Global Climate Change Evaluation

for the

West Lilac Residential Development Project
TM #5276

Submitted To:

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Table of Contents

List of Acronyms

APCD	Air Pollution Control District
AB	Assembly Bill
AB 32	Assembly Bill 32, Global Warming Solutions Act of 2006
ARB	Air Resources Board
ASTM	American Society of Testing and Materials
CAPCOA	California Air Pollution Control Officers Association
CAT	Climate Action Team
CCAP	Center for Clean Air Policy
CCAR	California Climate Action Registry
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DWR	Department of Water Resources
EIR	Environmental Impact Report
EPA	U.S. Environmental Protection Agency
EV	Electric Vehicles
GCC	Global Climate Change
GHG	Greenhouse Gas
GGEP	Greenhouse Gas Emissions Policy
GGRP	Greenhouse Gas Reduction Plan
GP	General Plan
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
IPCC	Intergovernmental Panel on Climate Change
LEED	Leadership in Energy and Environmental Design
MMT	Million Metric Tons
MW	Megawatts
N_2O	Nitrous Oxide
NOx	Oxides of Nitrogen
OPR	State Office of Planning and Research
PFCs	Perfluorocarbons
PM	Particulate Matter
ROG	Reactive Organic Gas
RPS	Renewable Portfolio Standards
S-3-05	Executive Order S-3-05
SB	Senate Bill
SDCGHGI	San Diego County Greenhouse Gas Inventory
SRI	Solar Reflective Index
THC	Total Hydrocarbon
UNFCCC	United Nations Framework Convention on Climate Change
URBEMIS	Urban Emissions Model

USBGC	U.S. Green Building Council
VMT	Vehicle Miles Traveled

Executive Summary

This report presents an assessment of potential global climate change impacts associated with the proposed West Lilac Residential Project. The evaluation addresses the potential for greenhouse gas emissions during construction and after full buildout of the project.

Greenhouse Gas (GHG) emissions have been calculated for business as usual conditions and for conditions with implementation of GHG emission reduction measures proposed by the Project applicant. A summary of the emission calculations is provided in Table ES-1. As shown in Table ES-1, emissions are less than 900 metric tons, which was a quantitative screening threshold suggested by the California Air Pollution Control Officers Association (CAPCOA 2008) intended to exclude small development projects that will contribute a relatively small fraction of the cumulative statewide GHG emissions. CAPCOA estimated that this threshold would exclude approximately 10% of new development projects but capture the remaining 90% of new residential development, thereby establishing a strong basis for demonstrating that cumulative reductions are being achieved across the state. Based on this standard, the proposed project would have a less than significant impact and comply with the California Global Warming Solutions Act (AB 32). No further analysis is required.

Table ES-1
SUMMARY OF ESTIMATED OPERATIONAL GREENHOUSE GAS EMISSIONS

Emission Source	**Annual Emissions (Metric tons/year)**		
	CO_2	**CH_4**	**N_2O**
Operational Emissions			
Electricity Use Emissions	132	0.001	0.0006
Natural Gas Use Emissions	66	0.01	0.0001
Water Consumption Emissions	18	0.0001	0.00008
Vehicle Emissions	628	0.052	0.047
Total	844	0.062	0.047
Global Warming Potential Factor	**1**	**21**	**310**
CO_2 Equivalent Emissions	844	1	15
TOTAL CO_2 Equivalent Emissions	**860**		

1.0 INTRODUCTION

This report presents an assessment of potential global climate change impacts associated with the proposed West Lilac Residential Project. The evaluation addresses the potential for greenhouse gas emissions during construction and after full buildout of the project.

The West Lilac residential development project is located within the unincorporated County of San Diego east of Bonsall. The project site is located south of West Lilac Road between Via Ararat Drive and Aqueduct Road, west of Interstate 15. The project will be developed on approximately 92.8 acres with 28 single-family residential lots.

1.1 General Principles and Existing Conditions

Global Climate Change (GCC) refers to changes in average climatic conditions on Earth as a whole, including temperature, wind patterns, precipitation and storms. Global temperatures are moderated by naturally occurring atmospheric gases, including water vapor, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which are known as greenhouse gases (GHGs). These gases allow solar radiation (sunlight) into the Earth's atmosphere, but prevent radiative heat from escaping, thus warming the Earth's atmosphere. Gases that trap heat in the atmosphere are often called greenhouse gases, analogous to a greenhouse. GHGs are emitted by both natural processes and human activities. The accumulation of GHGs in the atmosphere regulates the Earth's temperature. Emissions from human activities, such as electricity production and vehicle use, have elevated the concentration of these gases in the atmosphere.

GHGs have been at the center of a widely contested political, economic, and scientific debate surrounding GCC. Although the conceptual existence of GCC is generally accepted, the extent to which GHGs contribute to it remains a source of debate. The State of California has been at the forefront of developing solutions to address GCC. GCC refers to any significant change in measures of climate, such as average temperature, precipitation, or wind patterns over a period of time. GCC may result from natural factors, natural processes, and/or human activities that change the composition of the atmosphere and alter the surface and features of land.

Global climate change attributable to anthropogenic (human) emissions of GHGs (mainly CO_2, CH_4 and N_2O) is currently one of the most important and widely debated scientific, economic and political issues in the United States. Historical records indicate that global climate changes have occurred in the past due to natural phenomena (such as during previous ice ages). Some data indicate that the current global conditions differ from past climate changes in rate and magnitude.

The United Nations Intergovernmental Panel (Panel) on Climate Change constructed several emission trajectories of GHGs needed to stabilize global temperatures and climate change impacts. The Panel concluded that a stabilization of GHGs at 400 to 450 ppm CO_2 equivalent concentration is required to keep global mean warming below 35.6º Fahrenheit (2º Celsius), which is assumed to be necessary to avoid dangerous climate change (Association of Environmental Professionals 2007).

State law defines greenhouse gases as any of the following compounds: CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6) (California Health and Safety Code Section 38505g). CO_2, followed by CH_4 and N_2O, are the most common GHGs that result from human activity.

1.2 Sources and Global Warming Potentials of GHG

The State of California GHG Inventory performed by the California Air Resources Board (ARB), compiled statewide anthropogenic GHG emissions and sinks. It includes estimates for CO_2, CH_4, N_2O, SF_6, HFCs, and PFCs. The current inventory covers the years 1990 to 2004, and is summarized in Table 1. Data sources used to calculate this GHG inventory include California and federal agencies, international organizations, and industry associations. The calculation methodologies are consistent with guidance from the Intergovernmental Panel on Climate Change (IPCC). The 1990 emissions level is the sum total of sources and sinks from all sectors and categories in the inventory. The inventory is divided into seven broad sectors and categories in the inventory. These sectors include: Agriculture; Commercial; Electricity Generation; Forestry; Industrial; Residential; and Transportation.

Table 1
State of California GHG Emissions by Sector

Sector	Total 1990 Emissions ($MMTCO_2e$)	Percent of Total 1990 Emissions	Total 2004 Emissions ($MMTCO_2e$)	Percent of Total 2004 Emissions
Agriculture	23.4	5%	27.9	6%
Commercial	14.4	3%	12.8	3%
Electricity Generation	110.6	26%	119.8	25%
Forestry (excluding sinks)	0.2	<1%	0.2	<1%
Industrial	103.0	24%	96.2	20%
Residential	29.7	7%	29.1	6%
Transportation	150.7	35%	182.4	38%
Forestry Sinks	(6.7)		(4.7)	

When accounting for GHGs, all types of GHG emissions are expressed in terms of CO_2 equivalents (CO_2e) and are typically quantified in metric tons (MT) or millions of metric tons (MMT).

GHGs have varying global warming potential (GWP). The GWP is the potential of a gas or aerosol to trap heat in the atmosphere; it is the "cumulative radiative forcing effect of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas" (USEPA 2006). The reference gas for GWP is CO_2; therefore, CO_2 has a GWP of 1. The other main greenhouse gases that have been attributed to human activity include CH_4, which has a GWP of 21, and N_2O, which has a GWP of 310. Table 2 presents the GWP and atmospheric lifetimes of common GHGs.

Table 2

Global Warming Potentials and Atmospheric Lifetimes of GHGs

GHG	Formula	100-Year Global Warming Potential	Atmospheric Lifetime (Years)
Carbon Dioxide	CO_2	1	Variable
Methane	CH_4	21	12 ± 3
Nitrous Oxide	N_2O	310	120
Sulfur Hexafluoride	SF_6	23,900	3,200

Human-caused sources of CO_2 include combustion of fossil fuels (coal, oil, natural gas, gasoline and wood). Data from ice cores indicate that CO_2 concentrations remained steady prior to the current period for approximately 10,000 years. Concentrations of CO_2 have increased in the atmosphere since the industrial revolution.

CH_4 is the main component of natural gas and also arises naturally from anaerobic decay of organic matter. Human-caused sources of natural gas include landfills, fermentation of manure and cattle farming. Human-caused sources of N_2O include combustion of fossil fuels and industrial processes such as nylon production and production of nitric acid.

Other GHGs are present in trace amounts in the atmosphere and are generated from various industrial or other uses.

In addition to the State of California GHG Inventory, a more specific regional GHG inventory was prepared by the University of San Diego School of Law Energy Policy Initiative Center (University of San Diego 2008). This San Diego County Greenhouse Gas Inventory (SDCGHGI) is a detailed inventory that takes into account the unique characteristics of the region in calculating emissions. The SDCGHGI calculated GHG emissions for 1990, 2006, and projected 2020 emissions. Based on this inventory and the emission projections for the region, the study found that emissions of GHGs must be reduced by 33 percent below business as usual in order for San Diego County to achieve 1990 emission levels by the year 2020. "Business as usual," or forecasted emissions, is defined as the emissions that would occur in the absence of

Assembly Bill (AB) 32's mandated reductions. Construction of buildings using Title 24 building standards or the County's 2006 building code would create "business as usual" emissions.

Areas where feasible reductions can occur and the strategies for achieving those reductions are outlined in the SDCGHGI. A summary of the various sectors that contribute GHG emissions in San Diego County for the year 2006 is provided in Table 3. Total GHGs in San Diego County are estimated at 34 $MMTCO_2e$.

Table 3
San Diego County 2006 GHG Emissions by Category

Sector	Total Emissions ($MMTCO_2e$)	Percent of Total Emissions
On-Road Transportation	16	46%
Electricity	9	25%
Natural Gas Consumption	3	9%
Civil Aviation	1.7	5%
Industrial Processes & Products	1.6	5%
Other Fuels/Other	1.1	4%
Off-Road Equipment & Vehicles	1.3	4%
Waste	0.7	2%
Agriculture/Forestry/Land Use	0.7	2%
Rail	0.3	1%
Water-Born Navigation	0.13	0.4%

The sources of GHG emissions, GWP, and atmospheric lifetime of GHGs are all important variables to be considered in the process of calculating CO_2e for discretionary land use projects that require a climate change analysis.

1.3 Regulatory Framework

All levels of government have some responsibility for the protection of air quality, and each level (Federal, State, and regional/local) has specific responsibilities relating to air quality regulation. GHG emissions and the regulation of GHGs is a relatively new component of air quality.

1.3.1 National and International Efforts

International and Federal legislation have been enacted to deal with GCC issues. In 1988, the United Nations and the World Meteorological Organization established the IPCC to assess the scientific, technical, and socioeconomic information relevant to understanding the scientific basis for human-induced climate change, its potential impacts, and options for adaptation and mitigation. The most recent reports of the IPCC have emphasized the scientific consensus that real and measurable changes to the climate are occurring, that they are caused by human activity, and that significant adverse impacts on the environment, the economy, and human health and welfare are unavoidable.

In October 1993, President Clinton announced his Climate Change Action Plan (CCAP), which had a goal of returning GHG 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 GHG emissions. 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 (UNFCCC). Under the Convention, governments agreed to gather and share information on GHG emissions, national policies, and best practices; launch national strategies for addressing GHG 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 GCC. Recently, the United States Supreme Court declared in the court case of Massachusetts et al. vs. the Environmental Protection Agency et al., 549 C.S. 497 (2007) that the EPA does have the ability to regulate GHG emissions. In addition to the national and international efforts described above, many local jurisdictions have adopted climate change policies and programs.

Proposed Endangerment Finding. On April 17, 2009, EPA issued its proposed endangerment finding for GHG emissions. EPA is proposing to find that greenhouse gases in the atmosphere endanger the public health and welfare of current and future generations. Concentrations of greenhouse gases are at unprecedented levels compared to the recent and distant past. EPA has stated that these high atmospheric levels are the unambiguous result of human emissions, and are

very likely the cause of the observed increase in average temperatures and other climatic changes. The effects of climate change observed to date and projected to occur in the future – including but not limited to the increased likelihood of more frequent and intense heat waves, more wildfires, degraded air quality, more heavy downpours and flooding, increased drought, greater sea level rise, more intense storms, harm to water resources, harm to agriculture, and harm to wildlife and ecosystems – are effects on public health and welfare within the meaning of the Clean Air Act.

Proposed Mandatory GHG Reporting Rule. On March 10, 2009, in response to the FY2008 Consolidated Appropriations Act (H.R. 2764; Public Law 110–161), EPA proposed a rule that requires mandatory reporting of greenhouse gas (GHG) emissions from large sources in the United States. The proposed rule would collect accurate and comprehensive emissions data to inform future policy decisions.

EPA is proposing that suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions submit annual reports to EPA. The gases covered by the proposed rule are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulfur hexafluoride (SF_6), and other fluorinated gases including nitrogen trifluoride (NF_3) and hydrofluorinated ethers (HFE).

Proposed GHG Vehicle Emission Standards. As part of the effort to reduce emissions from vehicles, the EPA and U.S. Department of Transportation (DOT) currently intend to work in coordination to propose standards for control of emissions of greenhouse gases and for fuel economy, respectively. If proposed and finalized, these standards would apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles (light-duty vehicles) built in model years 2012 through 2016. The EPA is proposing GHG emission standards under the Clean Air Act. The CAA requires EPA to establish "standards applicable to the emission of any air pollutant from new motor vehicles or new motor vehicle engines which, in the Administrator's judgment, cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare." As noted above, EPA has made a preliminary endangerment finding for

GHGs. Section 202(a) of the CAA further provides that standards set pursuant to it "shall take effect after such period as the Administrator finds necessary to permit the development and application of the requisite technology, giving appropriate consideration to the cost of compliance within such period. EPA expects to propose a national CO_2 vehicle emissions standard under section 202 (a) of the Clean Air Act. EPA currently is considering proposing standards that would, if made final, achieve on average 250 grams/mile of CO_2 in model year 2016. The standards for earlier years would begin with the 2012 model year, with a generally linear phase-in from model year 2012 through to model year 2016.

Corporate Average Fuel Economy Standards. Under the Energy Policy and Conservation Act (EPCA), the National Highway Traffic Safety Administration (NHTSA), on behalf of the DOT, has authority to set fuel economy standards for on-road vehicles. The federal Corporate Average Fuel Economy (CAFE) standard determines the fuel efficiency of certain vehicle classes in the United States. The EPCA requires that the CAFE standards for each model year be set at the maximum feasible level. In determining that level, NHTSA must consider technological feasibility, economic practicability, the effect of other motor vehicle standards of the Government on fuel economy, and the need of the United States to conserve energy. NHTSA is prohibited from considering the availability of compliance flexibilities such as the ability to earn credits for exceeding CAFE standards in setting CAFE standards. Further, NHTSA must set the model year (MY) 2011-2020 CAFE standards sufficiently high to ensure that the industry-wide average of all new passenger cars and light trucks, combined, is not less than 35 miles per gallon by MY 2020. In May 2009, President Obama announced plans to increase CAFE standards to require light-duty vehicles to meet an average fuel economy of 35.5 miles per gallon by 2016. This equates to the EPA's emission standard of 250 grams/mile of CO_2 in model year 2016.

EPA and the NHTSA are proposing to utilize a "footprint-based" standard to establish GHG and CAFE standards. Under a footprint-based standard, each manufacturer would have a GHG and CAFE standard unique to its fleet, with a separate standard for passenger cars and light-trucks, depending on the footprints of the vehicle models produced by that manufacturer. Generally, manufacturers of larger vehicles (i.e. vehicles with larger footprints) would face less stringent standards (i.e., higher CO_2 grams/mile standards and lower CAFE standards) than manufacturers

of smaller vehicles. EPA and NHTSA expect to propose standards that are intended to provide compliance flexibility to manufacturers, especially in the early years of the program. This flexibility would be expected to provide sufficient lead time to make necessary technological improvements and additions, and reduce the overall cost of the program without compromising overall environmental and fuel economy objectives. EPA and NHTSA are proposing that a manufacturer's car and/or truck fleet that achieves a fleet average CO_2/CAFE level better than the standard would earn credits. Conversely, if the fleet average CO_2/CAFE level does not meet the standard the fleet would generate debits (also referred to as a deficit or negative credits). Credits may also be generated through development of alternatively-fueled vehicles and through improvements in air conditioning systems that reduce GHG emissions. Credits could then be used in future years.

1.3.2 State Regulations and Standards

The following subsections describe regulations and standards that have been adopted by the State of California to address GCC issues.

Assembly Bill 32, the California Global Warming Solutions Act of 2006. In September 2006, Governor Schwartzenegger signed California AB 32, the global warming bill, into law. AB 32 directs the ARB to do the following:

- Make publicly available a list of discrete early action GHG emission reduction measures that can be implemented prior to the adoption of the statewide GHG limit and the measures required to achieve compliance with the statewide limit.
- Make publicly available a GHG inventory for the year 1990 and determine target levels for 2020.
- On or before January 1, 2010, adopt regulations to implement the early action GHG emission reduction measures.
- On or before January 1, 2011, adopt quantifiable, verifiable, and enforceable emission reduction measures by regulation that will achieve the statewide GHG emissions limit by 2020, to become operative on January 1, 2012, at the latest. The emission reduction

measures may include direct emission reduction measures, alternative compliance mechanisms, and potential monetary and non-monetary incentives that reduce GHG emissions from any sources or categories of sources that ARB finds necessary to achieve the statewide GHG emissions limit.

- Monitor compliance with and enforce any emission reduction measure adopted pursuant to AB 32.

AB 32 required that by January 1, 2008, ARB determine what the statewide GHG emissions level was in 1990, and approve a statewide GHG emissions limit that is equivalent to that level, to be achieved by 2020. While the level of 1990 GHG emissions has not yet been officially approved, the ARB has estimated that the 1990 GHG emissions level was 427 MMT net CO_2e (ARB 2007b). In 2004, the emissions were estimated at 480 MMT net CO_2e (ARB 2007b). The ARB estimates that a reduction of 173 MMT net CO_2e emissions below business-as-usual would be required by 2020 to meet the 1990 levels (ARB 2007b). This amounts to a 15 percent reduction from today's levels, and a 30 percent reduction from projected business-as-usual levels in 2020 (ARB 2008).

Senate Bill 97. Senate Bill 97, enacted in 2007, amends the CEQA statute to clearly establish that GHG emissions and the effects of GHG emissions are appropriate subjects for CEQA analysis. It directs OPR to develop draft CEQA guidelines "for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions" by July 1, 2009 and directs the Resources Agency to certify and adopt the CEQA guidelines by January 1, 2010.

Executive Order S-3-05. Executive Order S-3-05, signed by Governor Schwartzenegger on June 1, 2005, calls for a reduction in GHG emissions to 1990 levels by 2020 and for an 80 percent reduction in GHG emissions by 2050. Executive Order S-3-05 also calls for the California EPA (CalEPA) to prepare biennial science reports on the potential impact of continued GCC on certain sectors of the California economy. The first of these reports, "Our Changing Climate: Assessing Risks to California", and its supporting document "Scenarios of Climate Change in California: An Overview" were published by the California Climate Change Center in 2006.

California Code of Regulations Title 24. Although not originally intended to reduce greenhouse gas emissions, California Code of Regulations Title 24 Part 6: California's Energy Efficiency Standards for Residential and Nonresidential Buildings were first established 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 amendments on which the state's GHG emission inventory are based were made in October 2005. The latest amendments to the energy efficiency standards were made in 2008 and will be effective on August 1, 2009. Energy efficient buildings require less electricity, natural gas, and other fuels. Electricity production from fossil fuels and on-site fuel combustion (typically for water heating) results in greenhouse gas emissions. Therefore, increased energy efficiency results in decreased greenhouse gas emissions.

State Standards Addressing Vehicular 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 ARB will apply to 2009 and later model year vehicles. ARB estimates that the regulation will reduce climate change emissions from light duty passenger vehicle fleet by an estimated 18% in 2020 and by 27% in 2030 (AEP 2007). Once implemented, emissions from new light-duty vehicles are expected to be reduced in San Diego County by 21 percent by 2020. Executive Order S-01-07 was enacted by the Governor on January 18, 2007. Essentially, the order mandates the following: 1) that a statewide goal be established to reduce the carbon intensity of California's transportation fuels by at least 10 percent by 2020; and 2) that a Low Carbon Fuel Standard ("LCFS") for transportation fuels be established for California. It is assumed that the effects of the LCFS would be a 10% reduction in GHG emissions from fuel use by 2020.

1.3.2 Local Regulations and Standards

The County is working to develop a comprehensive strategy that will enhance the sustainability of County business operations and communities, building on the many energy efficient and environmentally sound practices already in place in County departments. Additionally, the County is working on the General Plan Update. The Update includes smart growth and land

planning principles that will reduce Vehicle Miles Traveled (VMT) and thus result in a reduction in GHG emissions. The General Plan Update will result in development of an implementation plan for GHG reduction measures which will include the following actions:

- Prepare a climate change action plan with a baseline inventory and emissions reduction targets for greenhouse gas emissions from all sources.
- Develop regulations and procedures to encourage the design and construction of new buildings in accordance with "green building" programs.
- Develop regulations that encourage the use of energy recovery, as well as photovoltaic and wind energy in appropriate areas.

The County has also implemented a number of outreach programs such as the Green Building Program, lawn mower trade-in program, and reduction of solid waste by recycling to reduce air quality impacts as well as GHG emissions.

2.0 POTENTIAL CLIMATE CHANGE IMPACTS TO PROJECT SITE

2.1 Existing Conditions

The site is currently under agricultural uses and includes disturbed areas and avocado and citrus trees. Vegetation and soils temporarily store carbon as part of the terrestrial carbon cycle. Carbon is assimilated into plants and animals as they grow and then dispersed back into the environment when the die. There are two existing sources of carbon storage at the Project site: natural vegetation and soils. It is difficult to assess net changes in carbon storage associated with the West Lilac Residential Project. The key issue is the balance between the loss of existing vegetation and future carbon storage associated with landscaping. The situation is further complicated by changes in fire regime. Carbon in vegetation is likely to be released into the atmosphere through wildfire every 20 to 150 years. Carbon in landscaped areas will be protected from wildfire. The balance between these factors will influence the long-term carbon budget on the site. Also, it should be noted that agricultural operations also result in emissions of GHGs through the use of equipment and vehicles associated with the operations.

The majority of carbon within the site is stored in the soil. Soil carbon accumulates from inputs of plant and animal matter, roots, and other living components of the soil ecosystem (e.g., bacteria, worms, etc.). Soil carbon is lost through biological respiration, erosion, and other forms of disturbance. Overall, soil carbon moves more slowly through the carbon cycle, and it offers greater potential for long-term carbon storage. Field observations suggest that urban soils can sequester relatively large amounts of carbon. Observations from across the United States suggest that warmer and drier climates (such as southern California) may have slightly higher soil organic matter levels when compared to equivalent areas before development.

2.2 Typical Adverse Effects

The Climate Scenarios Report (CCCC 2006), uses a range of emissions scenarios developed by the IPCC to project a series of potential warming ranges (i.e., temperature increases) that may occur in California during the 21st century. Three warming ranges were identified: Lower warming range (3.0 to 5.5 degrees Fahrenheit (^{o}F)); medium warming range (5.5 to 8.0 ^{o}F); and

higher warming range (8.0 to 10.5 ºF). The Climate Scenarios report then presents an analysis of the future projected climate changes in California under each warming range scenario.

According to the report, substantial temperature increases would result in a variety of impacts to the people, economy, and environment of California. These impacts would result from a projected increase in extreme conditions, with the severity of the impacts depending upon actual future emissions of GHGs and associated warming. These impacts are described below.

Public Health. Higher temperatures are expected to increase the frequency, duration, and intensity of conditions conducive to air pollution formation. For example, days with weather conducive to ozone (O_3) formation are projected to increase by 25 to 35 percent under the lower warming range and 75 to 85 percent under the medium warming range. In addition, if global background O_3 levels increase as is predicted in some scenarios, it may become impossible to meet local air quality standards. An increase in wildfires could also occur, and the corresponding increase in the release of pollutants including $PM_{2.5}$ could further compromise air quality. The Climate Scenarios report indicates that large wildfires could become up to 55 percent more frequent if GHG emissions are not significantly reduced.

Potential health effects from global climate change may arise from temperature increases, climate-sensitive diseases, extreme events, and air quality. There may be direct temperature effects through increases in average temperature leading to more extreme heat waves and less extreme cold spells. Those living in warmer climates are likely to experience more stress and heat-related problems (e.g., heat rash and heat stroke). In addition, climate sensitive diseases (such as malaria, dengue fever, yellow fever, and encephalitis) may increase, such as those spread by mosquitoes and other disease-carrying insects.

Water Resources. A vast network of reservoirs and aqueducts capture and transport water throughout the State from northern California rivers and the Colorado River. The current distribution system relies on Sierra Nevada mountain snowpack to supply water during the dry spring and summer months. Rising temperatures, potentially compounded by decreases in precipitation, could severely reduce spring snowpack, increasing the risk of summer water

shortages. In addition, if temperatures continue to rise more precipitation would fall as rain instead of snow, further reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent. The State's water resources are also at risk from rising sea levels. An influx of seawater would degrade California's estuaries, wetlands, and groundwater aquifers.

Agriculture. Increased GHG and associated increases in temperature are expected to cause widespread changes to the agricultural industry, reducing the quantity and quality of agricultural products statewide. Significant reductions in available water supply to support agriculture would also impact production. Crop growth and development will change as will the intensity and frequency of pests and diseases.

Ecosystems/Habitats. Continued global warming will likely shift the ranges of existing invasive plants and weeds, thus alternating competition patterns with native plants. Range expansion is expected in many species while range contractions are less likely in rapidly evolving species with significant populations already established. Continued global warming is also likely to increase the populations of and types of pests. Continued global warming would also affect natural ecosystems and biological habitats throughout the State.

Wildland Fires. Global warming is expected to increase the risk of wildfire and alter the distribution and character of natural vegetation. If temperatures rise into the medium warming range, the risk of large wildfires in California could increase by as much as 55 percent, which is almost twice the increase expected if temperatures stay in the lower warming range. However, since wildfire risk is determined by a combination of factors including precipitation, winds, temperature, and landscape and vegetation conditions, future risks will not be uniform throughout the State.

Rising Sea Levels. Rising sea levels, more intense coastal storms, and warmer water temperatures will increasingly threaten the State's coastal regions. Under the high warming scenario, sea level is anticipated to rise 22 to 35 inches by 2100. A sea level risk of this magnitude would inundate coastal areas with salt water, accelerate coastal erosion, threaten levees and inland water systems, and disrupt wetlands and natural habitats.

3.0 CLIMATE CHANGE SIGNIFICANCE CRITERIA

Because the County of San Diego has not yet approved a guideline for determining significance for climate change, the project relied on the 900 metric ton screening threshold based on available guidance from CAPCOA's *CEQA and Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act* (CAPCOA 2008). This White Paper references a 900 metric ton guideline as a conservative threshold for requiring further analysis and mitigation. This threshold was one of many suggested by CAPCOA which was intended to exclude small development projects that will contribute a relatively small fraction of the cumulative statewide GHG emissions. CAPCOA estimated that this threshold would exclude approximately 10% of new development projects but capture the remaining 90% of new residential development, thereby establishing a strong basis for demonstrating that cumulative reductions are being achieved across the state.

Construction GHG emissions include emissions from heavy construction equipment, truck traffic, and worker trips. Emissions were calculated using the URBEMIS Model, Version 9.2.4, for completed and proposed construction. The URBEMIS Model contains emission factors from the OFFROAD2007 model for heavy construction equipment (CARB 2007), and from the EMFAC2007 model for on-road vehicles. Construction emissions are summarized in Table 4.

Table 4
Construction GHG Emissions
Metric tons/year

Construction Phase	CO_2 Emissions, metric tons
Mass Grading	247
Utilities	75
Paving	52
Building Construction	171
Architectural Coatings	1
TOTAL	346

Construction emissions are well below the 900 metric ton level suggested by CAPCOA below which reporting would be required for the purpose of GHG inventories. Construction emissions would be less than significant.

An evaluation of operational emissions from the West Lilac Residential Project indicate that emissions would be less than the 900 metric ton threshold. A discussion of the methodology used to calculation emissions is provided below. Emission calculations are provided in Appendix A, and summarized in Table 4.

Energy Use Emissions. As discussed above, energy use generates GHG through emissions from power plants that generate electricity as well as emissions from natural gas usage at the facility itself. Indirect emissions from electricity use, and emissions from natural gas use were calculated based on emission factors in the California Climate Action Registry General Reporting Protocol, Version 3.0 (CCAR 2008).

The project proposes to develop 28 residential dwelling units. According to the California Energy Commission (2004), the average annual residential energy use rate is 5,914 kWh per residential unit.

Natural gas use was estimated based on average gas consumption per square foot as reported by SCAQMD (SCAQMD 1993). Natural gas consumption was multiplied by the CCAP emission factors for CO_2 equivalents per therm. CO_2 for household electricity and natural gas use were combined and converted to metric tons for reporting.

Water. Water use and energy use are often closely linked. The provision of potable water to commercial users consumes large amounts of energy associated with five stages: source and conveyance, treatment, distribution, end use, and wastewater treatment. This inventory estimated that delivered water for the project will have an embodied energy of 3,519 kWh/acre foot or 0.0108 kWh/gallon (Wilkinson and Wolfe 2005).

Water usage was estimated based on an estimated water usage of 35 gallons per year per square foot (Dziegielewski 2000), assuming on average the homes in the development would be 4,000 square feet. Business as usual water usage, without water management strategies implemented, is estimated at 700,000 gallons per year.

Transportation. As discussed in Section 1.2, on-road vehicle emissions account for 46% of existing GHG emissions in San Diego County. Several regulatory initiatives have been passed to reduce emissions from on-road vehicles, as discussed in Section 1.3. These initiatives include improvements in the CAFE standard included in Title 49 of the Energy Independence and Security Act of 2007, AB 1493, and the Low Carbon Fuel Standard (LCFS). The federal CAFE standard determines the fuel efficiency of certain vehicle classes in the United States, and has remained largely unchanged since 1990; however, federal initiatives have increased CAFE standards for new light-duty vehicles to 35 miles per gallon by 2020. The new CAFE standards will take effect no sooner than 2011, which was the start date used in the SDCGHGI. It is anticipated that CAFE standard improvements would reduce GHG emissions by 5 percent by the year 2016, and by 12 percent by the year 2020. For the purpose of this analysis, the reduction in emissions attributable to implementation of the CAFE standard reductions was assumed to be 12 percent.

AB 1493 (also known as the Pavley Bill) is a standard for new light-duty passenger vehicles. AB 1493 has not been implemented due to legal challenges, but requires automobile manufacturers to reduce vehicle emissions of GHGs in light-duty vehicles, which are defined as light-duty passenger cars, light-duty trucks, and medium-duty trucks/vehicles. ARB estimates that the regulation will reduce climate change emissions from light-duty passenger vehicle fleet by an estimated 18% in 2020 and by 27% in 2030 (AEP 2007). Once implemented, emissions from new light-duty vehicles are expected to be reduced in San Diego County by 21 percent by 2020. For the purpose of this analysis, it was assumed that emissions from vehicles would be reduced by 18%.

The LCFS was included in Executive Order S-01-07, and addresses the type of fuel used in vehicles. The LCFS seeks to reduce the carbon content of the fuel, therefore reducing GHG emissions even if the total fuel consumption is not reduced. The LCFS has been approved by ARB as a discrete early action item under AB 32 and implementing regulations are currently under development. The SDCGHGI assumed a 10 percent reduction in GHG emissions in San Diego County by the year 2020 due to the LCFS. For the purpose of this analysis, a 10% reduction in GHG was assumed due to the LCFS.

The results of the inventory for operational emissions for the West Lilac Residential Project are presented in Table 5. These include GHG emissions associated with buildings (natural gas, purchased electricity) and water consumption (energy embodied in potable water). Table 5 summarizes projected emissions using the methodologies noted above.

Table 5
SUMMARY OF ESTIMATED OPERATIONAL GREENHOUSE GAS EMISSIONS

Emission Source	**Annual Emissions (Metric tons/year)**		
	CO_2	**CH_4**	**N_2O**
Operational Emissions			
Electricity Use Emissions	132	0.001	0.0006
Natural Gas Use Emissions	66	0.01	0.0001
Water Consumption Emissions	18	0.0001	0.00008
Vehicle Emissions	628	0.052	0.047
Total	844	0.062	0.047
Global Warming Potential Factor	**1**	**21**	**310**
CO_2 Equivalent Emissions	844	1	15
TOTAL CO_2 Equivalent Emissions	**860**		

4.0 CONCLUSIONS

Emissions of GHGs would result in a net increase in emissions that is below the 900 metric ton threshold identified by the California Air Pollution Control Officers Association (CAPCOA 2008). Based on this standard, the proposed project would have a less than significant impact and comply with the California Global Warming Solutions Act (AB 32). No further analysis is required.

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Appendix A

Greenhouse Gas Emission Calculations

Table A-1
Summary of Operational Greenhouse Emissions
West Lilac Residential Project

Emission Source	CO_2E (Metric Tons)
Project	
Mobile Sources[a]	643
Electricity[b]	132
Natural gas[c]	66
Water Usage[d]	18
Total	**860**

[a] *Mobile source values were derived using EMFAC2007 in addition to the California Climate Action Registry General Reporting Protocol; Version 2.2, March 2007.*

[b] *Electricity Usage Rates from Table A9-11-A, CEQA Air Quality Handbook, SCAQMD, 1993.*

[c] *Natural Gas Usage Rates from Table A9-12-A, CEQA Air Quality Handbook, SCAQMD, 1993.*

[d] *Water Usage Rates based on project information.*

Table A-2
Electricity Greenhouse Gases
West Lilac Residential Project

Electricity

Land Use	1,000 Sqft	Usage Rate [a] (kWh\sq.ft\yr)	(KWh\year)	MWh\year
Project			0	0.00
Office		12.95	0	0.00
Retail		13.55	0	0.00
Hotel/Motel		9.95	0	0.00
Restaurant		47.45	0	0.00
Food Store		53.30	0	0.00
Warehouse		4.35	0	0.00
Cinema		11.55	0	0.00
High School		10.50	0	0.00
Elementary School		5.90	0	0.00
Hospital		21.70	0	0.00
Library		10.50	0	0.00
Residential (DU)	28.0	11,828	331,184	331.18
Total Project			**331,184**	**331.18**

[a] Electricity Usage Rates from Table A9-11-A, CEQA Air Quality Handbook, SCAQMD, 1993.

GHG	lbs/MWh[b]	lbs	metric tons	CO_2E
Project				
CO_2	878.81	291047.811	132.0169587	132.0169587
CH_4	0.0067	2.2189328	0.00100649	0.021136293
N_2O	0.0037	1.2253808	0.000555823	0.172305108
				132.21

[b] Emission factors for CO_2, CH_4, and N_2O were derived from the California Climate Action Registry General Reporting Protocol; Version 2.2, March 2007

Table A-3
Natural Gas Greenhouse Gas Emissions
West Lilac Residential Project

Natural Gas

Land Use	1,000 Sqft	Usage Rate[c] (cu.ft\sq.ft\mo)	Total Natural Gas Usage (cu.ft\mo)	Total Natural Gas Usage (cu.ft\year)	Total Natural Gas Usage (MMBTU\year)
Project					
Office	0.0	2.0	-	-	-
Retail	0.0	2.9	-	-	-
Hotel/Motel	0.0	4.8	-	-	-
Restaurant	0.0	4.8	-	-	-
Food Store	0.0	2.9	-	-	-
Warehouse	0.0	2.0	-	-	-
Cinema	0.0	4.8	-	-	-
High School	0.0	2.9	-	-	-
Elementary School	0.0	2.0	-	-	-
Hospital	0.0	4.8	-	-	-
Library	0.0	2.9	-	-	-
Residential (DU)	28.0	8,023	224,644	2,695,728	2,750
Total Project			224,644	**2,695,728**	**2,750**

[a] Natural Gas Usage Rates from Table A9-12-A, CEQA Air Quality Handbook, SCAQMD, 1993.

GHG	Kg/MMBtu[b]	Kg	metric tons	CO_2E (Metric Tons)
Project				
CO_2	53.06	145,896.03	66.18	66.18
CH_4	0.0059	16.22	0.01	0.15
N_2O	0.0001	0.27	0.0001	0.04
				66.37

[b] Emission factors for CO_2, CH_4, and N_2O were derived from the California Climate Action Registry General Reporting Protocol; Version 2.2, March 2007

Table A-4
Water Use Greenhouse Gas Emissions
West Lilac Residential Project

Electricity

Land Use	gallons/year	Usage Rate (kWh\gal)	(KWh\year)	MWh\year
Project	3584000	12700	45,517	45.52
Total Project			**45,517**	**45.52**

[a] Electricity Usage Rates from Table A9-11-A, CEQA Air Quality Handbook, SCAQMD, 1993.

GHG	lbs/MWh[b]	lbs	metric tons	CO_2E
Project				
CO_2	878.81	40000.61901	18.14396078	18.14396078
CH_4	0.0067	0.30496256	0.000138329	0.0029049
N_2O	0.0037	0.16841216	7.63904E-05	0.023681027
				18.17

[b] Emission factors for CO_2, CH_4, and N_2O were derived from the California Climate Action Registry General Reporting Protocol; Version 2.2, March 2007

Table A-5
Project-Related Traffic GHG Emissions
West Lilac Residential Project

Vehicle Class	Number of Daily Trips	Speed (mph)	VMT (mi/vehicle-day)	CO2		CH4		N2O		Emissions, lbs/day			Emissions, tons/year		
				Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	Running Exhaust (g/mi)	Start-Up (g/start)[a]	CO2	CH4	N2O	CO2	CH4	N2O
Light-duty auto	262	35	20	367.007	164.624	0.03	0.053	0.02584	0.050825	2816.09	0.25	0.21	513.9364	0.0447	0.0389
Light-duty truck	74	35	20	452.44	194.636	0.031	0.046	0.031445	0.046265	978.30	0.07	0.07	178.5393	0.0129	0.0130
	336														
										3794.39	**0.32**	**0.28**	**692.48**	**0.06**	**0.05**
EMFAC2007 Emission Factors															
2010, 60 F temperature													628.2098	0.052238	0.047095
													643.9062		