supplement. Modeling was conducted for an adjusted BAU scenario, which includes GHG emissions reduction from the Pavley Fuel Efficiency Standard and the ARB LCFS.
- **Energy:** Natural gas and electricity use for residential and nonresidential land uses in the City were modeled using data provided by the SoCal Gas 2014 Gas Report and Long Beach Water Department, respectively. Natural gas supply is discussed in the air quality section above. Electricity use is based on the CalEEMod model energy consumption rates for each land use type for year 2012 to account existing annual use. Electricity use for residential and nonresidential land uses in the City was modeled using the estimated annual electricity consumption rate of 3.8 million megawatt hours per year (MWh/yr) for the City of Long Beach. Based on the service population ratio between the City of Long Beach and the proposed project Major Areas of Change, an estimated annual electricity consumption rate of 640,177 MWh/yr is used for the existing year 2012 analysis. Forecast year 2040 data are adjusted for increases in service population in the Major Areas of Change. The intensity factor of the purchased electricity is based on the 2012 CO_2e intensity factor provided by Southern California Edison. Intensity factors for CO_2, CH_4 and N_2O provided in the ARB's Local Government Operations Protocol (LGOP), Version 1.1, were used for natural gas. Future GHG emissions reductions for residential electricity use include a reduction in carbon intensity of the energy supply required under the 50 percent Renewable Portfolio Standard (RPS) (California Energy Commission 2015), a 46 percent increase in 2008 Title 24 building energy efficiency as a result of changes to the Building and Energy Efficiency Standards (i.e., proposed CALGreen Code effective January 2017), and energy conservation measures.
    - **Waste:** Modeling of landfilled waste disposed of by residents and employees in the City is based on the waste commitment method using the ARB's Landfill Emissions Tool model, Version 1.3, based on 37,357 tons of waste disposal (municipal solid waste and alternative daily cover) and waste characterization data for existing year 2012 from the California Department of Resources Recycling and Recovery (CalRecycle) Disposal Reporting System (CalRecycle 2016). Landfills in California have gas capture systems, but because the landfill gas captured is not under the jurisdiction of the City, the emissions from the capture system are not included in the City's inventory. Only fugitive sources of GHG emissions from landfills are included. Modeling assumes a 75 percent reduction in fugitive GHG emissions from the landfill's gas capture system. The landfill gas capture efficiency is based on the ARB's LGOP, Version 1.1. Biogenic CO_2 emissions are not included. Forecasts are adjusted for increases in population and employment (service population) in the City-proposed LUE/UDE Major Areas of Change, which is forecast to generate 52,121 tons of solid waste in year 2040.

- **Water/Wastewater:** GHG emissions from water and wastewater include indirect GHG emissions from the embodied energy (i.e., energy required for treatment and distribution) of water and wastewater. Existing year 2012 total water use in the City is based on the water-demand average data of approximately 11,409 acre-feet per year (afy) for the proposed LUE Major Areas of Change (i.e., service population ratio from the total City water use data) provided by Long Beach Water Department and also the existing year 2012 wastewater generation rate of 18,490 afy (i.e., service population ratio from the total City wastewater data) provided in the City's Urban Water Management Plan (UWMP). Forecasts are adjusted for increases in service population and are based on the target per capita SBx7-7.[1] Energy use from water use and wastewater treatment is estimated using energy rates identified by the California Energy Commission (2006) and carbon intensity of energy as provided and identified by Southern California Edison data. In addition to the indirect emissions associated with the embodied energy of water use and wastewater treatment, wastewater treatment also results in fugitive GHG emissions. Fugitive emissions from wastewater treatment associated with the Plan Area were calculated using the emissions factors in the ARB's LGOP, Version 1.1. Forecasts are adjusted for increases in service population in the Major Areas of Change.
- **Other Sources:** NONROAD and OFFROAD 2011 were used to estimate GHG emissions from landscaping equipment and light commercial equipment in the City. NONROAD and OFFROAD contain a database of equipment use and associated emissions for each county, compiled by the ARB. Annual emissions were compiled using NONROAD and OFFROAD for the County of Los Angeles for the year 2012. The amount of landscaping and light commercial equipment is estimated based on population (Landscaping) and employment (Light Commercial Equipment) for the City of Long Beach as a percentage of Los Angeles County. Daily emissions from off-road equipment are multiplied by 347 days per year to account for reduced/limited construction activity on weekends and holidays. Forecasts are adjusted for increases in service population in the City. It is assumed that construction emissions for the forecast year would be similar to historical levels.

  Industrial sources of emissions that require a permit from the SCAQMD are not included in the City's emissions inventory. However, due to the 15/15 Rule, natural gas use data for industrial land uses may also be aggregated with the nonindustrial land uses in the data provided by the Long Beach Gas & Oil Department.[2] Life-cycle emissions are also not included in this analysis because not enough information is available for the proposed project and therefore they would be speculative.

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1 SBx7-7 (2009) requires all water suppliers to reduce per capita urban water use by 20 percent by 2020, with incremental progress toward this goal (10 percent by 2015). The 2010 UWMPs contain water-use targets to meet this requirement. Effective 2016, urban retail water suppliers who do not meet the water conservation requirements established by SBx7-7 are not eligible for State water grants or loans.

2 The 15/15 Rule was adopted by the California Public Utilities Commission (CPUC) in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality. The 15/15 rule requires that any aggregated information provided by a utility must be made up of at least 15 customers, and a single customer's load must be less than 15 percent of an assigned category. If the number of customers in the complied data is below 15, or if a single customer's load is more than 15 percent of the total data, categories must be combined before the information is released. The Rule further requires that, if the 15/15 Rule is triggered for a second time after the data have been screened once already using the 15/15 Rule, the customer be dropped from the information provided.

5.2 THRESHOLDS OF SIGNIFICANCE

Based on *Guidelines for the Implementation of California Environmental Quality Act*, Appendix G, PRC Sections 15000–15387, a project would normally be considered to have a significant effect on air quality if the project would violate any AAQS, contribute substantially to an existing air quality violation, expose sensitive receptors to substantial pollutant concentrations, or conflict with adopted environmental plans and goals of the community in which it is located.

In addition to the NAAQS and CAAQS, there are daily emissions thresholds for construction and operation of a proposed project in the Basin. The Basin is administered by the SCAQMD, and guidelines and emissions thresholds established by the SCAQMD in its *CEQA Air Quality Handbook* are used in this analysis. Emission thresholds were established based on the attainment status of the Basin with regard to air quality standards for specific criteria pollutants. The attainment concentration standards were set at a level that protects public health with an adequate margin of safety; therefore, the emission thresholds are regarded as conservative in determining an individual project's contribution to health risks.

5.2.1 Regional Emissions Thresholds for Operation

Table G shows the CEQA significance thresholds that have been established for the Basin. Projects in the Basin with operation-related emissions that exceed any of the emission thresholds would be considered to have a significant air quality impact.

Table G: CEQA Operational Significance Thresholds

Air Pollutant	Operational Phase (lbs/day)
ROCs	55
CO	550
NO_X	55
SO_X	150
PM_{10}	150
$PM_{2.5}$	55

Source: SCAQMD (2015c).
CEQA = California Environmental Quality Act
CO = carbon monoxide
lbs/day = pounds per day
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
ROCs = reactive organic compounds
SO_X = sulfur oxides

5.2.2 Thresholds for Localized Significance

SCAQMD published its *Final Localized Significance Threshold Methodology* in June 2003, recommending that all project-level air quality analyses include an assessment of both construction and operational impacts on the air quality of nearby sensitive receptors. For this broad-based Proposed LUE/UDE, it is not possible to determine whether the scale and phasing of individual projects would result in the exceedance of the localized emissions thresholds and contribute to known health effects. Therefore, in accordance with the SCAQMD methodology, localized significance thresholds (LSTs) analysis can only be conducted at a project level and quantification of LSTs is not applicable for this program-level environmental analysis.

6.0 IMPACTS, STANDARD CONDITIONS, AND MITIGATION MEASURES

6.1 IMPACTS OF THE PROPOSED PROJECT

Air pollutant emissions associated with implementation of the proposed LUE/UDE would be long-term regional emissions generated by vehicular trips and stationary source emissions associated with proposed land uses. Long-term stationary source emissions would occur as a result of energy consumption, such as electricity usage and natural gas by the proposed land uses.

This section identifies the air quality impacts associated with implementation of the proposed LUE/UDE Major Areas of Change. This section also identifies impacts that are considered to be less than significant.

6.1.1 CEQA Guidelines for Air Quality

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

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

AQ-2 Violate any air quality standard or contribute substantially to an existing or projected air quality violation.

AQ-3 Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable Federal or State ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).

AQ-4 Expose sensitive receptors to substantial pollutant concentrations.

AQ-5 Create objectionable odors affecting a substantial number of people.

6.1.2 South Coast Air Quality Management District Thresholds

The analysis of the proposed project's air quality impacts follows the guidance and methodologies recommended in SCAQMD's "CEQA Air Quality Handbook" and the significance thresholds on SCAQMD's website.[1] CEQA allows the significance criteria established by the applicable air quality management or air pollution control district to be used to assess impacts of a project on air quality. The SCAQMD has established thresholds of significance for regional air quality emissions for construction activities and project operation. In addition to the daily thresholds listed above, projects

[1] SCAQMD's Air Quality Significance Thresholds are current as of March 2015 and can be found at http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2.

are also subject to the AAQS. These are addressed through an analysis of localized CO impacts and LSTs.

6.1.3 Regional Significance Thresholds

The SCAQMD has adopted regional construction and operational daily emissions thresholds to determine a project's daily and cumulative impact on air quality in the Basin. Specifically, these thresholds gauge whether a project would significantly contribute to a nonattainment designation based on the mass emissions generated. Table H lists the SCAQMD regional significance thresholds.

Table H: South Coast Air Quality Management District Construction and Operational Significance Thresholds

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

Source: SCAQMD (2015c).
CO = carbon monoxide
lbs/day = pounds per day
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
ROCs = reactive organic compounds
SCAQMD = South Coast Air Quality Management District
SO_X = sulfur oxides

6.1.4 CO Hotspots

Areas of vehicle congestion have the potential to create pockets of CO called hot spots. These pockets have the potential to exceed the State 1-hour standard of 20 parts per million (ppm) or the 8-hour standard of 9 ppm. Because CO is produced in greatest quantities from vehicle combustion and does not readily disperse into the atmosphere, adherence to AAQS is typically demonstrated through an analysis of localized CO concentrations. Hot spots are typically produced at intersections, where traffic congestion is highest because vehicles queue for longer periods and are subject to reduced speeds. Typically, for an intersection to exhibit a significant CO concentration, it would operate at level of service (LOS) E or worse without improvements (Caltrans 1997).

6.1.5 Health Risk Thresholds

Whenever a project would require use of chemical compounds that have been identified in SCAQMD Rule 1401, placed on the ARB air toxics list pursuant to AB 1807, or placed on the EPA's National Emissions Standards for Hazardous Air Pollutants, a health risk assessment is required by the SCAQMD. Table I lists the SCAQMD's TAC incremental risk thresholds for operation of a project. Residential, commercial, and office uses do not use substantial quantities of TACs, so these thresholds are typically applied to new industrial projects. Although not officially adopted by the SCAQMD, these thresholds are also commonly used to determine air quality land use compatibility of a project with major sources of TACs within 1,000 ft of a proposed project.

Table I: SCAQMD Toxic Air Contaminants Incremental Risk Thresholds

Maximum Incremental Cancer Risk	≥ 10 in 1 million
Cancer Burden (in areas ≥ 1 in 1 million)	> 0.5 excess cancer cases
Hazard Index (project increment)	≥ 1.0

Source: SCAQMD (2015b).
SCAQMD = South Coast Air Quality Management District

6.2 AIR QUALITY IMPACTS

This air quality evaluation was prepared in accordance with CEQA requirements to determine if significant air quality impacts are likely to occur in conjunction with future development that would be accommodated by the proposed LUE/UDE project. SCAQMD has published the *CEQA Air Quality Handbook* (Handbook) and updates on its website that are intended to provide local governments with guidance for analyzing and mitigating project-specific air quality impacts. The Handbook provides standards, methodologies, and procedures for conducting air quality analyses in EIRs, which were used in this analysis.

It is noted that the SCAQMD thresholds for operational emissions are designed for analysis of individual development projects, not for a long-range planning program such as the proposed LUE/UDE project, which will be implemented over a long period of time (i.e., 20 years or more) and covers the LUE/UDE Major Areas of Change. In order to quantify the level of emissions associated with individual development projects, specific information regarding the size and type of development and the location of receptors would be needed. Emissions associated with the operation of individual projects, depending on project type and size, could exceed project-specific thresholds established by the SCAQMD.

The following impact analysis addresses thresholds of significance. The applicable thresholds are identified in brackets after the impact statement.

Impact 1: The proposed LUE/UDE would be consistent with the SCAQMD Air Quality Management Plan as buildout of the proposed Land Use Plan would match the 2016 SCAG population and employment estimates and would not cumulatively contribute to the nonattainment designations of the Basin. [Threshold AQ-1]

Impact Analysis: CEQA requires that general plans be evaluated for consistency with the AQMP. A consistency determination plays an important role in local-agency project review by linking local planning and individual projects to the AQMP. It fulfills the CEQA goal of informing decision makers of the environmental effects of the project under consideration early enough to ensure that air quality concerns are fully addressed. It also provides the local agency with ongoing information as to whether they are contributing to the clean-air goals in the AQMP. Only new or amended general plan elements, specific plans, and major projects need to undergo a consistency review. This is because the AQMP strategy is based on projections from local general plans. Projects that are consistent with the local general plan are considered consistent with the air quality-related regional plan. There are two key indicators of consistency:

- **Indicator 1:** Whether the project would result in an increase in the frequency or severity of existing air quality violations, cause or contribute to new violations, or delay timely attainment of the AAQS or interim emission reductions in the AQMP.
- **Indicator 2:** Whether the project would exceed the assumptions in the AQMP. The AQMP strategy is, in part, based on projections from local general plans.

Indicator 1: The Basin is designated nonattainment for O_3 and $PM_{2.5}$ under the CAAQS and NAAQS, nonattainment for lead (Los Angeles County only) under the NAAQS, and nonattainment for PM_{10} under the CAAQS (ARB 2014). Because the proposed project involves long-term growth associated with buildout of the City of Long Beach, emissions of criteria pollutants associated with future development allowed for under the LUE/UDE could contribute emissions of PM_{10}, $PM_{2.5}$, NO_X, and VOCs. Future development under the proposed project would be required to comply with ARB motor vehicle standards, SCAQMD regulations from stationary sources and architectural coatings, Title 24 energy efficiency standards, and the proposed LUE/UDE project goals and policies. While existing City policies and regulations and proposed LUE/UDE goals and policies are intended to reduce impacts associated with air quality violations, specific standard conditions for future project developments that implement these policies and regulations are identified to ensure that the intended environmental protections are achieved. Consequently, emissions generated by development projects in addition to existing sources within the City are not considered to cumulatively contribute to the nonattainment designations of the Basin (refer to the discussion under Impact 3 below). Implementation of the LUE/UDE would not contribute to an increase in frequency or severity of air quality violations and delay attainment of the AAQS or interim emission reductions in the AQMP, and emissions generated from the proposed LUE/UDE would not result in a significant cumulative air quality impact. Therefore, the proposed project is concluded to result in a less than significant impact associated with consistency with the applicable air quality management plan. The proposed project would be consistent with the AQMP under the first indicator.

Indicator 2: The land-use designations in the City's existing LUE form, in part, the foundation for the emissions inventory for the Basin in the AQMP. The AQMP is based on projections in population, employment, and VMT in the Basin projected by SCAG. SCAG projections for the City LUE and UDE proposed Major Areas of Change are partially based on the current adopted General Plan. It is expected that implementation of the proposed General Plan LUE and UDE would result in a higher population and generate more employment for the City compared to SCAG forecasts given that the growth expected under the proposed project was unknown at the time SCAG developed the forecasts. It should be noted that the growth projected by SCAG is based on demographic trends in the region. These demographic trends are incorporated into the RTP/SCS compiled by SCAG to determine priority transportation projects and VMT in the SCAG region. Growth projections of the proposed LUE/UDE assume full buildout of the proposed Major Areas of Change by the year 2040, since there is no schedule for when this development would occur. As a result, the growth projections for the Major Areas of Change would be based on SCAG's 2016 RTP/SCS and the associated emissions inventory in SCAQMD's 2012 AQMP do not include the additional growth forecast in the LUE/UDE because at the time of preparation of the 2012 AQMP, the available data was from SCAG's 2012 RTP/SCS. Therefore, the 2012 AQMP does not consider emissions associated with the proposed LUE/UDE. However, once the proposed LUE/UDE is adopted and the AQMP is revised (currently in process), SCAG and SCAQMD will incorporate the growth projections associated with buildout of the proposed LUE/UDE in their regional planning projections, and the proposed LUE/UDE would become consistent with the upcoming 2016 AQMP. Based on the requirements for consistency with

emission control strategies in the AQMP, the LUE/UDE would not conflict with or obstruct the implementation of the AQMP and/or applicable portions of the SIP. Implementation of the proposed project would result in a less than significant impact associated with conflicts with applicable air quality plans.

Summary: As described above, the proposed project would be consistent with the next AQMP update because air pollutant emissions associated with buildout of the proposed LUE/UDE would be included in the 2016 AQMP emission inventory update and it would not cumulatively contribute to the nonattainment designations in the Basin. Furthermore, buildout of the proposed LUE/UDE would follow the trend of the current population and employment estimates for the City of Long Beach. The proposed Land Use Diagram (see Figure 2) would increase density and mixed-use development and would therefore be consistent with regional goals of improving transportation and land-use planning. In addition, the policies of the proposed LUE/UDE would help minimize air pollutant emissions. Based on the requirements for consistency with emission control strategies in the AQMP, the LUE/UDE would not conflict with or obstruct the implementation of the AQMP and/or applicable portions of the SIP. Implementation of the proposed project would result in a less than significant impact associated with conflicts with applicable air quality plans.

Impact 2: Construction activities associated with buildout of the proposed LUE/UDE would generate short-term emissions that could potentially exceed the SCAQMD'S significance thresholds without mitigation incorporated. [Thresholds AQ-2 and AQ-3]

Impact Analysis: It is important to note that, per the requirements of CEQA, this analysis is based on a comparison of the proposed LUE/UDE to existing land uses and not to the changes in population and employment associated with the potential developments under the current General Plan. It is also important to note that the proposed LUE/UDE is a regulatory document that establishes the framework for growth and development and does not directly result in development. Before development can occur, the development project is required to be analyzed for conformance with the General Plan, zoning requirements, and other applicable local and State requirements; comply with the requirements of CEQA; and obtain all necessary clearances and permits.

Construction activities associated with the proposed project would occur over the buildout horizon of the LUE/UDE, which would cause short-term emissions of criteria air pollutants. The primary source of NO_X, CO, and sulfur oxide (SO_X) emissions is the operation of construction equipment.

The primary sources of particulate matter (PM_{10} and $PM_{2.5}$) emissions are activities that disturb the soil, such as grading and excavation, road construction, and building demolition and construction.

The primary source of VOC emissions is the application of architectural coating and off-gas emissions associated with asphalt paving. A discussion of health impacts associated with air pollutant emissions generated by construction activities is included in section C.1, *Background: Air Pollutants and Health Effects*.

For this broad-based policy LUE/UDE, it is not possible to determine whether the scale and phasing of future individual projects would exceed the SCAQMD's short-term regional or localized construction emissions thresholds. As previously discussed, the SCAQMD recommends the evaluation of localized air quality impacts to sensitive receptors such as residential land uses in the

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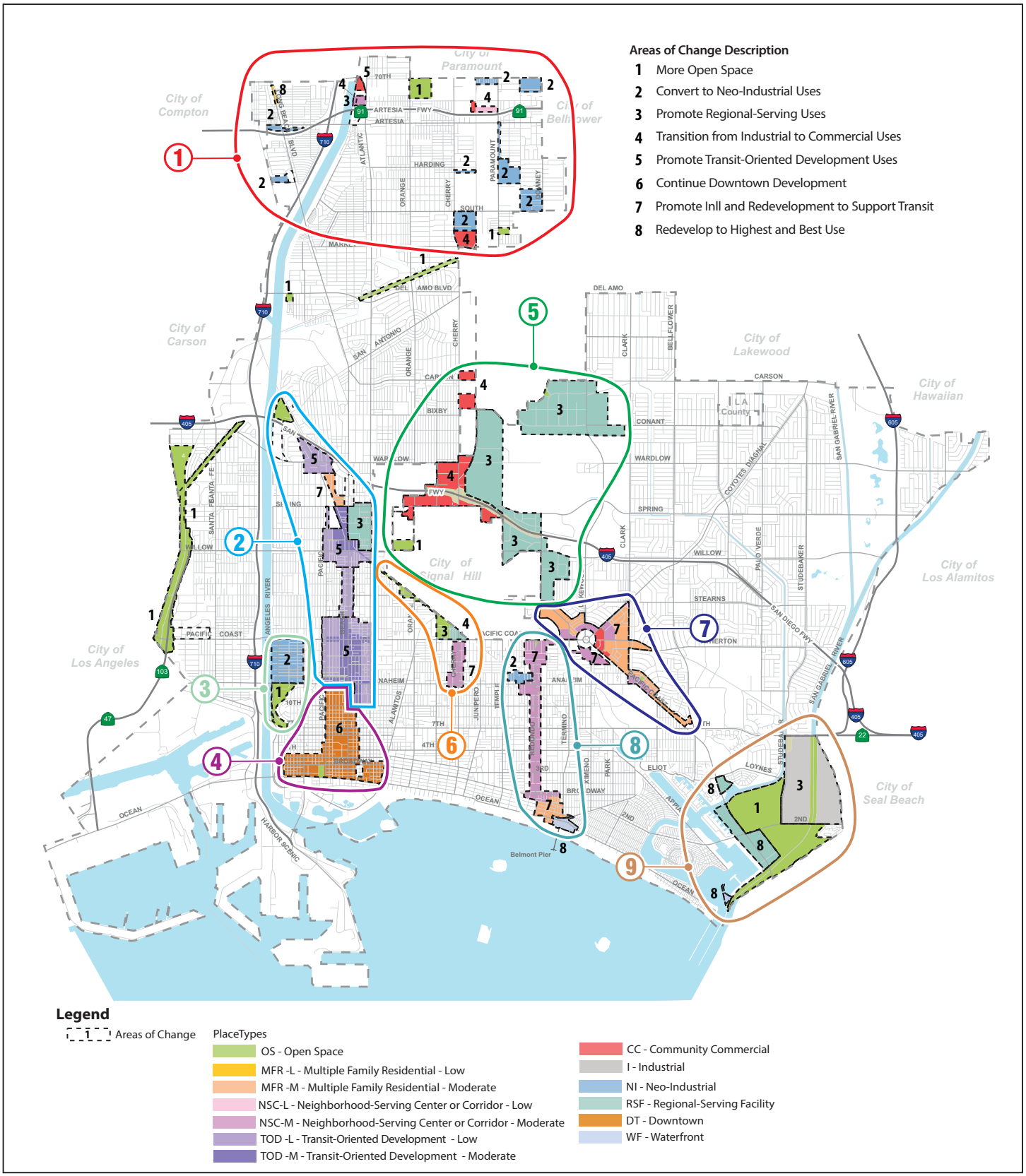

LSA

LEGEND

1. North Long Beach
2. Mid City
3. Riverside
4. Downtown
5. Airport
6. PCH
7. Traffic Circle
8. Redondo
9. SEADIP

N

FIGURE 2

Long Beach General Plan
Land Use and Urban Design Elements
Districts of Change

SOURCE: Proposed Land Use Element, City of Long Beach, June 2015

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immediate vicinity of the project site as a result of construction activities. The thresholds are based on standards established by the SCAQMD in the LST Methodology and are measured against construction emissions that occur on the project site. However, the LSTs are applicable to projects at the project-specific level and are not applicable to regional projects. In addition, the LSTs do not apply to emissions occurring off the project site, such as emissions from motor vehicles. These emissions are primarily generated from heavy-duty construction equipment and demolition, grading, and trenching activities. Thus, construction emissions have the potential to cause or contribute to significant air quality impacts to nearby residential land uses within the proposed LUE/UDE Major Areas of Change. This suggests that on-site construction emissions from future development pursuant to the proposed LUE/UDE could potentially cause or contribute to locally significant air quality impacts. However, it should be noted that roughly 21, 25, and 85 percent of regional VOC, NO_X, and PM_{10}, emissions, respectively, from the worst-day case construction are on-road mobile-source emissions associated with hauling and worker commutes. Nevertheless, localized construction impacts of future LUE/UDE projects could potentially exceed the LSTs, particularly for construction of planning areas larger than 5 acres or planning areas with more intense construction activities. To address this, regulatory measures (e.g., SCAQMD Rule 201 for a permit to operate, Rule 403 for fugitive dust control, Rule 1113 for architectural coatings, Rule 1403 for new source review, and the ARB's Airborne Toxic Control Measures) are currently in place, and mitigation imposed at the project level may include extension of construction schedules and/or use of special equipment.

Because the scale of construction activities has not been determined or estimated and in order to present conservative assumptions, the air quality impacts associated with future construction of individual projects that may occur with implementation of the proposed project are assumed to be potentially significant.

It should be noted that the amount of emissions from a project does not necessarily correspond to the concentrations of air pollutants. A dispersion modeling analysis is required to calculate health risk from project implementation. However, since it is not possible to translate the amount of emissions to a particular concentration, it is not possible to calculate the risk factor for a particular health effect at the time of this analysis.

Known health effects related to ozone include worsening of bronchitis, asthma, and emphysema and a decrease in lung function. Particulate matter can also lead to a variety of health effects in people. These include premature death of people with heart or lung disease, heart attacks, irregular heartbeat, decreased lung function, and increased respiratory symptoms. Regional emissions of criteria pollutants contribute to these known health effects. The SCAQMD is the primary agency responsible for ensuring the health and welfare of sensitive individuals and that they are not exposed to elevated concentrations of criteria pollutants in the Basin. To achieve the health-based standards established by the EPA, the SCAQMD prepares an AQMP that details regional programs to attain the AAQS. The proposed LUE/UDE includes goals regarding land use development and identifies policies designed to reduce emissions of criteria pollutants while protecting public health. These policies include requirements for new development design and construction methods to minimize impacts to air quality; encourage future development to reduce vehicular trips by utilizing compact regional and community-level development patterns; encourage new development to reduce air pollution by incorporating a mixture of uses within the City that encourage people to walk, bicycle, or use public transit; minimize land use conflicts that expose people to significant amounts of air pollution; support transportation management programs that reduce the use of single-occupancy vehicles; and encourage the use of low-emission vehicles and

equipment to improve air quality and reduce GHG emissions. While existing City policies and regulations and proposed LUE/UDE goals and policies are intended to minimize impacts associated with nonattainment criteria pollutants, specific BMP measures, identified below in Section 6.3 and included as Standard Conditions imposed by the City, are identified to ensure that the intended environmental protections are achieved. These BMP measures are identified for future project developments that may be implemented under the proposed project that would require environmental evaluation under CEQA. Additionally, Mitigation Measure AQ-1 is identified requiring the preparation of project-specific technical assessments evaluating construction-related air quality impacts to further ensure that construction-related emissions are reduced to the maximum extent feasible for projects that require environmental evaluation under CEQA. With implementation of Standard Conditions and Mitigation Measure AQ-1, the potential construction emissions impact associated with future development facilitated by the proposed project would be less than significant.

Impact 3: Buildout in accordance with the proposed LUE/UDE would generate long-term emissions that may potentially exceed the SCAQMD's regional significance thresholds; however, it would not cumulatively contribute to the nonattainment designations of the Basin. [Thresholds AQ-2 and AQ-3]

Impact Analysis: As previously identified, per the requirements of CEQA, this analysis is based on a comparison of the proposed LUE/UDE to existing land uses and not to the changes in population and employment associated with the potential developments under the current General Plan. It is also important to note that the proposed LUE/UDE is a regulatory document that establishes the framework for growth and development and does not directly result in development. Before development can occur, the development project is required to be analyzed for conformance with the General Plan, zoning requirements, and other applicable local and state requirements; comply with the requirements of CEQA; and obtain all necessary clearances and permits.

The proposed LUE/UDE guides growth and development within the City of Long Beach by designating land uses in the proposed Land Use Plan and through implementation of its goals and policies.
New development would result in air pollutant emissions in the City and contribute to the overall emissions inventory in the Basin. A discussion of health impacts associated with air pollutant emissions generated by operational activities is included in the *Air Pollutants and Health Effects* discussion in section C.1, *Setting*.

City of Long Beach Emissions Inventory: Table J summarizes the emissions inventory for the City in Year 2012 and under the proposed LUE/UDE (Year 2040). The analysis findings indicate implementation of the proposed LUE/UDE would result in an overall decrease in criteria air pollutant emissions from existing conditions (Year 2012). This decrease is based on the difference in vehicle emissions between existing land uses and land uses associated with buildout of the proposed LUE/UDE as well as an estimate of service population in the City in year 2040.

The determination of significance based on SCAQMD regional thresholds as it relates to operational emissions is based upon a daily threshold and is not correlated to the number of total emissions that may result from development that may occur with implementation of the LUE/UDE at buildout.

Table J: Buildout Year 2040 City of Long Beach Major Areas of Change Regional Criteria Air Pollutant Emissions Inventory

Sector	Criteria Air Pollutant Emissions (lbs/day)					
	VOC	NO_X	CO	SO_X	PM_{10}	$PM_{2.5}$
Existing Year 2012						
Transportation (2012 emission factors)[1]	4,265.95	9,090.11	36,209.28	52.23	188.98	179.54
Energy, Residential (natural gas use)[2]	0.12	10.48	4.46	0.07	0.85	0.85
Energy, Commercial + Industrial (natural gas use)[2]	1.05	9.59	8.06	0.06	0.73	0.73
Area, Landscaping/Consumer Products[3]	0.51	0.31	8.08	0.00	0.04	0.04
Existing Forecast Land Uses Total	**4,267.64**	**9,110.50**	**36,229.88**	**52.36**	**190.60**	**181.16**
LUE/UDE Year 2040						
Transportation (2040 emission factors)[1]	1,168.77	2,139.83	8,227.32	42.30	20.09	18.68
Energy, Residential (natural gas use)[2]	1.41	15.67	6.67	0.10	1.27	1.27
Energy, Commercial + Industrial (natural gas use)[2]	0.96	10.45	8.78	0.06	0.79	0.79
Area, Landscaping/Consumer Products[3]	0.55	0.36	8.82	0.00	0.04	0.04
Future with Project Total	**1,171.68**	**2,166.31**	**8,251.58**	**42.46**	**22.19**	**20.78**
Differences in Emissions	**-3,096**	**-6,944**	**-27,978**	**-9.90**	**-168**	**-160**
SCAQMD Regional Significance Threshold	**55**	**55**	**550**	**150**	**150**	**55**
Significant?	**No**	**No**	**No**	**No**	**No**	**No**

Source: Compiled by LSA Associates, Inc. (2016).

[1] EMFAC2014 based on daily vehicle miles traveled (VMT) provided by LSA Associates, Inc. Transportation sector includes the full trip length for internal-internal trips and 50 percent trip length for external-internal/internal-external trips. VMT per year based on a conversion of VMT × 347 days per year to account for less travel on weekend, consistent with ARB statewide GHG emissions inventory methodology (ARB 2008).

[2] Natural gas usage data provided by City of Long Beach Oil and Gas.

[3] NONROAD emissions estimated based on population for landscaping emissions and employment estimates for light commercial equipment. Estimates were based on population and employment data calculated using a percentage reflective of the City of Long Beach included in the Los Angeles County data included in the SCAG 2016 RTP/SCS. Excludes fugitive emissions from paved and unpaved surfaces and wood-burning fireplaces. Various industrial and commercial processes (e.g., manufacturing, dry cleaning) allowed under the Land Use Element would require permitting and would be subject to further study pursuant to SCAQMD Regulation XIII, New Source Review. Because the nature of those emissions cannot be determined at this time and are subject to further regulation and permitting, they are not considered for purposes of this analysis.

ARB = California Air Resources Board
CO = carbon monoxide
GHG = greenhouse gas
lbs/day = pounds per day
LUE/UDE = Land Use Element/Urban Design Element
NO_X = nitrogen oxides
PM_{10} = particulate matter less than 10 microns in size
$PM_{2.5}$ = particulate matter less than 2.5 microns in size
RTP/SCS = Regional Transportation Plan/Sustainable Communities Strategy
SCAG = Southern California Association of Governments
SCAQMD = South Coast Air Quality Management District
SO_X = sulfur oxides
VOC = volatile organic compound

Because the scale of operational activities has not been determined or estimated and in order to present conservative assumptions, the air quality impacts associated with future operation of individual projects that may occur with implementation of the proposed project, when measured against daily regional thresholds, are assumed to be potentially significant. Mitigation Measure AQ-2 is identified requiring the preparation of project-specific technical assessments evaluating operational-related air quality impacts to further ensure that operational-related emissions are reduced to the maximum extent feasible for projects that require environmental evaluation under CEQA. However, unlike construction activities where the extension of construction schedules and/or use of special equipment can be reasonably assumed to be implemented, operational characteristics and the associated emissions cannot be determined at the time of this analysis. Therefore, despite implementation of

Mitigation Measure AQ-2, and in an abundance of caution, the potential emissions impact associated with the operation of the proposed project would remain significant and unavoidable.

As identified above, emissions associated with the buildout of the proposed LUE/UDE may exceed the daily SCAQMD regional thresholds for VOC, NO_X, CO, PM_{10}, and $PM_{2.5}$. However, in a cumulative context, emissions would be lower under the Future (2040) with Project scenario at buildout (refer to Table J) because of the stringent EPA and State of California vehicle emissions standards aimed at reducing vehicle emissions, which would be phased in over the life of the project.

Implementation of the proposed LUE policies would help further reduce air pollutant emissions. Many of these policies promote an increase in concepts and designs that would increase walking, bicycling, and use of public transit, which would contribute to reduced VMT (e.g., Policies AQ 2.1.1, 2.1.2, 2.3.1, and 2.4.1). In addition, Policy 2.6.2 of the Air Quality Element encourages the installation of alternative fueling facilities such as electric chargers for vehicles. Furthermore, Policy MOP 5-2 of the Mobility Element calls for the continued active enforcement of the City's trip reduction through the use of alternative modes of transportation and Transportation Demand Management.

The proposed LUE includes the following Strategies and Policies that would result in a reduction in air emissions:

- **Strategy No. 1:** Support sustainable urban development patterns.
- **LU Policy 1-1:** Promote sustainable development patterns and development intensities that use land efficiently and accommodate and encourage walking.
- **Strategy No. 10:** Create healthy and sustainable neighborhoods.
- **LU Policy 10-2:** Provide for a wide variety of creative, affordable, and sustainable land use solutions to help resolve air, soil, and water pollution, energy consumption, and resource depletion issues.
- **LU Policy 10-5:** Ensure neighborhoods are accessible to open spaces, parks, trails, and recreational programs that encourage physical activity and walkability.

Emissions of criteria pollutants associated with future development consistent with the proposed project would not result in a cumulatively considerable significant impact associated with emissions of PM_{10} and $PM_{2.5}$, and O_3 precursors (VOCs, NO_X, and CO) under the CAAQS as shown in Table J. Future development under the proposed project would also be required to demonstrate compliance with the AQMP, SIP, ARB motor vehicle standards, SCAQMD regulations for stationary sources and architectural coatings, Title 24 energy efficiency standards, and the proposed LUE/UDE project goals and policies. Because implementation of the proposed LUE/UDE would result in a decrease in overall criteria air pollutant emissions from existing conditions, the cumulative air quality impact associated with the proposed project would be less than significant. No mitigation is required.

Impact 4: Buildout of the proposed LUE/UDE may expose sensitive receptors to substantial concentrations of criteria air pollutants and toxic air contaminants. [Threshold AQ-4]

Impact Analysis: Refer to the analysis provided under Impacts 2 and 3 above for a discussion of potential construction and operational impacts relating to criteria air pollutants. With implementation of Standard Conditions and Mitigation Measure AQ-1, the potential emissions impacts associated with construction of the proposed project would be less than significant. Despite implementation of Mitigation Measure AQ-2, the potential emissions impact associated with operation of the proposed project would remain significant and unavoidable. Operation of new land uses consistent with the Land Use Plan of the proposed LUE/UDE would generate fewer criteria air pollutants in the City from area/stationary sources and mobile sources at buildout as shown in Table J; therefore, the cumulative air quality impacts associated with the proposed project would be less than significant.

Toxic Air Contaminants: Various industrial and commercial processes (e.g., manufacturing and dry cleaning) allowed under the proposed LUE/UDE would be expected to release TACs. Industrial land uses, such as chemical processing facilities, chrome-plating facilities, dry cleaners, and gasoline-dispensing facilities, have the potential to be substantial stationary sources that would require a permit from SCAQMD for emissions of TACs. Emissions of TACs would be controlled through permitting issued by SCAQMD and would be subject to further study and health risk assessment prior to the issuance of any necessary air quality permits under SCAQMD Rule 1401. Since it is not possible to determine the amount of TAC concentrations at the time of this analysis, it is not possible to calculate the risks for a particular health effect within the proposed Major Areas of Change. The proposed project is a programmatic project and until specific future projects are proposed, the associated TAC emissions cannot be determined or modeled at this time. Future development projects would be subject to environmental review under CEQA and would be required to analyze potential TAC emissions and include mitigation as appropriate.

In addition to stationary/area sources of TACs, commercial and industrial operations could generate a substantial amount of diesel particulate matter emissions from off-road equipment use and truck idling. Diesel particulate matter (DPM) accounts for approximately 84 percent of the excess cancer risk in the Basin (SCAQMD 2008a). New land uses in the City that use diesel trucks, including trucks with transport refrigeration units, could generate an increase in DPM that would contribute to cancer and noncancer health risk in the Basin. Furthermore, trucks would travel on regional transportation routes throughout the Basin, contributing to near-roadway DPM concentrations. Land development projects are required to comply with AB 2588, SCAQMD Rule 1401, and ARB standards for diesel engines. As stated above, until specific future projects are proposed, the associated emissions cannot be determined or modeled at this time. Future projects would be subject to environmental review under CEQA and would be required to analyze potential emissions and include mitigation as appropriate.

As previously identified, the amount of emissions from a project does not necessarily correspond to the concentrations of air pollutants. A dispersion modeling analysis is required to calculate health risk from project implementation. However, since it is not possible to translate the amount of emissions to a particular concentration, it is not possible to calculate the risk factor for a particular health effect at the time of this analysis. Because the scale of operational activities has not been determined or estimated and in order to present conservative assumptions, the TAC health risk impacts associated with future operation of individual projects that may occur with implementation of the proposed

project are assumed to be potentially significant. Mitigation Measure AQ-3 is identified requiring the preparation of project-specific technical health risk assessments evaluating operational-related health risk impacts to further ensure that operational-related emissions are reduced to the maximum extent feasible for projects that require environmental evaluation under CEQA. However, unlike construction activities where the extension of construction schedules and/or use of special equipment can be reasonably assumed to be implemented, operational characteristics and the associated emissions cannot be determined at the time of this analysis. With implementation of Mitigation Measure AQ-3, the potential TAC health risk impact associated with operation of the proposed project would be remain significant and unavoidable.

CO Hot Spots: Areas of vehicle congestion have the potential to create pockets of CO called hot spots. These pockets have the potential to exceed the State 1-hour standard of 20 ppm or the 8-hour standard of 9.0 ppm. At the time of the publishing of the 1993 Handbook, the Basin was designated nonattainment under the CAAQS and NAAQS for CO. With the turnover of older vehicles, introduction of cleaner fuels, and implementation of control technology on industrial facilities, CO concentrations in the Basin and in the State have steadily declined. In 2007, the SCAQMD was designated in attainment for CO under both the CAAQS and NAAQS. As identified within SCAQMD's 2003 AQMP and the 1992 Federal Attainment Plan for Carbon Monoxide (1992 CO Plan), peak carbon monoxide concentrations in the Basin were a result of unusual meteorological and topographical conditions and not a result of congestion at a particular intersection. A CO hot spot analysis was conducted at four busy intersections in Los Angeles County at the peak morning and afternoon periods and did not predict a violation of CO standards.[1] Under existing and future vehicle emission rates, a project would have to increase traffic volumes at a single intersection by more than 44,000 vehicles per hour—or 24,000 vehicles per hour where vertical and/or horizontal air does not mix—in order to generate a significant CO impact (BAAQMD 2011). One of the top four worst intersections in Los Angeles County (i.e., Long Beach Boulevard/Imperial Highway)[2] is located approximately 4 miles north of the proposed LUE/UDE project. Since the SCAQMD modeled intersections do not exceed the CO standards, all intersections within the proposed project with less volumes of traffic and under less extreme conditions would not exceed the CO standards. Buildout of the proposed General Plan LUE and UDE would not produce the volume of traffic, as described above, required to generate a CO hot spot. Therefore, implementation of the LUE/UDE would not be expected to result in CO hot spots, and impacts would be less than significant. No mitigation is required.

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1 The four intersections were Long Beach Boulevard/Imperial Highway; Wilshire Boulevard/Veteran Avenue; Sunset Boulevard/Highland Avenue; and La Cienega Boulevard/Century Boulevard. The busiest intersection evaluated (Wilshire Boulevard/Veteran Avenue) had a daily traffic volume of approximately 100,000 vehicles and LOS E in the morning peak hour and LOS F in the evening peak hour.

2 The intersection of Long Beach Boulevard/Imperial Highway is not within the City limits but is used to represent a condition where there is a high volume of traffic during the a.m. and p.m. peak hours to demonstrate that intersections that are below the volume of traffic at this particular intersection, under less severe atmospheric conditions (i.e., where vertical and horizontal air does not mix), would not result in a CO hot spot.

Impact 5: Buildout of the proposed LUE/UDE may site sensitive land uses in proximity to air pollution sources and may expose sensitive receptors to substantial pollutant concentrations. [Threshold AQ-4]

Impact Analysis: Because placement of sensitive land uses falls outside ARB jurisdiction, the ARB developed and approved the *Air Quality and Land Use Handbook: A Community Health Perspective* (2005) to address the siting of sensitive land uses in the vicinity of freeways, distribution centers, rail yards, ports, refineries, chrome-plating facilities, dry cleaners, and gasoline-dispensing facilities. This guidance document was developed to assess compatibility and associated health risks when placing sensitive receptors near existing pollution sources.

The ARB's recommendations for the siting of new sensitive land uses were based on a compilation of recent studies that evaluated data on the adverse health effects from proximity to air pollution sources. The key observation in these studies is that proximity to air pollution sources substantially increases both exposure and the potential for adverse health effects. Respiratory and cardiovascular problems including asthma, lung cancer, and premature death have been associated with living near major roadways and freeways (Balmes et al. 2009). Children who live near major roadways and freeways have been found to have higher asthma rates and reduced lung function (ARB 2013c). There are three carcinogenic toxic air contaminants that constitute the majority of the known health risks from motor vehicle traffic: DPM from trucks and benzene and butadiene from passenger vehicles. Exposure to DPM accounts for more than 80 percent of the total carcinogenic risk in the Basin (SCAQMD 2008a). It has been found that outdoor concentrations are highest near the roadway and decrease with increasing distance downwind of the source (Zhu et al. 2002). The ARB recommends avoiding siting new sensitive land uses within 500 feet of urban roads with more than 100,000 vehicles per day or rural roads with more than 50,000 vehicles per day (ARB 2005).

Table K shows a summary of the other ARB recommendations for siting new sensitive land uses within the vicinity of air pollutant sources. Recommendations in the table are based on data that show that localized air pollution exposures can be reduced by as much as 80 percent by following ARB minimum distance separations.

Stationary sources of TACs within the City of Long Beach include the stationary sources permitted by the SCAQMD. Various permitted uses are dispersed throughout the City with a high concentration along the Interstate 710 (I-710) corridor (SCAQMD 2014). The other sources of TAC within the City are I-710 and Interstate 405 (I-405), which have annual average daily traffic volumes exceeding 100,000. Based on the information in the TIA, there are no local roadways with more than 100,000 average daily vehicle trips in the City (LSA 2016).

If new sensitive receptors were sited within 500 feet of I-710 or I-405 or within the ARB's minimum siting recommendations of other stationary sources, they may be exposed to significant concentrations of air pollutants. As shown in Figure 2, *Proposed General Plan Land Use Diagram*, residential land uses would be permitted along I-710; however, the LUE/UDE would not result in any change to residential uses proximate to I-405 and I-710. However, residential land uses would also be near or adjacent to areas designated for commercial and industrial uses and to existing permitted TAC sources. Thus, new residential and other sensitive developments could be sited within the buffer distances shown in Table K to TAC sources. This is a potentially significant impact, and mitigation measures would be required.

Table K: ARB Recommendations for Siting New Sensitive Land Uses

Source/Category	Advisory Recommendations
Freeways and High-Traffic Roads	Avoid siting new sensitive land uses within 500 feet of a freeway, urban roads with 100,000 vehicles per day, or rural roads with 50,000 vehicles per day.
Distribution Centers	Avoid siting new sensitive land uses within 1,000 feet of a distribution center (that accommodates more than 100 trucks per day, more than 40 trucks with operating transport refrigeration units [TRUs] per day, or where TRU unit operations exceed 300 hours per week). Take into account the configuration of existing distribution centers and avoid locating residences and other sensitive land uses near entry and exit points.
Rail Yards	Avoid siting new sensitive land uses within 1,000 feet of a major service and maintenance rail yard. Within 1 mile of a rail yard, consider possible siting limitations and mitigation approaches.
Ports	Avoid siting of new sensitive land uses immediately downwind of ports in the most heavily affected zones. Consult local air districts or the ARB on the status of pending analyses of health risks.
Refineries	Avoid siting new sensitive land uses immediately downwind of petroleum refineries. Consult with local air districts and other local agencies to determine an appropriate separation.
Chrome Platers	Avoid siting new sensitive land uses within 1,000 feet of a chrome plater.
Dry Cleaners using Perchloroethylene	Avoid siting new sensitive land uses within 300 feet of any dry cleaning operation. For operations with two or more machines, provide 500 feet. For operations with three or more machines, consult with the local air district. Do not site new sensitive land uses in the same building with perchloroethylene dry cleaning operations.
Gasoline Dispensing Facilities	Avoid siting new sensitive land uses within 300 feet of a large gas station (defined as a facility with a throughput of 3.6 million gallons per year or greater). A 50-foot separation is recommended for typical gas dispensing facilities.

Source: ARB (2005).
ARB = California Air Resources Board

The proposed LUE includes the following measures that would allow for buffers and other provisions for reducing exposure of sensitive receptors to TAC emissions:

- **Strategy No. 15:** Protect neighborhoods from adverse environmental conditions.
- **LU Policy 15-1:** Develop public health and environmental protection programs that promote equity and that provide for the fair treatment of all Long Beach residents, regardless of race, age, culture, income, or geographic location.
- **LU Policy 15-2:** Continue to work with the State, the Port of Los Angeles, and other agencies and organizations to improve air quality around the ports and reduce vessel, truck, rail, and other equipment emissions from port operations.
- **LU Policy 15-3:** Continue to be an advocate for residential neighborhoods that will be adversely affected by major port-related facility expansion projects.
- **LU Policy 15-4:** Work with regional agencies, residents, and businesses to preserve established homes, businesses, and open spaces; limit the exposure of toxic pollutants and vehicle noise and

minimize traffic issues impacting residential neighborhoods as a result of the I-710 Freeway expansion.

- **LU-M-48:** Continue to develop and implement innovative programs aimed at reducing the air pollutants from port operations (e.g., San Pedro Bay Clean Air Action Plan, Clean Truck Programs, Main Engine Low-Sulfur Fuel Incentive Program, and Shoreside Electricity).
- **North Long Beach Land Use Strategy 1:** Consolidate the intensity of commercial activities into neighborhood-serving nodes, at major corridor crossroads, and in expanded commercial centers.
- **North Long Beach Land Use Strategy 2:** Facilitate the development of new multiple-family housing along corridors between commercial nodes and centers.
- **North Long Beach Land Use Strategy 3:** Buffer heavy industrial activities from residential uses by encouraging Neo Industrial and commercial conversions of some industrial properties.
- **North Long Beach Land Use Strategy 4:** Along Cherry Avenue, Paramount Boulevard, and Downey Avenue, use the Neo Industrial Place Type to develop cleaner and more attractive commercial/industrial properties.
- **North Long Beach Land Use Strategy 5:** Upgrade the quality of development by using design guidelines, new zoning standards, and improved design review processes to ensure that all new buildings, remodels, and additions enhance the neighborhood fabric.
- **North Long Beach Land Use Strategy 6:** Use design guidelines and upgraded zoning standards to further protect established residential districts from the intrusion of commercial activities.
- **North Long Beach Land Use Strategy 7:** Continue to implement the North Long Beach Strategic Guide for Development and North Long Beach Street Enhancement Master Plans (originated under the Redevelopment Agency) including the North Village and North Library plans.
- **North Long Beach Land Use Strategy 8:** Seek opportunities to create open recreation and green areas, and implement the RiverLink Plan for the Los Angeles River.
- **North Long Beach Land Use Strategy 9:** Implement the I-710 Livability Plan.
- **North Long Beach Land Use Strategy 10:** Implement Mobility Element capital improvements for North Long Beach include:
    - Artesia Boulevard Complete Streets Improvements
    - Atlantic Avenue Streetscape Enhancements
    - South Street Signal Improvements
    - Market Street Enhanced Bikeway Access
    - Walnut Avenue Bikeway

Goals and policies are included in the proposed General Plan LUE/UDE that would reduce concentrations of criteria air pollutant emissions and air toxics generated by construction and operation of new developments on nearby residences. Review of projects by SCAQMD for permitted sources of air toxics would ensure that health risks are minimized.

It is important to note that the proposed Neo-Industrial Place Type in the Major Areas of Change would be used as a buffer between existing industrial and residential neighborhoods. Future industrial developments pursuant to the proposed LUE/UDE are part of larger planning areas designated as Neo-Industrial Place Types with the zoning code of mixed-use development. Specifically, no heavy industrial, warehousing, and distribution facilities are permitted in this land use category within the Major Areas of Change near Cherry Boulevard. Instead, the future industrial uses would likely be linked to and serve more of a supporting role to the office land uses. Based on this supportive role, the industrial uses would likely be below-average truck trip generators. Thus, no future projects or uses that would generate the level of truck trips expected for heavy industrial and/or warehouses are proposed as part of the proposed LUE/UDE Major Areas of Change. However, since it is not possible to determine the amount of TAC concentrations at the time of this analysis, it is not possible to calculate the risks for a particular health effect within the proposed Major Areas of Change.

Future development consistent with the proposed LUE/UDE project would not result in significant emissions of diesel particulate matter. Land development projects are required to comply with AB 2588, SCAQMD Rule 1401, and ARB standards for diesel engines. While existing City policies and regulations and proposed LUE/UDE goals and policies are intended to minimize impacts associated with sensitive receptors, specific measures for future project developments that implement these policies and regulations are proposed to ensure that the intended environmental protections are achieved. Mitigation Measure AQ-3 has been identified to ensure that mobile sources of TACs not covered under SCAQMD permits are considered during subsequent project-level environmental review. Mitigation Measure AQ-3 requires the preparation of project-specific technical health risk assessments evaluating operational-related health risk impacts to further ensure that operational-related emissions are reduced to the maximum extent feasible for projects that require environmental evaluation under CEQA. However, unlike construction activities where the extension of construction schedules and/or use of special equipment can be reasonably assumed to be implemented, operational characteristics and the associated emissions cannot be determined at the time of this analysis. With implementation of Mitigation Measure AQ-3, the potential TAC health risk impact associated with the operation of the proposed project would remain significant and unavoidable.

Impact 6: Land uses associated with buildout of the proposed LUE/UDE would not have the potential to create objectionable odors that could affect a substantial number of people. [Threshold AQ-5]

Impact Analysis: Growth within the City of Long Beach could generate new sources of odors and place sensitive receptors near existing sources of odors. Nuisance odors from land uses in the Basin are regulated under SCAQMD Rule 402, Nuisance, which states:

> *A person shall not discharge from any source whatsoever such quantities of 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. The provisions of this rule shall not apply to odors emanating from agricultural operations necessary for the growing of crops or the raising of fowl or animals.*

Industrial land uses have the potential to generate objectionable odors. Examples of odor-generating industrial projects are wastewater treatment plants, compost facilities, landfills, solid-waste transfer stations, fiberglass manufacturing facilities, paint/coating operations (e.g., auto body shops), dairy farms, petroleum refineries, asphalt batch plants, chemical manufacturing, and food manufacturing facilities. While industrial land uses associated with the proposed General Plan LUE and UDE would be required to comply with SCAQMD Rule 402, additional measures may be necessary to prevent an odor nuisance.

Residential and commercial land uses could result in generation of odors such as exhaust from landscaping equipment. However, unlike industrial land uses, these are not considered potential generators of odor that could affect a substantial number of people. Therefore, impacts from potential odors generated from residential and commercial land uses associated with the LUE/UDE are considered less than significant.

During construction activities, construction equipment exhaust and application of asphalt and architectural coatings would temporarily generate odors. Any construction-related odor emissions would be temporary and intermittent. Additionally, noxious odors would be confined to the immediate vicinity of the construction equipment. By the time such emissions reached any sensitive receptor sites, they would be diluted to well below any level of air quality concern. Furthermore, short-term construction-related odors are expected to cease upon the drying or hardening of the odor-producing materials. Therefore, impacts associated with construction-generated odors are considered less than significant.

While odor sources are present within the City, the odor policies enforced by the SCAQMD, including Rule 402, and City of Long Beach Municipal Code Section 8.64.040, prohibit nuisance odors and identify enforcement measures to reduce odor impacts to nearby receptors. Development of land uses consistent with the proposed LUE/UDE that would have the potential to result in nuisance odors, such as new industrial facilities, would be required to comply with these regulations. Therefore, impacts associated with objectionable odors would be less than significant.

6.3 STANDARD CONDITIONS

Standard Conditions (SC) are specific standards imposed uniformly by the approving agency based on the proposed action taken and are required of the proposed project to reduce its potential environmental effects. Because these features are standard, they do not constitute mitigation measures.

SC AQ-1 To ensure compliance with South Coast Air Quality Management District (SCAQMD) rules and provide Best Management Practices (BMPs) to reduce air pollutant emissions during construction of future projects facilitated under the proposed project, the construction contractor shall implement the following BMPs during construction, where feasible, to further reduce emissions from these sources.

- Install temporary construction power supply meters on site and use these to provide power to electric power tools whenever feasible. If temporary electric power is available on site, forbid the use of portable gasoline- or diesel-fueled electric generators.

- Use of diesel oxidation catalysts and/or catalyzed diesel particulate traps on diesel equipment, as feasible.
- Maintain equipment according to manufacturers' specifications.
- Restrict idling of equipment and trucks to a maximum of 5 minutes (per California Air Resources Board [ARB] regulation).
- Phase grading operations to reduce disturbed areas and times of exposure.
- Avoid excavation and grading during wet weather.
- Limit on-site construction routes and stabilize construction entrance(s).
- Remove existing vegetation only when absolutely necessary.
- Sweep up spilled dry materials (e.g., cement, mortar, or dirt track-out) immediately. Never attempt to wash them away with water. Use only minimal water for dust control.
- Store stockpiled materials and wastes under a temporary roof or secured plastic sheeting or tarp.
- Properly dispose of all demolition wastes. Materials that can be recycled from demolition projects include: metal framing, wood, concrete, asphalt, and plate glass. Unusable, un-recyclable debris should be confined to dumpsters, covered at night, and taken to a landfill for disposal.
- Hazardous debris such as asbestos must be handled in accordance with specific laws and regulations and disposed of as hazardous waste. For more information on asbestos handling and disposal regulations, contact the SCAQMD.

6.4 LEVEL OF SIGNIFICANCE BEFORE MITIGATION MEASURES

Upon implementation of regulatory requirements and standard conditions of approval, the following air quality impacts may still be potentially significant and require mitigation:

- **Impact 2:** Construction activities associated with buildout of the proposed LUE/UDE could generate short-term emissions that could potentially exceed the SCAQMD'S significance thresholds.
- **Impact 3:** Buildout in accordance with the proposed LUE/UDE would generate long-term emissions that may potentially exceed the SCAQMD's regional significance thresholds; however, these emissions would not cumulatively contribute to the nonattainment designations of the Basin.
- **Impact 4:** Buildout of the proposed LUE/UDE may expose sensitive receptors to substantial concentrations of criteria air pollutants and toxic air contaminants.
- **Impact 5:** Buildout of the proposed LUE/UDE may site sensitive land uses in proximity to air pollution sources and may expose sensitive receptors to substantial pollutant concentrations.

6.5 AIR QUALITY MITIGATION MEASURES

Impact 2. Mitigation Measure (MM) AQ-1 would reduce construction period air pollutant emissions of the proposed project.

MM AQ-1 Prior to issuance of any construction permits, future development projects subject to discretionary review shall prepare and submit to the City of Long Beach (City) Department of Development Services Planning Bureau a technical assessment evaluating potential project construction-related air quality impacts. The evaluation shall be prepared in conformance with South Coast Air Quality Management District (SCAQMD) methodology for assessing air quality impacts. If construction-related criteria air pollutants are determined to have the potential to exceed the SCAQMD-adopted thresholds of significance, the Department of Development Services shall require that applicants for new development projects incorporate mitigation measures to reduce air pollutant emissions during construction activities. These identified measures shall be incorporated into all appropriate construction documents (e.g., construction management plans) submitted to the City and shall be verified by the Department of Development Services. Mitigation measures to reduce construction-related emissions include, but are not limited to:

- Require the following fugitive-dust control measures:
  - Use nontoxic soil stabilizers to reduce wind erosion.
  - Apply water every 4 hours to active soil-disturbing activities.
  - Tarp and/or maintain a minimum of 24 inches of freeboard on trucks hauling dirt, sand, soil, or other loose materials.
- Use construction equipment rated by the United States Environmental Protection Agency (EPA) as having Tier 3 (model year 2006 or newer) or Tier 4 (model year 2008 or newer) emission limits, applicable for engines between 50 and 750 horsepower.
- Ensure that construction equipment is properly serviced and maintained to the manufacturers' standards.
- Limit nonessential idling of construction equipment to no more than 5 consecutive minutes.
- Using Super-Compliant volatile organic compound (VOC) paints for coating of architectural surfaces whenever possible.[1]

Impact 3. Mitigation Measure AQ-2 would reduce operational air pollutant emissions of the proposed project.

[1] A list of Super-Compliant architectural coating manufactures can be found on the SCAQMD website at http://www.aqmd.gov/prdas/brochures/Super-Compliant_AIM.pdf.

MM AQ-2 Prior to future discretionary project approval, development project applicants shall prepare and submit to the City Department of Development Services a technical assessment evaluating potential project operation phase-related air quality impacts. The evaluation shall be prepared in conformance with SCAQMD methodology in assessing air quality impacts. If operation-related air pollutants are determined to have the potential to exceed the SCAQMD-adopted thresholds of significance, the Department of Development Services shall require that applicants for new development projects incorporate mitigation measures to reduce air pollutant emissions during operational activities. The identified measures shall be included as part of the Standard Conditions of Approval. Below are possible mitigation measures to reduce long-term emissions:

- For site-specific development that requires refrigerated vehicles, the construction documents shall demonstrate an adequate number of electrical service connections at loading docks for plugging in the anticipated number of refrigerated trailers to reduce idling time and emissions.
- Applicants for manufacturing and light industrial uses shall consider energy storage and combined heat and power in appropriate applications to optimize renewable energy generation systems and avoid peak energy use.
- Site-specific developments with truck delivery and loading areas and truck parking spaces shall include signage as a reminder to limit idling of vehicles while parked for loading/unloading in accordance with California Air Resources Board (ARB) Rule 2845 (13 California Code of Regulations [CCR] Chapter 10, Section 2485).
- Site-specific development shall demonstrate that an adequate number of electric-vehicle Level 2 charging stations are provided on site. The location of the electrical outlets shall be specified on building plans, and proper installation shall be verified by the Department of Development Services prior to issuance of a Certificate of Occupancy.

Impacts 4 and 5. Mitigation Measure AQ-3 would reduce operational toxic air contaminant emissions of the proposed project.

MM AQ-3 Prior to future discretionary approval for projects that require environmental evaluation under California Environmental Quality Act (CEQA), the City of Long Beach would evaluate new development proposals for sensitive land uses (e.g., residences, schools, and daycare centers) within the City for potential incompatibilities with regard to the ARB *Air Quality and Land Use Handbook: A Community Health Perspective* (April 2005). In addition, applicants for siting or expanding sensitive land uses that are within the recommended buffer distances listed in Table 1-1 of the ARB Handbook would submit a Health Risk Assessment (HRA) to the City. The HRA shall be prepared in accordance with the policies and procedures of the State Office of Environmental Health Hazard Assessment (OEHHA) and the SCAQMD. The latest OEHHA guidelines shall be used for the analysis, including age-sensitivity factors, breathing rates, and body weights appropriate for children. If the HRA shows that the incremental cancer risk and/or

non-cancer hazard index exceeds the respective thresholds, as established by the SCAQMD at the time a project is considered, the Applicant will be required to identify and demonstrate that mitigation measures are capable of reducing potential cancer and non-cancer risks to an acceptable level (i.e., below the aforementioned thresholds as established by the SCAQMD), including appropriate enforcement mechanisms. Measures to reduce risk may include, but are not limited to, the following:

- Air intakes oriented away from high-volume roadways and/or truck loading zones; and.
- Heating, ventilation, and air conditioning systems of the buildings provided with appropriately sized maximum efficiency rating value filters.

Prior to future discretionary project approval, applicants for new industrial or warehousing land uses that (1) have the potential to generate 100 or more diesel truck trips per day or have 40 or more trucks with operating diesel-powered transport refrigeration units, and (2) are within 1,000 feet of a sensitive land use (e.g., residential, schools, hospitals, or nursing homes), as measured from the property line of the project to the property line of the nearest sensitive use, shall submit an HRA to the City Department of Development Services. The HRA shall be prepared in accordance with policies and procedures of the State OEHHA and the SCAQMD. If the HRA shows that the incremental cancer risk and/or non-cancer hazard index exceeds the respective thresholds, as established by the SCAQMD at the time a project is considered, the Applicant will be required to identify and demonstrate that best available control technologies for toxics (T-BACTs), including appropriate enforcement mechanisms, are capable of reducing potential cancer and non-cancer risks to an acceptable level. T-BACTs may include, but are not limited to, restricting idling on site or electrifying warehousing docks to reduce diesel particulate matter, or requiring use of newer equipment and/or vehicles. T-BACTs identified in the HRA shall be identified as mitigation measures in the environmental document and/or incorporated into the site plan.

6.6 LEVEL OF SIGNIFICANCE AFTER MITIGATION

Mitigation Measures AQ-1 through AQ-3 would significantly reduce criteria air pollutant emissions generated during construction activities, operational activities, and the emission of TACs. While implementation of Mitigation Measures AQ-1 through AQ-3 would reduce criteria pollutant emissions and emissions of TACs, there currently is not enough information available to quantify emissions during operation of future development that may occur under the proposed LUE/UDE project. Without quantification to guarantee a less than significant finding, future development projects may still exceed the SCAQMD regional significance thresholds, and Impacts 3 through 5 would remain significant and unavoidable.

As concluded above under the discussion of Impact 2, specific BMP measures are included as Standard Conditions imposed by the City, and are identified to ensure that the intended environmental protections are achieved. These BMP measures are identified for future project developments that may be

implemented under the proposed project that require environmental evaluation under CEQA. Additionally, Mitigation Measure AQ-1 is identified requiring the preparation of project-specific technical assessments evaluating construction-related air quality impacts to further ensure that construction-related emissions are reduced to the maximum extent feasible for projects that require environmental evaluation under CEQA. With implementation of Standard Conditions and Mitigation Measure AQ-1, the potential construction emissions impacts associated with future development facilitated by the proposed project would be less than significant.

6.7 IMPACTS OF PROPOSED PROJECT GREENHOUSE GAS EMISSIONS

6.7.1 Existing Conditions

An emissions inventory of the City of Long Beach was conducted based on the existing land uses and is shown in Table L, which identifies existing land uses as residential, commercial, office, and industrial. Criteria air pollutant emissions generated in the City's LUE Major Areas of Change were estimated using EMFAC2014, OFFROAD, NONROAD, and data provided by the City of Long Beach Water Department and SoCal Gas for electricity and natural gas use, respectively.

Emissions for the City's LUE Major Areas of Change come from the following sources:[1]

- **Transportation:** Emissions from vehicle trips beginning and ending in the City and from external/internal vehicle trips (i.e., trips that either begin or end in the City).
- **Area Sources:** Emissions generated from lawn and garden, commercial, and construction equipment use in the City.
- **Energy:** Emissions generated from purchased electricity and natural gas consumption used for cooking and heating in the City.
- **Solid Waste Disposal:** Indirect emissions from waste generated in the City.
- **Water/Wastewater:** Emissions from electricity used to supply, treat, and distribute water based on the overall water demand and wastewater generation in the City.

[1] Life-cycle emissions include indirect emissions associated with materials manufacture. However, these indirect emissions involve numerous parties, each of which is responsible for GHG emissions of their particular activity. The California Resources Agency, in adopting the CEQA Guidelines Amendments on GHG emissions, found that life-cycle analysis was not warranted for project-specific CEQA analysis in most situations, for a variety of reasons, including lack of control over some sources and the possibility of double-counting emissions (see Final Statement of Reasons for Regulatory Action, December 2009). Because the amount of materials consumed during the operation or construction of the proposed project is not known, the origin of the raw materials purchased is not known, and manufacturing information for those raw materials are also not known, calculation of life-cycle emissions would be speculative. A life-cycle analysis is not warranted (OPR 2008).

Table L: Existing City of Long Beach LUE Major Areas of Change Greenhouse Gas Emissions Inventory

Sector	Existing (CEQA Baseline) 2012 GHG Emissions	
	MT CO_2e/yr	Percentage of Total
Transportation[1]	826,184	80.19
Energy – Residential[2]	54,054	5.94
Energy – Nonresidential[2]	130,111	12.63
Waste[3]	4,932	0.48
Water/Wastewater[4]	15,006	1.46
Existing LUE Major Areas of Change Emissions Total	**1,030,893**	**100**
Service Population[5]	107,893	N/A
MT CO_2e/Year/Service Population	9.5	N/A

Source: Compiled by LSA Associates, Inc.(2016).
Note: Emissions may not total 100 percent due to rounding.

[1] EMFAC2014. Model runs were based on daily per capita VMT data provided by LSA Associates, Inc.

[2] Electricity and natural gas usage data provided by Southern California Edison and City of Long Beach Oil and Gas and 2014 California Gas Report, respectively. The carbon intensity of the purchased electricity is provided by CEC for Long Beach area. For natural gas, the intensity factors for CO_2, CH_4 and N_2O are from the Local Government Operations Protocol (LGOP), Version 1.1 (May 2010).

[3] Landfill Emissions Tool Version 1.3 and CalRecycle. Waste generation based on 2012 waste commitment for the City of Long Beach obtained from CalRecycle. Assumes 75 percent of fugitive GHG emissions are captured within the landfill's Landfill Gas Capture System. The landfill gas capture efficiency is based on ARB's LGOP, Version 1.1. Significant CH_4 production typically begins 1 or 2 years after waste disposal in a landfill and continues for 10 to 60 years or longer. Therefore, the highest CH_4 emissions from waste disposal in a given year are reported.

[4] LGOP, Version 1.1, based on the City's Urban Water Management Plan (UWMP) for water demand and City-provided wastewater generation rates.

[5] Consists of approximately 59,598 residents and 48,295 employees for existing condition year 2012 within the LUE Major Areas of Change.

CalRecycle = California Department of Resources Recycling and Recovery
CEC = California Energy Commission
CEQA = California Environmental Quality Act
CH_4 = methane
CO_2e = carbon dioxide equivalent
GHG = greenhouse gas
LUE = Land Use Element
MT CO_2e/yr = metric tons of carbon dioxide equivalent per year
N/A = Not Applicable
N_2O = nitrous oxide
SP = Service Population
VMT = vehicle miles traveled

6.7.2 CEQA Guidelines for GHG

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

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

6.7.3 South Coast Air Quality Management District

The SCAQMD has adopted a significance threshold of 10,000 MT CO_2e per year for permitted (stationary) sources of GHG emissions for which SCAQMD is the designated lead agency. To provide guidance to local lead agencies on determining significance for GHG emissions in their CEQA documents, the SCAQMD convened a GHG CEQA Significance Threshold Working Group (Working Group). Based on the last Working Group meeting (Meeting No. 15) in September 2010, the SCAQMD identified a tiered approach for evaluating GHG emissions for development projects where it is not the lead agency:

- **Tier 1.** If a project is exempt from CEQA, project-level and cumulative GHG emissions are less than significant.
- **Tier 2.** If the project complies with a GHG emissions reduction plan or mitigation program that avoids or substantially reduces GHG emissions in the project's geographic area (i.e., city or county), project-level and cumulative GHG emissions are less than significant.

  For projects that are not exempt or where no qualifying GHG reduction plans are directly applicable, the SCAQMD requires an assessment of GHG emissions. The SCAQMD is proposing a "bright-line" screening-level threshold of 3,000 MT CO_2e annually for all land-use types or the following land-use-specific thresholds: 1,400 MT CO_2e for commercial projects, 3,500 MT CO_2e for residential projects, or 3,000 MT CO_2e for mixed-use projects. This bright-line threshold is based on a review of the Governor's Office of Planning and Research database of CEQA projects. Based on its review of 711 CEQA projects, 90 percent of CEQA projects would exceed the bright-line thresholds identified above. Therefore, projects that do not exceed the bright-line threshold would have a nominal, and therefore, less than cumulatively considerable impact on GHG emissions.
- **Tier 3.** If GHG emissions are less than the screening-level threshold, project-level and cumulative GHG emissions are less than significant.
- **Tier 4.** If emissions exceed the screening threshold, a more detailed review of the project's GHG emissions is warranted.

  The SCAQMD has identified an efficiency target for projects that exceed the screening threshold. The current recommended approach is per capita efficiency targets. The SCAQMD is not recommending use of a percentage emissions-reduction target; instead, the SCAQMD identified a 2020 efficiency target of 4.8 MT CO_2e per year per service population ($MTCO_2e$/yr/SP) for project-level analyses and 6.6 MT CO_2e/yr/SP for plan-level projects (e.g., general plans). Service population (SP) is defined as the sum of the residential and employment populations provided by a project.

For purposes of this analysis, as the buildout year for the proposed LUE/UDE project is 2040, its per capita emissions rate is evaluated to an interim year 2040 efficiency target as discussed below.

6.7.4 Consistency with the Statewide GHG Reduction Targets

The per capita efficiency targets are based on the AB 32 GHG reduction target and 2020 GHG emissions inventory prepared for the ARB 2008 Scoping Plan.[1] Because the project is LUE update to the existing General Plan, project emissions are compared to the SCAQMD's plan-level efficiency threshold. The following threshold is the applicable GHG threshold for the proposed project:

- 2040 GHG efficiency target of 3.4 MT CO_2e per service population, per year.

If the community GHG emissions exceed this per capita efficiency target, GHG emissions would be considered potentially significant in the absence of mitigation measures.

6.8 GREENHOUSE GAS EMISSIONS IMPACT

This GHG evaluation was prepared in accordance with the requirements of CEQA to determine if significant GHG impacts are likely to occur in conjunction with future development that would be accommodated by the proposed LUE/UDE project.[2]

The following impact analysis addresses thresholds of significance for which the Initial Study disclosed potentially significant impacts. The applicable thresholds are identified in brackets after the impact statement. Mitigation measures are recommended, as appropriate, for significant impacts to eliminate or reduce GHG emissions.

Impact 7: Buildout of the proposed LUE/UDE project would result in a substantial reduction in GHG emissions per service population; as such, there would be a substantial decrease in GHG emissions compared to existing conditions. However, despite the project's decrease in GHG emissions, the proposed LUE/UDE Plan GHG emissions would exceed the State threshold of 3.4 MT CO_2e per Service Population per year. [Threshold GHG-1]

Impact Analysis: Implementation of the proposed LUE/UDE would contribute to global climate change through direct and indirect emissions of GHG from land uses within the City of Long Beach. The change in GHG emissions is based on the difference between existing land uses and those associated with the proposed implementation of the LUE/UDE. Table M compares the community-wide GHG emissions inventory for the City of Long Beach at buildout in year 2040 to existing conditions and year 2040 without State and Federal reductions (BAU). The adjusted BAU (ABAU) buildout inventory includes reductions from Federal and State measures identified in the ARB's Scoping Plan, including the Pavley fuel efficiency standards, LCFS for fuel use (transportation and off-road), and a reduction in carbon intensity from electricity use.

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1 The SCAQMD took the 2020 statewide GHG reduction target for land-use-only GHG emissions sectors and divided it by the 2020 statewide employment for the land-use sectors to derive a per capita GHG efficiency metric that coincides with the GHG reduction targets of AB 32 for year 2020.

2 The methodology used in completing the GHG inventory was employed for purposes of fulfilling the requirements of CEQA and may differ from the methodology used in completing the GHG inventory found in the City's Sustainability City Action Plan.

Table M: LUE/UDE Buildout 2040 GHG Emissions Inventory

Sectors	Existing 2012 GHG Emissions (MT CO_2e/yr)	LUE/UDE 2040 Buildout	General Plan 2040	Percent Total LUE/UDE 2040	LUE/UDE Change from 2012	General Plan Change from 2012
Transportation[1]	826,184	682,844	544,830	76.69	-143,341	-281,354
Energy – Residential[2]	54,054	52,588	42,964	5.91	-1,466	-11,090
Energy – Nonresidential[2]	130,111	136,968	112,952	15.38	6,857	-17,159
Waste[3]	4,932	3,638	2,903	0.41	-1,294	-2,030
Water/Wastewater[4]	15,006	14,392	11,786	1.62	-614	-3,220
Emissions Total	1,030,287	890,428	715,434		-139,859	-314,853
Service Population[5]	107,893	150,002	119,684	N/A	N/A	N/A
Emissions per Service Population	9.5	5.9	6.0	N/A	N/A	N/A
SCAQMD Proposed Plan-Level Efficiency Standard	N/A	3.4	3.4	N/A	N/A	N/A

Source: Compiled by LSA Associates, Inc. (2016).

Notes:

Emissions forecast based on changes in population (residential energy), employment (nonresidential energy), or service population (City energy, waste, water/wastewater, and transportation).

General Plan 2040 includes reductions identified in the Scoping Plan associated with transportation (Pavley+LCFS), energy (50% RPS), and Title 24 2017 CALGreen Building code (46% efficiency improvement over 2008 Title 24 code). The current inventory does not account for reductions in building energy use from Title 24 cycle updates.

Emissions may not total 100 percent due to rounding.

[1] EMFAC2014 based on daily per capita VMT data provided by LSA Associates, Inc. (2016). Modeling was conducted for both a General Plan 2040 scenario, and for the LUE/UDE 2040 scenario, which includes all statewide vehicle regulations.

[2] Electricity and natural gas usage data provided by Southern California Edison and City of Long Beach Oil and Gas, respectively. The carbon intensity of the purchased electricity is estimated by CEC for Long Beach area. For natural gas, the intensity factors for CO_2, CH_4, and N_2O are provided by the EPA's e-GRID data for year 2012. The LUE/UDE 2040 scenario for residential electricity use includes a reduction in carbon intensity of Long Beach Water Department's energy supply required under the 50 percent RPS (CEC 2015).

[3] Landfill Emissions Tool Version 1.3 and CalRecycle. Waste generation based on 2012 waste commitment for the City of Long Beach obtained from CalRecycle. Assumes 75 percent of fugitive GHG emissions are captured in the landfill's Landfill Gas Capture System. The landfill gas capture efficiency is based on the ARB's LGOP, Version 1.1. Significant CH_4 production typically begins 1 or 2 years after waste disposal in a landfill and continues for 10 to 60 years or longer. Therefore, the highest CH_4 emissions from waste disposal in a given year are reported.

[4] LGOP, Version 1.1, based on the three-year water demand data as provided by Long Beach Water Department and City's 2010 UWMP. Forecasts are adjusted for increases in population and employment and are based on the target per capita of SBx7-7. The LUE/UDE 2040 scenario for residential electricity use includes a reduction in carbon intensity of Long Beach Water Department's energy supply required under the 50 percent RPS (CEC 2015).

[5] Based on an existing service population of 107,893 people (59,598 residents and 48,295 employees), a projected LUE/UDE 2040 service population of 150,002 people (82,858 residents and 67,144 employees), and a projected General Plan 2040 service population of 119,684 people (63,707 residents and 55,977 employees).

ARB = California Air Resources Board
CALGreen = California Green Building Standards
CalRecycle = California Department of Resources Recycling and Recovery
CEC = California Energy Commission
CH_4 = methane
CO_2 = carbon dioxide
GHG = greenhouse gas
LCFS = Low Carbon Fuel Standard
LGOP = Local Government Operations Protocol
LUE/UDE = Land Use Element/Urban Design Element
MT CO_2e/yr = metric tons of carbon dioxide equivalent per year
N/A = Not Applicable
N_2O = nitrous oxide
RPS = Renewable Portfolio Standard
SCAQMD = South Coast Air Quality Management District
EPA = United States Environmental Protection Agency
UWMP = Urban Water Management Plan
VMT = vehicle miles traveled

As shown in Table M, the LUE/UDE GHG emissions with reduction measures incorporated in the City for buildout year 2040 would still exceed the interim efficiency threshold of 3.4 MT CO_2e/yr/SP. On a per capita basis, buildout of the proposed LUE/UDE would reduce the GHG emissions from 9.5 MT CO_2e/yr/SP under existing conditions down to 5.9 MT CO_2e/yr/SP. Consequently, the implementation of the proposed LUE/UDE would result in lower GHG emissions within the City.

The LUE includes the following strategies and policies that would result in further reductions in GHG emissions:

- **Strategy No. 2:** Promote efficient management of energy resources to reduce greenhouse gas emissions and the impacts of climate change.
- **LU IM-11:** Continue to implement the Sustainability Action Plan. Introduce new goals and action measures that promote sustainability, including items related to land use and mobility planning, increasing walking and biking, increasing energy efficiency, reducing greenhouse gases and promoting renewable energy.
- **LU IM-60:** Continue to update the City's greenhouse gas (GHG) emissions inventory with the California Climate Action Registry, which will enable the City to better meet future environmental regulations and secure future grant funding for sustainability programs.
- **LU IM-61:** Through the Port of Long Beach, provide Greenhouse Gas Emissions Reduction Grant Program and similar programs aimed at implementing strategies to reduce the impacts of greenhouse gases.
- **LU IM-64:** Continue to participate in programs and organizations aimed at improving energy efficiency and reducing greenhouse gas emissions.
- **LU IM-66:** Consult with utility companies in promoting and developing renewable energy and emerging greenhouse gas reduction technologies. Identify potential sites within the Regional-Serving Facilities Place Type to locate such facilities.
- **Eastside Land Use Strategy 10:** Finish the City's urban forestry inventories then develop and implement tree planting, maintenance and greening plans, which are coordinated with citywide air quality improvement (greenhouse gas reduction) and local water-saving landscape plans and programs.

Consistency with the Long-Term Goal of Executive Orders B-30-15 and S-03-05: EO B-30-15 and EO S-03-05 identified the long-term goals of reducing GHG emissions by 40 percent and 80 percent of 1990 levels by 2030 and 2050, respectively. As shown in Table M, the community-wide GHG emissions with reduction measures incorporated in the City for buildout year 2040 would exceed the interim efficiency threshold of 3.4 MT CO_2e /yr/SP. This interim efficiency threshold measures progress in meeting the EO B-30-15 and EO S-03-05 reduction targets.

The proposed LUE/UDE includes various policies that would contribute to reduced GHG emissions. While these policies would contribute to reduced GHG emissions, the City would require assistance from additional Federal and State programs and regulations to achieve the long-term GHG emissions goal. Therefore, GHG impacts within the City of Long Beach from the overall growth under the proposed LUE/UDE project would need to develop a GHG reduction plan as recommended under CEQA Guidelines Section 15183.5 and a VMT reduction plan under CEQA Guidelines Section

21083 in order to achieve the long-term GHG reductions goals under EO B-30-15 and EO S-03-05 and would not cumulatively contribute to the long-term GHG emissions in the State. Mitigation measure is required.

Impact 8: The proposed LUE/UDE project would not conflict with the ARB Scoping Plan or SCAG's 2016 RTP/SCS. [Threshold GHG-2]

Impact Analysis: The following discusses the consistency of the proposed LUE/UDE project to the ARB Scoping Plan and SCAG's 2012 RTP/SCS in addition to the City's Sustainable City Action Plan.

ARB Scoping Plan: In accordance with AB 32, the ARB developed the Scoping Plan to outline the State's strategy to achieve 1990-level emissions by year 2020. Since adoption of the 2008 Scoping Plan, State agencies have adopted programs identified in the Scoping Plan, and the legislature has passed additional legislation to achieve the GHG reduction targets. Statewide strategies to reduce GHG emissions include the LCFS and changes in the corporate average fuel economy standards (e.g., Pavley I and 2017–2025 CAFE standards). These statewide measures are applicable uniformly throughout the state, and all future developments under the proposed LUE/UDE would be in compliance.

The City is assisting the State with implementation of the AB 32 Scoping Plan measures by reviewing projects for compliance with Title 24 standards that help reduce GHG emissions through increasing energy efficiency of new residential and nonresidential buildings. Table N presents the electricity and natural gas consumption rate reductions from the implementation of the proposed 2016 Title 24 standards that would be effective on and after January 1, 2017. All new residential and nonresidential buildings constructed under the proposed LUE/UDE would be required to be in compliance with 2016 Title 24 standards, which would save approximately 87,548 megawatt hours (MWh) of electricity and 2,616 therms of natural gas annually.

Table N: Energy Consumption Rate Reductions

	Residential	Nonresidential	Total
Electricity (MWh)	14,556	72,993	87,548
Natural Gas (therms)	996	1,620	2,616

Source: Compiled by LSA Associates, Inc. (2016).
MWh = megawatt hours

Table O provides a summary of the statewide strategies and the associated GHG emissions reductions when integrated into the proposed LUE/UDE project. In addition to these statewide strategies, the LUE/UDE policies outlined above would also contribute to reducing GHG emissions. Therefore, the proposed LUE/UDE project would be consistent with the Scoping Plan, and impacts are considered less than significant.

Table O: Statewide GHG Emissions Reduction Strategies

Policy/Action	Policy/Implementation Action Description
Circulation/Land Use	
Pavley I	A clean-car standard that reduces GHG emissions from new passenger vehicles (light- to medium-duty) from 2009 through 2016 and is anticipated to reduce GHG emissions from new passenger vehicles by 30 percent in 2016. California implements the Pavley I standards through a waiver granted to California by the U.S. Environmental Protection Agency.
Advanced Clean Car (Pavley II)	A multifaceted approach focused on controlling smog and soot and reducing GHG emissions from passenger vehicles for model years 2015–2025. It is designed to extend beyond Pavley I (i.e., 2016). The program is anticipated to reduce GHG emissions by 12 percent in year 2025.
Low Carbon Fuel Standard (LCFS)	Requires a reduction of 2.5 percent in the carbon intensity of California's transportation fuels by 2015 and of at least 10 percent by 2020. Applies to refiners, blenders, producers, and importers of transportation fuels and uses market-based mechanisms to allow providers to use the most economically feasible methods to reduce emissions during the fuel cycle.
Energy Efficiency and Use	
Title 24 Energy Standards	Energy conservation standards for new residential and nonresidential buildings were adopted by the California Energy Resources Conservation and Development Commission in June 1977 and are updated triennially to allow for consideration and possible incorporation of new energy-efficiency technologies and methods. The 2016 Building and Energy Efficiency Standards will be effective on January 1, 2017. Buildings that are constructed in accordance with the 2016 Building and Energy Efficiency Standards are 46 percent more energy efficient than the 2008 standards as a result of better windows, insulation, lighting, ventilation systems, and other features that reduce energy consumption in homes and businesses.
Title 24 CALGreen	Adopted in 2008 as part of the California Green Building Standards Code. Established planning and design standards for sustainable site development, energy efficiency, water conservation, material conservation, and internal air contaminants.
50 percent RPS	Senate Bill 350 was signed in October 2015 and expands the State's renewable energy standard to 50 percent renewable power by 2030. Renewable sources of electricity include wind, small hydropower, solar, geothermal, biomass, and biogas. The increase in renewable electricity production will decrease indirect GHG emissions from development projects, because electricity production from renewable sources is generally considered carbon neutral.
Title 25	The 2006 Appliance Efficiency Regulations were adopted by the California Energy Commission and approved by the California Office of Administrative Law in 2006. The regulations include standards for both federally and non-federally regulated appliances.

Source: Compiled by LSA Associates, Inc. (2016).
CALGreen = California Green Building Standards
GHG = greenhouse gas
RPS = Renewable Portfolio Standard

SCAG's 2012 Regional Transportation Plan/Sustainable Communities Strategies: SCAG's 2012 RTP/SCS is a regional growth-management strategy that targets per capita GHG reduction from passenger vehicles and light-duty trucks in the Southern California region. The 2012 RTP/SCS incorporates local land-use projections and circulation networks in city and county general plans. The projected regional development pattern, including locations of land uses and residential densities

included in local general plans, when integrated with the proposed regional transportation network identified in the 2012 RTP/SCS, would reduce per capita vehicular travel-related GHG emissions and achieve the GHG reduction per capita targets for the SCAG region of 8 percent per capita from 2005 GHG emission levels by 2020 and 13 percent per capita from 2005 GHG emission levels by 2035. Consistency with SCAG's 2012–2035 RTP/SCS goals, provides an assessment of the proposed project's relationship to applicable RTP/SCS goals. The proposed LUE/UDE project and its policies would be consistent with the applicable RTP/SCS goals. Implementation of General Plan Air Quality Elements policies would create higher density mixed-use communities. These policies, in addition to Policies LU 4.6, 18.1, and 21.6, which also call for creation of more mixed-use and walkable communities, would contribute to reduced VMT per capita and overall GHG emissions from passenger vehicles. Therefore, the proposed LUE/UDE project is consistent with SCAG's 2012 RTP/SCS.

City of Long Beach Sustainable City Action Plan: The Sustainable City Action Plan is a City-adopted plan to guide the City in becoming more sustainable. The plan identifies a wide range of goals and implementation actions to conserve energy and water, reduce solid waste, address global warming, tailor urban design, protect natural habitats, improve transportation options, and reduce risks to human health. Specific goals related to GHG include increasing the use of renewable energy in Long Beach and reducing the City's overall electric load by 10 percent. Other goals include reducing single-occupancy vehicle trips by 10 percent and advancing higher density mixed-use neighborhoods that are bike and pedestrian friendly. The proposed LUE/UDE project includes various policies that are and would be consistent with these goals and initiatives of the Sustainable City Action Plan.

Existing Regulations and Standard Conditions: The following list includes State and local regulations and conditions.

- **State**
  - **EO S-3-05 and EO B-30-15:** Greenhouse Gas Emission Reduction Targets
  - **AB 32:** California Global Warming Solutions Act
  - **SB 375:** Sustainable Communities Strategies
  - **AB 1493:** Pavley Fuel Efficiency Standards
  - **Title 20 California Code of Regulations:** Appliance Energy Efficiency Standards
  - **Title 17 California Code of Regulations:** Low Carbon Fuel Standard
  - **AB 1881:** California Water Conservation in Landscaping Act of 2006
  - **SB 1368:** Statewide Retail Provider Emissions Performance Standards
  - **SB 350:** Renewable Portfolio Standards
  - **Title 24, Part 6, California Code of Regulations:** Building and Energy Efficiency Standards
  - **Title 24, Part 11, California Code of Regulations:** Green Building Standards Code

- **Local**
  - **Green Building Ordinance:** City of Long Beach Municipal Code Title 14, Chapter 14.04, Sections 14.04.500 to 14.04.526

6.9 LEVEL OF GHG SIGNIFICANCE BEFORE MITIGATION

Upon implementation of regulatory requirements and standard conditions of approval, the GHG impact would be significant:

Impact 7. Buildout of the proposed LUE/UDE project would result in a decrease in GHG emissions compared to existing conditions. However, the proposed project GHG emissions would not meet the long-term GHG reductions goal under EO B-30-15 and EO S-03-05 reduction targets.

Therefore, mitigation is required**.**

6.10 MITIGATION MEASURES

Impact 7. Mitigation Measures GHG-1 through GHG-4 would reduce GHG emissions of the Proposed Project.

MM GHG-1 The City of Long Beach (City) shall develop a greenhouse gas (GHG) Reduction Plan or Climate Action Plan (CAP) to ensure that the City continues on a trajectory that aligns with the short-term, interim, and long-term state GHG reduction goals of Assembly Bill (AB) 32 (2020 goal), Executive Order (EO) B-30-15 (2030 goal), and EO S-03-05 (2050 goal). Within approximately 36 months of adoption of the proposed General Plan Land Use Element (LUE)/Urban Design Element (UDE) project, the City of Long Beach shall prepare and present to the City Council for adoption a community climate action plan/greenhouse gas reduction plan (Plan). The Plan shall identify strategies to be implemented to reduce GHG emissions associated with the City, and shall include as one alternative a program that achieves the AB 32 targets. In addition, the City shall monitor GHG emissions by updating its community-wide GHG emissions inventory every 5 years upon adoption of the initial Plan. Upon the next update to the Plan, the inventory, GHG reduction measures, and GHG reductions shall be forecast to year 2040 to ensure progress toward achieving the interim target that aligns with the long-term GHG reduction goals of EO S-03-04. The Plan update shall take into account the reductions achievable from Federal and State actions and measures as well as ongoing work by the City and the private sector. The 2040 Plan update shall be completed by January 1, 2020, with a plan to achieve GHG reductions for 2030 (EO B-30-15 goal), provided the State has an actual plan to achieve reductions for 2030. New reduction programs in similar sectors as the proposed Plan (building energy, transportation, waste, water, wastewater, agriculture, and others) will likely be necessary. Future targets shall be considered in alignment with State reduction targets, to the maximum extent feasible, but it is premature at this time to determine whether or not such targets can be feasibly met through the combination of Federal, State, and local action given technical, logistical and financial constraints. Future updates to the Plan shall account for the horizon

beyond 2030 as the State adopts actual plans to meet post-2030 targets. The Plan will include details on how the reduction programs will be implemented and will designate responsible parties to monitor progress and ensure implementation of the reductions within the Plan. A monitoring and reporting program will be included to ensure the Plan achieves the reduction targets. The Plan will also include criteria that would trigger an update to the Plan. Examples of triggers requiring a Plan update include monitoring of progress that demonstrate that the Plan will not achieve the reduction targets, or economic and/or population growth that exceeds the scope of the Plan. In all instances, the Plan and any updates shall be consistent with State and Federal law.

Long Beach GHG Reduction Plan or Climate Action Plan Measures:

- Establish a goal to encourage 15 percent of existing single-family homes to install solar installations before 2020.
- Establish a goal to encourage 15 percent of existing commercial/industrial buildings to install solar installations before 2020.
- Collaborate with Long Beach Transit to implement "Smart Bus" technology, global positioning system (GPS), and electronic displays at all transit stops by 2020 to provide customers with "real-time" arrival and departure time information.
- Develop public education materials that support and encourage the use of recycled water.
- Consider a plan for installing recycled water infrastructure for all new parks, schools, and other public facilities to use 100 percent recycled water for non-potable outdoor uses.
- Adopt a municipal goal of 100 percent recycled water for non-potable sources, as feasible, depending on available recycled water infrastructure.
- Adopt a landscaping water conservation ordinance that exceeds the requirements in the Model Landscape Ordinance (AB 1881).

Post-2020 Measures:

- Prior to January 1, 2020, the City of Long Beach shall update the GHG Reduction Plan or CAP to address the GHG reduction goals of EO B-30-15 for GHG sectors for which the City has direct or indirect jurisdictional control. The City shall identify a GHG emissions reduction target for year 2030 that is consistent with the GHG reduction goals identified in EO S-03-05. The GHG Reduction Plan or CAP shall be updated to include measures to ensure that the City is on a trajectory that aligns with the State's 2030 GHG emissions reduction target.

MM GHG-2 Within approximately 18 months of adoption of the proposed General Plan LUE/UDE project, the City shall prepare and present to the City Council for adoption a vehicle miles traveled (VMT) reduction plan to ensure that GHG reduction can be achieved by reducing VMT and by increasing or encouraging the use of alternative fuels and transportation technologies.

- The City will ensure that new development incorporate both local and regional transit measures into the project design that promote the use of alternative modes of transportation.
- The City shall give priority to transportation projects that will contribute to a reduction in VMT per capita, while maintaining economic vitality and sustainability.
- The City will create an interconnected transportation system that allows a shift in travel from private passenger vehicle to alternative modes, including public transit, ride sharing, car sharing, bicycling, and walking.

MM GHG-3 Prior to issuance of building permits for residential development projects within the LUE/UDE Major Areas of Change, the property owner/developer shall indicate on the building plans that the following features have been incorporated into the design of the building(s). Proper installation of these features shall be verified by the City of Long Beach Building and Safety Bureau prior to issuance of a certificate of occupancy.

- For multifamily dwellings, electric vehicle charging shall be provided as specified in Section A4.106.8.2 (Residential Voluntary Measures) of the CALGreen Code.
- Bicycle parking shall be provided as specified in Section A4.106.9 (Residential Voluntary Measures) of the CALGreen Code.

MM GHG-4 Prior to issuance of building permits for non-residential development projects within the LUE/UDE Major Areas of Change, the property owner/developer shall indicate on the building plans that the following features have been incorporated into the design of the building(s). Proper installation of these features shall be verified by the City of Long Beach Building and Safety Bureau prior to issuance of a certificate of occupancy.

- For buildings with more than ten tenant-occupants, changing/shower facilities shall be provided as specified in Section A5.106.4.3 (Nonresidential Voluntary Measures) of the CALGreen Code.
- Preferential parking for low-emitting, fuel-efficient, and carpool/van vehicles shall be provided as specified in Section A5.106.5.1 (Nonresidential Voluntary Measures) of the CALGreen Code.
- Facilities shall be installed to support future electric vehicle charging at each non-residential building with 30 or more parking spaces. Installation shall be consistent with Section A5.106.5.3 (Nonresidential Voluntary Measures) of the CALGreen Code.

6.11 LEVEL OF SIGNIFICANCE AFTER MITIGATION

Mitigation Measures GHG-1 through GHG-4 would encourage and accommodate use of alternative-fueled vehicles and nonmotorized transportation and ensure that GHG emissions from the build out of the Proposed Project would be minimized. However, additional statewide measures would be necessary to reduce GHG emissions under the Proposed Project to meet the long-term GHG reduction goals under EO S-3-05, which identified a goal to reduce GHG emissions to 80 percent below 1990 levels by 2050, and EO B-30-15, which identified a goal to reduce GHG emissions to 40 percent below 1990 levels by 2030. The new EO B-30-15 requires ARB to prepare another update to the Scoping Plan to address the 2030 target for the State. At this time, there is no plan past 2020 that achieves the long-term GHG reduction goal established under EO S-3-05 or the new EO B-30-15. As identified by the California Council on Science and Technology (CCST), the State cannot meet the 2050 goal without major advancements in technology (California Council on Science and Technology 2012). Since no additional statewide measures are currently available, Impact 7 would remain significant and unavoidable.

7.0 REFERENCES

Balmes, J.R., Earnest, G., Katz, P.P., Yelin, E.E., Eisner, M.D., Chen, H., Trupin, L., Lurmann, F., and Blanc, P.D. 2009. Exposure to traffic: Lung function and health status of adults with asthma. *The Journal of Allergy and Clinical Immunology*, 123(3):626–631.

Bay Area Air Quality Management District (BAAQMD). 2011, May (Revised). California Environmental Quality Act Air Quality Guidelines.

California Air Resources Board (ARB). 2016. Air Pollution Monitoring Data (2012, 2013, and 2014). Website: http://www.arb.ca.gov/adam/topfour/topfour1.php (accessed January 2016).

———. 2015a, October 1. Ambient Air Quality Standards. http://www.arb.ca.gov/research/aaqs/aaqs2.pdf.

———. 2015b, June. California Greenhouse Gas Inventory for 2000–2013 – 2015 Edition.

———. 2014, May 15. Proposed First Update to the Climate Change Scoping Plan: Building on the Framework. http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm.

———. 2013. Overview of the Children's Health Study. Website accessed on December 10, 2013, at http://www.arb.ca.gov/research/chs/over.htm.

———. 2012. Status of Scoping Plan Recommended Measures. http://www.arb.ca.gov/cc/scopingplan/status_of_scoping_plan_measures.pdf.

———. 2010a, September. Resolution 10-31: Regional Greenhouse Gas Emissions Reduction Targets Pursuant to SB 375. September 23.

———. 2010b, May. Local Government Operations Protocol (LGOP), Version 1.1.

———. 2008, October. *Climate Change Proposed Scoping Plan, a Framework for Change*.

———. 2007a. Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California Recommended for Board Consideration. October.

———. 2007b. "ARB approves tripling of early action measures required under AB 32" News Release 07-46. Website: www.arb.ca.gov/newsrel/nr102507.htm. October 25.

———. 2005, April. Air Quality and Land Use Handbook: A Community Health Perspective.

———. 2000. Stationary Source Division and Mobile Source Control Division. *Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles*. October.

California Climate Action Team. 2006, March. Climate Action Team Report to Governor Schwarzenegger and the Legislature.

California Council on Science and Technology (CCST). 2012. Reducing Greenhouse Gas Emissions by 2050: California's Energy Future. http://ccst.us/news/2012/0921ghg.php#sthash.UkRWTh7P.dpuf.

California Department of Resources Recycling and Recovery (CalRecycle). 2016. Disposal Reporting System, Jurisdiction Reporting by Facility. Website: http://www.calrecycle.ca.gov/LGCentral/Reports/DRS/Destination/JurDspFa.aspx.

California Department of Transportation (Caltrans). 1997, December. Transportation Project-Level Carbon Monoxide Protocol. UCD-ITS-RR-97-21. Prepared by Institute of Transportation Studies, University of California, Davis.

California Energy Commission (CEC). 2015. Renewable Portfolio Standard Guidebook. CEC-300-2015-001-ED8-SF.

City of Long Beach. 2010. *City of Long Beach Sustainably City Action Plan*. February.

———. 1996. *Long Beach General Plan*. December.

Governor's Office of Planning and Research (OPR). 2008, June. Technical Advisory, CEQA and Climate Change: Addressing Climate Change Through CEQA Review. http://www.opr.ca.gov/ceqa/pdfs/june08-ceqa.pdf.

Intergovernmental Panel on Climate Change (IPCC). 2007. Fourth Assessment Report: Climate Change 2007. New York: Cambridge University Press.

LSA Associates, Inc. 2016. Draft Traffic Impact Analysis. General Plan Land Use and Urban Design Elements. February.

South Coast Air Quality Management District (SCAQMD). 2015a, May. Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES IV) Final Report. Website: http://www.aqmd.gov/docs/default-source/air-quality/air-toxic-studies/mates-iv/mates-iv-final-draft-report-4-1-15.pdf?sfvrsn=7.

———. 2015b. Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES IV) Interactive Map. Website: http://www3.aqmd.gov/webappl/OI.Web/OI.aspx?jurisdictionID=AQMD.gov&shareID=73f55d6b-82cc-4c41-b779-4c48c9a8b15b (accessed March 2016).

———. 2015c, March (Revised). SCAQMD Air Quality Significance Thresholds. Website: http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf?sfvrsn=2.

———. 2015d. Air Quality Analysis Handbook. Updates to CEQA Air Quality Handbook. http://www.aqmd.gov/ceqa/hdbk.html.

———. 2014. Facility Information Details Maps. Pinpoints locations of permitted facilities.

———. 2013. California Emissions Estimator Model (CalEEMod), Version 2013.2.2.

———. 2012. Final 2012 Air Quality Management Plan. http://www.aqmd.gov/aqmp/2012aqmp/Final/index.html.

———. 2008a, September. Multiple Air Toxics Exposure Study in the South Coast Air Basin (MATES III).

———. 2008b, June. Final Localized Significance Threshold Methodology.

———. 2005, May. Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning.

———. 1993. *California Environmental Quality Act Air Quality Handbook.*

Southern California Association of Governments (SCAG). 2016, April. 2016-2040 Regional Transportation Plan/ Sustainable Communities Strategy (RTP/SCS). http://rtpscs.scag.ca.gov/Pages/default.aspx.

Southern California Gas Company. 2014. California Gas Report. Prepared by the California Gas and Electric Utilities.

United States Environmental Protection Agency (EPA). 2015. Black Carbon. September. http://www3.epa.gov/blackcarbon/basic.html (accessed on September 17, 2015).

———. 2014, April 20. What are the Six Common Air Pollutants? http://www.epa.gov/airquality/urbanair.

———. 2012. Greenhouse Gas Emissions. http://www.epa.gov/climatechange/ghgemissions/gases.html.

———. 2010. Press Release. December 23.

———. 2008. NONROAD model. Emission factor model for nonroad equipment.

Western Regional Climate Center (WRCC). 2014. Western U.S. Historical Summaries – Long Beach Monitoring Station (Station ID No. 046719). http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?ca1779 (accessed March 23, 2016).

Zhu, Y., Hinds, W.C., Kim, S., Shen, S., and Sioutas, C. 2002. Study of ultrafine particles near a major roadway with heavy-duty diesel traffic. Atmospheric Environment, 36(27):4323-4335.

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APPENDIX A

EMISSION INVENTORY DATA

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CITY OF LONG BEACH - CRITERIA AIR POLLUTANT INVENTORY

EXISTING	2012 - lbs/day					
SECTORS	**VOC**	**NOx**	**CO**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Transportation (VMT data)	4,265.95	9,090.11	36,209.28	52.23	188.98	179.54
Energy - Residential (Natural Gas)	0.12	10.48	4.46	0.07	0.85	0.85
Energy - Nonresidential (Natural Gas)	1.05	9.59	8.06	0.06	0.73	0.73
Area Sources (Landscaping, Light commercial equipment)	0.51	0.31	8.08	0.00	0.04	0.04
Total	4,267.64	9,110.50	36,229.88	52.36	190.60	181.16

EXISTING GENERAL PLAN with 2040 EMISSION RATES	2040 - lbs/day					
SECTORS	**VOC**	**NOx**	**CO**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Transportation (VMT data)	932.54	1,707.34	6,564.44	33.75	16.03	14.91
Energy - Residential (Natural Gas)	1.83	15.67	6.67	0.10	1.27	1.27
Energy - Nonresidential (Natural Gas)	1.15	10.45	8.78	0.06	0.79	0.79
Area Sources (Landscaping, Light commercial equipment)	0.55	0.36	8.82	0.00	0.04	0.04
Total	936.07	1,733.81	6,588.71	33.91	18.13	17.01
Net Change from Existing	-5,204	-10,844	-42,819	-86	-209	-198

LUE/UDE FORECAST YEAR 2040 EMISSION RATES	2040 - lbs/day					
SECTORS	**VOC**	**NOx**	**CO**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Transportation (VMT data)	1,168.77	2,139.83	8,227.32	42.30	20.09	18.68
Energy - Residential (Natural Gas)	1.41	15.67	6.67	0.10	1.27	1.27
Energy - Nonresidential (Natural Gas)	0.96	10.45	8.78	0.06	0.79	0.79
Area Sources (Landscaping, Light commercial equipment)	0.55	0.36	8.82	0.00	0.04	0.04
Total	1,171.68	2,166.31	8,251.58	42.46	22.19	20.78
Net Change from Baseline	-3,096	-6,944	-27,978	-9.90	-168	-160

Notes:

Transportation: EMFAC2014 (exhaust and evaporative only) and ADT Data from Traffic Study LSA 2016.

The existing 2012 vehicle traffic within the Areas of Change is approximately 261,667 average daily trips (ADT).

Emission forecasts estimated based on changes in population (residential energy), employment (nonresidential energy), and service population (transportation). Under the General Plan, the traffic is estimated to generate approximately 345,672 ADTs in year 2040. Under the proposed LUE/UDE project, the growth in traffic is estimated to increase with an additional 87,564 ADTs, or a total of 433,236 ADTs in year 2040 .

Trip lengths were estimated using the information from Table A9 and Table A10 of the Highway and Arterial Appendix of the SCAG 2016-2040 RTP/SCS (SCAG 2016), where it assumed 13.28 miles for the median home based work trip length and 7.71 miles median non-work trip length within Los Angeles County.

Energy: annual gas supply data of 24.4 million cubic feet per year (244,000 therms per year) provided by the Long Beach Gas & Oil Department. 2014 SoCal Gas Report for existing year 2012. The estimated amount of natural gas consumption for the Proposed Project Areas of Change is approximately 68,808 therms per year.

Area Sources: NONROAD and OFFROAD2011. Estimated based on population (landscaping) and employment (light commercial equipment) for Long Beach as apercentage of Los Angeles County. Dos not include emissions from wood burning fireplaces.

CITY OF LONG BEACH - COMMUNITY AREA OF CHANGE GHG EMISSIONS INVENTORY

	$MTCO_2e$				$MTCO_2e$	
SECTORS	**2012**	**Percent of Total**	**2040 LUE/UDE**	**Percent of Total**	**2040 GP**	**Percent of Total**
Transportation	826,184	80.19%	682,844	76.69%	544,830	76.15%
Residential (Natural Gas and Electricity)	54,054	5.25%	52,588	5.91%	42,964	6.01%
Nonresidential (Natural Gas and Electricity)	130,111	12.63%	136,968	15.38%	112,952	15.79%
Solid Waste	4,932	0.48%	3,638	0.41%	2,903	0.41%
Water/Wastewater	15,006	1.46%	14,392	1.62%	11,786	1.65%
Total Area of Change Emissions	1,030,287		890,428		715,434	
Service Population	107,893		150,002		119,684	
$MTCO_2e$/SP	9.5		5.9		6.0	
SCAQMD GHG GP Threshold (PROGRAM LEVEL)	N/A		3.4		3.4	

Notes: Based on IPCC's 2007 fourth assessment report (AR4) global warming potentials

Transportation: EMFAC2014 (exhaust and evaporative only) and ADT Data from Traffic Study LSA 2016. EMFAC2014 reflects recently adopted ARB's regulations including advanced clean car, Pavley, LCFS, heavy duty diesel vehicles, and heavy duty tractor trailer GHG regulations.

The existing 2012 vehicle traffic within the Areas of Change is approximately 261,677 average daily trips (ADT).

Adjusted daily VMT was multiplied by 347 days per year to account for reduced traffic on weekends and holidays to estimate annual emissions. This assumption is consistent with the ARB's methodology within the Climate Change Scoping Plan Measure Documentation Supplement. Emission forecasts estimated based on changes in population (residential energy), employment (nonresidential energy), and service population (transportation). Under the General Plan, the traffic is estimated to generate approximately 345,672 ADTs in year 2040. Under the proposed LUE/UDE project, the growth in traffic is estimated to increase with an additional 87,564 ADTs, or a total of 433,236 ADTs in year 2040 .

Trip lengths were estimated using the information from Table A9 and Table A10 of the Highway and Arterial Appendix of the SCAG 2016-2040 RTP/SCS (SCAG 2016), where it assumed 13.28 miles for the median home based work trip length and 7.71 miles median non-work trip length within Los Angeles County.

Energy: Electricity and natural gas usage data provided by Southern California Edison and City of Long Beach Oil and Gas, respectively. Annual gas supply data of 24.4 million cubic feet per year (244,000 therms per year) provided by the Long Beach Gas & Oil Department, 2014 SoCal Gas Report for existing year 2012. The estimated amount of natural gas consumption for the Proposed Project Areas of Change is approximately 68,808 therms per year. Electricity use for residential and nonresidential land uses in the City was modeled using the estimated annual electricity consumption rate of 3.8 million megawatt hours per year for the City of Long Beach. Based on the service population ratio between the City of Long Beach and the Proposed Project Areas of change, an estimated annual electricity consumption rate of 640,177 megawatt hours per year is used for the existing year 2012 analysis and 1,088,451 megawatt hours per year is used for year 2040. The intensity factor of the purchased electricity is based on the 2012 CO2e intensity factor provided by CEC for Long Beach area (i.e., Southern Califorina Edison service area).

Solid Waste: Landfill Emissions Tool Version 1.3 and CalRecycle. Waste generation based on 2012 waste commitment for the City of Long Beach obtained from CalRecycle. Assumes 75 percent of fugitive GHG emissions are captured in the landfill's Landfill Gas Capture System. The landfill gas capture efficiency is based on the ARB's LGOP, version 1.1. Significant CH4 production typically begins one or two years after waste disposal in a landfill and continues for 10 to 60 years or longer. Therefore, the highest CH4 emissions from waste disposal in a given year are reported.

Water/Wastewater: LGOP, version 1.1, based on the Year 2012 water demand data as provided by Long Beach Water Department and City's 2010 UWMP. Forecasts are adjusted for increases in population and employment and are based on the target per capita of SBx7-7. The LUE/UDE 2040 scenario for residential electricity use includes a reduction in carbon intensity of Southern California Edison energy supply required under the 50 percent RPS

CITY OF LONG BEACH AREAS OF CHANGE - GHG EMISSIONS INVENTORY COMPARISON

	LUE/UDE 2040 Change from 2012 MTCO2e		GP 2040 Change from 2012	
SECTORS	**Delta 2040**	**Percent of Total**	**Delta 2040**	**Percent of Total**
Transportation	-143,341	76.69%	-281,354	76.15%
Residential (natural Gas and Electricity)	-1,466	5.91%	-11,090	6.01%
Nonresidential (Natural Gas and Electricity)	6,857	15.38%	-17,159	15.79%
Solid Waste	-1,294	0.41%	-2,030	0.41%
Water/Wastewater	-614	1.62%	-3,220	1.65%
Total Area of Change Emissions	-139,859		-314,853	

Model Input Data

		Area of Change	
City of Long Beach General Plan Draft Land Use Elements	Year 2012	LUE/UDE Year 2040	GP Year 2040
Population	59,598	82,858	63,707
Employment	48,295	67,144	55,977
Service Population	**107,893**	**150,002**	**119,684**

Growth Rates from Baseline	Year 2012	LUE/UDE Year 2040	GP Year 2040
Service Population Growth Rate	1.00	1.39	1.11

Electricity	**Year 2012**	LUE/UDE Year 2040	GP Year 2040
Residential Electricity (MWh)	187,668	291,637	232,692
Commercial + Industrial Electricity (MWh)	452,509	796,814	635,764
Total Electricity (MWh)	640,177	1,088,451	868,456
Natural Gas	**Year 2012**	LUE/UDE Year 2040	GP Year 2040
Residential Natural Gas (Therms)	24,736	40,544	32,349
Commercial + Industrial Natural Gas (Therms)	17,244	28,264	22,551
Total Natural Gas (Therms)	41,980	68,808	54,900
Transportation	**Year 2012**	LUE/UDE Year 2040	GP Year 2040
Daily VMT	4,615,850	6,162,782	4,917,184
Average Daily Trips	321,662	433,236	345,672
Water	**Year 2012**	LUE/UDE Year 2040	GP Year 2040
Water (AF/year)	11,409	16,195	12,922
Water (Gallons/year)	3,717,720,083	5,277,087,873	4,210,497,093
Wastewater	**Year 2012**	LUE/UDE Year 2040	GP Year 2040
Wastewater (AF/year)	18,490	26,587	21,213
Wastewater (gallons/year)	6,025,058,437	8,663,380,730	6,912,361,564
Soild Waste	**Year 2012**	LUE/UDE Year 2040	GP Year 2040
Waste Generation (tons/year)	80,191	118,179	94,293
Waste Reduction via recycling and regeneration (tons/year)	44,824	66,059	52,707
Total Waste Disposal (tons/year)	35,367	52,121	41,586

Estimated City-wide Data

City of Long Beach	Year 2012	Year 2040
Population	466,255	484,485
Employment	153,154	181,665
Service Population	**619,409**	**666,150**

Growth Rates from Baseline	Year 2012	Year 2040
Service Population Growth Rate	1.00	1.08

Electricity	Year 2012	Year 2040
Residential Electricity (MWh)	1,077,392	1,295,140
Commercial + Industrial Electricity (MWh)	2,597,833	3,538,604
City (MWh)	123,723	157,641
Total Electricity (MWh)	3,798,948	4,991,386
Natural Gas	**Year 2012**	**Year 2040**
Residential Natural Gas (Therms)	142,008	180,054
Commercial + Industrial Natural Gas (Therms)	98,995	125,517
City (Therms)	3,000	3,803
Total Natural Gas (Therms)	244,000	309,371
Transportation	**Year 2012**	**Year 2040**
Daily VMT	14,792,287	16,159,379
Average Daily Trips	1,113,877	1,201,441
Water	**Year 2012**	**Year 2040**
Water (AF/year)	65,500	71,920
Water (Gallons/year)	21,343,268,600	23,435,234,774
Wastewater	**Year 2012**	**Year 2040**
Wastewater (AF/year)	106,151	118,071
Wastewater (gallons/year)	34,589,597,300	38,473,560,840
Soild Waste	**Year 2012**	**Year 2040**
Waste Generation (tons/year)	460,375	524,828
Waste Reduction via recycling and regeneration (tons/year)	257,335	293,362
Total Waste Disposal (tons/year)	203,040	231,466

APPENDIX B

EMISSION FACTORS DATA

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CITY OF LONG BEACH — TRANSPORTATION SECTOR

VMT	Population	Employment	Service Population (SP)	Average Daily Trip (ADT)	Average Miles Traveled	Daily VMT
Existing Year 2012	59,598	48,295	107,893	321,662	14.35	4,615,850
LUE/UDE Year 2040	82,858	67,144	150,002	433,236	14.225	6,162,782
GP Baseline in 2040	63,707	55,977	119,684	345,672	14.225	4,917,184

VMT is adjusted based on per capita VMT in the Traffic Study provided by LSA (i.e., VMT/population and employment (service population)).

CRITERIA AIR POLLUTANTS

	lbs/day					
	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Existing Year 2012	4,265.95	9,090.11	36,209.28	52.23	188.98	179.54
LUE/UDE Year 2040	1,168.77	2,139.83	8,227.32	42.30	20.09	18.68
GP Baseline in 2040	932.54	1,707.34	6,564.44	33.75	16.03	14.91
Differences LUE vs Existing	-3,097.18	-6,950.28	-27,981.96	-9.93	-168.89	-160.86

	Tons/year					
	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Existing Year 2012	740.14	1,577.13	6,282.31	9.06	32.79	31.15
LUE/UDE Year 2040	202.78	371.26	1,427.44	7.34	3.49	3.24
GP Baseline in 2040	161.80	296.22	1,138.93	5.86	2.78	2.59

Source: EMFAC2014-EI

GHG EMISSIONS

	CO_2MTons/year	Percent Change from 2012
Existing Year 2012	826,184	N/A
LUE/UDE Year 2040	682,844	-17.35%
GP Baseline in 2040	544,830	-25.3%

Source: EMFAC2014-EI

Note: MTons = metric tons; CO_2e = carbon dioxide-equivalent. Adjusted BAU Includes Pavley and the Low Carbon Fuel Standard (LCFS). State and Federal Fuel Efficiency Improvements + Low Carbon Fuel Standard (LCFS)+Pavley I Fuel Efficiency Standards.

In January 2012, the California Air Resources Board (CARB) adopted the Advanced Clean Car Program which implements the Pavley II Fuel Efficiency Standards and projects that by 2025, one in every seven new cars sold will be electric vehicles (PHEV or PEV). However, the Pavley II Advanced Clean Car Program is not included in the transportation emissions reductions and therefore reductions are conservative.

CRITERIA AIR POLLUTANTS	**lbs/VMT/day**					
Emission Factors	**ROG**	**NOx**	**CO**	**SOx**	**PM_{10}**	**$PM_{2.5}$**
Year 2012	0.000924196	0.001969326	0.007844553	1.13164E-05	4.09421E-05	3.88971E-05
Year 2040	0.000189649	0.000347218	0.001335	6.86394E-06	3.26006E-06	3.03136E-06

EMFAC2014 - EI

GHG EMISSIONS	**MT/VMT/Year**
Emission Factors	**CO2**
Year 2012	0.178988537
Year 2040	0.110801186

EMFAC2014 based on daily VMTs provided by LSA. Transportation sector includes the full trip length for internal-internal trips (Median Non-work Trip Length) and 50 percent trip length for external-internal/internal-external trips (Median Home-Based Work Trip Length). VMT per year based on a conversion of VMT x 347 days per year to account for less travel on weekend, consistent with CARB statewide GHG emissions inventory methodology (CARB 2008).

EMFAC2014 (v1.0.7) Emissions Inventory
Region Type: Sub-Area
Region: Los Angeles (SC)
Calendar Year: 2012
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	Year	Population	VMT	Trips	ROG_TOTAL	NOx_TOTEX	CO_TOTEX	SOx_TOTEX	PM10_TOTEX	PM2_5_TOTEX	CO2_TOTEX	Fuel_Consumption
LA County	**2012**	6,170,557	205,667,884	38,913,601	95.03869513	202.5135847	806.6863488	1.163714407	4.210242245	3.999946394	116940.9198	12302.76405
				tons/year	32978.42721	70272.21391	279920.163	403.8088991	1460.954059	1387.981399	36812193.6	MT/year
				lbs/day	190077.3903	405027.1695	1613372.698	2327.428813	8420.48449	7999.892788	233881839.6	
				lbs/VMT/day	0.000924196	0.001969326	0.007844553	1.13164E-05	4.09421E-05	3.88971E-05	0.178988537	MT/VMT/year
LA County		**Population**	**VMT**	**Trips**	**ROG_TOTAL**	**NOx_TOTEX**	**CO_TOTEX**	**SOx_TOTEX**	**PM10_TOTEX**	**PM2_5_TOTEX**	**CO2_TOTEX**	**Fuel_Consumption**
	2040	8,807,598	260,172,160	54,526,326	24.67071434	45.16828176	173.66498	0.892902957	0.424087797	0.394337236	91575.65622	9321.218169
				tons/year	8560.737874	15673.39377	60261.74805	309.837326	147.1584656	136.8350209	28827383.87	MT/year
				lbs/day	49341.42867	90336.56352	347329.9599	1785.805913	848.175594	788.6744719	183151312.4	
				lbs/VMT/day	0.000189649	0.000347218	0.001335	6.86394E-06	3.26006E-06	3.03136E-06	0.110801186	MT/VMT/year

Criteria Air Pollutants from Natural Gas

	Population	Employment	Service Population (SP)	Therms/population	Therms/employment
Year 2012	59,598	48,295	107,893	0.415	0.357
LUE/UDE Year 2040 + 2016 Title 24	82,858	67,144	150,002	0.477	0.324
GP Year 2040 + 2016 Title 24	63,707	55,977	119,684	0.621	0.389

Natural Gas Rate	**lbs/MMBTU**					
	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Residential	0.01078431	0.09215686	0.03921569	0.00058824	0.00745098	0.00745098
Non-residential	0.01078431	0.09803922	0.08235294	0.00058824	0.00745098	0.00745098
Source: CalEEMod Version 2013.2.2 - which referenced natural gas emission factors are from EPA AP-42.						

Natural Gas	**2012 lbs/day**					
	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Residential	0.12	10.48	4.46	0.07	0.85	0.85
Commercial + Industrial	1.05	9.59	8.06	0.06	0.73	0.73
Total	1.18	20.07	12.52	0.12	1.58	1.58

Natural Gas	**LUE/UDE 2040 lbs/day**					
	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Residential	1.41	12.05	5.13	0.08	0.97	0.97
Commercial + Industrial	0.96	8.71	7.32	0.05	0.66	0.66
Total	2.37	20.76	12.44	0.13	1.64	1.64
Increase from Baseline	1.19	20.76	12.44	0.13	1.64	1.64

Natural Gas	**GP 2040 lbs/day**					
	ROG	NOx	CO	SOx	PM_{10}	$PM_{2.5}$
Residential	1.83	15.67	6.67	0.10	1.27	1.27
Commercial + Industrial	1.15	10.45	8.78	0.06	0.79	0.79
Total	2.98	26.12	15.44	0.16	2.06	2.06
Increase from Baseline	1.81	6.05	2.93	0.04	0.49	0.49

General Conversion Factors

MWh to MMBtu	3.412
cubic feet to Therms	0.01
MMBtu to Therms	10
lbs to Tons	2000
Tons to Mton	0.9071847

Source: California Air Resources Board (CARB). 2010. Local Government Operations Protocol. Version 1.1. Appendix F, Standard Conversion Factors

Energy

Natural Gas Emission Factors

Natural Gas	**Intensity Factor**			**CO2e**
	MTCO2/Therm	**CH4 MT/Therm**	**N2O MT/Therm**	**MT/Therm**
All Years	0.0053	5.00E-07	1.00E-08	0.00532

Source: CO2, CH4 and N2O intensity based on Table G.3 of the LGOP for residential and non-residential (CO2, 53.02 kg/Mmbtu; CH4: 0.005 kg/MMBtu; N2O: 0.0001 kg/MMBtu)

Electricity Carbon Intensity

	Intensity factor
	MT CO2e/MWh
2012	0.287

Source: Year 2012 CO2e Intensity=633 lbs/MWh

The 2007 SCE carbon-intensity factor is presented in Table 2 in pounds (lbs) of CO2e per megawatt hour (MWh). This emission factor (631 lb/MWh) is used in this report, which takes into account the mix of energy sources used to generate electricity for SCE. California Climate Action Registry (CCAR) Database. MID PUP Report. 2007

Adjusted Carbon Intensity

	2012	2040	CO2e
Assumed Percent Renewable	24%	50% RPS	MTons/MWh
CO2e MTons/Mwh	0.287	0.189	0.189
Carbon Intensity Without RPS	0.378		

GHG Emissions from Energy Use

	2012	LUE/UDE 2040	General Plan 2040
Electricity	**MWh/year**		
Residential	53,923	52,377	42,795
Commercial + Industrial	130,019	136,826	112,836
Total	183,942	189,203	155,631

	2012	LUE/UDE 2040	General Plan 2040
Natural Gas	**$MTCO_2e$/year**		
Residential	131	210	169
Commercial + Industrial	92	142	116
Total	223	352	285

Summary	2012	LUE/UDE 2040	General Plan 2040
	MTCO2e/year		
Residential Total	54,054	52,588	42,964
Commercial + Industrial Total	130,111	136,968	112,952
Total	184,165	189,555	155,916

General Conversion Factors

lbs to kg	0.4536
kg to Mtons	0.001
Mmbtu to Therm	0.1
Therm to kWh	29.3071111
kWh to MWh	0.001
lbs to Tons	2000
Tons to Mton	0.9071847

Source: California Air Resources Board (CARB). 2010. Local Government Operations Protocol. Version 1.1. Appendix F, Standard Conversion Factors

	Global Warming Potentials (GWP)
CO_2	1
CH_4	25
N_2O	298

Source: Intergovernmental Panel on Climate Change (IPCC). 2007. Fourth Assessment Report: Climate Change 2007.

Water and Wastewater
Water Demand/Wastewater Generation Calculations

Year	Water Demand (acre-feet/year) Total	Water Demand (gallons/year) Total
2012	11,409	3,717,720,083
2040	16,195	5,277,087,873

Year	Wastewater Generation (acre-feet/year) Total	Wastewater Generation (gallons/year) Total
2012	18,490	6,025,058,437
2040	26,587	8,663,380,730

Fugitive Emissions - Process Emissions from WWTP with Nitrification/Denitrification

CH_4 - Microorganisms can biodegrade soluble organic material in wastewater under aerobic (presence of oxygen) or anaerobic (absence of oxygen) conditions. Anaerobic conditions result in the production of CH_4.

N_2O - Treatment of domestic wastewater during both nitrification and denitrification of the nitrogen present leads to the formation of N_2O, usually in the form of urea, ammonia, and proteins. These compounds are converted to nitrate through the aerobic process of nitrification. Denitrification occurs under anoxic conditions (without free oxygen), and involves the biological conversion of nitrate into dinitrogen. N_2O can be an intermediate product of both processes, but more often is associated with denitrification.

Fugitive Emissions - Process Emissions from WWTP with Nitrification/Denitrification for combustion of biogas.

Anaerobic digesters produce methane-rich biogas which is typically combusted on-site. In some cases the biogas is combusted simply for the purpose of converting methane to CO_2, which has a lower global warming potential than methane. In many cases, a cogeneration system is used to harvest the heat from combustion and use it to generate electricity for on-site energy needs. In both cases, inherent inefficiencies in the system result in incomplete combustion of the biogas, which results in remaining methane emissions. Excludes biogenic emissions from combustion of biogas.

LGOP Version 1.1. Equation 10.1.

CH_4 = Wastewater x Digester Gas x FCH_4 x $Þ_{CH4}$ x (1-DE) x 0.0283 x 10^-3 x 10^-3

	2012 Baseline	Proposed Project	
wastewater (gallons) =	6,025,058,437	8,663,380,730	
Digester gas	0.01		ft^3 biogas/gallon wastewater
FCH_4	0.65		fraction of CH_4 in biogas
$Þ_{CH4}$	662		g/m^3; density of CH_4 at standard conditions
DE	0.99		CH_4 destruction efficiency
0.0283 =	0.0283		m^3/ft^3; conversion factor
10^-3 =	1.00E-03		MT/kg conversion factor
10^-3 =	1.00E-03		kg/g conversion factor

	2012 Baseline	Proposed Project
	MT	MT
CH_4 =	7.34	10.55
CO_2e =	183.43	263.75

Source: California Air Resources Board (CARB). 2010, May. Local Government Operations Protocol (LGOP), Version 1.1. The LGOP protocol provides default values for all the terms except the digester gas, which is assumed to be 0.1 cubic feet of biogas per gallon of wastewater effluent based on USEPA methodology outlined in the CalEEMod program manual. South Coast Air Quality Management District (SCAQMD). 2013. California Emissions Estimator Model (CalEEMod), Version 2013.2.2. User's Manual. USEPA. 2008. Page 8-12. USEPA cites Metcalf & Eddy, Inc., 1991, “Wastewater Engineering: Treatment Disposal, and Reuse,” 3rd Ed. McGraw Hill Publishing.

Water and Wastewater

Buildout Fugitive Emissions - Process Emissions from WWTP with Nitrification/Denitrification from discharge into aquatic environments

LGOP Version 1.1. Equation 10.9.

N_2O = Wastewater x 10^-6 x Nload x 44/28 x EF effluent x 10^3

	2012	2040
wastewater (gallons) =	6,025,058,437	8,663,380,730
10^-6 =	1.00E-06	conversion factor; kg/mg
N Load	26.00	mg/L of wastewater
48/28	1.57	Ratio of molecular weights for N_2O and N_2
EF effluent	0.01	kg/N_2O/kg N
10^-3 =	1.00E-03	conversion factor: MTons/kg

	2012 Baseline	Proposed Project
	MT	MT
N_2Oe =	2.46	3.54
CO_2e =	732.91	1053.84

Source: California Air Resources Board (CARB). 2010, May. Local Government Operations Protocol (LGOP), Version 1.1. The LGOP protocol provides default values for all the terms except the Nitrogen Load, which is assumed to be 26 mg of N per Liter of wastewater effluent based on USEPA methodology outlined in the CalEEMod program manual. South Coast Air Quality Management District (SCAQMD). 2013. California Emissions Estimator Model (CalEEMod), Version 2013.2.2. Appendix A. USEPA 2013. California Statewide average. USEPA Database at http://cfpub.epa.gov/dmr/ez_search.cfm.

Total Fugitive Emissions - Process Emissions from WWTP with Nitrification/Denitrification

	2012	2040
$MTCO_2e$ =	916.34	1,317.59

Wastewater Modeling assumes 0% septic treatment for years 2012 and 2040.

Water and Wastewater

Energy for Water Conveyance, Treatment, Distribution, and Wastewater Treatment (Southern California)

Water Supply and Conveyance	Water Treatment	Water Distribution	Total Water	Wastewater Treatment
kWh/million gallons				
9,727	111	1,272	11,110	1,911

Source: California Energy Commission (CEC). 2006, December. Refining Estimates of Water-Related Energy Use in California. CEC-500-2006-118. Prepared by Navigant Consulting, Inc. Based on the electricity use for Southern California. Same reference to the Default Factors and Methodology used in CalEEMod.

Electricity Carbon Intensity

	Intensity factor
	CO_2e MT/MWh
2012	0.282

Source: Year 2012 CO_2e Intensity=621 lbs/MWh

Adjusted Carbon Intensity

	2012	2040	CO2e
Assumed Percent Renewable*	24%	50%	MTons/MWh
CO2e MTons/Mwh	0.282	0.1745	0.1745
Carbon Intensity Without RPS	0.349	---	---

GHG Emissions from Energy Associated with Water/Wastewater

	2012	**LUE/UDE 2040**	**General Plan 2040**
Energy Associated with Water Use	MWh/year		
Water	41,304	58,628	46,779
Wastewater	11,514	16,556	13,210
Total Water/Wastewater	52,818	75,184	59,988

GHG Emissions from Energy Associated with Water Use/Wastewater Generation	**2012**	**LUE/UDE 2040**	**General Plan 2040**
	$MTCO_2e$/year		
Water	11,648	10,231	8,163
Wastewater	3,247	2,889	2,305
Total Water/Wastewater	14,895	13,120	10,468

Total GHG Emissions

	2012	**LUE/UDE 2040**	**General Plan 2040**
GHG Emissions from Water/Wastewater Use	$MTCO_2e$/year		
Water	11,648	10,231	8,163
Wastewater + WWTP Process	3,358	4,161	3,623
Total Water/Wastewater	15,006	14,392	11,786

General Conversion Factors

	Global Warming Potentials (GWP)
CO_2	1
CH_4	25
N_2O	298

Source: Intergovernmental Panel on Climate Change (IPCC). 2007. Fourth Assessment Report: Climate Change 2007.

Units	Conversion factors
gallons to Liters	3.785
killowatt hrs to megawatt hrs	0.001
AF to gallons	1 acre foot/325851.429 gallons

Solid Waste Disposal

Source: CalRecycle Disposal By Facility - City of Long Beach (Disposal Reporting System)

Waste Generated Within City Limits
Waste in Place Method

Year	Interstate Tons + Transform Tons	ADC+AIC	Total
2012	35,578	1,779	37,357
LUE/UDE 2040	49,639	2,482	52,121
GP 2040	39,606	1,980	41,586

Source: CalRecycle, 2016, Disposal Reporting System, Jurisdiction Reporting by Facility,
http://www.calrecycle.ca.gov/LGCentral/Reports/DRS/Destination/JurDspFa.aspx

Landfill Emission Tool (version 1.3) Model Results using the Methane Commitment Method (~50 years of decomposition)

Forecasted based on linear regression.

	MT CH4 in CO2e 2012 Disposal	Existing MTCO2e w/LFG Capture 2012 Disposal	LUE/UDE 2040 MTCO2e w/LFG Capture 2040 Disposal	General Plan 2040 MTCO2e w/LFG Capture 2040 Disposal
1	317	79	117	93
2	626	156	114	91
3	613	153	112	89
4	601	150	110	87
5	589	147	107	86
6	578	144	105	84
7	566	142	103	82
8	555	139	101	80
9	544	136	99	79
10	533	133	97	77
11	521	130	94	75
12	510	128	93	74
13	500	125	91	72
14	489	122	89	71
15	479	120	87	69
16	469	117	85	68
17	459	115	83	66
18	449	112	81	65
19	440	110	80	64
20	431	108	78	62
21	422	105	76	61
22	413	103	75	60
23	404	101	73	58
24	396	99	72	57
25	387	97	70	56
26	379	95	69	55
27	371	93	67	54
28	364	91	66	53
29	356	89	64	51
30	348	87	63	50
31	341	85	62	49
32	334	83	61	48
33	327	82	59	47
34	320	80	58	46
35	313	78	57	45
36	307	77	56	44
37	300	75	54	43
38	294	73	53	43
39	288	72	52	42
40	282	70	51	41
41	276	69	50	40
42	270	68	49	39
43	264	66	48	38
44	259	65	47	37
45	253	63	46	37
46	248	62	45	36
47	243	61	44	35
48	238	59	43	34
49	233	58	42	34
50	228	57	41	33

Total	19,729	4,932	3,638	2,903

Waste. Landfill Emissions Tool Version 1.3 and CalRecycle. Biogenic CO2 emissions are not included.

Notes:

LFG Capture Efficiency 0.75

This method assumes that the degradable organic component (degradable organic carbon, DOC) in waste decays slowly throughout a few decades, during which CH4 and biogenic CO2 are formed. If conditions are constant, the rate of CH4 production depends solely on the amount of carbon remaining in the waste. As a result emissions of CH4 from waste deposited in a disposal site are highest in the first few years after deposition, then gradually decline as the degradable carbon in the waste is consumed by the bacteria responsible for the decay. Significant CH4 production typically begins one or two years after waste disposal in a landfill and continues for 10 to 60 years or longer.

Decomposition based on an average annual rainfall of 20.26 inches per year average in Long Beach (anaerobic decomposition factor (k) of 0.038)

The Landfill Gas Estimator only includes the landfill gas (LFG) capture in the landfill gas heat output and therefore the reduction and emissions from landfill gas capture are calculated separately. Assumes 75 percent of fugitive GHG emissions are captured within the landfill's Landfill Gas Capture System with a landfill gas capture efficiency of 75%. The Landfill gas capture efficiency is based on the California Air Resources Board's (CARB) Local Government Operations Protocol (LGOP), Version 1.1.

Biogenic CO2 emissions are not included.

Area Sources - Criteria Air Pollutants

	2012		VOC Exhaust	NOx Exhaust	CO Exhaust	SO_2 Exhaust	PM_{10} Exhaust	$PM_{2.5}$ Exhaust*
		NONROAD Estimate based on:	lbs/day					
Lawn & Garden Equipment		Based on the percentage of households in Long Beach compared to Los Angeles County.	0.41	0.11	5.20	0.00	0.01	0.01
Light Commercial Equipment		Based on the percentage of households in Long Beach compared to Los Angeles County.	0.10	0.21	2.88	0.00	0.02	0.02
Total			0.51	0.31	8.08	0.00	0.04	0.04

	2040		VOC Exhaust	NOx Exhaust	CO Exhaust	SO_2 Exhaust	PM_{10} Exhaust	$PM_{2.5}$ Exhaust*
		Forecast Adjusted for:	lbs/day					
Lawn & Garden Equipment		proportional to population growth	0.43	0.11	5.41	0.00	0.02	0.02
Light Commercial Equipment		proportional to employment growth	0.12	0.24	3.41	0.00	0.03	0.03
Total			0.55	0.36	8.82	0.00	0.04	0.04

* assumes PM2.5 is 99 percent of PM10
SOURCE: SCAG 2016-2040 RTP/SCS.

Area Sources - GHG Emissions

Year 2012	$MTCO_2e$	Notes
Lawn & Garden Equipment	15	Based on the percentage of residential units in Long Beach compared to Los Angeles County.
Light Commercial Equipment	22	Based on the percentage of employment in Long Beach compared to Los Angeles County.
Total	36	

Year 2040	$MTCO_2e$	Notes
Lawn & Garden Equipment	15	Based on the percentage of residential units in Long Beach compared to Los Angeles County.
Light Commercial Equipment	26	Based on the percentage of employment in Long Beach compared to Los Angeles County.
Total	41	

Lawn & Garden — Tons/Day

Equipment	Fuel	MaxHP	Population	Activity	Consumption	VOC Exhaust	Nox Exhaust	CO Exhaust	SO2 Exhaust	PM Exhaust	CO2 Exhaust	N2O Exhaust	CH4 Exhaust	CO2e
Lawn Mowers	G2	15	2.65E+02	1.66E+02	1.88E+01	2.12E-03	5.64E-04	3.82E-02	4.66E-06	3.57E-04	1.13E-01	1.47E-04	1.32E-04	1.61E-01
Lawn Mowers	G2	15	1.99E+03	8.45E+01	1.17E+01	2.24E-03	3.08E-04	2.97E-02	2.37E-06	1.84E-04	5.76E-02	7.38E-05	1.39E-04	8.34E-02
Chainsaws	G2	2	4.75E+02	3.76E+02	2.24E+01	1.88E-02	2.95E-04	3.39E-02	3.78E-06	5.34E-05	9.17E-02	1.52E-04	1.17E-03	1.63E-01
Chainsaws	G2	2	5.34E+03	7.17E+01	3.81E+00	1.82E-03	5.96E-05	7.89E-03	7.20E-07	3.11E-05	1.75E-02	2.97E-05	1.13E-04	2.90E-02
Chainsaws	G2	15	3.34E+02	2.65E+02	3.82E+01	3.19E-02	5.03E-04	5.78E-02	6.43E-06	9.09E-05	1.56E-01	1.72E-04	1.99E-03	2.51E-01
Chainsaws	G2	15	3.76E+03	5.05E+01	6.28E+00	2.84E-03	1.00E-04	1.27E-02	1.23E-06	5.80E-05	2.98E-02	3.32E-05	1.76E-04	4.37E-02
Chainsaws Preempt	G2	15	4.16E+02	3.30E+02	4.76E+01	3.98E-02	6.26E-04	7.19E-02	8.01E-06	1.13E-04	1.94E-01	2.14E-04	2.47E-03	3.13E-01
Chainsaws Preempt	G2	15	4.68E+03	6.29E+01	8.77E+00	4.75E-03	1.05E-04	1.88E-02	1.53E-06	4.22E-05	3.70E-02	3.77E-05	2.95E-04	5.49E-02
Trimmers/Edgers/Brush Cutters	G2	2	1.55E+03	5.15E+02	2.28E+01	1.23E-02	3.53E-04	4.06E-02	4.52E-06	6.38E-05	1.10E-01	1.94E-04	7.65E-04	1.86E-01
Trimmers/Edgers/Brush Cutters	G2	2	1.73E+04	1.02E+03	4.29E+01	1.89E-02	7.11E-04	8.01E-02	8.92E-06	1.26E-04	2.16E-01	3.86E-04	1.18E-03	3.61E-01
Leaf Blowers/Vacuums	G2	2	2.31E+03	1.24E+03	6.63E+01	4.58E-02	9.47E-04	1.09E-01	1.21E-05	1.71E-04	2.94E-01	4.95E-04	2.84E-03	5.08E-01
Leaf Blowers/Vacuums	G2	2	5.96E+03	7.84E+01	4.04E+00	1.92E-03	6.32E-05	8.37E-03	7.64E-07	3.30E-05	1.85E-02	3.19E-05	1.20E-04	3.10E-02
Snowblowers	G2	15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	G2	15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	G2	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	G2	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Shredders	G2	15	1.17E+01	4.34E+00	1.91E+00	1.07E-04	8.29E-05	5.16E-03	4.06E-07	8.27E-05	9.87E-03	9.63E-06	6.66E-06	1.30E-02
Shredders	G2	15	4.16E+02	1.03E+00	4.97E-01	9.21E-05	1.55E-05	1.34E-03	9.60E-08	1.95E-05	2.33E-03	1.98E-06	5.72E-06	3.06E-03
Commercial Turf Equipment	G2	15	6.20E+00	1.36E+01	5.56E+00	2.53E-04	1.90E-04	1.51E-02	1.19E-06	1.35E-05	2.89E-02	2.55E-05	1.57E-05	3.72E-02
Commercial Turf Equipment	G2	25	3.06E+00	6.70E+00	5.95E+00	2.62E-04	2.00E-04	1.67E-02	1.24E-06	1.40E-05	3.01E-02	1.88E-05	1.63E-05	3.63E-02
Other Lawn & Garden Equipment	G2	2	2.62E+00	4.92E-01	2.74E-02	1.34E-05	4.35E-07	5.00E-05	5.56E-09	7.86E-08	1.35E-04	2.12E-07	8.34E-07	2.18E-04
Other Lawn & Garden Equipment	G2	2	8.02E+01	9.45E-01	5.64E-02	2.65E-05	8.85E-07	1.17E-04	1.07E-08	4.61E-07	2.59E-04	4.17E-07	1.65E-06	4.23E-04
Other Lawn & Garden Equipment	G2	15	1.14E+00	2.14E-01	5.97E-02	2.92E-05	9.46E-07	1.09E-04	1.21E-08	1.71E-07	2.94E-04	2.17E-07	1.81E-06	3.99E-04
Other Lawn & Garden Equipment	G2	15	3.49E+01	4.11E-01	1.19E-01	5.27E-05	1.90E-06	2.42E-04	2.33E-08	1.10E-06	5.65E-04	4.24E-07	3.28E-06	7.65E-04
Lawn Mowers	G4	5	1.57E+03	9.83E+02	1.16E+02	1.38E-02	3.51E-03	2.55E-01	2.31E-05	2.11E-03	6.70E-01	8.68E-04	7.81E-04	9.56E-01
Lawn Mowers	G4	5	2.49E+04	1.06E+03	1.45E+02	1.36E-02	3.90E-03	3.97E-01	2.49E-05	1.69E-03	7.20E-01	9.13E-04	7.70E-04	1.02E+00
Tillers	G4	5	1.63E+02	2.49E+01	3.53E+00	3.11E-04	7.81E-05	8.90E-03	6.52E-07	4.95E-05	1.89E-02	2.04E-05	1.76E-05	2.56E-02
Tillers	G4	5	6.33E+02	3.12E+01	4.75E+00	4.84E-04	1.32E-04	1.29E-02	8.16E-07	5.78E-05	2.36E-02	2.89E-05	2.73E-05	3.32E-02
Trimmers/Edgers/Brush Cutters	G4	5	2.87E+02	1.07E+02	3.26E+00	4.23E-04	1.90E-04	7.44E-03	6.27E-07	5.92E-06	1.82E-02	6.48E-05	2.39E-05	3.88E-02
Trimmers/Edgers/Brush Cutters	G4	5	1.34E+03	7.86E+01	2.75E+00	3.77E-04	1.18E-04	7.46E-03	4.63E-07	1.72E-05	1.34E-02	4.37E-05	2.13E-05	2.74E-02
Leaf Blowers/Vacuums	G4	5	7.30E+01	1.24E+01	8.19E-01	6.05E-05	1.49E-05	2.19E-03	1.46E-07	9.91E-06	4.23E-03	6.12E-06	3.42E-06	6.20E-03
Leaf Blowers/Vacuums	G4	5	6.28E+01	8.25E-01	6.16E-02	5.39E-06	1.33E-06	1.86E-04	9.71E-09	5.53E-07	2.81E-04	4.61E-07	3.05E-07	4.31E-04
Snowblowers	G4	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	G4	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	G4	15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	G4	15	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	G4	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	G4	25	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Rear Engine Riding Mowers	G4	15	8.60E+02	6.39E+02	2.11E+02	9.80E-03	7.05E-03	6.12E-01	2.95E-05	4.80E-04	1.03E+00	1.03E-03	5.54E-04	1.37E+00
Rear Engine Riding Mowers	G4	15	7.54E+02	5.82E+01	1.93E+01	9.41E-04	6.36E-04	5.65E-02	2.69E-06	3.72E-05	9.43E-02	9.25E-05	5.32E-05	1.24E-01
Rear Engine Riding Mowers	G4	25	3.93E+00	2.92E+00	1.87E+00	8.41E-05	6.15E-05	5.61E-03	2.26E-07	4.14E-06	8.94E-03	6.64E-06	4.76E-06	1.11E-02
Rear Engine Riding Mowers	G4	25	3.39E+00	2.62E-01	1.69E-01	8.16E-06	5.06E-06	5.07E-04	2.03E-08	3.16E-07	8.01E-04	5.64E-07	4.61E-07	9.86E-04
Front Mowers	G4	15	3.94E+01	2.93E+01	1.54E+01	7.17E-04	5.16E-04	4.48E-02	2.16E-06	3.51E-05	7.57E-02	6.06E-05	4.06E-05	9.53E-02
Front Mowers	G4	15	1.27E+03	9.84E+01	5.22E+01	2.54E-03	1.72E-03	1.52E-01	7.25E-06	1.00E-04	2.54E-01	2.01E-04	1.44E-04	3.20E-01
Front Mowers	G4	25	3.09E+01	2.29E+01	1.62E+01	7.30E-04	5.34E-04	4.87E-02	1.97E-06	3.60E-05	7.75E-02	5.50E-05	4.13E-05	9.55E-02
Front Mowers	G4	25	9.98E+02	7.71E+01	5.49E+01	2.65E-03	1.65E-03	1.65E-01	6.60E-06	1.03E-04	2.60E-01	1.75E-04	1.50E-04	3.18E-01
Shredders	G4	5	3.09E+01	1.15E+01	3.13E+00	4.06E-04	1.82E-04	7.14E-03	6.02E-07	5.68E-06	1.74E-02	2.24E-05	2.30E-05	2.49E-02
Shredders	G4	5	1.15E+03	2.84E+00	9.59E-01	8.60E-05	2.90E-05	2.95E-03	1.48E-07	7.64E-06	4.30E-03	4.38E-06	4.86E-06	5.76E-03
Lawn & Garden Tractors	G4	15	1.58E+02	5.55E+01	3.52E+01	1.38E-03	1.00E-03	1.03E-01	4.95E-06	6.80E-05	1.73E-01	1.16E-04	7.78E-05	2.11E-01
Lawn & Garden Tractors	G4	15	1.02E+03	4.09E+01	2.61E+01	1.14E-03	7.98E-04	7.64E-02	3.65E-06	4.62E-05	1.28E-01	8.87E-05	6.44E-05	1.57E-01
Lawn & Garden Tractors	G4	25	6.21E+01	2.19E+01	2.21E+01	8.54E-04	5.92E-04	6.63E-02	2.68E-06	4.15E-05	1.06E-01	5.69E-05	4.83E-05	1.24E-01
Lawn & Garden Tractors	G4	25	4.04E+02	1.61E+01	1.64E+01	7.17E-04	4.51E-04	4.93E-02	1.98E-06	2.82E-05	7.80E-02	4.24E-05	4.05E-05	9.20E-02
Lawn & Garden Tractors	G4	50	8.99E-01	2.56E-01	3.95E-01	7.11E-06	1.40E-05	2.95E-04	4.03E-08	2.54E-07	3.32E-03	9.05E-07	4.02E-07	3.61E-03
Wood Splitters	G4	5	5.29E+01	1.86E+01	5.46E+00	5.74E-04	1.45E-04	1.28E-02	1.05E-06	8.91E-05	3.04E-02	2.48E-05	3.25E-05	3.88E-02
Wood Splitters	G4	5	1.32E+03	3.99E+00	1.43E+00	1.05E-04	2.86E-05	4.40E-03	2.25E-07	1.16E-05	6.51E-03	4.94E-06	5.93E-06	8.17E-03
Chippers/Stump Grinders	G4	15	7.46E-01	2.58E+00	2.18E+00	1.72E-04	1.26E-04	6.33E-03	2.99E-07	8.78E-05	1.05E-02	9.16E-06	9.58E-06	1.35E-02
Chippers/Stump Grinders	G4	15	1.33E+00	6.02E-02	5.27E-02	3.77E-06	1.99E-06	1.59E-04	6.97E-09	1.91E-06	2.45E-04	1.74E-07	2.13E-07	3.03E-04
Chippers/Stump Grinders	G4	25	4.24E+00	1.46E+01	2.09E+01	1.69E-03	1.09E-03	6.25E-02	2.47E-06	8.16E-04	9.73E-02	6.49E-05	9.40E-05	1.19E-01
Chippers/Stump Grinders	G4	25	7.54E+00	3.41E-01	4.97E-01	3.41E-05	1.67E-05	1.53E-03	5.74E-08	1.77E-05	2.27E-03	1.22E-06	1.93E-06	2.68E-03
Commercial Turf Equipment	G4	15	5.58E+01	1.22E+02	6.54E+01	3.73E-03	2.65E-03	1.90E-01	9.07E-06	1.78E-04	3.18E-01	2.82E-04	2.09E-04	4.10E-01
Commercial Turf Equipment	G4	25	2.75E+01	6.02E+01	5.72E+01	3.09E-03	2.35E-03	1.72E-01	6.86E-06	1.51E-04	2.71E-01	1.90E-04	1.73E-04	3.33E-01
Commercial Turf Equipment	G4	50	1.11E+01	2.23E+01	3.67E+01	9.62E-04	1.54E-03	5.17E-02	3.27E-06	2.06E-05	2.69E-01	9.13E-05	5.42E-05	2.98E-01
Commercial Turf Equipment	G4	120	7.33E-02	1.47E-01	3.60E-01	1.61E-06	9.60E-06	8.70E-05	3.22E-08	2.58E-07	3.33E-03	6.11E-07	9.09E-08	3.52E-03
Other Lawn & Garden Equipment	G4	5	4.90E+01	9.20E+00	1.89E+00	1.66E-04	4.15E-05	4.76E-03	3.49E-07	2.65E-05	1.01E-02	9.16E-06	9.40E-06	1.31E-02
Other Lawn & Garden Equipment	G4	5	1.50E+03	1.77E+01	4.26E+00	3.64E-04	9.10E-05	1.29E-02	6.71E-07	3.77E-05	1.94E-02	1.84E-05	2.06E-05	2.55E-02
Other Lawn & Garden Equipment	G4	15	2.18E+01	4.09E+00	1.82E+00	7.19E-05	5.23E-05	5.31E-03	2.56E-07	3.56E-06	8.98E-03	7.12E-06	4.07E-06	1.13E-02
Other Lawn & Garden Equipment	G4	15	6.67E+02	7.85E+00	3.62E+00	1.76E-04	1.11E-04	1.08E-02	4.92E-07	5.92E-06	1.73E-02	1.44E-05	9.93E-06	2.19E-02
Other Lawn & Garden Equipment	G4	25	4.60E-01	8.64E-02	8.43E-02	3.28E-06	2.28E-06	2.53E-04	1.02E-08	1.60E-07	4.03E-04	2.22E-07	1.86E-07	4.76E-04
Other Lawn & Garden Equipment	G4	25	1.42E+01	1.67E-01	1.67E-01	8.01E-06	4.56E-06	5.13E-04	1.98E-08	2.67E-07	7.79E-04	4.34E-07	4.53E-07	9.23E-04
Other Lawn & Garden Equipment	G4	50	3.33E-02	5.57E-03	1.19E-02	2.30E-07	4.64E-07	8.55E-06	1.22E-09	7.69E-09	1.00E-04	2.45E-08	1.30E-08	1.08E-04
Other Lawn & Garden Equipment	G4	120	7.99E-02	1.34E-02	7.37E-02	9.22E-07	4.30E-06	2.10E-05	6.52E-09	5.23E-08	6.75E-04	1.19E-07	5.22E-08	7.13E-04
Leaf Blowers/Vacuums	D	15	5.33E-02	1.75E-02	2.40E-03	2.75E-08	1.93E-07	1.61E-07	4.10E-10	8.10E-09	2.63E-05	0.00E+00	2.48E-09	2.64E-05
Leaf Blowers/Vacuums	D	120	4.66E-02	1.53E-02	3.40E-02	3.78E-07	3.11E-06	2.17E-06	4.37E-09	2.05E-07	3.73E-04	0.00E+00	3.41E-08	3.73E-04
Leaf Blowers/Vacuums	D	250	1.33E-02	4.38E-03	1.99E-02	9.70E-08	1.45E-06	4.13E-07	2.47E-09	3.68E-08	2.19E-04	0.00E+00	8.75E-09	2.20E-04
Snowblowers	D	175	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	D	250	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Snowblowers	D	500	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lawn & Garden Tractors	D	15	1.29E+02	1.92E+02	8.12E+01	9.38E-04	6.60E-03	5.43E-03	1.38E-05	2.96E-04	8.90E-01	0.00E+00	8.47E-05	8.91E-01
Lawn & Garden Tractors	D	25	1.01E+02	1.50E+02	9.75E+01	1.30E-03	8.26E-03	4.41E-03	1.36E-05	3.51E-04	1.07E+00	0.00E+00	1.17E-04	1.07E+00
Chippers/Stump Grinders	D	25	6.00E-02	7.64E-02	7.00E-02	9.27E-07	5.86E-06	3.16E-06	9.75E-09	2.26E-07	7.68E-04	0.00E+00	8.37E-08	7.70E-04
Chippers/Stump Grinders	D	120	1.65E+00	2.10E+00	7.30E+00	1.00E-04	7.18E-04	5.02E-04	9.37E-07	5.55E-05	7.99E-02	0.00E+00	9.04E-06	8.01E-02
Chippers/Stump Grinders	D	175	1.13E-01	1.44E-01	8.65E-01	8.12E-06	7.50E-05	5.00E-05	1.07E-07	3.66E-06	9.50E-03	0.00E+00	7.32E-07	9.51E-03
Chippers/Stump Grinders	D	250	2.66E-02	3.39E-02	3.42E-01	2.16E-06	2.69E-05	7.72E-06	4.24E-08	7.79E-07	3.77E-03	0.00E+00	1.95E-07	3.78E-03
Chippers/Stump Grinders	D	500	2.46E-01	3.14E-01	3.51E+00	2.01E-05	2.46E-04	8.14E-05	3.80E-07	7.48E-06	3.88E-02	0.00E+00	1.81E-06	3.88E-02
Chippers/Stump Grinders	D	750	2.80E-01	3.56E-01	9.59E+00	5.64E-05	6.95E-04	2.23E-04	1.07E-06	2.08E-05	1.06E-01	0.00E+00	5.09E-06	1.06E-01
Chippers/Stump Grinders	D	1000	5.33E-01	6.78E-01	2.60E+01	1.93E-04	2.62E-03	7.09E-04	2.88E-06	7.10E-05	2.87E-01	0.00E+00	1.74E-05	2.87E-01
Commercial Turf Equipment	D	15	3.24E+00	9.47E+00	4.17E+00	4.74E-05	3.33E-04	2.79E-04	7.11E-07	1.30E-05	4.57E-02	0.00E+00	4.27E-06	4.58E-02
Commercial Turf Equipment	D	25	6.09E+01	1.78E+02	1.17E+02	1.55E-03	9.82E-03	5.30E-03	1.63E-05	3.68E-04	1.29E+00	0.00E+00	1.40E-04	1.29E+00
Other Lawn & Garden Equipment	D	15	4.66E-02	5.53E-02	3.08E-02	3.51E-07	2.47E-06	2.06E-06	5.26E-09	9.97E-08	3.38E-04	0.00E+00	3.16E-08	3.38E-04
Other Lawn & Garden Equipment	D	25	6.66E-03	7.90E-03	5.86E-03	7.76E-08	4.91E-07	2.65E-07	8.16E-10	1.90E-08	6.43E-05	0.00E+00	7.01E-09	6.45E-05

Source: NONROAD Emission Factors 2012

				Tons/year								
				VOC Exhaust	Nox Exhaust	CO Exhaust	SO2 Exhaust	PM Exhaust	CO2 Exhaust	N2O Exhaust	CH4 Exhaust	CO2e
Los Angeles County	84,737	8,476	1,609	0.250	0.066	3.181	0.000	0.009	10.081	0.007	0.015	14.726
	Population	Activity	Consumption	lbs/day								
Long Beach	4,021	402	76	0.409	0.108	5.205	0.000	0.015	175	0	0	255

As a percent of 2012 Total Population — Los Angeles County 9,827,000 — Long Beach 466,300 — Percent 4.75%

SOURCE: SCAG 2016-2040 RTP/SCS.

Light Commercial

Tons/Day

Equipment	Fuel	MaxHP	Population	Activity	Consumption	VOC Exhaust	NOx Exhaust	CO Exhaust	SO_2 Exhaust	PM Exhaust	CO_2 Exhaust	N_2O Exhaust	CH_4 Exhaust	CO_2e
Generator Sets	G2	2	1.49E+01	5.48E+00	3.23E-01	7.07E-05	1.30E-05	6.91E-04	7.27E-08	6.64E-06	1.77E-03	3.93E-06	4.39E-06	3.08E-03
Generator Sets	G2	2	1.17E+01	2.90E+00	1.83E-01	4.76E-05	6.78E-06	4.16E-04	3.84E-08	3.68E-06	9.33E-04	2.05E-06	2.96E-06	1.63E-03
Generator Sets	G2	15	1.50E-01	5.53E-02	3.12E-02	1.75E-06	1.20E-06	8.54E-05	6.60E-09	7.45E-08	1.60E-04	1.30E-07	1.09E-07	2.03E-04
Generator Sets	G2	15	1.15E-01	2.83E-02	1.69E-02	2.12E-06	5.96E-07	4.66E-05	3.38E-09	8.27E-08	8.21E-05	6.52E-08	1.32E-07	1.05E-04
Pumps	G2	2	5.93E+01	4.19E+01	2.21E+00	3.17E-04	9.62E-05	4.10E-03	5.63E-07	4.80E-05	1.37E-02	2.97E-05	1.97E-05	2.33E-02
Pumps	G2	2	4.66E+01	2.21E+01	1.27E+00	2.51E-04	5.36E-05	2.62E-03	2.98E-07	2.66E-05	7.22E-03	1.61E-05	1.56E-05	1.25E-02
Pumps	G2	15	1.60E+01	1.13E+01	5.73E+00	3.72E-04	2.83E-04	1.55E-02	1.21E-06	2.47E-04	2.95E-02	2.89E-05	2.31E-05	3.90E-02
Pumps	G2	15	1.26E+01	5.96E+00	3.08E+00	2.49E-04	1.45E-04	8.39E-03	6.42E-07	1.31E-04	1.56E-02	1.50E-05	1.55E-05	2.06E-02
Pumps	G2	25	1.93E-01	1.37E-01	1.51E-01	9.94E-06	6.74E-06	4.21E-04	3.12E-08	6.36E-06	7.59E-04	5.02E-07	6.18E-07	9.27E-04
Pumps	G2	25	1.50E-01	7.14E-02	7.93E-02	5.27E-06	3.45E-06	2.22E-04	1.63E-08	3.33E-06	3.97E-04	2.60E-07	3.28E-07	4.84E-04
Generator Sets	G4	5	1.96E+02	7.20E+01	1.74E+01	3.00E-03	7.25E-04	4.03E-02	3.20E-06	3.18E-04	9.27E-02	1.09E-04	1.69E-04	1.30E-01
Generator Sets	G4	5	1.54E+02	3.80E+01	9.67E+00	1.74E-03	3.80E-04	2.40E-02	1.69E-06	1.65E-04	4.90E-02	5.71E-05	9.85E-05	6.88E-02
Generator Sets	G4	15	5.38E+02	1.98E+02	1.19E+02	7.95E-03	5.09E-03	3.47E-01	1.63E-05	2.99E-04	5.73E-01	4.97E-04	4.49E-04	7.36E-01
Generator Sets	G4	15	4.22E+02	1.05E+02	6.54E+01	5.48E-03	2.62E-03	1.95E-01	8.63E-06	1.56E-04	3.03E-01	2.59E-04	3.10E-04	3.89E-01
Generator Sets	G4	25	2.89E+02	1.06E+02	1.38E+02	8.94E-03	5.60E-03	4.14E-01	1.65E-05	3.40E-04	6.50E-01	3.92E-04	5.06E-04	7.82E-01
Generator Sets	G4	25	2.27E+02	5.61E+01	7.51E+01	5.89E-03	2.79E-03	2.28E-01	8.70E-06	1.77E-04	3.43E-01	2.00E-04	3.33E-04	4.12E-01
Generator Sets	G4	50	9.62E+01	3.03E+01	6.84E+01	1.48E-03	2.85E-03	5.48E-02	6.91E-06	4.36E-05	5.69E-01	1.43E-04	8.40E-05	6.15E-01
Generator Sets	G4	120	1.86E+01	5.84E+00	3.10E+01	4.47E-04	1.93E-03	9.98E-03	2.72E-06	2.18E-05	2.82E-01	5.29E-05	2.53E-05	2.99E-01
Generator Sets	G4	175	1.75E+00	5.52E-01	4.97E+00	4.24E-05	3.44E-04	1.45E-03	4.52E-07	3.63E-06	4.55E-02	7.01E-06	2.40E-06	4.77E-02
Pumps	G4	5	6.94E+01	4.91E+01	8.17E+00	1.34E-03	5.66E-04	1.63E-02	1.66E-06	2.95E-05	4.81E-02	8.09E-05	7.59E-05	7.48E-02
Pumps	G4	5	5.46E+01	2.59E+01	4.71E+00	8.59E-04	2.83E-04	1.07E-02	8.77E-07	3.52E-05	2.54E-02	4.14E-05	4.86E-05	3.93E-02
Pumps	G4	15	7.52E+01	5.32E+01	2.87E+01	2.23E-03	1.61E-03	8.27E-02	3.96E-06	1.16E-03	1.39E-01	1.46E-04	1.26E-04	1.87E-01
Pumps	G4	15	5.91E+01	2.81E+01	1.54E+01	1.26E-03	8.17E-04	4.48E-02	2.09E-06	6.12E-04	7.34E-02	7.58E-05	7.15E-05	9.84E-02
Pumps	G4	25	1.93E+01	1.36E+01	1.61E+01	1.24E-03	8.04E-04	4.75E-02	1.92E-06	6.34E-04	7.56E-02	5.37E-05	7.02E-05	9.37E-02
Pumps	G4	25	1.51E+01	7.19E+00	8.52E+00	6.68E-04	4.13E-04	2.53E-02	1.01E-06	3.35E-04	3.99E-02	2.79E-05	3.78E-05	4.94E-02
Pumps	G4	50	7.69E+00	4.65E+00	1.04E+01	2.34E-04	3.85E-04	8.70E-03	1.04E-06	6.57E-06	8.58E-02	2.01E-05	1.32E-05	9.23E-02
Pumps	G4	120	9.74E+00	5.89E+00	3.55E+01	5.27E-04	1.77E-03	1.14E-02	3.12E-06	2.50E-05	3.23E-01	4.60E-05	2.98E-05	3.38E-01
Pumps	G4	175	2.94E-01	1.78E-01	1.60E+00	1.37E-05	9.17E-05	4.81E-04	1.46E-07	1.17E-06	1.47E-02	1.85E-06	7.75E-07	1.52E-02
Air Compressors	G4	5	2.51E+01	3.88E+01	8.54E+00	1.38E-03	6.18E-04	1.63E-02	1.78E-06	1.68E-05	5.14E-02	7.60E-05	7.78E-05	7.66E-02
Air Compressors	G4	5	1.97E+01	2.05E+01	4.51E+00	7.28E-04	3.26E-04	8.62E-03	9.39E-07	8.86E-06	2.72E-02	4.02E-05	4.11E-05	4.05E-02
Air Compressors	G4	15	1.27E+01	1.97E+01	7.54E+00	5.92E-04	4.37E-04	2.16E-02	1.04E-06	3.06E-04	3.65E-02	4.60E-05	3.34E-05	5.14E-02
Air Compressors	G4	15	9.98E+00	1.04E+01	3.97E+00	3.05E-04	2.25E-04	1.14E-02	5.49E-07	1.62E-04	1.93E-02	2.40E-05	1.72E-05	2.71E-02
Air Compressors	G4	25	1.71E+00	2.65E+00	2.54E+00	2.05E-04	1.32E-04	7.52E-03	3.03E-07	1.00E-04	1.19E-02	9.54E-06	1.15E-05	1.51E-02
Air Compressors	G4	25	1.35E+00	1.40E+00	1.34E+00	1.06E-04	6.85E-05	3.97E-03	1.60E-07	5.29E-05	6.31E-03	5.00E-06	5.98E-06	7.99E-03
Air Compressors	G4	50	2.92E+00	3.87E+00	8.42E+00	2.86E-04	3.85E-04	9.35E-03	7.96E-07	5.02E-06	6.55E-02	1.87E-05	1.61E-05	7.16E-02
Air Compressors	G4	120	9.48E+00	1.25E+01	4.77E+01	1.17E-03	3.14E-03	2.27E-02	4.06E-06	3.25E-05	4.20E-01	9.24E-05	6.60E-05	4.50E-01
Air Compressors	G4	175	6.37E-01	8.44E-01	5.78E+00	7.17E-05	4.56E-04	1.88E-03	5.23E-07	4.19E-06	5.26E-02	9.33E-06	4.05E-06	5.56E-02
Welders	G4	15	4.91E+01	2.79E+01	1.57E+01	1.34E-03	8.28E-04	4.58E-02	2.11E-06	6.13E-04	7.41E-02	7.61E-05	7.55E-05	9.93E-02
Welders	G4	25	1.77E+02	1.01E+02	8.87E+01	7.17E-03	4.31E-03	2.64E-01	1.05E-05	3.47E-03	4.14E-01	3.34E-04	4.05E-04	5.26E-01
Welders	G4	50	1.53E+01	8.69E+00	2.11E+01	5.70E-04	9.37E-04	1.84E-02	2.09E-06	1.32E-05	1.72E-01	4.34E-05	3.23E-05	1.86E-01
Welders	G4	120	1.56E+01	8.87E+00	3.00E+01	5.65E-04	1.92E-03	1.09E-02	2.61E-06	2.09E-05	2.70E-01	5.95E-05	3.19E-05	2.89E-01
Welders	G4	175	1.07E+00	6.11E-01	3.68E+00	3.86E-05	2.73E-04	1.10E-03	3.34E-07	2.68E-06	3.37E-02	6.02E-06	2.19E-06	3.56E-02
Pressure Washers	G4	5	5.26E+01	1.93E+01	6.75E+00	9.97E-04	2.88E-04	1.43E-02	1.34E-06	1.32E-04	3.89E-02	3.60E-05	5.64E-05	5.12E-02
Pressure Washers	G4	5	4.13E+01	1.02E+01	3.98E+00	6.92E-04	1.58E-04	9.67E-03	7.10E-07	6.89E-05	2.06E-02	1.94E-05	3.91E-05	2.74E-02
Pressure Washers	G4	15	4.69E+01	1.73E+01	1.01E+01	6.74E-04	4.32E-04	2.94E-02	1.39E-06	2.54E-05	4.86E-02	4.27E-05	3.81E-05	6.26E-02
Pressure Washers	G4	15	3.69E+01	9.12E+00	5.54E+00	4.65E-04	2.22E-04	1.66E-02	7.32E-07	1.32E-05	2.57E-02	2.22E-05	2.63E-05	3.31E-02
Pressure Washers	G4	25	8.81E+00	3.24E+00	4.97E+00	3.06E-04	2.00E-04	1.49E-02	5.95E-07	1.22E-05	2.35E-02	1.30E-05	1.73E-05	2.79E-02
Pressure Washers	G4	25	6.92E+00	1.71E+00	2.69E+00	2.03E-04	1.01E-04	8.16E-03	3.14E-07	6.35E-06	1.24E-02	6.68E-06	1.15E-05	1.47E-02
Pressure Washers	G4	50	8.59E-01	2.70E-01	6.84E-01	1.40E-05	2.49E-05	5.06E-04	7.00E-08	4.41E-07	5.76E-03	1.23E-06	7.90E-07	6.15E-03
Generator Sets	G4	120	1.38E+00	4.35E-01	2.73E+00	1.78E-06	1.19E-04	5.70E-04	0.00E+00	1.62E-06	1.83E-02	0.00E+00	1.49E-05	1.86E-02
Generator Sets	G4	175	1.15E+00	3.61E-01	3.94E+00	2.04E-06	1.71E-04	6.84E-04	0.00E+00	2.37E-06	2.66E-02	0.00E+00	1.71E-05	2.70E-02
Gas Compressors	C4	50	2.15E-01	5.00E+00	1.71E+01	9.72E-06	3.53E-04	1.72E-03	0.00E+00	9.00E-06	1.17E-01	0.00E+00	8.15E-05	1.19E-01
Gas Compressors	C4	120	4.44E-01	1.03E+01	1.00E+02	5.30E-05	2.09E-03	2.76E-02	0.00E+00	5.11E-05	6.60E-01	0.00E+00	4.44E-04	6.70E-01
Gas Compressors	C4	175	7.16E-02	1.67E+00	2.57E+01	1.48E-05	5.59E-04	5.61E-03	0.00E+00	1.37E-05	1.72E-01	0.00E+00	1.24E-04	1.74E-01
Gas Compressors	C4	250	5.73E-02	1.33E+00	2.66E+01	1.14E-05	5.41E-04	6.45E-03	0.00E+00	1.57E-05	1.77E-01	0.00E+00	9.53E-05	1.79E-01
Gas Compressors	C4	500	5.01E-02	1.17E+00	3.75E+01	1.60E-05	7.63E-04	9.09E-03	0.00E+00	2.22E-05	2.49E-01	0.00E+00	1.34E-04	2.52E-01
Generator Sets	D	15	3.64E+01	3.37E+01	1.57E+01	2.36E-04	1.62E-03	1.13E-03	2.67E-06	9.01E-05	1.72E-01	0.00E+00	2.13E-05	1.72E-01
Generator Sets	D	25	2.66E+01	2.46E+01	1.98E+01	3.13E-04	1.91E-03	1.06E-03	2.75E-06	1.04E-04	2.17E-01	0.00E+00	2.82E-05	2.18E-01
Generator Sets	D	50	3.25E+01	3.01E+01	4.24E+01	1.12E-03	4.15E-03	3.71E-03	5.95E-06	3.14E-04	4.60E-01	0.00E+00	1.01E-04	4.62E-01
Generator Sets	D	120	4.94E+01	4.57E+01	1.63E+02	2.21E-03	1.60E-02	1.10E-02	2.09E-05	1.20E-03	1.78E+00	0.00E+00	1.99E-04	1.78E+00
Generator Sets	D	175	2.92E+00	2.70E+00	1.75E+01	1.60E-04	1.52E-03	9.87E-04	2.16E-06	7.12E-05	1.92E-01	0.00E+00	1.44E-05	1.92E-01
Generator Sets	D	250	1.63E+00	1.51E+00	1.45E+01	8.58E-05	1.15E-03	3.16E-04	1.80E-06	3.11E-05	1.60E-01	0.00E+00	7.74E-06	1.60E-01
Generator Sets	D	500	3.63E+00	3.36E+00	5.12E+01	2.71E-04	3.63E-03	1.15E-03	5.55E-06	1.03E-04	5.65E-01	0.00E+00	2.45E-05	5.66E-01
Generator Sets	D	750	2.26E+00	2.09E+00	5.13E+01	2.82E-04	3.76E-03	1.15E-03	5.70E-06	1.05E-04	5.67E-01	0.00E+00	2.54E-05	5.67E-01
Generator Sets	D	9999	5.87E-01	5.43E-01	2.58E+01	1.92E-04	2.58E-03	6.93E-04	2.86E-06	6.95E-05	2.85E-01	0.00E+00	1.73E-05	2.85E-01
Pumps	D	15	2.74E+01	3.02E+01	1.02E+01	1.76E-04	1.07E-03	7.34E-04	1.74E-06	6.73E-05	1.12E-01	0.00E+00	1.58E-05	1.12E-01
Pumps	D	25	8.17E+00	9.01E+00	8.02E+00	1.49E-04	7.71E-04	4.30E-04	1.11E-06	4.51E-05	8.77E-02	0.00E+00	1.34E-05	8.80E-02
Pumps	D	50	1.42E+01	1.57E+01	2.49E+01	7.02E-04	2.45E-03	2.28E-03	3.48E-06	1.92E-04	2.69E-01	0.00E+00	6.33E-05	2.71E-01
Pumps	D	120	2.79E+01	3.08E+01	1.10E+02	1.54E-03	1.10E-02	7.51E-03	1.41E-05	8.42E-04	1.20E+00	0.00E+00	1.39E-04	1.20E+00
Pumps	D	175	3.02E+00	3.33E+00	2.13E+01	2.02E-04	1.88E-03	1.22E-03	2.63E-06	9.04E-05	2.33E-01	0.00E+00	1.83E-05	2.34E-01
Pumps	D	250	2.18E+00	2.40E+00	2.19E+01	1.35E-04	1.75E-03	4.83E-04	2.72E-06	4.86E-05	2.42E-01	0.00E+00	1.22E-05	2.42E-01
Pumps	D	500	4.30E-02	4.74E-02	7.40E-01	4.12E-06	5.30E-05	1.70E-05	8.02E-08	1.54E-06	8.17E-03	0.00E+00	3.71E-07	8.18E-03
Pumps	D	750	7.16E-03	7.90E-03	2.04E-01	1.17E-06	1.51E-05	4.68E-06	2.26E-08	4.33E-07	2.25E-03	0.00E+00	1.06E-07	2.25E-03
Pumps	D	9999	1.58E-01	1.74E-01	1.07E+01	8.15E-05	1.08E-03	2.92E-04	1.18E-06	2.93E-05	1.18E-01	0.00E+00	7.36E-06	1.18E-01
Air Compressors	D	15	3.72E-01	8.31E-01	2.74E-01	4.71E-06	2.87E-05	1.96E-05	4.66E-08	1.80E-06	3.00E-03	0.00E+00	4.25E-07	3.01E-03
Air Compressors	D	25	7.38E-01	1.65E+00	1.08E+00	2.01E-05	1.04E-04	5.82E-05	1.51E-07	6.10E-06	1.19E-02	0.00E+00	1.81E-06	1.19E-02
Air Compressors	D	50	6.70E+00	1.50E+01	1.54E+01	5.86E-04	1.60E-03	1.76E-03	2.15E-06	1.46E-04	1.66E-01	0.00E+00	5.29E-05	1.67E-01
Air Compressors	D	120	4.47E+01	9.96E+01	2.14E+02	3.59E-03	2.29E-02	1.57E-02	2.74E-05	2.00E-03	2.34E+00	0.00E+00	3.24E-04	2.34E+00
Air Compressors	D	175	1.69E+00	3.77E+00	1.52E+01	1.76E-04	1.44E-03	9.36E-04	1.87E-06	7.88E-05	1.67E-01	0.00E+00	1.59E-05	1.67E-01
Air Compressors	D	250	2.38E+00	5.30E+00	3.15E+01	2.40E-04	2.71E-03	7.46E-04	3.91E-06	8.13E-05	3.48E-01	0.00E+00	2.16E-05	3.48E-01
Air Compressors	D	500	3.10E+00	6.92E+00	7.25E+01	5.07E-04	5.48E-03	1.76E-03	7.86E-06	1.75E-04	8.01E-01	0.00E+00	4.58E-05	8.02E-01
Air Compressors	D	750	1.16E+00	2.59E+00	4.19E+01	2.97E-04	3.28E-03	1.01E-03	4.65E-06	1.03E-04	4.63E-01	0.00E+00	2.68E-05	4.64E-01
Air Compressors	D	1000	2.86E-02	6.39E-02	1.41E+00	1.19E-05	1.50E-04	4.10E-05	1.56E-07	4.25E-06	1.55E-02	0.00E+00	1.08E-06	1.55E-02
Welders	D	15	1.24E+01	2.18E+01	6.18E+00	1.06E-04	6.46E-04	4.42E-04	1.05E-06	4.06E-05	6.75E-02	0.00E+00	9.56E-06	6.77E-02
Welders	D	25	1.09E+01	1.92E+01	9.87E+00	1.83E-04	9.49E-04	5.29E-04	1.37E-06	5.55E-05	1.08E-01	0.00E+00	1.65E-05	1.08E-01
Welders	D	50	3.35E+01	5.90E+01	7.08E+01	2.45E-03	7.21E-03	7.49E-03	9.88E-06	6.27E-04	7.64E-01	0.00E+00	2.21E-04	7.69E-01
Welders	D	120	2.60E+01	4.58E+01	8.27E+01	1.31E-03	8.64E-03	5.93E-03	1.06E-05	7.24E-04	9.03E-01	0.00E+00	1.18E-04	9.06E-01
Welders	D	175	1.29E-01	2.27E-01	1.01E+00	1.10E-05	9.39E-05	6.08E-05	1.25E-07	4.92E-06	1.11E-02	0.00E+00	9.91E-07	1.11E-02
Welders	D	250	2.86E-02	5.04E-02	2.72E-01	1.93E-06	2.28E-05	6.28E-06	3.37E-08	6.69E-07	3.00E-03	0.00E+00	1.74E-07	3.00E-03
Welders	D	500	7.16E-02	1.26E-01	9.56E-01	6.16E-06	7.09E-05	2.27E-05	1.04E-07	2.20E-06	1.06E-02	0.00E+00	5.56E-07	1.06E-02
Pressure Washers	D	15	1.69E+00	6.71E-01	1.50E-01	2.25E-06	1.55E-05	1.07E-05	2.55E-08	8.60E-07	1.64E-03	0.00E+00	2.03E-07	1.64E-03
Pressure Washers	D	25	3.94E-01	1.56E-01	5.09E-02	8.04E-07	4.90E-06	2.73E-06	7.08E-09	2.68E-07	5.58E-04	0.00E+00	7.26E-08	5.60E-04
Pressure Washers	D	50	7.81E-01	3.10E-01	2.03E-01	4.17E-06	1.93E-05	1.52E-05	2.86E-08	1.30E-06	2.21E-03	0.00E+00	3.76E-07	2.22E-03
Pressure Washers	D	120	3.22E-01	1.28E-01	1.40E-01	1.69E-06	1.33E-05	9.08E-06	1.80E-08	9.01E-07	1.54E-03	0.00E+00	1.52E-07	1.54E-03

Source: OFFROAD Emission Factors 2012

				Tons/year								
				VOC Exhaust	NOx Exhaust	CO Exhaust	SO_2 Exhaust	PM Exhaust	CO_2 Exhaust	N_2O Exhaust	CH_4 Exhaust	CO_2e
Los Angeles County	3,340	1,747	2,343	0.080	0.161	2.254	0.000	0.017	19.906	0.003	0.006	21.769
	Population	Activity	Consumption	lbs/day								
Long Beach	124	65	87	0.102	0.205	2.876	0.000	0.022	269	0	0	294

As a percent of 2012 Total Employment Los Angeles County 4,140,000 Long Beach 153,200 Percent 3.70%

SOURCE: SCAG 2016-2040 RTP/SCS.

APPENDIX C

REFERENCE DATA

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TABLE A8 Average Vehicle Occupancy for All Trips

County	Base Year 2012	Baseline 2040	Plan 2040
Imperial	1.40	1.40	1.41
Los Angeles	1.51	1.52	1.55
Orange	1.47	1.50	1.53
Riverside	1.44	1.45	1.47
San Bernardino	1.45	1.44	1.48
Ventura	1.40	1.40	1.42
Region	1.48	1.49	1.52

TABLE A9 Median Home Based Work Trip Length (miles)

County	Base Year 2012	Baseline 2040	Plan 2040
Imperial	10.93	11.47	10.53
Los Angeles	13.28	13.45	13.39
Orange	12.93	12.66	13.26
Riverside	23.20	19.11	19.24
San Bernardino	23.08	21.24	21.95
Ventura	16.49	16.68	16.81
Region	15.44	15.07	15.22

TABLE A10 Median Non-Work Trip Length (miles)

County	Base Year 2012	Baseline 2040	Plan 2040
Imperial	6.96	6.90	6.76
Los Angeles	7.71	7.50	7.45
Orange	7.65	7.65	7.75
Riverside	8.92	8.80	8.34
San Bernardino	9.20	8.36	8.91
Ventura	7.80	7.25	7.22
Region	8.00	7.80	7.79

TABLE A11 Average Daily Delay Per Capita (minutes)

County	Base Year 2012	Baseline 2040	Plan 2040
Imperial	0.65	2.71	2.07
Los Angeles	14.69	15.87	10.51
Orange	11.64	12.93	7.20
Riverside	5.82	12.40	5.56
San Bernardino	7.62	17.28	6.45
Ventura	7.04	11.65	5.76
Region	7.91	12.14	6.26

2014 CALIFORNIA GAS REPORT

PREPARED BY THE CALIFORNIA GAS AND ELECTRIC UTILITIES

Southern California Gas Company
Pacific Gas and Electric Company
San Diego Gas & Electric Company
Southwest Gas Corporation
City of Long Beach Gas & Oil Department
Southern California Edison Company

2014 CALIFORNIA GAS REPORT

LONG BEACH GAS AND OIL DEPARTMENT

CITY OF LONG BEACH MUNICIPAL GAS & OIL DEPARTMENT

The annual gas supply and forecast requirements prepared by the Long Beach Gas & Oil Department (Long Beach) are shown on the following tables for the years 2014 through 2035.

Serving approximately 145,000 customers, Long Beach is the largest California municipal gas utility and the fifth largest municipal gas utility in the United States. Long Beach's service territory includes the cities of Long Beach and Signal Hill, and sections of surrounding communities including Lakewood, Bellflower, Compton, Seal Beach, Paramount, and Los Alamitos. Long Beach's customer load profile is 56 percent residential and 44 percent commercial/industrial.

As a municipal utility, Long Beach's rates and policies are established by the City Council, which acts as the regulatory authority. The City Charter requires the gas utility to establish its rates comparable to the rates charged by surrounding gas utilities for similar types of service.

Long Beach receives a small amount of its gas supply directly into its pipeline system from local production fields that are located within Long Beach's service territory, as well as offshore. Currently, Long Beach receives approximately 5 percent of its gas supply from local production. The majority of Long Beach supplies are purchased at the California border, primarily from the Southwestern United States. Long Beach, as a wholesale customer, receives intrastate transmission service for this gas from SoCalGas.

2014 CALIFORNIA GAS REPORT

LONG BEACH GAS AND OIL DEPARTMENT
TABULAR DATA

TABLE 1A-LB

CITY OF LONG BEACH - GAS & OIL DEPARTMENT

ANNUAL GAS SUPPLY AND SENDOUT - MMCF/DAY
RECORDED YEARS 2009 THRU 2013

LINE	ACTUAL DELIVERIES BY END-USE		2009	2010	2011	2012	2013	LINE
1	CORE	Residential	13.4	14.2	14.9	13.7	14.2	1
2	CORE/NONCORE	Commercial	5.1	5.3	5.6	5.4	5.9	2
3	CORE/NONCORE	Industrial	5.1	4.4	3.6	3.4	3.4	3
4		Subtotal	23.6	23.9	24.1	22.5	23.6	4
5	NON CORE	Non-EOR Cogeneration	0.4	0.8	0.8	1.6	1.5	5
6		EOR Cogen. & Steaming	-	-	-	-	-	6
7		Electric Utilities	-	-	-	-	-	7
8		Subtotal	0.4	0.8	0.8	1.6	1.5	8
9	WHOLESALE	Residential	-	-	-	-	-	9
10		Com. & Ind., others	-	-	-	-	-	10
11		Electric Utilities	-	-	-	-	-	11
12		Subtotal-WHOLESALE	-	-	-	-	-	12
13		Co. Use & LUAF	0.5	0.4	0.6	0.2	0.2	13
14		Subtotal-END USE	24.5	25.1	25.5	24.4	25.4	14
15		Storage Injection	-	-	-	-	-	15
16	SYSTEM TOTAL-THROUGHPUT		24.5	25.1	25.5	24.4	25.4	16
	ACTUAL TRANSPORTATION AND EXCHANGE							
17		Residential	N/A	N/A	N/A	N/A	N/A	17
18		Commercial/Industrial	4.2	3.5	2.7	2.7	2.5	18
19		Non-EOR Cogeneration	0.3	0.8	0.8	1.6	1.5	19
20		EOR Cogen. & Steaming	N/A	N/A	N/A	N/A	N/A	20
21		Electric Utilites	N/A	N/A	N/A	N/A	N/A	21
22		Subtotal-RETAIL	4.5	4.2	3.5	4.3	3.9	22
23	WHOLESALE	All End Uses	-	-	-	-	-	23
24	TOTAL TRANSPORTATION & EXCHANGE		4.5	4.2	3.5	4.3	3.9	24
	ACTUAL CURTAILMENT							
25		Residential	-	-	-	-	-	25
26		Commercial/Industrial	-	-	-	-	-	26
27		Non-EOR Cogeneration	-	-	-	-	-	27
28		EOR Cogen. & Steaming	-	-	-	-	-	28
29		Electric Utilites	-	-	-	-	-	29
30		Wholesale	-	-	-	-	-	30
31		TOTAL- Curtailment	-	-	-	-	-	31
32	REFUSAL		-	-	-	-	-	32

TABLE 1-LB

CITY OF LONG BEACH - GAS & OIL DEPARTMENT

ANNUAL GAS SUPPLY AND SENDOUT - MMCF/DAY
RECORDED YEARS 2009 THRU 2013

LINE	GAS SUPPLY AVAILABLE	2009	2010	2011	2012	2013	LINE
	California Source Gas						
1	Regular Purchases	-	-	-	-	-	1
2	Received for Exchange/Transport	-	-	-	-	-	2
3	Total California Source Gas	-	-	-	-	-	3
4	Purchases from Other Utilities	-	-	-	-	-	4
	Out-of-State Gas						
5	Pacific Interstate Companies	-	-	-	-	-	5
6	Additional Core Supplies	-	-	-	-	-	6
7	Incremental Supplies	-	-	-	-	-	7
8	Out-of-State Transport	-	-	-	-	-	8
9	Total Out-of-State Gas	-	-	-	-	-	9
10	Subtotal	-	-	-	-	-	10
11	Underground Storage Withdrawal	-	-	-	-	-	11
12	GAS SUPPLY AVAILABLE	-	-	-	-	-	12
	GAS SUPPLY TAKEN						
	California Source Gas						
13	Regular Purchases	2.2	1.6	1.1	1.2	1.9	13
14	Received for Exchange/Transport	0	0	0	0	0	14
15	Total California Source Gas	2.2	1.6	1.1	1.2	1.9	15
16	Purchases from Other Utilities	-	-	-	-	-	16
	Out-of-State Gas						
17	Pacific Interstate Companies	-	-	-	-	-	17
18	Additional Core Supplies	-	-	-	-	-	18
19	Incremental Supplies	22.3	23.5	24.3	23.2	23.5	19
20	Out-of-State Transport	-	-	-	-	-	20
21	Total Out-of-State Gas	22.3	23.5	24.3	23.2	23.5	21
							22
22	Subtotal	24.5	25.1	25.5	24.4	25.4	
							23
23	Underground Storage Withdrawal	-	-	-	-	-	
							24
24	TOTAL Gas Supply Taken & Transported	24.5	25.1	25.5	24.4	25.4	

TABLE 2-LB

CITY OF LONG BEACH - GAS & OIL DEPARTMENT

ANNUAL GAS SUPPLY AND REQUIREMENTS - MMCF/DAY
ESTIMATED YEARS 2014 THRU 2018

AVERAGE TEMPERATURE YEAR

LINE	CAPACITY AVAILABLE		2014	2015	2016	2017	2018	LINE
1	California Source Gas							1
2	Out-of-State Gas							2
3	TOTAL CAPACITY AVAILABLE							3
	GAS SUPPLY TAKEN							
4	California Source Gas		1.1	0.9	0.8	0.8	0.8	4
5	Out-of-State Gas		23.9	24.4	24.4	24.5	24.7	5
6	TOTAL SUPPLY TAKEN		25.0	25.3	25.2	25.3	25.5	6
7	Net Underground Storage Withdrawal		-	-	-	-	-	7
8	TOTAL THROUGHPUT (1)		25.0	25.3	25.2	25.3	25.5	8
	REQUIREMENTS FORECAST BY END-USE (1)							
9	CORE	Residential	14.7	14.7	14.8	14.9	14.9	9
10		Commercial	5.2	5.2	5.2	5.3	5.3	10
11		NGV	0.3	0.3	0.3	0.3	0.3	11
12		Subtotal-CORE	20.2	20.3	20.4	20.4	20.5	12
13	NONCORE	Industrial	3.3	3.3	3.3	3.2	3.3	13
14		Non-EOR Cogeneration	1.2	1.5	1.3	1.4	1.4	14
15		EOR	-	-	-	-	-	15
16		Utility Electric Generation	-	-	-	-	-	16
17		NGV	-	-	-	-	-	17
18		Subtotal-NONCORE	4.5	4.8	4.6	4.6	4.7	18
19		Co. Use & LUAF	0.2	0.2	0.2	0.2	0.2	19
20	SYSTEM TOTAL THROUGHPUT (1)		25.0	25.3	25.2	25.3	25.5	20
21	SYSTEM CURTAILMENT		-	-	-	-	-	21
	TRANSPORTATION							
22	CORE	All End Uses	-	-	-	-	-	22
23	NONCORE	Industrial	2.5	2.5	2.5	2.5	2.5	23
24		Non-EOR Cogeneration	1.2	1.5	1.3	1.3	1.4	24
25		EOR	-	-	-	-	-	25
26		Utility Electric Generation	-	-	-	-	-	26
27		Subtotal NONCORE	3.7	3.9	3.8	3.8	3.9	27
28	TOTAL TRANSPORTATION		3.7	3.9	3.8	3.8	3.9	28

(1) Requirement forecast by end-use includes sales and transportation volumes.

TABLE 3-LB

CITY OF LONG BEACH - GAS & OIL DEPARTMENT

ANNUAL GAS SUPPLY AND REQUIREMENTS - MMCF/DAY
ESTIMATED YEARS 2019 THRU 2035

AVERAGE TEMPERATURE YEAR

LINE	CAPACITY AVAILABLE		2019	2020	2025	2030	2035	LINE
1	California Source Gas							1
2	Out-of-State Gas							2
3	TOTAL CAPACITY AVAILABLE							3
	GAS SUPPLY TAKEN							
4	California Source Gas		0.7	0.7	0.5	0.4	0.4	4
5	Out-of-State Gas		24.7	24.8	25.3	25.8	26.2	5
6	TOTAL SUPPLY TAKEN		25.4	25.5	25.9	26.2	26.5	6
7	Net Underground Storage Withdrawal		0	0	0	0	0	7
8	TOTAL THROUGHPUT (1)		25.4	25.5	25.9	26.2	26.5	8
	REQUIREMENTS FORECAST BY END-USE (1)							
9	CORE	Residential	15.0	15.0	15.3	15.7	16.0	9
10		Commercial	5.3	5.3	5.3	5.3	5.3	10
11		NGV	0.3	0.3	0.3	0.3	0.3	11
12		Subtotal-CORE	20.6	20.6	21.0	21.3	21.6	12
13	NONCORE	Industrial	3.3	3.3	3.3	3.3	3.3	13
14		Non-EOR Cogeneration	1.4	1.4	1.4	1.4	1.4	14
15		EOR	0	0	0	0	0	15
16		Utility Electric Generation	0	0	0	0	0	16
17		NGV	0	0	0	0	0	17
18		Subtotal-NONCORE	4.6	4.7	4.7	4.7	4.7	18
19		Co. Use & LUAF	0.2	0.2	0.2	0.2	0.2	19
20	SYSTEM TOTAL THROUGHPUT (1)		25.4	25.5	25.9	26.2	26.5	20
21	SYSTEM CURTAILMENT		0	0	0	0	0	21
	TRANSPORTATION							
22	CORE	All End Uses	0	0	0	0	0	22
23	NONCORE	Industrial	2.5	2.5	2.5	2.5	2.5	23
24		Non-EOR Cogeneration	1.3	1.4	1.3	1.3	1.3	24
25		EOR	0	0	0	0	0	25
26		Utility Electric Generation	0	0	0	0	0	26
27		Subtotal NONCORE	3.8	3.8	3.8	3.8	3.8	27
28	TOTAL TRANSPORTATION		3.8	3.8	3.8	3.8	3.8	28

(1) Requirement forecast by end-use includes sales and transportation volumes.

TABLE 6-LB

CITY OF LONG BEACH - GAS & OIL DEPARTMENT

ANNUAL GAS SUPPLY AND REQUIREMENTS - MMCF/DAY
ESTIMATED YEARS 2014 THRU 2018

1 in 35 TEMPERATURE YEAR

LINE	CAPACITY AVAILABLE		2014	2015	2016	2017	2018	LINE
1	California Source Gas							1
2	Out-of-State Gas							2
3	TOTAL CAPACITY AVAILABLE							3
	GAS SUPPLY TAKEN							
4	California Source Gas		1.1	0.9	0.8	0.8	0.8	4
5	Out-of-State Gas		25.2	25.7	25.7	25.8	26.0	5
6	TOTAL SUPPLY TAKEN		26.3	26.6	26.6	26.6	26.8	6
7	Net Underground Storage Withdrawal		-	-	-	-	-	7
8	TOTAL THROUGHPUT (1)		26.3	26.6	26.6	26.6	26.8	8
	REQUIREMENTS FORECAST BY END-USE (1)							
9	CORE	Residential	15.8	15.9	16.0	16.0	16.0	9
10		Commercial	5.4	5.4	5.4	5.4	5.4	10
11		NGV	0.3	0.3	0.3	0.3	0.3	11
12		Subtotal-CORE	21.5	21.6	21.7	21.7	21.8	12
13	NONCORE	Industrial	3.3	3.3	3.3	3.2	3.3	13
14		Non-EOR Cogeneration	1.2	1.5	1.3	1.4	1.4	14
15		EOR	-	-	-	-	-	15
16		Utility Electric Generation	-	-	-	-	-	16
17		NGV	-	-	-	-	-	17
18		Subtotal-NONCORE	4.5	4.8	4.6	4.6	4.7	18
19		Co. Use & LUAF	0.2	0.3	0.2	0.3	0.3	19
20	SYSTEM TOTAL THROUGHPUT (1)		26.3	26.6	26.6	26.6	26.8	20
21	SYSTEM CURTAILMENT		-	-	-	-	-	21
	TRANSPORTATION							
22	CORE	All End Uses	-	-	-	-	-	22
23	NONCORE	Industrial	2.5	2.5	2.5	2.5	2.5	23
24		Non-EOR Cogeneration	1.2	1.5	1.3	1.3	1.4	24
25		EOR	-	-	-	-	-	25
26		Utility Electric Generation	-	-	-	-	-	26
27		Subtotal NONCORE	3.7	3.9	3.8	3.8	3.9	27
28	TOTAL TRANSPORTATION		3.7	3.9	3.8	3.8	3.9	28

(1) Requirement forecast by end-use includes sales and transportation volumes.

TABLE 7-LB

CITY OF LONG BEACH - GAS & OIL DEPARTMENT

ANNUAL GAS SUPPLY AND REQUIREMENTS - MMCF/DAY
ESTIMATED YEARS 2019 THRU 2035

1 in 35 TEMPERATURE YEAR

LINE	CAPACITY AVAILABLE		2019	2020	2025	2030	2035	LINE
1	California Source Gas							1
2	Out-of-State Gas							2
3	TOTAL CAPACITY AVAILABLE							3
	GAS SUPPLY TAKEN							
4	California Source Gas		0.7	0.7	0.5	0.5	0.5	4
5	Out-of-State Gas		26.0	26.2	26.7	27.1	27.5	5
6	TOTAL SUPPLY TAKEN		26.7	26.9	27.2	27.6	27.9	6
7	Net Underground Storage Withdrawal		0	0	0	0	0	7
8	TOTAL THROUGHPUT (1)		26.7	26.9	27.2	27.6	27.9	8
	REQUIREMENTS FORECAST BY END-USE (1)							
9	CORE	Residential	16.1	16.2	16.5	16.8	17.2	9
10		Commercial	5.4	5.5	5.5	5.5	5.5	10
11		NGV	0.3	0.3	0.3	0.3	0.3	11
12		Subtotal-CORE	21.9	22.0	22.3	22.7	23.0	12
13	NONCORE	Industrial	3.3	3.3	3.3	3.3	3.3	13
14		Non-EOR Cogeneration	1.4	1.4	1.4	1.4	1.4	14
15		EOR	0	0	0	0	0	15
16		Utility Electric Generation	0	0	0	0	0	16
17		NGV	0	0	0	0	0	17
18		Subtotal-NONCORE	4.6	4.7	4.7	4.7	4.7	18
19		Co. Use & LUAF	0.3	0.3	0.3	0.3	0.3	19
20	SYSTEM TOTAL THROUGHPUT (1)		26.7	26.9	27.2	27.6	27.9	20
21	SYSTEM CURTAILMENT		0	0	0	0	0	21
	TRANSPORTATION							
22	CORE	All End Uses	0	0	0	0	0	22
23	NONCORE	Industrial	2.5	2.5	2.5	2.5	2.5	23
24		Non-EOR Cogeneration	1.3	1.4	1.3	1.3	1.3	24
25		EOR	0	0	0	0	0	25
26		Utility Electric Generation	0	0	0	0	0	26
27		Subtotal NONCORE	3.8	3.8	3.8	3.8	3.8	27
28	TOTAL TRANSPORTATION		3.8	3.8	3.8	3.8	3.8	28

(1) Requirement forecast by end-use includes sales and transportation volumes.

Jurisdiction Disposal By Facility

With Reported Alternative Daily Cover (ADC) and Alternative Intermediate Cover (AIC)

Disposal during 2012 for Long Beach

Destination Facility	SWISNo	Qtr	Instate Ton	Transform Ton	Export Ton	Total ADC	Total AIC
Antelope Valley Public Landfill	19-AA-5624		345				
Azusa Land Reclamation Co. Landfill	19-AA-0013		1,296			596	
Chiquita Canyon Sanitary Landfill	19-AA-0052		2,848				
Commerce Refuse-To-Energy Facility	19-AA-0506			222			
El Sobrante Landfill	33-AA-0217		15,450				
Frank R. Bowerman Sanitary LF	30-AB-0360		21,344				
Kettleman Hills - B18 Nonhaz Codisposal	16-AA-0023		1				
Lancaster Landfill and Recycling Center	19-AA-0050		819			899	
McKittrick Waste Treatment Site	15-AA-0105		3,653				
Mid-Valley Sanitary Landfill	36-AA-0055		70			44	
Olinda Alpha Sanitary Landfill	30-AB-0035		50,288				
Prima Deshecha Sanitary Landfill	30-AB-0019		5,542				
Puente Hills Landfill	19-AA-0053		58,965			378	1
San Timoteo Sanitary Landfill	36-AA-0087		8			1	
Savage Canyon Landfill	19-AH-0001		30				
Simi Valley Landfill & Recycling Center	56-AA-0007		17,135			20,196	
Southeast Resource Recovery Facility	19-AK-0083			201,860			
Sunshine Canyon City/County Landfill	19-AA-2000		62,470				
Yearly Totals:			240,265.69	202,081.57		22,113.43	1.05

Notes:
1. Disposal tonnage is subject to change due to revisions. Report is based upon information provided by County disposal reports.
2. AIC information was not collected prior to 2006.

Data Input: Lanfill Characteristics

Landfill Name:		**Year Opened:**		Click for lists of k values	
State/Country:	CA	**If Closed, Year:**		**k Value:**	0.020
City/County:	Long Beach			**M Value:**	

Data Input: Waste Deposit History

	Waste			Daily Cover			
	Waste Deposited			Greenwaste & Compost		Sludge	
Year	**Tons**	**% ANDOC**		**Tons**	**% ANDOC**	**Tons**	**% ANDOC**
2000							
2001							
2002							
2003							
2004							
2005							
2006							
2007							
2008							
2009							
2010							
2011							
2012	35,578	7.52%		1,779	6.24%		
2013							
2014							
2015							
2016							
2017							
2018							
2019							
2020							

Model Output: Lanfill Characteristics

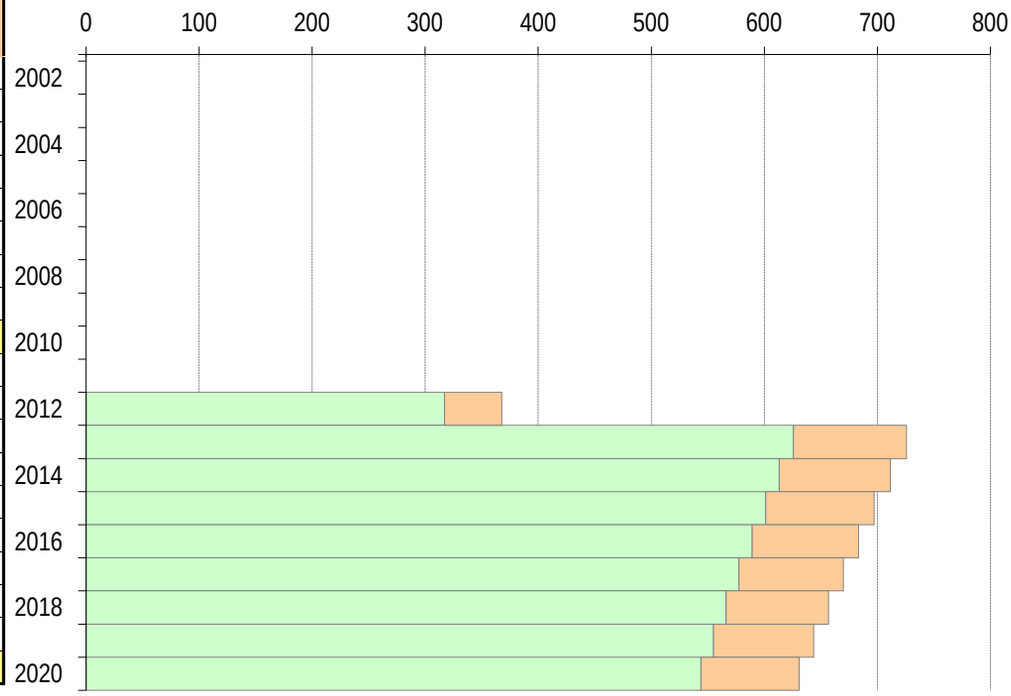
Landfill Name:
State: CA
City/County: Long Beach

Year Opened:
If Closed, Year:

k Value: 0.020
M Value: 6

Model Output: Methane and Carbon Dioxide Emissions (metric tonnes of CO_2 equivalent)

Year	CH_4	CO_2
2002		
2003		
2004		
2005		
2006		
2007		
2008		
2009		
2010		
2011		
2012	317	51
2013	626	100
2014	613	98
2015	601	96
2016	589	94
2017	578	92
2018	566	90
2019	555	89
2020	544	87



Model Output: Lanfill Characteristics

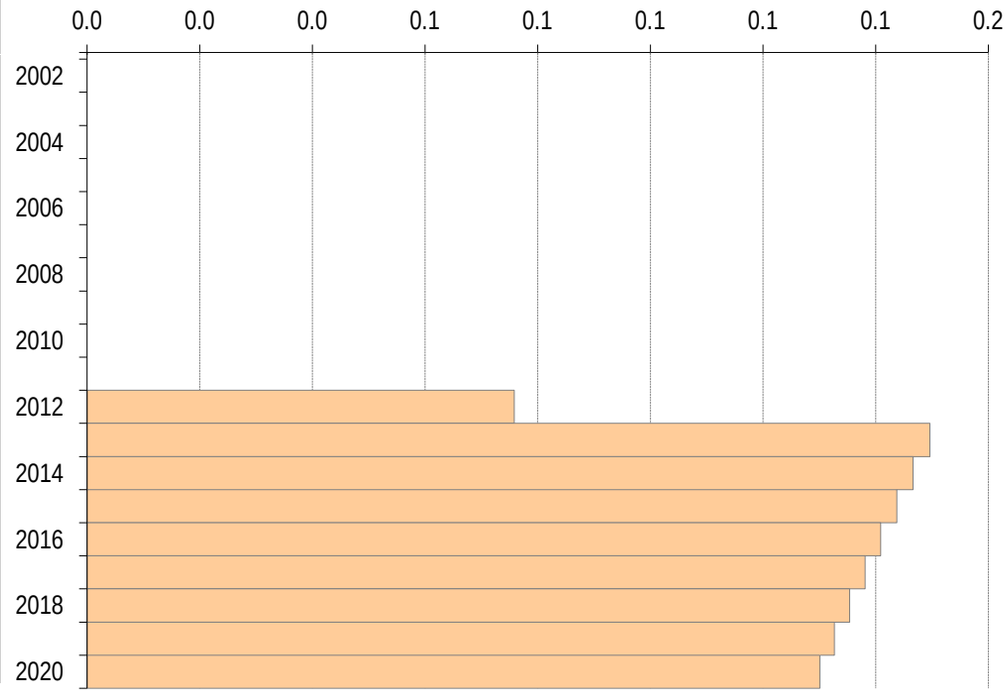
Landfill Name:
State: CA
City/County: Long Beach

Year Opened:
If Closed, Year:

k Value: 0.020
M Value: 6

Model Output: Landfill Gas Captured and Captured Gas Heat (graph values in MMbtu/hr)

Year	Landfill Gas Captured (scf/min)	Captured Gas Heat (MMbtu/hr)
2002		
2003		
2004		
2005		
2006		
2007		
2008		
2009		
2010		
2011		
2012	2	0.1
2013	5	0.1
2014	5	0.1
2015	5	0.1
2016	5	0.1
2017	5	0.1
2018	4	0.1
2019	4	0.1
2020	4	0.1



Percent of Anaerobically Degradable Carbon (ANDOC%): Default Values Used for California

For documentation on these values, see the ARB's Local Government Operations Protocol, available online at:
http://www.arb.ca.gov/cc/protocols/localgov/pubs/pubs.htm

Table 1: **EPA 1960 Waste Characterization Study (Applies for waste deposited up to 1964)**

Waste Type	WIPFRAC	TDOC	DANF	%ANDOC
Newspaper	6.40%	47.09%	15.05%	0.45%
Office Paper	10.70%	38.54%	87.03%	3.59%
Corrugated Boxes	10.80%	44.84%	44.25%	2.14%
Coated Paper	2.20%	33.03%	24.31%	0.18%
Food	14.80%	14.83%	86.52%	1.90%
Grass	12.10%	13.30%	47.36%	0.76%
Leaves	6.05%	29.13%	7.30%	0.13%
Branches	6.05%	44.24%	23.14%	0.62%
Lumber	3.70%	43.00%	23.26%	0.37%
Textiles	2.10%	24.00%	50.00%	0.25%
Diapers	0.05%	24.00%	50.00%	0.01%
Construction/Demolition	2.60%	4.00%	50.00%	0.05%
Medical Waste	0.00%	15.00%	50.00%	0.00%
Sludge/Manure	0.00%	5.00%	50.00%	0.00%
MSW Total				**10.45%**

Table 2: **EPA 1970 Waste Characterization Study (Applies for waste deposited from 1965 to 1974)**

Waste Type	WIPFRAC	TDOC	DANF	%ANDOC
Newspaper	6.40%	47.09%	15.05%	0.45%
Office Paper	11.30%	38.54%	87.03%	3.79%
Corrugated Boxes	13.50%	44.84%	44.25%	2.68%
Coated Paper	2.00%	33.03%	24.31%	0.16%
Food	11.30%	14.83%	86.52%	1.45%
Grass	10.25%	13.30%	47.36%	0.65%
Leaves	5.13%	29.13%	7.30%	0.11%
Branches	5.13%	44.24%	23.14%	0.52%
Lumber	3.30%	43.00%	23.26%	0.33%
Textiles	1.80%	24.00%	50.00%	0.22%
Diapers	0.30%	24.00%	50.00%	0.04%
Construction/Demolition	2.50%	4.00%	50.00%	0.05%
Medical Waste	0.00%	15.00%	50.00%	0.00%
Sludge/Manure	0.00%	5.00%	50.00%	0.00%
MSW Total				**10.44%**

Table 3: **EPA 1980 Waste Characterization Study (Applies for waste deposited from 1975 to 1984)**

Waste Type	WIPFRAC	TDOC	DANF	%ANDOC
Newspaper	5.90%	47.09%	15.05%	0.42%
Office Paper	12.00%	38.54%	87.03%	4.02%
Corrugated Boxes	11.50%	44.84%	44.25%	2.28%
Coated Paper	2.40%	33.03%	24.31%	0.19%
Food	9.50%	14.83%	86.52%	1.22%
Grass	10.05%	13.30%	47.36%	0.63%
Leaves	5.03%	29.13%	7.30%	0.11%
Branches	5.03%	44.24%	23.14%	0.51%
Lumber	5.10%	43.00%	23.26%	0.51%
Textiles	1.70%	24.00%	50.00%	0.20%
Diapers	1.40%	24.00%	50.00%	0.17%
Construction/Demolition	3.50%	4.00%	50.00%	0.07%
Medical Waste	0.00%	15.00%	50.00%	0.00%
Sludge/Manure	0.00%	5.00%	50.00%	0.00%
MSW Total				**10.34%**

Table 4: **EPA 1990 Waste Characterization Study (Applies for waste deposited from 1985 to 1992)**

Waste Type	WIPFRAC	TDOC	DANF	%ANDOC
Newspaper	4.80%	47.09%	15.05%	0.34%
Office Paper	13.10%	38.54%	87.03%	4.39%
Corrugated Boxes	10.50%	44.84%	44.25%	2.08%
Coated Paper	2.10%	33.03%	24.31%	0.17%
Food	12.10%	14.83%	86.52%	1.55%
Grass	8.95%	13.30%	47.36%	0.56%
Leaves	4.48%	29.13%	7.30%	0.10%
Branches	4.48%	44.24%	23.14%	0.46%
Lumber	7.00%	43.00%	23.26%	0.70%
Textiles	3.30%	24.00%	50.00%	0.40%
Diapers	1.60%	24.00%	50.00%	0.19%
Construction/Demolition	3.90%	4.00%	50.00%	0.08%
Medical Waste	0.00%	15.00%	50.00%	0.00%
Sludge/Manure	0.00%	5.00%	50.00%	0.00%
MSW Total				**11.02%**

Table 5: EPA 1995 Waste Characterization Study (Applies for waste deposited from 1993 to 1995)

Waste Type	WIPFRAC	TDOC	DANF	%ANDOC
Newspaper	3.90%	47.09%	15.05%	0.28%
Office Paper	15.00%	38.54%	87.03%	5.03%
Corrugated Boxes	10.30%	44.84%	44.25%	2.04%
Coated Paper	1.80%	33.03%	24.31%	0.14%
Food	13.40%	14.83%	86.52%	1.72%
Grass	6.55%	13.30%	47.36%	0.41%
Leaves	3.28%	29.13%	7.30%	0.07%
Branches	3.28%	44.24%	23.14%	0.34%
Lumber	7.30%	43.00%	23.26%	0.73%
Textiles	4.50%	24.00%	50.00%	0.54%
Diapers	1.90%	24.00%	50.00%	0.23%
Construction/Demolition	4.50%	4.00%	50.00%	0.09%
Medical Waste	0.00%	15.00%	50.00%	0.00%
Sludge/Manure	0.00%	5.00%	50.00%	0.00%
MSW Total				**11.62%**

Table 6: CIWMB 1999 Waste Characterization Study (Applies for waste deposited from 1996 to 2002)

Waste Type	WIPFRAC	TDOC	DANF	%ANDOC
Newspaper	4.28%	47.09%	15.05%	0.30%
Office Paper	4.44%	38.54%	87.03%	1.49%
Corrugated Boxes	4.59%	44.84%	44.25%	0.91%
Coated Paper	16.92%	33.03%	24.31%	1.36%
Food	15.72%	14.83%	86.52%	2.02%
Grass	5.27%	13.30%	47.36%	0.33%
Leaves	2.63%	29.13%	7.30%	0.06%
Branches	2.37%	44.24%	23.14%	0.24%
Lumber	4.91%	43.00%	23.26%	0.49%
Textiles	2.11%	24.00%	50.00%	0.25%
Diapers	6.91%	24.00%	50.00%	0.83%
Construction/Demolition	6.65%	4.00%	50.00%	0.13%
Medical Waste	0.02%	15.00%	50.00%	0.00%
Sludge/Manure	0.14%	5.00%	50.00%	0.00%
MSW Total				**8.42%**

Table 7: CIWMB 2004 Waste Characterization Study (Applies for waste deposited from 2003 to 2006)

Waste Type	WIPFRAC	TDOC	DANF	%ANDOC
Newspaper	2.20%	47.09%	15.05%	0.16%
Office Paper	1.95%	38.54%	87.03%	0.65%
Corrugated Boxes	5.75%	44.84%	44.25%	1.14%
Coated Paper	11.09%	33.03%	24.31%	0.89%
Food	14.55%	14.83%	86.52%	1.87%
Grass	2.81%	13.30%	47.36%	0.18%
Leaves	1.41%	29.13%	7.30%	0.03%
Branches	2.59%	44.24%	23.14%	0.26%
Lumber	9.65%	43.00%	23.26%	0.96%
Textiles	4.44%	24.00%	50.00%	0.53%

Diapers	4.36%	24.00%	50.00%	0.52%
Construction/Demolition	12.06%	4.00%	50.00%	0.24%
Medical Waste	0.04%	15.00%	50.00%	0.00%
Sludge/Manure	0.09%	5.00%	50.00%	0.00%
MSW Total				**7.45%**

Table 8: CIWMB 2008 Waste Characterization Study (Applies for waste deposited from 2007 to the present)

Waste Type	WIPFRAC	TDOC	DANF	%ANDOC
Newspaper	1.65%	47.09%	15.05%	0.12%
Office Paper	1.84%	38.54%	87.03%	0.62%
Corrugated Boxes	4.80%	44.84%	44.25%	0.95%
Coated Paper	8.98%	33.03%	24.31%	0.72%
Food	15.50%	14.83%	86.52%	1.99%
Grass	1.90%	13.30%	47.36%	0.12%
Leaves	3.24%	29.13%	7.30%	0.07%
Branches	1.95%	44.24%	23.14%	0.20%
Lumber	14.51%	43.00%	23.26%	1.45%
Textiles	5.47%	24.00%	50.00%	0.66%
Diapers	4.33%	24.00%	50.00%	0.52%
Construction/Demolition	5.48%	4.00%	50.00%	0.11%
Medical Waste	0.00%	15.00%	50.00%	0.00%
Sludge/Manure	0.05%	5.00%	50.00%	0.00%
MSW Total				**7.52%**

Landfill Specific Value Calculator for the Percent of Anaerobically Degradable Carbon (ANDOC%)

Landfill specific Waste Characterization Data

Waste Type	WIPFRAC	TDOC	DANF	%ANDOC
Newspaper	6.40%	47.09%	15.05%	0.45%
Office Paper	10.70%	38.54%	87.03%	3.59%
Corrugated Boxes	10.80%	44.84%	44.25%	2.14%
Coated Paper	2.20%	33.03%	24.31%	0.18%
Food	14.80%	14.83%	86.52%	1.90%
Grass	12.10%	13.30%	47.36%	0.76%
Leaves	6.05%	29.13%	7.30%	0.13%
Branches	6.05%	44.24%	23.14%	0.62%
Lumber	3.70%	43.00%	23.26%	0.37%
Textiles	2.10%	24.00%	50.00%	0.25%
Diapers	0.05%	24.00%	50.00%	0.01%
Construction/Demolition	2.60%	4.00%	50.00%	0.05%
Medical Waste	0.00%	15.00%	50.00%	0.00%
Sludge/Manure	0.00%	5.00%	50.00%	0.00%
MSW Total				**10.45%**

1) Enter your landfill specific waste characterization data (WIPFRAC).
2) Copy the result of the calculation (MSW total) and overwrite the default %ANDOC value for the particular year on the ***Landfill Model Inputs*** page.
Note: Only the data for the Fraction of the Waste in Place (WIPFRAC) should be altered. If you wish to modify the TDOC or DANF values, please contact ARB staff.

AIR QUALITY AND GREENHOUSE GAS METHODOLOGY MEMORANDUM

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BERKELEY
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IRVINE
PALM SPRINGS
PT. RICHMOND

RIVERSIDE
ROCKLIN
SAN LUIS OBISPO

M E M O R A N D U M

DATE: June 20, 2016

TO: Ashley Davis and Alyssa Helper

FROM: Michael Slavick

SUBJECT: Air Quality and Greenhouse Gas Methodology for the City of Long Beach General Plan Land Use and Urban Design Elements

This memorandum provides a summary of the methodology used to calculate the air quality and greenhouse gas emission inventory analysis. The emission inventory evaluates the changes in regional baseline and forecast emissions associated with the City of Long Beach's (City) existing General Plan (i.e., existing year 2012) and the proposed project (i.e., forecast year 2040 with LUE and UDE), and determines whether the proposed project would impact air quality in a local and regional context. The emission inventory analysis is based on the available city-wide population and employment information provided by the City, vehicle miles traveled (VMT) provided by LSA, and natural gas use data provided by the 2014 California Gas Report prepared by the California Gas and Electric Utilities. A ratio of the area of land uses associated with the Major Areas of Change and land uses associated with City-wide area was used to determine the population and employment data for the Major Areas of Change. A summary of the methodology for the air quality and greenhouse gas analyses are provided below.

Air Quality Impacts

Methodology. This air quality evaluation was prepared in accordance with CEQA requirements to determine if significant air quality impacts are likely to occur in conjunction with future development that would be accommodated by the proposed LUE/UDE. SCAQMD has published the *CEQA Air Quality Handbook* (Handbook) and updates on its website that are intended to provide local governments with guidance for analyzing and mitigating project-specific air quality impacts. The Handbook provides standards, methodologies, and procedures for conducting air quality analyses in environmental documents, which were used in this analysis.

The City's criteria air pollutant emissions inventory includes the following sectors:

Transportation: Transportation emissions forecasts were modeled for vehicle trips beginning and ending within the City of Long Beach and from external/internal vehicle trips (i.e., trips that either begin or end within the City) using the Air Resources Board's (ARB) EMFAC2014-EI. The estimated traffic from the proposed project's Major Areas of Change was addressed in the Traffic Impact Analysis (TIA) prepared for the proposed project (LSA 2016). Based on the TIA, the existing 2012 vehicle traffic within the Major Areas of Change is approximately 345,672 average daily trips (ADT). These trips are associated with the existing residential development, commercial facilities, and industrial facilities within the Major Areas of Change. The growth in traffic is estimated to increase with an additional 87,564 ADTs, for a total of 433,236 ADTs in year 2040 within the

Proposed Project Major Areas of Change. For conservative purposes, trip lengths were estimated using the information from Table A9 and Table A10 of the Highway and Arterial Appendix of the Southern California Association of Government's (SCAG) 2016-2040 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) (SCAG 2016), where it assumed 13.28 miles for the median home based work trip length and 7.71 miles for the median non-work trip length within Los Angeles County. Commuting distances would likely be reduced for a portion of those trips due to incorporating mixed uses into the design of the proposed project. The VMT provided, per SCAG 2016 RTP/SCS average trip length data for Los Angeles County and ADT data from the TIA for Major Areas of Change, includes the full trip length for land uses in Los Angeles County (origin-destination approach) and a 50 percent reduction in the trip length for external/internal trips. Forecasts are adjusted for increases in population in the City. Adjusted daily VMT was multiplied by 347 days per year to account for reduced daily traffic on weekends and holidays to estimate annual emissions. To estimate emissions associated with project-generated traffic, the EMFAC2014 emission factor model was used. The EMFAC2014 model is the latest version of the emission factor model for on-road traffic. Emission factors representing the vehicle mix for 2012 and 2040 for Los Angeles County were used to estimate emissions. Based on the results of the EMFAC2014 model for subsequent years, emissions would decrease on an annual basis from 2015 onward due to phase-out of higher polluting vehicles and implementation of more stringent emission standards that are taken into account in the EMFAC2014 model for future year scenarios.

Energy: Natural gas use for residential and nonresidential land uses in the City was modeled using an annual gas supply of 24.4 million cubic feet per year for the City of Long Beach provided by the Long Beach Gas & Oil Department available in the 2014 California Gas Report for existing year 2012. The unit of measure for the natural gas was converted from cubic foot to therms (i.e., 244,000 therms per year). The estimated amount of natural gas consumption for the proposed project's Major Areas of Change is approximately 41,980 therms per year. The emission factors for the natural gas consumption were obtained from the CalEEMod model, which is further referenced in the U.S. Environmental Protection Agency AP-42 Emission Factor Estimation document. Forecasts for the proposed project buildout year are adjusted for projected increases in population and employment in the City.

Area Sources: NONROAD and OFFROAD2011 emission factors were used to estimate criteria air pollutant emissions from landscaping equipment and light commercial equipment in the City. NONROAD and OFFROAD2011 contain a database of equipment use and associated emissions for each county compiled by the ARB. Annual emissions were compiled using NONROAD and OFFROAD for the County of Los Angeles for year 2012. Landscaping and light commercial equipment is estimated based on population (Landscaping) and employment (Light Commercial Equipment) for the City of Long Beach as a percentage of Los Angeles County. Forecasts are adjusted for increases in population and employment in the City, with the exception of construction activities, which assume that construction emissions for the forecast year would be similar to historical levels. Area sources exclude emissions from fireplaces and consumer products in the City.

Greenhouse Gas Emissions Impact

Methodology. The GHG evaluation was prepared in accordance with the requirements of CEQA to determine if significant GHG impacts are likely to occur in conjunction with future development that

would be accommodated by the proposed LUE/UDE.[1] The analysis includes the five primary sources of GHG emissions: mobile sources, areas sources (natural gas consumption/combustion), and indirect emissions related to electricity use, water use, and solid waste generation and disposal. The GHG emissions inventory includes the following sectors:

Transportation: Transportation emissions forecasts were modeled for vehicle trips beginning and ending within the City of Long Beach and from external/internal vehicle trips (i.e., trips that either begin or end within the City) using ARB's EMFAC2014-EI. As previously described above, the EMFAC2014 Model runs were based on VMT data and emission factors for baseline year 2012 (existing) and forecast 2040 emission rates. The VMT provided, per SCAG 2016 RTP/SCS average VMT data for Los Angeles County, includes the full trip length for land uses in the County (origin-destination approach) and a 50 percent reduction in the trip length for external/internal trips. Forecasts are adjusted for increases in population in the City. Adjusted daily VMT was multiplied by 347 days per year to account for reduced traffic on weekends and holidays to estimate annual emissions. This assumption is consistent with the ARB's methodology within the Climate Change Scoping Plan Measure Documentation Supplement. Modeling was conducted for an adjusted BAU scenario, which includes GHG emissions reduction from the Pavley Fuel Efficiency Standard and the ARB Low Carbon Fuel Standard (LCFS).

Energy: Natural gas and electricity use for residential and nonresidential land uses in the City were modeled using data provided in the 2014 California Gas Report and the City of Long Beach Gas and Oil Department.. Natural gas supply information is previously mentioned in the air quality section above. Electricity use is based on the CalEEMod model energy consumption rates for each land use types for year 2012 to account existing annual use. Electricity use for residential and nonresidential land uses in the City was modeled using the estimated annual electricity consumption rate of 3.8 million megawatt hours per year for the City of Long Beach. Based on the service population ratio between the City of Long Beach and the proposed project's Major Areas of Change, an estimated annual electricity consumption rate of 640,177 megawatt hours per year is used for the existing year 2012 analysis. Forecast year 2040 data are adjusted for increases in service population in the Major Areas of Change. The intensity factor of the purchased electricity is based on the 2012 CO_2e intensity factor provided by Southern California Edison. Intensity factors for CO_2, CH_4 and N_2O provided in the ARB's Local Governments Protocol (LGOP), Version 1.1, were used for natural gas. Reductions from BAU for residential electricity use include a reduction in carbon intensity of the energy supply required under the 33 percent Renewable Portfolio Standard (RPS) (California Energy Commission 2012), an increase in building energy efficiency as a result of changes to the Building and Energy Efficiency Standards, and energy conservation measures.

Waste: Modeling of landfilled waste disposed of by residents and employees in the City is based on the waste commitment method using the ARB's Landfill Emissions Tool model, version 1.3, based on 37,357 tons of waste disposal (municipal solid waste and alternative daily cover) and waste characterization data for year 2012 from CalRecycle Disposal Reporting System (CalRecycle 2016).

[1] The methodology used in completing the GHG inventory was employed for purposes of fulfilling the requirements of CEQA and may differ from the methodology used in completing the GHG inventory found in the City's Climate Action Plan.

Landfills in California have gas capture systems, but because the landfill gas captured is not under the jurisdiction of the City, the emissions from the capture system are not included in the City's inventory. Only fugitive sources of GHG emissions from landfills are included. Modeling assumes a 75 percent reduction in fugitive GHG emissions from the landfill's gas capture system. The landfill gas capture efficiency is based on the ARB's LGOP, version 1.1. Biogenic CO_2 emissions are not included. Forecasts are adjusted for increases in population and employment in the City, which is forecasted to generate 41,586 tons of solid waste in year 2040.

Water/Wastewater: GHG emissions from water and wastewater include indirect GHG emissions from the embodied energy (i.e., energy required for treatment and distribution) of water and wastewater. Existing year 2012 total water use in the City is based on the water-demand average data provided by the Long Beach Water Department and also the existing year 2012 wastewater generation data) provided in the City's Urban Water Management Plan (UWMP). Forecasts are adjusted for increases in population and employment and are based on the target per capita SBx7-7.[1] Energy use from water use and wastewater treatment is estimated using energy rates identified by the California Energy Commission (2006) and carbon intensity of energy as provided and identified by Pacific Gas and Electric and EPA e-GRID data. In addition to the indirect emissions associated with the embodied energy of water use and wastewater treatment, wastewater treatment also results in fugitive GHG emissions. Fugitive emissions from wastewater treatment associated with the Plan Area were calculated using the emissions factors in the ARB's LGOP, version 1.1. Forecasts are adjusted for increases in population and employment in the Plan Areas of Change.

Other Sources: NONROAD and OFFROAD2011 were used to estimate GHG emissions from landscaping equipment and light commercial equipment in the City. NONROAD and OFFROAD2011 contain a database of equipment use and associated emissions for each county, compiled by the ARB. Annual emissions were compiled using NONROAD and OFFROAD2011 for the County of Los Angeles for the year 2012. The number of landscaping and light commercial equipment is estimated based on population (Landscaping) and employment (Light Commercial Equipment) for the City of Long Beach as a percentage of Los Angeles County. Daily emissions from off-road equipment are multiplied by 347 days per year to account for reduced/limited construction activity on weekends and holidays. Forecasts are adjusted for increases in population and employment in the City. It is assumed that construction emissions for the forecast year would be similar to historical levels.

Industrial sources of emissions that require a permit from the SCAQMD are not included in the City's emissions inventory. However, due to the 15/15 Rule, natural gas use data for industrial land uses may also be aggregated with the nonindustrial land uses in the data provided by the Long Beach

[1] SBx7-7 (2009) requires all water suppliers to reduce per capita urban water use by 20 percent by 2020, with incremental progress toward this goal (10 percent by 2015). The 2010 UWMPs contain water-use targets to meet this requirement. Effective 2016, urban retail water suppliers who do not meet the water conservation requirements established by SBx7-7 are not eligible for State water grants or loans.

Water Department.[1] Life-cycle emissions are also not included in this analysis because not enough information is available for the proposed project, and therefore they would be speculative.

REFERENCES

California Air Resources Board (ARB). 2010, May. Local Government Operations Protocol (LGOP), Version 1.1.

———. 2015. EMFAC2014. Emission factor model for motor vehicles.

———. 2010. OFFROAD2011. Emission factor model for off-road equipment.

California's Department of Resources Recycling and Recovery (CalRecycle). 2016, Disposal Reporting System, Jurisdiction Reporting by Facility.

California Gas and Electric Utilities. 2014. California Gas Report.

South Coast Air Quality Management District (SCAQMD). 2013. California Emissions Estimator Model (CalEEMod), Version 2013.2.2.

Southern California Association of Governments (SCAG). 2016. 2016 – 2040 Regional Transportation Plan / Sustainable Communities Strategies (RTP/SCS).

U.S. Environmental Protection Agency (EPA). 2008. NONROAD model. Emission factor model for nonroad equipment.

[1] The 15/15 Rule was adopted by the California Public Utilities Commission in the Direct Access Proceeding (CPUC Decision 97-10-031) to protect customer confidentiality. The 15/15 rule requires that any aggregated information provided by a utility must be made up of at least 15 customers, and a single customer's load must be less than 15 percent of an assigned category. If the number of customers in the complied data is below 15, or if a single customer's load is more than 15 percent of the total data, categories must be combined before the information is released. The Rule further requires that, if the 15/15 Rule is triggered for a second time after the data have been screened once already using the 15/15 Rule, the customer be dropped from the information provided. Categories must be combined before the information is released. The Rule further requires that, if the 15/15 Rule is triggered for a second time after the data have been screened once already using the 15/15 Rule, the customer be dropped from the information provided.