Global Climate Change Analysis
University Hills Specific Plan
City of San Bernardino, California

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December 13, 2007

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ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ARB	California Air Resources Control Board
CAT	Climate Action Team (Report)
CEQA	California Environmental Quality Act
CFC	Chlorofluorocarbons
CH_4	Methane
CO_2	Carbon Dioxide
EIR	Environmental Impact Report
EPA	Environmental Protection Agency
GCC	Global Climate Change
gpd	gallons per day
HCFC	Hydrochlorofluorocarbons
HFC	Hydrofluorocarbons
kWh	Kilowatt-hours
LEED	Leadership in Energy and Environmental Design
$MTCO_2E$	Metric Tons of Carbon Dioxide Equivalent
$MMTCO_2e$	Million Metric Tons of Carbon Dioxide Equivalent
MWh	megawatt-hour
NO_x	Nitrogen Oxides
N_2O	Nitrous Oxide
PFC	perfluorocarbons
ppm	Parts per Million
ppt	Parts per Trillion
SB	Senate Bill

SCAQMD	South Coast Air Quality Management District
U.S.	United States
VOC	Volatile Organic Compound

SECTION 1: INTRODUCTION

This document assesses the impact of the University Hills Specific Plan (project) on global climate change. This document accompanies the Draft Environmental Impact Report (EIR) prepared for the Project and incorporates it by reference.

In 2006, Governor Arnold Schwarzenegger signed AB 32, which charged the California Air Resources Board (ARB) with developing regulations on how the State would address global climate change (also known as "global warming"). The ARB, the California Environmental Protection Agency, the U.S. Environmental Protection Agency (EPA), or other appropriate governmental organizations have not yet developed guidelines on how to prepare a California Environmental Quality Act (CEQA) assessment for global climate change. Nevertheless, in absence of published CEQA thresholds, this analysis includes CEQA-level discussions that includes thresholds of significance and determines the potential impact of the proposed project with regard to its contribution to greenhouse gases based on the intent of AB 32. Note that this analysis is specific to the project and may not apply to other projects in the City.

1.1 - Executive Summary

During construction of the project, approximately 0.0034 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) would be emitted. During operation, the proposed project is anticipated to result in approximately 0.02 $MMTCO_2e$ per year.

Without mitigation, the project could result in a potentially significant impact with regard to global climate change. However, with mitigation and project design features, the project would comply with 1) all applicable State of California strategies to reduce greenhouse gases to levels proposed under Executive Order S-3-05 and AB 32, and 2) all applicable ARB early reduction strategies to reduce greenhouse gas emissions in California. In summary, the project level analysis indicates that the project would have a less than significant impact on global climate change.

It not is anticipated that the project would be impacted by rising sea levels or other secondary effects of global climate change.

The cumulative impacts of the project regarding climate change are speculative at this time.

1.1.1 - Mitigation Measures

The following mitigation measures would reduce direct and indirect greenhouse gas emissions from the project.

AIR-9a To encourage recycling, there shall be areas designated for recycling incorporated into the project design of the multi-family housing areas and in the community center.

AIR-9b To increase energy efficiency, the following measures shall be implemented to the satisfaction of the City of San Bernardino: a) there shall be a minimum 10 percent reduction in all buildings combined space heating, cooling, and water heating energy compared to the current Title 24 Standards; b) the project shall incorporate light roof colors and cool pavements in the driveway areas; c) each appliance (i.e., stoves, washer/dryers, refrigerators, etc.) provided by the builder must be Energy Star qualified if an Energy Star designation is applicable for that appliance; d) low flow appliances (i.e., toilets, dishwashers, shower heads, washing machines) shall be installed if provided by the builder/applicant and; e) solar powered water heaters and photovoltaic cells (solar panels) shall be offered to homebuyers as an option.

1.2 - Project Description

1.2.1 - Project Location

The project is located in southwestern San Bernardino County, within the northern end of the City of San Bernardino. The project site consists of approximately 404 gross acres of land generally located east of Northpark Boulevard and north of the California State University San Bernardino campus. Exhibits 1 and 2 show the regional and local location of the project site.

1.2.2 - Existing Uses and Improvements

The project site is undeveloped and vacant at this time. There are several remnant foundations and sections of wall still onsite from former uses (e.g., former spa, a single residence, etc.). A large water conveyance pipeline maintained by the Metropolitan Water District (MWD) crosses the center of the site from east to west. There are also numerous dirt roads and trails on the site. Several large flood control debris basins are immediately south of the project site, and the campus of the California State University San Bernardino (CSUSB) is immediately south of the debris basins from the project site.

1.2.3 - Proposed Project

The 404-acre-site comprises a unique residential development nestled in the foothills of the San Bernardino Mountains immediately adjacent to the CSUSB campus. Because of the geologic and hydraulic forces that have shaped the site, the development footprint of University Hills is focused onto approximately 170 acres, or only 42 percent of the total site. Development is mainly concentrated south of the San Andreas Fault on the lower portions of the site where the slopes are generally below 15 percent. North of the San Andreas Fault, approximately 235 acres, or 58 percent of the site, will remain undeveloped and is designated as permanent open space to be used by CSUSB as a land laboratory to study the local biology, habitat, and geology. Within the development footprint, the project proposes a maximum of 980 units that are distributed among neighborhoods that

are separated by open space corridors, drainage ways, roadways, and sloped areas and interconnected by a system of pathways. A centrally located clubhouse offers recreational and community amenities, there are four neighborhood parks, with landscaping and streetscape amenities as well. Residential densities range from 3.1 to 20 dwelling units per acre. The lowest densities (0–3.1 units per acre) are located north of the San Andreas Fault and include single family detached estate homes. Immediately south of the San Andreas Fault are low density units (3.2–9 units per acre) include single-family detached, small-lot detached units, and cluster court homes. Medium density units (9.1–15 units per acre), including small−lot detached, clustered, and townhomes products are located in the interior and perimeter of the site. The highest densities (15.1–20 units per acre) are in the interior portions of the community around the clubhouse and behind Badger Hill. The higher density products include stacked flats, townhomes, and clustered courtyard developments. Four acres of the highest density area (Planning Area 16) will be dedicated to CSUSB for exclusive use as 60 units of faculty housing. The current site plan is shown in Exhibit 3.

1.2.4 - Project Design Features

The project has the following design features that will help reduce greenhouse emissions.

Sustainability/Green Design Components

The University Hills Specific Plan outlines how project development will comply with applicable guidelines of the Leadership in Energy and Environmental Design (LEED) "Green Building Program" to minimize energy use impacts on the environment (LEED website 2007). The project design will help reduce vehicle miles traveled which is one of the major sources of greenhouse gases (i.e., motor vehicle emissions). Therefore, a reduction of vehicle miles travels equates to a reduction in greenhouse gas emissions.

Pedestrian and Bicycle Facilities

The University Hills Specific Plan will provide pedestrian and bicycle facilities to interconnect with regional trails. Internal project streets will be pedestrian friendly with inter-connections to all portions of the project area and all surrounding uses such as the CSUSB campus. These trails will provide a link to the City's Master Plan of Trails. The pedestrian and bicycle facilities will help to reduce vehicle trips thereby reducing greenhouse gas emissions.

Landscaping

Landscaping will be provided throughout the project site to include a mix of deciduous and evergreen trees, shrubs, vines, and various types of groundcover. The residential component proposes a combination of street trees, under story trees, accent trees, alley trees, buffer plantings, vines, and turf. The recreation and open space component proposes a combination of accent and shade trees and groundcover plantings along the San Andreas Fault. The remainder of the site is proposed to remain as open space and no landscaping is proposed for this portion. The community center component

proposes evergreen trees, landscaping at project site entrance points and at building entrances, canopy trees within parking lots, and various landscaping along walkways and building edges.

The onsite landscaping helps to counter-balance the project's contribution of greenhouse gases by providing onsite carbon storage. The trees and shrubs take in carbon dioxide and store it.

Recreation and Open Space Component

Approximately 10.2 acres of public and private parks will be provided to meet the City requirement of 5 acres per 1,000 residents for new development. These parks may include picnic areas, tot lots, trails, and open play fields. Parks will help to reduce vehicle trips because the uses will be accessible to those living and working within the project area.

Exhibit 1: Regional Vicinity Map

Exhibit 2: Local Vicinity Map

Exhibit 3: Site Plan

SECTION 2: GLOBAL CLIMATE CHANGE

Briefly stated, global climate change is a change in the average weather of the earth that may be measured by changes in wind patterns, storms, precipitation, and temperature. These changes are measured using historical records of temperature changes that have occurred in the past, such as during previous ice ages. Many of the recent concerns over climate change use this data to extrapolate a level of statistical significance specifically focusing on temperature records from the last 150 years (the Industrial Age) that differ from previous climate changes in rate and magnitude.

The United Nations Intergovernmental Panel on Climate Change (IPCC) constructed several emission trajectories of greenhouse gases needed to stabilize global temperatures and climate change impacts. The IPCC predicted that global mean temperature change from 1990 to 2100, given six scenarios, could range from 1.1 degrees Centigrade (°C) to 6.4°C (IPCC 2007). Regardless of analytical methodology, global average temperature and sea level are expected to rise under all scenarios (IPCC 2007).

2.1 - Greenhouse Gases

Gases that trap heat in the atmosphere are called greenhouse gases. The effect is analogous to the way a greenhouse retains heat. Common greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxides, chlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, ozone, and aerosols. Natural processes and human activities emit greenhouse gas. The accumulation of greenhouse gases in the atmosphere regulates the earth's temperature. Without the natural heat-trapping effect of greenhouse gas, the earth's surface would be about 34°C cooler (CAT 2006). However, it is believed that emissions from human activities, such as electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere beyond the level of naturally occurring concentrations.

Climate change is driven by forcings and feedbacks. Radiative forcing is the difference between the incoming energy and outgoing energy in the climate system. A feedback is "an internal climate process that amplifies or dampens the climate response to a specific forcing" (NRC 2005). The global warming potential is the potential of a gas or aerosol to trap heat in the atmosphere; it is the "cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas" (EPA 2006a).

Individual greenhouse gas compounds have varying warming potentials and atmospheric lifetimes. The reference gas for the global warming potential is carbon dioxide; as shown in Table 2, carbon dioxide has a global warming potential of one. The calculation of the carbon dioxide equivalent is a consistent methodology for comparing greenhouse gas emissions since it normalizes various greenhouse gas emissions to a consistent metric. Methane's warming potential of 21 indicates that methane has a 21 times greater global warming effect than carbon dioxide on a molecule per

molecule basis (EPA 2006b). One million metric tons of carbon dioxide equivalent ($MMTCO_2e$) is the mass emissions of an individual greenhouse gas multiplied by its global warming potential.

The atmospheric lifetime and global warming potentials of selected greenhouse gases are summarized in Table 1. As shown in the table, global warming potentials range from 1 (carbon dioxide) to 23,900 (sulfur hexafluoride).

Table 1: Global Warming Potentials and Atmospheric Lifetimes of Select Greenhouse Gases

Greenhouse Gas	Atmospheric Lifetime (years)	Global Warming Potential (100-year time horizon)
Carbon Dioxide (CO_2)	50 – 200	1
Methane (CH_4)	12 ± 3	21
Nitrous Oxide (N_2O)	120	310
HFC-23	264	11,700
HFC-134a	14.6	1,300
HFC-152a	1.5	140
PFC: Tetrafluoromethane	50,000	6,500
PFC: Hexafluoroethane	10,000	9,200
Sulfur Hexafluoride	3,200	23,900
Source: EPA 2006b		

Water Vapor

Description: Of all greenhouse gases in the atmosphere, water vapor is the most abundant, important, and variable. It is not considered a pollutant; in the atmosphere, it maintains a climate necessary for life.

Health Effects: There are no health effects from water vapor. When some pollutants are exposed to water vapor, they can dissolve and then the water vapor can be a transport mechanism to enter the human body.

Sources: The main source of water vapor is evaporation from the oceans (JAC 2002). Other sources include evaporation from other water bodies, sublimation (change from solid to gas) from sea ice and snow, and transpiration from plant leaves.

Ozone

Description: Ozone (O_3) is known as a photochemical pollutant. Ozone is a greenhouse gas; however, unlike other greenhouse gases, ozone in the troposphere is relatively short-lived and therefore is not global in nature. It is difficult to make an accurate determination of the contribution of ozone precursors (nitrogen oxides [NO_x] and volatile organic compounds [VOC]) to climate

change (ARB 2004b). Ozone is not emitted directly into the atmosphere, but is formed by a complex series of chemical reactions between VOC, NO_x, and sunlight. VOC and NO_x are emitted from automobiles, solvents and fuel combustion, the sources of which are widespread throughout the South Coast Air Basin. In order to reduce ozone, it is necessary to control emissions of these ozone precursors such as NO_x. Significant ozone formation generally requires an adequate amount of precursors in the atmosphere and several hours in a stable atmosphere with strong sunlight. A reduction of ozone precursors reduces ozone. The conditions conducive to the formation of ozone include extended periods of daylight (solar radiation) and hot temperatures. These conditions are prevalent during the summer when thermal inversions are most likely to occur. As a result, summertime conditions of long periods of daylight and hot temperatures form ozone in the greatest quantities. During the summer, thermal inversions trap ozone from dispersing vertically, and high concentrations of this pollutant are prevalent.

Health Effects: Health effects of ozone can include the following: respiratory system irritation, reduction of lung capacity, asthma aggravation, inflammation of and damage to lung cells, aggravated cardiovascular disease, and permanent lung damage. The greatest health risk is to those who are more active outdoors during smoggy periods, such as children, athletes, and outdoor workers. Ozone also damages natural ecosystems such as forests and foothill communities, and damages agricultural crops (EPA 2003).

Sources: Ozone is a secondary pollutant, thus it is not emitted directly into the lower level of the atmosphere. The sources of ozone precursors (VOC and NO_x) are discussed above in the description of ozone.

Aerosols

Description: Aerosols are suspensions of particulate matter in a gas emitted into the air through burning biomass (plant material) and fossil fuels. Aerosols can warm the atmosphere by absorbing and emitting heat and can cool the atmosphere by reflecting light. Cloud formation can also be affected by aerosols. Sulfate aerosols are emitted when fuel containing sulfur is burned. Black carbon (or soot) is emitted during biomass burning and incomplete combustion of fossil fuels.

Health Effects: Particulate matter can be inhaled directly into the lungs where it can be absorbed into the bloodstream. It is a respiratory irritant and can cause direct pulmonary effects such as coughing, bronchitis, lung disease, respiratory illnesses, increased airway reactivity, and exacerbation of asthma (EPA 2003b). Particulate matter is also thought to have direct effects on the health, capacity, and productivity of the heart (EPA 2003b). Relatively recent mortality studies have shown a statistically significant direct association between mortality and daily concentrations of particulate matter in the air (EPA 2003b). Non-health effects include reduced visibility and soiling of property.

Sources: Sulfate aerosols are emitted when fuel containing sulfur is burned. Black carbon (or soot) is emitted during biomass burning and incomplete combustion of fossil fuels. The regulation of

particulate matter has been lowering aerosol concentrations in the United States; however, global concentrations are likely increasing.

Carbon Dioxide

Description: Carbon dioxide (CO_2) is an odorless, colorless natural greenhouse gas.

Health Effects: Outdoor levels of carbon dioxide are not high enough to result in negative health effects. The National Institute for Occupational Safety and Health reference exposure level is 5,000 ppm, averaged over 10 hours in a 40-hour workweek. The short-term reference exposure level is 30,000 ppm, averaged over 15 minutes. At those levels, potential health problems are as follows: headache, dizziness, restlessness, paresthesia (skin tingling, prickling, or numbness); dyspnea (breathing difficulty); sweating, malaise (vague feeling of discomfort); increased heart rate, cardiac output, blood pressure; coma; asphyxia; and/or convulsions (NIOSH 2005).

Sources: Carbon dioxide is emitted from natural and anthropogenic sources. Natural sources include the following: decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Anthropogenic sources are from burning coal, oil, natural gas, and wood. Concentrations of carbon dioxide were 379 ppm in 2005, which is an increase of 1.4 ppm per year since 1960 (IPCC 2007). The concentration of carbon dioxide in the atmosphere is projected to increase to a minimum of 540 ppm by 2100 as a direct result of anthropogenic sources (IPCC 2001).

Sinks: Sinks are mechanisms by which a gas or aerosol is taken out of the atmosphere. Carbon dioxide is removed from the air by photosynthesis, dissolution into ocean water, transfer to soils and ice caps, and mineral sequestration into solid carbonate salts (surface limestone or calcium carbonate).

Methane

Description: Methane (CH_4) is a flammable gas and is the main component of natural gas. When one molecule of methane is burned in the presence of oxygen, one molecule of carbon dioxide and two molecules of water are released.

Health Effects: There are no ill health effects from methane. The immediate health hazard is that it may cause burns if it ignites. It is highly flammable and may form explosive mixtures with air. Methane is violently reactive with oxidizers, halogens, and some halogen-containing compounds. Methane is also an asphyxiant and may displace oxygen in an enclosed space (OSHA 2003).

Sources: A natural source of methane is from the anaerobic decay of organic matter. Geological deposits, known as natural gas fields, also contain methane, which is extracted for fuel. Other sources are from landfills, fermentation of manure, and ruminants such as cattle.

Nitrous Oxide

Description: Nitrous oxide (N_2O), also known as laughing gas, is a colorless greenhouse gas.

Health Effects: Higher concentrations can cause dizziness, euphoria, and sometimes-mild hallucinations.

Sources: Nitrous oxide is produced by microbial processes in soil and water, including those reactions that occur in fertilizer containing nitrogen. In addition to agricultural sources, some industrial processes (fossil fuel-fired power plants, nylon production, nitric acid production, and vehicle emissions) also contribute to its atmospheric load. It is used in rocket engines, racecars, and as an aerosol spray propellant.

Chlorofluorocarbons

Description: Chlorofluorocarbons (CFCs) are gases formed synthetically by replacing all hydrogen atoms in methane or ethane with chlorine and/or fluorine atoms. CFCs are nontoxic, nonflammable, insoluble, and chemically unreactive in the troposphere (the level of air at the earth's surface).

Health Effects: CFCs are no longer being used; therefore, it is not likely that health effects would be experienced. Nonetheless, in confined indoor locations, working with CFC-113 or other CFCs are thought to result in death by cardiac arrhythmia (heart frequency too high or too low) or asphyxiation (NIOSH 1989).

Sources: CFCs were first synthesized in 1928 for use as refrigerants, aerosol propellants, and cleaning solvents. They destroy stratospheric ozone; therefore, their production was stopped as required by the Montreal Protocol in 1987.

Hydrofluorocarbons

Description: Hydrofluorocarbons (HFCs) are synthetic man-made chemicals that are used as a substitute for CFCs. Of all the greenhouse gases, they are one of three groups with the highest global warming potential. The HFCs with the largest measured atmospheric abundances are (in order), HFC-23 (CHF_3), HFC-134a (CF_3CH_2F), and HFC-152a (CH_3CHF_2) (EPA 2006c). Prior to 1990, the only significant emissions were HFC-23. HFC-134a use is increasing due to its use as a refrigerant. Concentrations of HFC-23 and HFC-134a are now about 10 parts per trillion (ppt) each (EPA 2006c). Concentrations of HFC-152a are about 1 ppt.

Health Effects: Most HFCs do not have health effects associated with them. For example, 1, 1-difluoroethane (HCFC-152A) does not have any adverse health effects (EPA 1995). However, HFC-134a has a chronic inhalation exposure of 80 mg/m3; the critical effect is Leydig cell hyperplasia (EPA 1995).

Sources: HFCs are man made for applications such as automobile air conditioners and refrigerants.

Perfluorocarbons

Description: Perfluorocarbons (PFCs) have stable molecular structures and do not break down through the chemical processes in the lower atmosphere. High-energy ultraviolet rays about 60 kilometers above Earth's surface are able to destroy the compounds. Because of this, PFCs have very long lifetimes, between 10,000 and 50,000 years. Two common PFCs are tetrafluoromethane (CF_4) and hexafluoroethane (C_2F_6). Concentrations of CF_4 in the atmosphere are over 70 ppt (EPA 2006c).

Health Effects: High concentrations of CF_4 can cause confusion, dizziness, or headache and may cause effects on the cardiovascular system, resulting in cardiac disorders (NIOSH 1997).

Sources: The two main sources of PFCs are primary aluminum production and semiconductor manufacture.

Sulfur Hexafluoride

Description: Sulfur hexafluoride is an inorganic, odorless, colorless, nontoxic, nonflammable gas. It also has the highest global warming potential of any gas evaluated, 23,900. Concentrations in the 1990s were about 4 ppt (EPA 2006c).

Health Effects: In high concentrations in confined areas, the gas presents the hazard of suffocation because it displaces the oxygen needed for breathing.

Sources: Sulfur hexafluoride is used for insulation in electric power transmission and distribution equipment, in the magnesium industry, in semiconductor manufacturing, and as a tracer gas for leak detection.

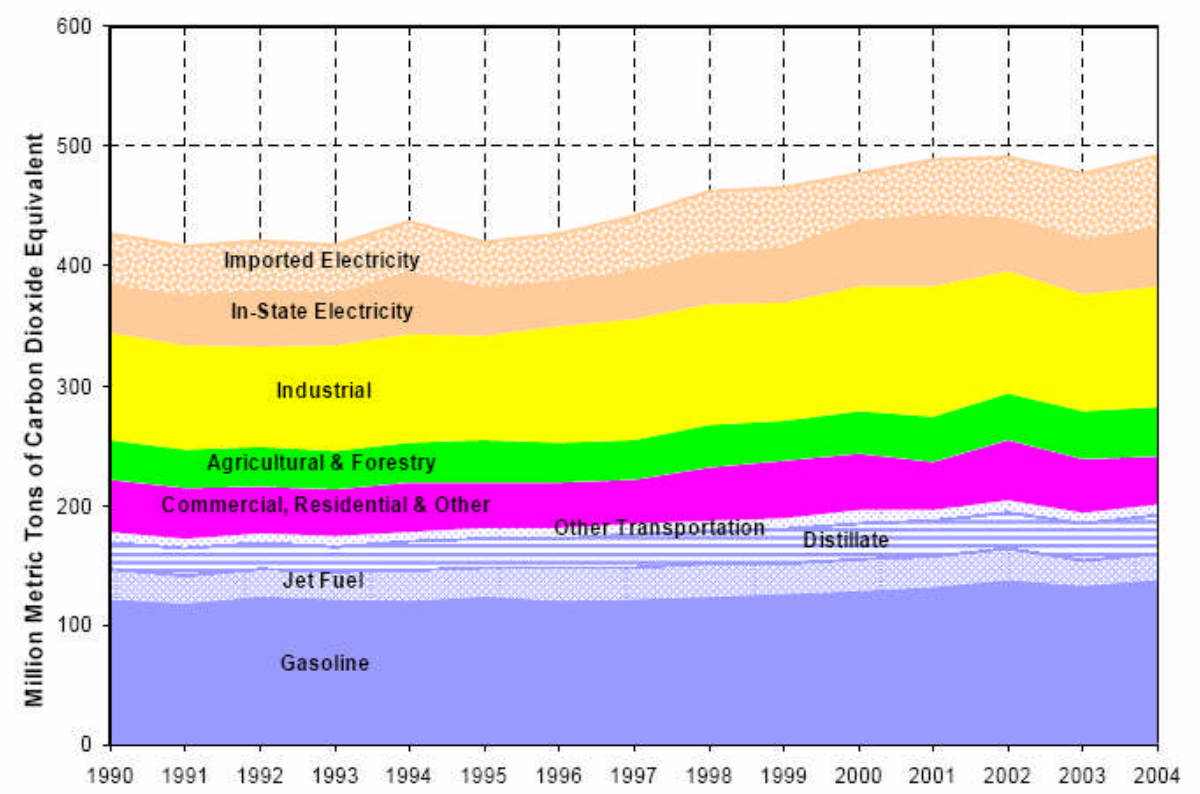
2.1.1 - Federal Inventory

In 2004, total worldwide greenhouse gas emissions were estimated to be 20,135 $MMTCO_2e$, excluding emissions/removals from land use, land use change, and forestry (UNFCCC 2006). (Note that sinks, or greenhouse gas removal processes, play an important role in the greenhouse gas inventory as forest and other land uses absorb carbon.) In 2004, greenhouse gas emissions in the U.S. were 7,074.4 $MMTCO_2e$ (EPA 2006a). In 2005, total U.S. greenhouse gas emissions were 7,260.4 $MMTCO_2e$, a 16.3 percent increase from 1990 emissions, while U.S. gross domestic product has increased by 55 percent over the same period (EPA 2007a). Emissions rose from 2004 to 2005, increasing by 0.8 percent. The main causes of the increase are believed to be: (1) strong economic growth in 2005, leading to increased demand for electricity, and (2) an increase in the demand for electricity due to warmer summer conditions (EPA 2007a). However, a decrease in demand for fuels due to warmer winter conditions and higher fuel prices moderated the increase in emissions (EPA 2007a).

2.1.2 - State Inventory

California is a substantial contributor of greenhouse gases as it is the second largest contributor in the U.S. and the sixteenth largest in the world (CEC 2006). In 2004, California produced 500 $MMTCO_2e$ (CEC 2007), including imported electricity and excluding combustion of international fuels and carbon sinks or storage, which is approximately 7 percent of U.S. emissions. The major source of greenhouse gases in California is transportation, contributing 41 percent of the State's total greenhouse gas emissions (CEC 2006). Electricity generation is the second largest source, contributing 22 percent of the State's greenhouse gas emissions (CEC 2006). Exhibit 4 shows that emissions for the major energy sectors vary over time.

Exhibit 4: California's Gross Greenhouse Gas Emission Trends



Source: California Energy Commission. December 2006. Inventory of California Greenhouse Gas Emissions and Sinks: 1990 to 2004. Staff Final Report. (CEC 2006)

2.1.3 - Local Inventory

The local agencies (i.e., the South Coast Air Quality Management District [SACQMD] or the City) have not developed a local inventory of greenhouse gases.

2.2 - Regulatory Environment

2.2.1 - International and Federal

International and Federal legislation has been enacted to deal with global climate change issues. The Montreal Protocol was originally signed in 1987 and substantially amended in 1990 and 1992. The Montreal Protocol governs compounds that deplete ozone in the stratosphere—chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform. The Protocol provided that these compounds were to be phased out by 2000 (2005 for methyl chloroform).

In 1988, the United Nations and the World Meteorological Organization established the Intergovernmental Panel on Climate Change to assess "the scientific, technical and socio-economic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts, and options for adaptation and mitigation" (IPCC 2004).

On March 21, 1994, the United States joined a number of countries around the world in signing the United Nations Framework Convention on Climate Change. Under the Convention, governments do the following: gather and share information on greenhouse gas emissions, national policies, and best practices; launch national strategies for addressing greenhouse gas emissions and adapting to expected impacts, including the provision of financial and technological support to developing countries; and cooperate in preparing for adaptation to the impacts of climate change (UNFCCC 2007).

A particularly notable result of the United Nations Framework Convention on Climate Change efforts was a treaty known as the Kyoto Protocol. When countries sign the treaty, they demonstrate their commitment to reduce their emissions of greenhouse gases or engage in emissions trading. More than 160 countries—representing 55 percent of global emissions—are currently participating in the protocol. In 1998, United States Vice President Al Gore symbolically signed the Protocol; however, in order for the Protocol to be formally ratified, it must be ratified by the United States Congress. This was not done by the Congress during the Clinton Administration, and the current US President, George W. Bush, has indicated that he does not intend to submit the treaty for ratification.

In October 1993, President Clinton announced his Climate Change Action Plan, which had a goal to return greenhouse gas emissions to 1990 levels by the year 2000. This was to be accomplished through 50 initiatives that relied on innovative voluntary partnerships between the private sector and government aimed at producing cost-effective reductions in greenhouse gas emissions.

The U.S. EPA currently does not regulate greenhouse gas emissions from motor vehicles. *Massachusetts v. EPA* (Supreme Court Case 05-1120) was argued before the United States Supreme Court on November 29, 2006, in which it was petitioned that EPA regulate four greenhouse gases, including carbon dioxide, under Section 202(a)(1) of the Clean Air Act. A decision was made on

April 2, 2007, in which the Court held that petitioners have a standing to challenge the EPA and that the EPA has statutory authority to regulate emissions of greenhouse gases from new motor vehicles.

2.2.2 - California

There has been significant legislative activity regarding global climate change and greenhouse gases in California. Although it was not originally intended to reduce greenhouse gases, California Code of Regulations Title 24 Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings, was first adopted in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. The latest amendments were made in October 2005 and currently require new homes to use half the energy they used only a decade ago. Energy efficient buildings require less electricity, and electricity production by fossil fuels results in greenhouse gas emissions. Therefore, increased energy efficiency results in decreased greenhouse gas emissions.

California Assembly Bill 1493 (Pavley), enacted on July 22, 2002, required the ARB to develop and adopt regulations that reduce greenhouse gases emitted by passenger vehicles and light-duty trucks. Regulations adopted by the ARB would apply to 2009 and later model year vehicles. The ARB estimates that the regulation would reduce climate change emissions from the light-duty passenger vehicle fleet by an estimated 18 percent in 2020 and by 27 percent in 2030 (ARB, 2004).

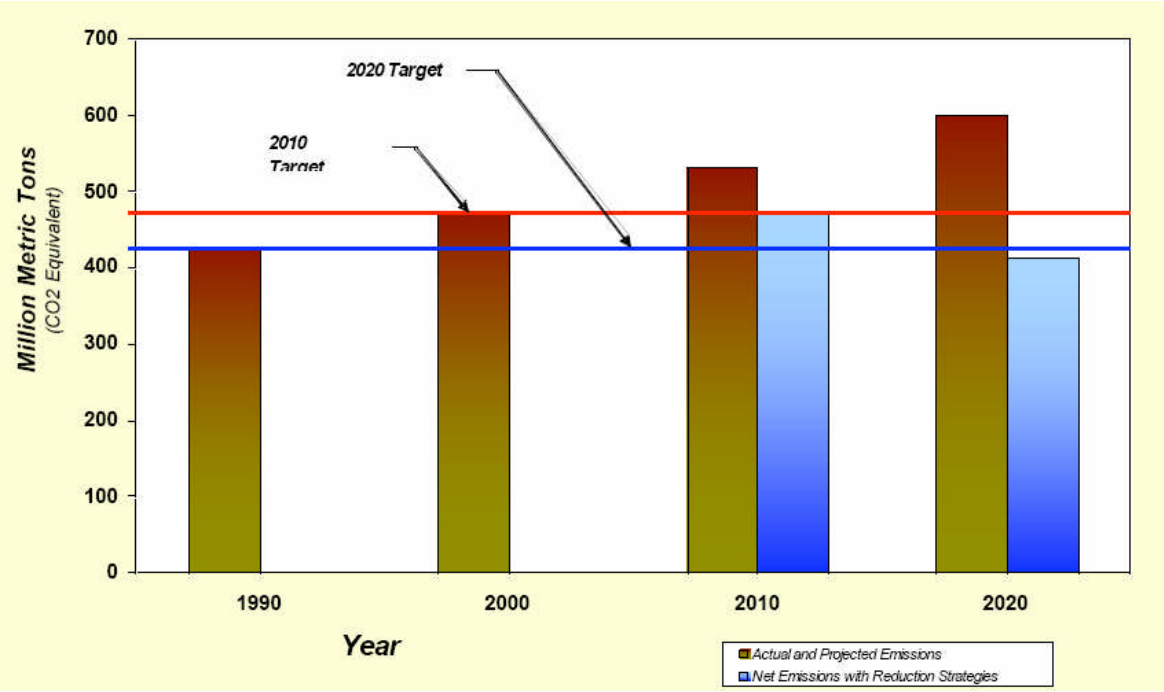
California Governor Arnold Schwarzenegger announced on June 1, 2005, through Executive Order S-3-05, the following greenhouse gas emission reduction targets:

- by 2010, reduce greenhouse gas emissions to 2000 levels;
- by 2020, reduce greenhouse gas emissions to 1990 levels; and
- by 2050, reduce greenhouse gas emissions to 80 percent below 1990 levels (CA 2005).

To meet these targets, the Governor directed the Secretary of the California EPA to lead a Climate Action Team (CAT) made up of representatives from the Business, Transportation and Housing Agency; the Department of Food and Agriculture; the Resources Agency; the Air Resources Board; the Energy Commission; and the Public Utilities Commission. The CAT's Report to the Governor in 2006 contains recommendations and strategies to help ensure the targets in Executive Order S-3-05 are met (CAT 2006).

The CAT report (2006) contains baseline emissions as estimated by the ARB and the California Energy Commission, as shown in Exhibit 5 below.

Exhibit 5: California Greenhouse Gas Emissions



Source: State of California, Environmental Protection Agency, Climate Action Team. March 2006. Climate Action Team Report to Governor Schwarzenegger and the California Legislature. (CAT 2006).

Executive Order S-01-07 was enacted by the Governor on January 18, 2007. The order mandates that a statewide goal shall be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020. It also requires that a Low Carbon Fuel Standard for transportation fuels be established for California.

The Western Climate Initiative was signed on February 26, 2007 by five states: Washington, Oregon, Arizona, New Mexico, and California. British Columbia, Canada joined on April 20, 2007. Members of the Initiative plan on collaborating to identify, evaluate, and implement ways to reduce greenhouse gas emissions in the states collectively and to achieve related co-benefits. Members also plan to design a regional market-based multi-sector mechanism, such as a load-based cap and trade program, by August 2008. In addition, a multi-state registry will track, manage, and credit entities that reduce greenhouse gas emissions. The Initiative published its regional greenhouse gas reduction goals on August 22, 2007, which include a reduction of 15 percent below 2005 levels by 2020 (WCI 2007).

California is also exploring the possibility of cap and trade systems for greenhouse gases. The Market Advisory Committee to the ARB published draft recommendations for designing a greenhouse gas cap and trade system for California (MAC 2007).

SB 97 was passed in August 2007. SB 97 indicates that Section 21083.05 will be added to the Public Resources Code, "(a) On or before July 1, 2009, the Office of Planning and Research shall prepare, develop, and transmit to the Resources Agency guidelines for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions as required by this division, including, but not limited to, effects associated with transportation or energy consumption. (b) On or before January 1, 2010, the Resources Agency shall certify and adopt guidelines prepared and developed by the Office of Planning and Research pursuant to subdivision (a)" (SB 97). Section 21097 is also added to the Public Resources Code and indicates that the failure to analyze adequately the effects of greenhouse gases in a document related to the environmental review of a transportation project funded under the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006 does not create a cause of action for a violation. However, SB 97 does not safeguard non-transportation funded projects from being challenged in court for omitting a global climate change analysis.

AB 32

In 2006, the California State Legislature adopted AB 32, the California Global Warming Solutions Act of 2006. AB 32 focuses on reducing greenhouse gas emissions in California. Greenhouse gases, as defined under AB 32, include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. AB 32 requires that greenhouse gases emitted in California be reduced to 1990 levels by the year 2020. ARB is the state agency charged with monitoring and regulating sources of emissions of greenhouse gases that cause global warming in order to reduce emissions of greenhouse gases. AB 32 requires that by January 1, 2008, ARB must determine what the statewide greenhouse gas emissions level was in 1990, and it must approve a statewide greenhouse gas emissions limit so it may be applied to the 2020 benchmark.

The ARB Board approved the 1990 greenhouse gas emissions level of 427 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) on December 6, 2007. Therefore, in 2020, emissions in California are required to be at or below 427 $MMTCO_2e$.

Under AB 32, the ARB published its Final Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California (ARB 2007b). Discrete early action measures are currently underway or are enforceable by January 1, 2010. Early action measures are regulatory or non-regulatory and are currently underway or to be initiated by the ARB in the 2007 to 2012 timeframe. The ARB has 44 early action measures that apply to the transportation, commercial, forestry, agriculture, cement, oil and gas, fire suppression, fuels, education, energy efficiency, electricity, and waste sectors. Of those early action measures, nine are considered discrete early action measures, as they are regulatory and enforceable by January 1, 2010. The ARB estimates that the 44 recommendations are expected to result in reductions of at least 42 $MMTCO_2e$ by 2020, representing approximately 25 percent of the 2020 target. Note that the ARB currently defers measures involving General Plans and CEQA; early action is not recommended.

Under AB 32, the ARB has the primary responsibility for reducing greenhouse gas emissions. However, the CAT Report contains strategies that many other California agencies can take. The CAT published a public review draft of Proposed Early Actions to Mitigate Climate Change in California (CAT 2007). Most of the strategies were in the 2006 CAT Report or are similar to the 2006 CAT strategies.

2.2.3 - Local Public Agencies

The local agencies such as the SCAQMD and the City do not currently have formal reduction plans or legislation regarding greenhouse gases.

SECTION 3: THRESHOLDS OF SIGNIFICANCE AND ANALYTICAL APPROACH

3.1 - Thresholds of Significance

CEQA requires that Lead Agencies inform decision makers and the public regarding potential significant environmental effects of proposed projects and feasible ways that environmental damage can be avoided or reduced, through the use of feasible mitigation measures and/or project alternatives, and disclose the reasons why the Lead Agency approved a project if significant environmental effects are involved (CEQA Guidelines Section 15002). CEQA also requires Lead Agencies to evaluate potential environmental effects based on, to the fullest extent possible, scientific and factual data (CEQA Guidelines Section 15064[b]). Significance conclusions must be based on substantial evidence, which includes facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts (CEQA Guidelines Section 15064f[5]).

There are currently no published thresholds of significance established by any state or regional regulatory agency for measuring the impact of global climate change on or from a project. CEQA Guidelines Section 15064.7 indicates, "each public agency is encouraged to develop and publish thresholds of significance that the agency uses in the determination of the significance of environmental effects."

Although it is unknown if AB 32 alone is enough to reduce California's fair-share contribution to global greenhouse gas inventory, it is currently the only well-defined and widely accepted benchmark for greenhouse gas emissions in California. Therefore, the threshold to be used for this project is as follows:

> Greenhouse gas emissions created by the project are considered to be potentially significant if the project would result in an increase in greenhouse gas emissions that would significantly hinder or delay California's ability to meet the reduction targets contained in AB 32.

Note that the threshold and the analysis contained in this report may not be relevant to other projects. Therefore, this analysis does not establish thresholds in the City or set precedence for the type of assessment in a global climate change analysis.

3.2 - Analytical Approach

There are two ways to address global climate change: on a project level basis and a cumulative basis. Even though global climate change is cumulative in nature, CEQA requires both a project level and a cumulative level approach. Therefore, both analyses are contained herein and are described below. There are numerous resources available to project applicants that provide strategies for reducing greenhouse gas emissions. Although compliance with these strategies are not required by law, they

provide guidance in this new area of environmental protection. For this reason, they are discussed below. Impacts to the project from climate change are also addressed.

3.2.1 - Project Level Analysis Approach

There are no project-level thresholds to measure the significance of a project's impact on global climate change. Thus, a standard CEQA "significance" determination is difficult to make in this context. Nevertheless, according to a paper presented by the Association of Environmental Professionals (AEP 2007), the following two-part approach may be used to address greenhouse gas thresholds and assess the significance of the project's contribution to global climate change:

1. **Inventory:** Generate an inventory of greenhouse gas emissions by the project. The inventory is presented for informational purposes and compared to the inventory for California and the United States.

2. **Compliance with Strategies:** Assess project compliance with the current California emission reduction strategies to reduce greenhouse gases.

3.2.2 - Cumulative Level Analysis Approach

Section 15130(b) of the CEQA Guidelines states the following:

> The following elements are necessary to an adequate discussion of significant cumulative impacts: 1) Either: (A) A list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or (B) A summary of projections contained in an adopted general plan or related planning document, or in a prior environmental document which has been adopted or certified, which described or evaluated regional or areawide conditions contributing to the cumulative impact.

The approach to be used to address cumulative impacts is the list of projects approach. The City or the SCAQMD do not have a summary of projections contained in an adopted planning document related to greenhouse gases or climate change.

SECTION 4: IMPACT ANALYSIS

The following impact analysis addresses global climate change on a project level and cumulative level. Impacts to the project from climate change are also addressed.

4.1 - Project-Level Analysis

4.1.1 - Project Inventory of Greenhouse Gases

An inventory of construction and operation-related greenhouse gas emissions generated by the project is presented below.

Construction

The project would emit greenhouse gases from combustion of fuels from worker vehicles and construction equipment. The project emissions of carbon dioxide from project construction are shown in Table 2 below. Emissions of nitrous oxide and methane are negligible. Emissions were estimated using URBEMIS2007 as discussed in the Air Quality Analysis Report prepared by Michael Brandman Associates (MBA 2007). As shown in Table 2, construction would emit approximately 3744 tons of carbon dioxide or 0.0034 $MMTCO_2e$.

Table 2: Construction Exhaust Greenhouse Gas Emissions (Unmitigated)

Activity	Carbon Dioxide Emissions (tons)	$MMTCO_2e$*
Mass grading	793	0.0007
Fine grading	124	0.0001
Trenching	60	0.0001
Asphalt paving	64	0.0001
Building	2,683	0.0024
Coating	20	0.0000
Total	**3,744**	**0.0034**

Source: URBEMIS2007, Appendix A
* Million metric tons of carbon dioxide equivalent converted from tons of carbon dioxide by multiplying by 0.902 and dividing by 1,000,000

Operation

During operation of the project, greenhouse gas emissions would result from motor vehicles (cars and small trucks visiting the project site), natural gas consumption, indirect emissions from electricity generation, indirect emissions from water transportation, landscape, fugitive refrigerants (air conditioning and refrigerator). A summary of the anticipated greenhouse gas emissions from operation of the proposed project is presented in Table 3.

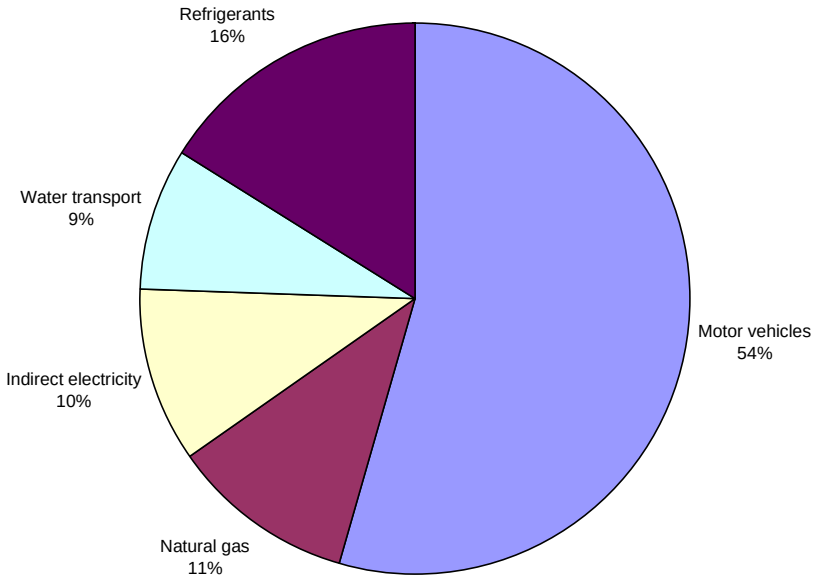
Table 3: Project Operational Greenhouse Gas Emissions (Unmitigated)

Source	$MTCO_2e$ per year	$MMTCO_2e$ per year
Motor vehicles	10,769	0.011
Natural gas	2,175	0.002
Indirect electricity	2,004	0.002
Hearth	3	0.000
Water transport	1,685	0.002
Landscape	2	0.000
Refrigerants	3,163	0.003
Total	**19,801**	**0.020**

Source: URBEMIS2007 output and spreadsheets contained in Appendix A
$MTCO_2e$ = metric tons of carbon dioxide equivalent
$MMTCO_2e$ = million metric tons of carbon dioxide equivalent

Project operational emissions of carbon dioxide equivalents are displayed in Exhibit 6. As shown in Exhibit 6, the major sources of operational greenhouse gases are from motor vehicles, contributing approximately 54% of the total carbon dioxide equivalents.

Exhibit 6: Project Operational Carbon Dioxide Equivalent Emissions at Buildout (Unmitigated)



At buildout, total unmitigated carbon dioxide equivalents would be approximately 19801 $MTCO_2E$ per year, or 0.02 million metric tons of carbon dioxide equivalents ($MMTCO_2e$) per year, which is 0.004 percent of California's 2004 emissions (0.02 $MMTCO_2e$ divided by 500 $MMTCO_2e$ = 0.00004 x 100 = 0.004 percent). The project inventory is 0.0003 percent of 2005 U.S. emissions (7,260.4 $MMTCO_2e$) and 0.00001 percent of reported 2004 global emissions (20,135 $MMTCO_2e$).

Note that emissions models such as URBEMIS evaluate aggregate emissions and do not demonstrate, with respect to a global impact, how much of these emissions are "new" emissions specifically attributable to the proposed project.

Negligible Greenhouse Gas Emissions

The project does not contribute substantially to water vapor because water vapor concentrations in the upper atmosphere are primarily due to climate feedbacks rather than emissions from project-related activities.

Ozone is a greenhouse gas; however, unlike the other greenhouse gases, ozone in the troposphere is relatively short-lived and therefore is not global in nature. According to the ARB, it is difficult to make an accurate determination of the contribution of ozone precursors (NO_x and VOCs) to global warming (ARB 2004b). Therefore, it is assumed that project emissions of ozone precursors would not significantly contribute to global climate change.

As mentioned previously, there is a ban on chlorofluorocarbons; therefore, the project would not generate emissions of these greenhouse gases and they are not considered any further in this analysis.

Perfluorocarbons and sulfur hexafluoride are typically used in industrial applications, none of which would be used by the project. Therefore, it is not anticipated that the project would emit any of these greenhouse gases.

4.1.2 - Compliance with State Strategies

To assess compliance with California strategies to reduce greenhouse gas emissions, two main documents are used. The first is the 2006 Climate Action Team Report to Governor Schwarzenegger (2006 CAT Report) and the second is the ARB's early action measures for AB 32.

2006 CAT Report and AB 32

As discussed above in Section 2.2.2, California Governor Arnold Schwarzenegger announced on June 1, 2005 through Executive Order S-3-05, greenhouse gas emission reduction targets as follows:

- By 2010, reduce greenhouse gas emissions to 2000 levels;
- By 2020, reduce greenhouse gas emissions to 1990 levels;
- By 2050, reduce greenhouse gas emissions to 80 percent below 1990 levels (CA 2005).

Similar to Executive Order S-3-05, AB 32 requires that by January 1, 2008, the ARB shall determine what the statewide greenhouse gas emissions level was in 1990, and approve a statewide greenhouse gas emissions limit that is equivalent to that level, to be achieved by 2020.

The 2006 CAT Report is not in response to AB 32; however, the 2006 CAT Report introduces strategies that can be implemented by the ARB and other California agencies to reduce California's emissions to 1990 levels by 2020, which is the same target for AB 32. In addition, the 2006 CAT Report is consistent with the intent of AB 32. AB 32 contains a timeline for development and approval of strategies to reduce state emissions. The bulk of the strategies are not yet developed. Therefore, in the absence of climate change thresholds and standards, the strategies published for Executive Order S-3-05 are used for this analysis because it contains the most complete list of strategies as of the date of this analysis.

An assessment of project consistency with the 2006 CAT Report strategies is contained in Table 4. As shown in the table, with mitigation, the project is consistent the applicable strategies.

Table 4: California Greenhouse Gas Emission Reduction Strategies

Agency	Greenhouse Gas Emission Reduction Strategy	Consistency Analysis
California Air Resources Board	**Vehicle Climate Change Standards** AB 1493 required the State to develop and adopt regulations that achieve the maximum feasible and cost-effective reduction of climate change emissions emitted by passenger vehicles and light-duty trucks. Regulations were adopted by the ARB in September 2004.	**Consistent**: The vehicles that access the project will be in compliance with any vehicle standards that CARB proposes.
California Air Resources Board	**Diesel Anti-Idling** In July 2004, the CARB adopted a measure to limit diesel-fueled commercial motor vehicle idling.	**Consistent**: Mitigation AIR-3b includes provisions intended to prevent idling of delivery trucks to the community center.
	Hydrofluorocarbon Reduction (1) Ban retail sale of HFC in small cans; (2) require that only low GWP refrigerants be used in new vehicular systems; (3) adopt specifications for new commercial refrigeration; (4) add refrigerant leak-tightness to the pass criteria for vehicular inspection and maintenance programs; (5) enforce federal ban on releasing HFCs.	**Consistent**: This measure applies to consumer products. When CARB adopts regulations for these reduction measures, any products that the regulations apply to will comply with the measures.
	Transportation Refrigeration Units (TRUs), Off-Road Electrification, Port Electrification Strategies to reduce emissions from TRUs, increase off-road electrification, and increase use of shore-side/port electrification.	**Consistent**: The project is not expected to have TRUs visiting the project site, but Mitigation AIR-3b limits idling for delivery trucks.

Table 5: California Greenhouse Gas Emission Reduction Strategies (Cont.)

Agency	Greenhouse Gas Emission Reduction Strategy	Consistency Analysis
	Heavy-Duty Vehicle Emission Reduction Measures Increased efficiency in the design of heavy-duty vehicles and an education program for the heavy-duty vehicle sector.	**Consistent**: These are CARB-enforced standards; vehicles that access the project that are required to comply with the standards will comply with the strategy.
	Achieve 50% Statewide Recycling Goal Achieving the State's 50 percent waste diversion mandate as established by the Integrated Waste Management Act of 1989 (AB 939, Sher, Chapter 1095, Statutes of 1989) will reduce climate change emissions associated with energy-intensive material extraction and production as well as methane emission from landfills. A diversion rate of 48% has been achieved on a statewide basis. Therefore, a 2% additional reduction is needed.	**Consistent**: Mitigation Measures US-XX and US-XX require the proposed project to implement recycling and waste diversion measures during the construction and operation phases, respectively.
Department of Forestry	**Urban Forestry** A new statewide goal of planting 5 million trees in urban areas by 2020 would be achieved through the expansion of local urban forestry programs.	**Consistent**: Specific Plan contains extensive landscaping including hundreds of trees that will grow to maturity in this location. Trees are expected to be both low emitters of VOC and efficient users of water.
Department of Water Resources	**Water Use Efficiency** Approximately 19 percent of all electricity, 30 percent of all natural gas, and 88 million gallons of diesel are used to convey, treat, distribute and use water and wastewater. Increasing the efficiency of water transport and reducing water use would reduce greenhouse gas emissions.	**Consistent**: The proposed project would incorporate a variety of design features intended to promote sustainability through trip reduction and energy and water conservation. Water conservation measures are designed into the project; including: a recycled water system for landscape irrigation that eliminates the need to use potable water for outdoor watering; re-circulating hot water systems to reduce the need to heat water; tankless hot water heaters that reduce water consumption; green roofs that capture stormwater runoff during the rainy season and keep building interiors cool during warmer months; bioswales that promote percolation of stormwater runoff and reduce the need for pumping stormwater through a conveyance system; evapotranspiration-based water controllers that adjust outdoor irrigation in response to weather conditions; water budgets for landscape irrigation to monitor and regulate outdoor water usage; waterless urinals in non-residential buildings to reduce water usage.

Table 5: California Greenhouse Gas Emission Reduction Strategies (Cont.)

Agency	Greenhouse Gas Emission Reduction Strategy	Consistency Analysis
California Energy Commission	**Building Energy Efficiency Standards in Place and in Progress** Public Resources Code 25402 authorizes the CEC to adopt and periodically update its building energy efficiency standards (that apply to newly constructed buildings and additions and alterations to existing buildings).	**Consistent**: The proposed project would incorporate a variety of design features intended to promote sustainability through trip reduction and energy and water conservation. Mitigation Measure AIR-9a requires implementation of extensive energy conservation measures including: use of glass windows to promote natural day lighting of interior areas to reduce need for lighting, occupancy sensors that automatically shut off lights when rooms are unoccupied, high-efficiency clothes washers and dishwashing machines, re-circulating hot water systems, and tankless water heaters.
	Appliance Energy Efficiency Standards in Place and in Progress Public Resources Code 25402 authorizes the Energy Commission to adopt and periodically update its appliance energy efficiency standards (that apply to devices and equipment using energy that are sold or offered for sale in California).	**Consistent**: Mitigation Measure AIR-9a requires the use of occupancy sensors that automatically shut off lights when rooms are unoccupied, high-efficiency clothes washers and dishwashing machines, recirculating hot water systems, and tankless water heaters.
Building, Transportation, and Housing Agency	**Smart Land Use and Intelligent Transportation Systems (ITS)** Smart land use, demand management, ITS, and value pricing are critical elements in this plan for improving mobility and transportation efficiency. Specific strategies include promoting jobs/housing proximity and transit-oriented development; encouraging high density residential/commercial development along transit/rail corridor; valuing and congestion pricing; implementing intelligent transportation systems, traveler information/traffic control, and incident management; accelerating the development of broadband infrastructure; and comprehensive, integrated, multimodal/intermodal transportation planning.	**Consistent**: The proposed project is not an in-fill project or a mixed-use project. However, it is designed to provide a pedestrian-oriented environment that is also readily accessible for bicycles and public transit in proximity to the Cal State San Bernardino campus. The project is located within walking distance of several major existing activity centers, including the CSUSB campus and several smaller shopping centers at University Parkway and Kendall Drive. The proposed project is located next to the Chestnut Trail and will have pedestrian/bike connections with the trail at several points. The project includes a community center that would be served by OmniTrans bus service, including routes serving destinations in the City of San Bernardino and elsewhere. Mitigation Measure AQ-3a requires the project to provide bicycle parking at the community center and all parks. All of these measures are consistent with smart land use and ITS strategies.

Table 5: California Greenhouse Gas Emission Reduction Strategies (Cont.)

Agency	Greenhouse Gas Emission Reduction Strategy	Consistency Analysis
	Measures to Improve Transportation Energy Efficiency Builds on current efforts to provide a framework for expanded and new initiatives including incentives, tools, and information that advance cleaner transportation and reduce climate change emissions.	**Consistent**: The proposed project promotes fuel conservation through design features, which promote pedestrian traffic, and programs that encourage employee carpooling and public transportation use.
State Consumer Services Agency	**Green Buildings Initiative** Green Building Executive Order, S-20-04 (CA 2004), sets a goal of reducing energy use in public and private buildings by 20 percent by the year 2015, compared with 2003 levels. The Executive Order and related action plan spell out specific actions State agencies are to take with state-owned and -leased buildings. The order and plan also discuss various strategies and incentives to encourage private building owners and operators to achieve the 20 percent target.	**Consistent**: Mitigation Measure AIR-9b requires the project to exceed the 2005 Title 24 standards. Mitigation Measure US-1a, US-1b, and US-1c require the project to implement several water conservation measures. Mitigation Measure US-5 requires the project to implement energy conservation measures.
Source: Strategies are from California Climate Action Team, 2006.		

Compliance with ARB Early Action Measures for AB 32

Under AB 32, the ARB has the primary responsibility to reduce greenhouse gas emissions in California. The ARB published a list of early action measures to reduce greenhouse gases in California (ARB 2007b). The ARB anticipates that these early action measures will reduce emissions by 25 percent of the 2020 target. Other measures will follow in the coming years. A review of the ARB's reduction measures underway or to be initiated by the ARB in the 2007 to 2012 timeframe indicates that only a few measures would be applicable to the project. Some of the measures are regulatory and some are non-regulatory. Many of the measures have not been considered by the ARB Board as of yet. Therefore, if the proposed project voluntarily chooses to be consistent with the strategies, then it would be consistent with the State's strategies to reduce climate change ahead of schedule.

Cool Communities Program

The Cool Communities Program is anticipated to have a ARB hearing date in the third quarter of 2008. This program is recommended to be a non-regulatory voluntary program with guidelines to foster the establishment or transition to cool communities in California. The strategies to be adopted in the Cool Communities Program guidelines include the following:

- **Cool Roofs.** Cool roof programs as part of the Building Energy Efficiency standards (Title 24) can save as much as 15 percent of cooling energy use during hot months of the year. The

per-house cost premium is estimated at about $500 (ARB 2007b). However, the cost for industrial warehouses and other uses was not provided.

- **Cool Pavements.** Cool pavements can reduce the ambient air temperature by 1 degree Fahrenheit, thereby reducing energy cooling demand. (ARB 2007b)

- **Shade Trees and Urban Forest.** Shade trees would reduce potential heat island effects and reduce heating and cooling needs.

Summary

If the project were to take part in the voluntary early action strategies, it would be consistent with the strategies. As the project is designed currently, it does not comply with all the strategies. However, with mitigation, the project would comply with the applicable and feasible strategies.

4.1.3 - Level of Significance before Mitigation

Potentially significant.

Without mitigation, the project does not comply with all of California's strategies to reduce greenhouse gas emissions.

4.1.4 - Level of Significance after Mitigation

Less than significant.

Mitigation measures that improve the efficiency of construction as contained in the Air Quality Analysis (MBA 2007) would reduce emissions of carbon dioxide during construction from worker trips and the construction equipment. The reductions afforded by the construction mitigation measures is at least 5% of the estimated emissions.

Mitigation measures contained in the Air Quality Analysis (MBA 2007), project design features (see Section 1.2), and the new mitigation measures as listed in Section 1.1 would reduce greenhouse gases as well.

With the project design features, mitigation measures in this analysis, and the mitigation measures in the Air Quality Analysis, the project would comply with 1) all applicable state strategies in the 2006 CAT Report to reduce greenhouse gases to levels proposed under Executive Order S-3-05 and 2) all applicable ARB early reduction strategies for AB 32 to reduce greenhouse gas emissions in California.

In summary, the project level analysis indicates that the project would have a less than significant impact to global climate change on a project-level.

4.2 - Cumulative Level Analysis

According to CEQA Guidelines 15145, if a Lead Agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate the discussion of the impact. The assessment of cumulative global climate change impacts, which are project impacts plus all the other "cumulative" projects, is speculative at this time for the following reasons:

- The list of cumulative projects for climate change is unknown, in that it could conceivably include all projects around the globe. Guidelines for establishing the radius for global climate change have not yet been adopted. Without such guidelines, it is impossible to know how big the impact study area is supposed to be. For example, does the list of project include those only within a one-mile radius of the project, or does it include projects within the entire air basin, or the state of California? For this reason, the "project list" approach for conducting a CEQA cumulative impacts analysis is not feasible.

- There is no approved plan that covers the jurisdiction of the project that discusses global climate change or greenhouse gases; therefore, the plan approach is not viable at this time. If the City prepares a Greenhouse Gas Reduction Plan or incorporates climate change policies in its general plan, perhaps a cumulative analysis could be based on that, as in the plan approach. However, at this time, no such document exists to base this cumulative discussion or significance finding on. State and local agencies are currently trying to develop strategies to reduce greenhouse gases in their jurisdictions; however, these strategies are not complete at this time.

- There are no thresholds for measuring project or cumulative impacts of greenhouse gases.

4.3 - General Plan Compliance

The project lies within the City of San Bernardino General Plan; therefore, the policies in the General Plan pertain to the proposed project. The General Plan contains 3 goals and 19 related policies (12.5.1 through 12.7.7) that identify ways the City and development within the City can minimize degradation of air resources. The policies contain measures to reduce emissions during construction. The Specific Plan demonstrates that the project complies with those measures applicable to the project.

4.4 - Climate Change Impacts on the Project

AB 32 indicates that "the potential effects of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snow pack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidence of infections, disease, asthma, and other health-related problems" (AB 32, section 38501(a)).

The California Climate Change Center (CCCC 2006) published a report that assesses the risks of climate change to California. The following is a summary of the potential risks to California from that report:

- A reduction in the Sierra snow pack could result a reduction in hydropower, which comprises about 15 percent of California's in-state electricity production.
- A reduction in the Sierra snow pack could result in a loss of winter recreation from insufficient snow for skiing and snowboarding.
- A decrease in water supply could also negatively impact the food supply that depends on that water for use.
- Climate change could also increase temperatures, leading to decreased supply of certain agricultural products such as wine, fruit, nuts, and milk. California farmers may also have to face increasing threats from pests and pathogens.
- Climate change could also result in increasing wildfires. If temperatures rise into the medium range, the risk of fires in California could increase as much as 55 percent.
- Climate change could result in plant and animal species relocating to cooler more habitable "up slope" locations.
- Climate change could negatively affect the health and productivity of California's forests. The productivity of mixed conifer forests is expected to diminish as much as 18 percent by the end of the century.
- A rise in sea levels could result in increased coastal floods and shrinking beaches.

Air quality problems could increase due to increased use of electricity to cool, which may result in increased indirect emissions. The project would not significantly contribute to this effect as mitigation and project design features increase energy efficiency of the project. Although it is not anticipated that the project would directly obtain its water from the Sierra snow pack, the project attempts to incorporate all feasible water efficiency measures thereby reducing the use of water. The project is at least 1,700 feet above sea level, which would be threatened from rising sea waters. In regard to the potential for increased wildfires, the project EIR indicates that the potential for wildfires is mitigated to less than significant with project design and mitigation. In summary, global climate change impacts to the proposed project are anticipated to be less than significant.

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Appendix A: Greenhouse Gas Emission Spreadsheets and URBEMIS 2007 Model Output

Summary of Operational Greenhouse Gases
Unmitigated
University Hills
Prepared by Michael Brandman Associates
Buildout Year 2011

Source	Carbon Dioxide	Nitrous Oxide	Methane	Hydro-fluorocarbons	Units	Metric Tons CO2E	MMTCO2e
Motor vehicles	11,361	1.64	3.28		tons per year	10769	0.011
Natural gas	2,400	0.01	0.42		tons per year	2175	0.002
Indirect electricity	2,218	0.01	0.02		tons per year	2004	0.002
Hearth	4				tons per year	3	0.000
Water transport	1,865	0.01	0.02		tons per year	1685	0.002
Landscape	2				tons per year	2	0.000
Refrigerants				2.70	tons per year	3163	0.003
Total	17,849	1.67	3.73	2.70	tons per year	19801	0.020
Total	16,100	1.50	3.37	2.43	metric tons per year		
GWP	1	310	21				
Total	16,100	466	71	3,163	MTCO2E per year		
Total	0.0161	0.0005	0.0001	0.0032	MMTCO2E per year		

Total - all gases	19,801	MTCO2E per year
	0.0198	MMTCO2E per year
California emissions in 2004	500	MMTCO2 Eq. per year
Project percent of emissions	0.003960%	
U.S. emissions in 2005	7,260.4	
Project percent of emissions	0.000273%	
Global emissions in 2004	20135	
Project percent of emissions	0.000098%	

Emissions converted from tons per year to metric tons of carbon dioxide equivalents (MTCO2E) per year by using the formula: (tons of gas) x (global warming potential) x (0.902 metric tons)

Emissions converted to million metric tons of carbon dioxide equivalents (MMTCO2E) using the formula: MMTCO2E = (metric tons of gas) / (1,000,000).

Mobile Emissions - Methane ***Unmitigated*** Page 1
University Hills 13-Dec-07
Prepared by Michael Brandman Associates
Buildout Year 2011 **Vehicle Miles Traveled** 62,028

Starting Emissions	0.66	lbs/day	0.0003	tons/day	0.12 tons/year
Running Emissions	17.33	lbs/day	0.0087	tons/day	3.16 tons/year
Total	17.99	lbs/day	0.0090	tons/day	3.28 tons/year

Vehicle Percentages

Vehicle Type	Percent	Non-Catalyst	Catalyst	Diesel
Light Auto	54.7%	1.1%	98.7%	0.2%
Light Truck < 3,750 lbs	15.2%	2.0%	96.0%	2.0%
Light Truck 3,751- 5,750	16.2%	1.2%	98.1%	0.7%
Med Truck 5,751- 8,500	7.3%	1.4%	95.9%	2.7%
Lite-Heavy 8,501-10,000	1.1%	0.0%	81.8%	18.2%
Lite-Heavy 10,001-14,000	0.3%	0.0%	66.7%	33.3%
Med-Heavy 14,001-33,000	1.0%	0.0%	20.0%	80.0%
Heavy-Heavy 33,001-60,000	0.9%	0.0%	11.1%	88.9%
Line Haul > 60,000 lbs	0.0%	0.0%	0.0%	100.0%
Urban Bus	0.2%	0.0%	50.0%	50.0%
Motorcycle	1.6%	68.8%	31.2%	0.0%
School Bus	0.1%	0.0%	0.0%	100.0%
Motor Home	1.4%	7.1%	85.7%	7.2%

Running Emission Factors (g/mile)

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Light Auto	LDA	0.1931	0.1127	0.0161
Light Truck < 3,750 lbs	LDT1	0.2253	0.1448	0.0161
Light Truck 3,751- 5,750	LDT2	0.2253	0.1448	0.0161
Med Truck 5,751- 8,500	MDV	0.2253	0.1448	0.0161
Lite-Heavy 8,501-10,000	LHDT1	0.2012	0.1448	0.0805
Lite-Heavy 10,001-14,000	LHDT2	0.2012	0.1448	0.0805
Med-Heavy 14,001-33,000	MHDT	0.2012	0.1448	0.0805
Heavy-Heavy 33,001-60,000	HHDT	0.2012	0.1448	0.0805
Line Haul > 60,000 lbs	LHV	0.2012	0.1448	0.0805
Urban Bus	UB	0.2012	0.1448	0.0805
Motorcycle	MCY	0.2092	0.2092	0.2092
School Bus	SBUS	0.2012	0.1448	0.0805
Motor Home	MH	0.2012	0.1448	0.0805

Running Emissions (pounds per day)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Light Auto	0.16	8.30	0.00
Light Truck < 3,750 lbs	0.09	2.88	0.01
Light Truck 3,751- 5,750	0.06	3.14	0.00
Med Truck 5,751- 8,500	0.03	1.38	0.00
Lite-Heavy 8,501-10,000	0.00	0.18	0.02
Lite-Heavy 10,001-14,000	0.00	0.04	0.01
Med-Heavy 14,001-33,000	0.00	0.04	0.09
Heavy-Heavy 33,001-60,000	0.00	0.02	0.09
Line Haul > 60,000 lbs	0.00	0.00	0.00
Urban Bus	0.00	0.02	0.01
Motorcycle	0.31	0.14	0.00
School Bus	0.00	0.00	0.01
Motor Home	0.03	0.24	0.01
Total	0.68	16.39	0.26

Mobile Emissions - Methane

University Hills

Prepared by Michael Brandman Associates

Buildout Year 2011 **Total Trips** 6140

Starting Emission Factors (g/start)

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Light Auto	LDA	0.059	0.009	-0.003
Light Truck < 3,750 lbs	LDT1	0.067	0.099	-0.004
Light Truck 3,751- 5,750	LDT2	0.067	0.099	-0.004
Med Truck 5,751- 8,500	MDV	0.067	0.099	-0.004
Lite-Heavy 8,501-10,000	LHDT1	0.147	0.215	-0.004
Lite-Heavy 10,001-14,000	LHDT2	0.147	0.215	-0.004
Med-Heavy 14,001-33,000	MHDT	0.147	0.215	-0.004
Heavy-Heavy 33,001-60,000	HHDT	0.147	0.215	-0.004
Line Haul > 60,000 lbs	LHV	0.147	0.215	-0.004
Urban Bus	UB	0.147	0.215	-0.004
Motorcycle	MCY	0.024	0.024	0.033
School Bus	SBUS	0.147	0.215	-0.004
Motor Home	MH	0.147	0.215	-0.004

Trip Distribution

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Light Auto	LDA	36.9	3314.9	6.7
Light Truck < 3,750 lbs	LDT1	18.7	895.9	18.7
Light Truck 3,751- 5,750	LDT2	11.9	975.8	7.0
Med Truck 5,751- 8,500	MDV	6.3	429.8	12.1
Lite-Heavy 8,501-10,000	LHDT1	0.0	55.2	12.3
Lite-Heavy 10,001-14,000	LHDT2	0.0	12.3	6.1
Med-Heavy 14,001-33,000	MHDT	0.0	12.3	49.1
Heavy-Heavy 33,001-60,000	HHDT	0.0	6.1	49.1
Line Haul > 60,000 lbs	LHV	0.0	0.0	0.0
Urban Bus	UB	0.0	6.1	6.1
Motorcycle	MCY	67.6	30.7	0.0
School Bus	SBUS	0.0	0.0	6.1
Motor Home	MH	6.1	73.7	6.2
Total		147.5	5812.9	179.6

Starting Emissions (pounds per day)

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Light Auto	LDA	0.0048	0.0656	0.0000
Light Truck < 3,750 lbs	LDT1	0.0028	0.1951	-0.0002
Light Truck 3,751- 5,750	LDT2	0.0018	0.2125	-0.0001
Med Truck 5,751- 8,500	MDV	0.0009	0.0936	-0.0001
Lite-Heavy 8,501-10,000	LHDT1	0.0000	0.0261	-0.0001
Lite-Heavy 10,001-14,000	LHDT2	0.0000	0.0058	-0.0001
Med-Heavy 14,001-33,000	MHDT	0.0000	0.0058	-0.0004
Heavy-Heavy 33,001-60,000	HHDT	0.0000	0.0029	-0.0004
Line Haul > 60,000 lbs	LHV	0.0000	0.0000	0.0000
Urban Bus	UB	0.0000	0.0029	-0.0001
Motorcycle	MCY	0.0036	0.0016	0.0000
School Bus	SBUS	0.0000	0.0000	-0.0001
Motor Home	MH	0.0020	0.0348	-0.0001
Total		0.0158	0.6469	-0.0016

- Source of running emission factors: U.S. Environmental Protection Agency. Climate Leaders Greenhouse Gas Inventory Protocol, Core Module Guidance. Direct Emissions from Mobile Combustion Sources. October 2004.
- Source of vehicle percentages: URBEMIS2002 default values.
- Source of starting emissions: U.S. Environmental Protection Agency. Prepared by ICF Consulting. EPA420-P-04-016. Update of Methane and Nitrous Oxide Emission Factors for On-Highway Vehicles. November 2004.

Mobile Emissions - Nitrous Oxide ***Unmitigated***
University Hills 13-Dec-07
Prepared by Michael Brandman Associates
Buildout Year 2011 **Vehicle Miles Traveled** 62,028

Starting Emissions	1.07	lbs/day	0.0005	tons/day	0.20 tons/year
Running Emissions	7.92	lbs/day	0.0040	tons/day	1.44 tons/year
Total	8.99	lbs/day	0.0045	tons/day	1.64 tons/year

Vehicle Percentages

Vehicle Type	Percent	Non-Catalyst	Catalyst	Diesel
Light Auto	54.7%	1.1%	98.7%	0.2%
Light Truck < 3,750 lbs	15.2%	2.0%	96.0%	2.0%
Light Truck 3,751- 5,750	16.2%	1.2%	98.1%	0.7%
Med Truck 5,751- 8,500	7.3%	1.4%	95.9%	2.7%
Lite-Heavy 8,501-10,000	1.1%	0.0%	81.8%	18.2%
Lite-Heavy 10,001-14,000	0.3%	0.0%	66.7%	33.3%
Med-Heavy 14,001-33,000	1.0%	0.0%	20.0%	80.0%
Heavy-Heavy 33,001-60,000	0.9%	0.0%	11.1%	88.9%
Line Haul > 60,000 lbs	0.0%	0.0%	0.0%	100.0%
Urban Bus	0.2%	0.0%	50.0%	50.0%
Motorcycle	1.6%	68.8%	31.2%	0.0%
School Bus	0.1%	0.0%	0.0%	100.0%
Motor Home	1.4%	7.1%	85.7%	7.2%

Running Emission Factors (g/mile)

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Light Auto	LDA	0.0166	0.0518	0.0161
Light Truck < 3,750 lbs	LDT1	0.0208	0.0649	0.0322
Light Truck 3,751- 5,750	LDT2	0.0208	0.0649	0.0322
Med Truck 5,751- 8,500	MDV	0.0208	0.0649	0.0322
Lite-Heavy 8,501-10,000	LHDT1	0.0480	0.1499	0.0483
Lite-Heavy 10,001-14,000	LHDT2	0.0480	0.1499	0.0483
Med-Heavy 14,001-33,000	MHDT	0.0480	0.1499	0.0483
Heavy-Heavy 33,001-60,000	HHDT	0.0480	0.1499	0.0483
Line Haul > 60,000 lbs	LHV	0.0480	0.1499	0.0483
Urban Bus	UB	0.0480	0.1499	0.0483
Motorcycle	MCY	0.0073	0.0073	0.0073
School Bus	SBUS	0.0480	0.1499	0.0483
Motor Home	MH	0.0480	0.1499	0.0483

Running Emissions (pounds per day)

Vehicle Type	Non-Catalyst	Catalyst	Diesel
Light Auto	0.01	3.82	0.00
Light Truck < 3,750 lbs	0.01	1.29	0.01
Light Truck 3,751- 5,750	0.01	1.41	0.00
Med Truck 5,751- 8,500	0.00	0.62	0.01
Lite-Heavy 8,501-10,000	0.00	0.18	0.01
Lite-Heavy 10,001-14,000	0.00	0.04	0.01
Med-Heavy 14,001-33,000	0.00	0.04	0.05
Heavy-Heavy 33,001-60,000	0.00	0.02	0.05
Line Haul > 60,000 lbs	0.00	0.00	0.00
Urban Bus	0.00	0.02	0.01
Motorcycle	0.01	0.00	0.00
School Bus	0.00	0.00	0.01
Motor Home	0.01	0.25	0.01
Total	0.05	7.69	0.17

Mobile Emissions - Nitrous Oxide
University Hills
Prepared by Michael Brandman Associates
Buildout Year 2011 **Total Trips** 6140

Starting Emission Factors (g/start)

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Light Auto	LDA	0.028	0.072	0.000
Light Truck < 3,750 lbs	LDT1	0.032	0.093	-0.001
Light Truck 3,751- 5,750	LDT2	0.032	0.093	-0.001
Med Truck 5,751- 8,500	MDV	0.032	0.093	-0.001
Lite-Heavy 8,501-10,000	LHDT1	0.070	0.194	-0.002
Lite-Heavy 10,001-14,000	LHDT2	0.070	0.194	-0.002
Med-Heavy 14,001-33,000	MHDT	0.070	0.194	-0.002
Heavy-Heavy 33,001-60,000	HHDT	0.070	0.194	-0.002
Line Haul > 60,000 lbs	LHV	0.070	0.194	-0.002
Urban Bus	UB	0.070	0.194	-0.002
Motorcycle	MCY	0.012	0.012	0.012
School Bus	SBUS	0.070	0.194	-0.002
Motor Home	MH	0.070	0.194	-0.002

Trip Distribution

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Light Auto	LDA	36.9	3314.9	6.7
Light Truck < 3,750 lbs	LDT1	18.7	895.9	18.7
Light Truck 3,751- 5,750	LDT2	11.9	975.8	7.0
Med Truck 5,751- 8,500	MDV	6.3	429.8	12.1
Lite-Heavy 8,501-10,000	LHDT1	0.0	55.2	12.3
Lite-Heavy 10,001-14,000	LHDT2	0.0	12.3	6.1
Med-Heavy 14,001-33,000	MHDT	0.0	12.3	49.1
Heavy-Heavy 33,001-60,000	HHDT	0.0	6.1	49.1
Line Haul > 60,000 lbs	LHV	0.0	0.0	0.0
Urban Bus	UB	0.0	6.1	6.1
Motorcycle	MCY	67.6	30.7	0.0
School Bus	SBUS	0.0	0.0	6.1
Motor Home	MH	6.1	73.7	6.2
Total		147.5	5812.9	179.6

Starting Emissions (pounds per day)

Vehicle Type	Type	Non-Catalyst	Catalyst	Diesel
Light Auto	LDA	0.0023	0.5251	0.0000
Light Truck < 3,750 lbs	LDT1	0.0013	0.1833	0.0000
Light Truck 3,751- 5,750	LDT2	0.0008	0.1996	0.0000
Med Truck 5,751- 8,500	MDV	0.0004	0.0879	0.0000
Lite-Heavy 8,501-10,000	LHDT1	0.0000	0.0236	-0.0001
Lite-Heavy 10,001-14,000	LHDT2	0.0000	0.0052	0.0000
Med-Heavy 14,001-33,000	MHDT	0.0000	0.0052	-0.0002
Heavy-Heavy 33,001-60,000	HHDT	0.0000	0.0026	-0.0002
Line Haul > 60,000 lbs	LHV	0.0000	0.0000	0.0000
Urban Bus	UB	0.0000	0.0026	0.0000
Motorcycle	MCY	0.0018	0.0008	0.0000
School Bus	SBUS	0.0000	0.0000	0.0000
Motor Home	MH	0.0009	0.0314	0.0000
Total		0.0076	1.0675	-0.0007

- Source of running emission factors: U.S. Environmental Protection Agency. Climate Leaders Greenhouse Gas Inventory Protocol, Core Module Guidance. Direct Emissions from Mobile Combustion Sources. October 2004.
- Source of vehicle percentages: URBEMIS2002 default values.
- Source of starting emissions: U.S. Environmental Protection Agency. Prepared by ICF Consulting. EPA420-P-04-016. Update of Methane and Nitrous Oxide Emission Factors for On-Highway Vehicles. November 2004.

Electricity - Indirect Emissions

Project: University Hills
Prepared by: Michael Brandman Associates
Prepared on: 12/13/2007

Electricity Use 5,513,970 KWh/year
Electricity Use 5514 MWh/year

Greenhouse Gas	Emission Factor (pounds per MWh/year)	Emissions (pounds/year)	Emissions (tons/year)
Carbon dioxide	804.54	4,436,209	2,218
Methane	0.0067	37	0.018
Nitrous oxide	0.0037	20	0.010

Emission factor source:
California Climate Action Registry. General Reporting Protocol. Reporting Entity-Wide Greenhouse Gas Emissions. Version 2.2, March 2007. www.climateregistry.org

Residential electricity usage rate: 5626.50 kwh/unit/year, from South Coast Air Quality Management 1993 CEQA Handbook, Table 9-11-A

Electricity Use in Typical Urban Water Systems

Project: University Hills
Prepared by: Michael Brandman Associates
Prepared on: 12/13/2007

	kWh/MG	
	Northern California	**Southern California**
Water Supply and Conveyance	150	8,900
Water Treatment	100	100
Water Distribution	1,200	1,200
Wastewater Treatment	2,500	2,500
Totals	***3,950***	***12,700***

From California's Water Energy Relationship, CEC 2005

	Gallons per day	**Millions Gallons (MG) per year**
Water Usage	1000000	365

	kWh	**MWh**
Energy Usage	4,635,500	4,636

Greenhouse Gas	**Indirect Electricity Emission Factor (pounds per MWh/year)**	**Emissions (pounds/year)**	**Emissions (tons/year)**
Carbon dioxide	804.54	3,729,445	1,865
Methane	0.0067	31.06	0.016
Nitrous oxide	0.0037	17.15	0.009

Emission factor for electricity source:
California Climate Action Registry. General Reporting Protocol. Reporting Entity-Wide Greenhouse Gas Emissions. Version 2.2, March 2007. www.climateregistry.org

CEC 2005: California Energy Commission. California's Energy-Water Relationship. Final Staff Report. November 2005. CEC-700-2005-011-SF

Natural Gas Combustion

University Hills
Prepared by Michael Brandman Associates
12/13/2007

Gas	Type of Land Use	Square Feet or Units	Natural Gas Usage Factor* (SCF/square foot or unit/month)	Natural Gas Usage for Project (SCF/month)	Natural Gas usage for Project (SCF/year)	Emission Factor (g CO2/SCF)**	Emission Factor (g/MMBTU)**	Heating Value of Natural Gas (BTU/SCF)**	Emissions (tons per year)	Emissions (pounds per day)
Methane	Office	0	2.0	0	0	N/A	4.75	1020	0.00	0.00
	Retail/Shopping	0	2.9	0	0	N/A	4.75	1020	0.00	0.00
	Residential	980	6665	6531700	78380400	N/A	4.75	1020	0.42	2.29
	Industrial		241611	0	0	N/A	4.75	1020	0.00	0.00
	Multi-family	0	4011.5	0	0	N/A	4.75	1020	0.00	0.00
Nitrous Oxide	Office	0	2.0	0	0	N/A	0.095	1020	0.00	0.00
	Retail/Shopping	0	2.9	0	0	N/A	0.095	1020	0.00	0.00
	Residential	980	6665	6531700	78380400	N/A	0.095	1020	0.01	0.05
	Industrial		241611	0	0	N/A	0.095	1020	0.00	0.00
	Multi-family	0	4011.5	0	0	N/A	0.095	1020	0.00	0.00

Total

Units	Mitigation Reduction	Nitrous Oxide	Methane
pounds per day	0%	0.05	2.29
tons per year		0.01	0.42
GWP		310	21
Tg CO2 Eq/year		0.000003	0.000009

* Natural gas usage factor from URBEMIS2002 default; Industrial is based on number of buildings
** USEPA, 2004: Direct Emissions from Stationary Combustion Sources, Climate Leaders Greenhouse Inventory Protocol, Core Model Guidance, October 2004
Emissions of CH4, N2O = Emission Factor x Heating Value of Natural Gas x Natural Gas Usage x Number of Units/Square Feet

Air Conditioning and Refrigeration Fugitive Emissions

Project: University Hills
Prepared by: Michael Brandman Associates
Prepared on: 12/13/2007

Type of Unit	Units	Capacity of Unit (kg)	Annual Leak Rate in percent of capacity	Emissions (kg/year)	Emissions (tons/year)	Global Warming Potential	Metric Tons CO2 Equiv./year
Domestic Refrigeration	980	0.5	0.5%	2.45	0.003	1300	3
Residential A/C	980	50	5%	2450	2.695	1300	3,160
Total					**2.698**		**3,163**

Source:
EPA 2004c U.S. Environmental Protection Agency, Climate Leaders. October 2004. Direct HFC and PFC Emissions from Use of Refrigeration and Air Conditioning Equipment. EPA430-K-03-004. www.epa.gov/climateleaders/docs/refrige_acequipuseguidance.pdf

Notes:
The number of air conditioning units for commercial is estimated by assuming one unit per 1,000 square feet. This information is based on experience with other projects.

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Urbemis 2007 Version 9.2.2

Combined Annual Emissions Reports (Tons/Year)

File Name: S:\Cori\Air Quality Peer Reviews\25330006\UnivHillsURBEMIS.urb9

Project Name: University Hills

Project Location: South Coast AQMD

On-Road Vehicle Emissions Based on: Version : Emfac2007 V2.3 Nov 1 2006

Off-Road Vehicle Emissions Based on: OFFROAD2007

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Summary Report:

CONSTRUCTION EMISSION ESTIMATES

	CO2
2009 TOTALS (tons/year unmitigated)	1,428.22
2009 TOTALS (tons/year mitigated)	1,428.22
Percent Reduction	0.00
2010 TOTALS (tons/year unmitigated)	2,315.38
2010 TOTALS (tons/year mitigated)	2,315.38
Percent Reduction	0.00

AREA SOURCE EMISSION ESTIMATES

	CO2
TOTALS (tons/year, unmitigated)	2,405.67

OPERATIONAL (VEHICLE) EMISSION ESTIMATES

	CO2
TOTALS (tons/year, unmitigated)	11,361.36

SUM OF AREA SOURCE AND OPERATIONAL EMISSION ESTIMATES

	CO2
TOTALS (tons/year, unmitigated)	13,767.03

Construction Unmitigated Detail Report:

CONSTRUCTION EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

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	CO2
2009	1,428.22
Mass Grading 01/01/2009-07/31/2009	792.73
Mass Grading Dust	0.00
Mass Grading Off Road Diesel	766.72
Mass Grading On Road Diesel	0.00
Mass Grading Worker Trips	26.01
Fine Grading 08/01/2009-10/31/2009	124.25
Fine Grading Dust	0.00
Fine Grading Off Road Diesel	118.18
Fine Grading On Road Diesel	0.00
Fine Grading Worker Trips	6.07
Trenching 08/01/2009-10/31/2009	59.77
Trenching Off Road Diesel	55.73
Trenching Worker Trips	4.04
Asphalt 11/01/2009-12/31/2009	64.39
Paving Off-Gas	0.00
Paving Off Road Diesel	31.21
Paving On Road Diesel	29.75
Paving Worker Trips	3.42

Building 11/01/2009-12/31/2010	387.08
Building Off Road Diesel	71.47
Building Vendor Trips	101.36
Building Worker Trips	214.25
2010	2,315.38
Building 11/01/2009-12/31/2010	2,295.76
Building Off Road Diesel	423.97
Building Vendor Trips	601.29
Building Worker Trips	1,270.50
Coating 03/01/2010-12/31/2010	19.62
Architectural Coating	0.00
Coating Worker Trips	19.62

Phase Assumptions

Phase: Fine Grading 8/1/2009 - 10/31/2009 - Default Fine Site Grading/Excavation Description

Total Acres Disturbed: 160

Maximum Daily Acreage Disturbed: 20

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day

1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

1 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

2 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

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Phase: Mass Grading 1/1/2009 - 7/31/2009 - Default Mass Site Grading/Excavation Description

Total Acres Disturbed: 170

Maximum Daily Acreage Disturbed: 50

Fugitive Dust Level of Detail: Default

20 lbs per acre-day

On Road Truck Travel (VMT): 0

Off-Road Equipment:

1 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day

1 Graders (174 hp) operating at a 0.61 load factor for 8 hours per day

2 Rubber Tired Dozers (357 hp) operating at a 0.59 load factor for 8 hours per day

3 Scrapers (313 hp) operating at a 0.72 load factor for 8 hours per day

3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 8 hours per day

1 Water Trucks (189 hp) operating at a 0.5 load factor for 8 hours per day

Phase: Trenching 8/1/2009 - 10/31/2009 - Default Trenching Description

Off-Road Equipment:

2 Excavators (168 hp) operating at a 0.57 load factor for 8 hours per day

1 Other General Industrial Equipment (238 hp) operating at a 0.51 load factor for 8 hours per day

1 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 0 hours per day

Phase: Paving 11/1/2009 - 12/31/2009 - Default Paving Description

Acres to be Paved: 40

Off-Road Equipment:

1 Pavers (100 hp) operating at a 0.62 load factor for 8 hours per day

2 Paving Equipment (104 hp) operating at a 0.53 load factor for 8 hours per day

2 Rollers (95 hp) operating at a 0.56 load factor for 6 hours per day

Phase: Building Construction 11/1/2009 - 12/31/2010 - Default Building Construction Description

Off-Road Equipment:

1 Cranes (399 hp) operating at a 0.43 load factor for 7 hours per day

3 Forklifts (145 hp) operating at a 0.3 load factor for 8 hours per day

4 Generator Sets (49 hp) operating at a 0.74 load factor for 8 hours per day

3 Tractors/Loaders/Backhoes (108 hp) operating at a 0.55 load factor for 7 hours per day

3 Welders (45 hp) operating at a 0.45 load factor for 8 hours per day

Phase: Architectural Coating 3/1/2010 - 12/31/2010 - Default Architectural Coating Description

Rule: Residential Interior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 100

Rule: Residential Interior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 50

Rule: Residential Exterior Coatings begins 1/1/2005 ends 6/30/2008 specifies a VOC of 250

Rule: Residential Exterior Coatings begins 7/1/2008 ends 12/31/2040 specifies a VOC of 100

Rule: Nonresidential Interior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Rule: Nonresidential Exterior Coatings begins 1/1/2005 ends 12/31/2040 specifies a VOC of 250

Area Source Unmitigated Detail Report:

AREA SOURCE EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

Source	CO2
Natural Gas	2,400.13
Hearth	3.65
Landscape	1.89
Consumer Products	
Architectural Coatings	
TOTALS (tons/year, unmitigated)	2,405.67

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Area Source Changes to Defaults

Percentage of residences with wood stoves changed from 10% to 0%

Percentage of residences with wood fireplaces changed from 5% to 0%

Percentage of residences with natural gas fireplaces changed from 85% to 100%

Operational Unmitigated Detail Report:

OPERATIONAL EMISSION ESTIMATES Annual Tons Per Year, Unmitigated

Source	CO2
Single family housing	1,894.85
Condo/townhouse general	9,466.51
TOTALS (tons/year, unmitigated)	11,361.36

Operational Settings:

Does not include correction for passby trips

Does not include double counting adjustment for internal trips

Analysis Year: 2011 Season: Annual

Emfac: Version : Emfac2007 V2.3 Nov 1 2006

Summary of Land Uses

Land Use Type	Acreage	Trip Rate	Unit Type	No. Units	Total Trips	Total VMT
Single family housing	70.00	9.57	dwelling units	107.00	1,023.99	10,345.17
Condo/townhouse general	90.00	5.86	dwelling units	873.00	5,115.78	51,683.70
					6,139.77	62,028.87

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Vehicle Fleet Mix

Vehicle Type	Percent Type	Non-Catalyst	Catalyst	Diesel
Light Auto	51.6	0.8	99.0	0.2
Light Truck < 3750 lbs	7.3	2.7	94.6	2.7
Light Truck 3751-5750 lbs	23.0	0.4	99.6	0.0
Med Truck 5751-8500 lbs	10.6	0.9	99.1	0.0
Lite-Heavy Truck 8501-10,000 lbs	1.6	0.0	81.2	18.8
Lite-Heavy Truck 10,001-14,000 lbs	0.5	0.0	60.0	40.0
Med-Heavy Truck 14,001-33,000 lbs	0.9	0.0	22.2	77.8
Heavy-Heavy Truck 33,001-60,000 lbs	0.5	0.0	0.0	100.0
Other Bus	0.1	0.0	0.0	100.0
Urban Bus	0.1	0.0	0.0	100.0
Motorcycle	2.8	64.3	35.7	0.0
School Bus	0.1	0.0	0.0	100.0
Motor Home	0.9	0.0	88.9	11.1

Travel Conditions

	Residential			Commercial		
	Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer
Urban Trip Length (miles)	12.7	7.0	9.5	13.3	7.4	8.9
Rural Trip Length (miles)	17.6	12.1	14.9	15.4	9.6	12.6
Trip speeds (mph)	30.0	30.0	30.0	30.0	30.0	30.0
% of Trips - Residential	32.9	18.0	49.1			

Travel Conditions

Residential			Commercial		
Home-Work	Home-Shop	Home-Other	Commute	Non-Work	Customer

% of Trips - Commercial (by land use)

Operational Changes to Defaults