Section 3.4
Climate Change

Summary

Table 3.4-1 below provides a summary of the potential environmental impacts of the Proposed Project related to climate change. As shown in Table 3.4-1, the Proposed Project would not have potentially significant impacts or contribute considerably to climate change.

Table 3.4-1. Summary of Potential Impacts on Climate Change

Impact	Level of Significance before Mitigation	Mitigation Measures	Level of Significance after Mitigation
Impact CLI-1: Emission of GHGs During Construction and Operation	Less than Significant/ Less than Cumulatively considerable	Mitigation not required.	N/A
Impact CLI-2: Consistency with AB 32	Less than Significant/ Less than Cumulatively considerable	Mitigation not required.	N/A
Impact CLI-3: Impact of Climate Change on the Project	Less than Significant	Mitigation not required.	N/A

Introduction

This section provides background information on climate change and discusses the potential impacts that occur as a result of the Proposed Project. The Proposed Project would generate greenhouse gases (GHG) which would be emitted during the construction and operation phases. This section covers federal and state policies associated with the regulation of GHG, provides the existing environmental setting and discusses the potential project and cumulative impacts that could result. An analysis of the Proposed Project's consistency with Assembly Bill 32, California's Global Warming Solutions Act 2006, is also presented.

Regulatory Setting

Federal

Although there is currently no federal overarching law or policy related to climate change or regulation of GHGs, recent activity suggests that regulation may be forthcoming. Foremost among legal developments to date has been the U.S. Supreme Court's decision in *Massachusetts v. EPA*, the "Endangerment Finding," and "Cause or Contribute Finding," which is described below. Despite these findings, the future of GHG regulations at the federal level is still uncertain. While the U.S. Environmental Protection Agency (EPA) is considering regulation of GHG sources, EPA authority may be pre-empted by congressional action.

The following summarizes recent federal legal cases, legislation, and policies related to climate change and GHG regulation.

Massachusetts et al. v. U.S. Environmental Protection Agency (2007)

Twelve U.S. states and cities including California, in conjunction with several environmental organizations, sued the EPA in an effort to force the agency to regulate GHG as a pollutant pursuant to the CAA in *Massachusetts et al. v. Environmental Protection Agency*. On April 2, 2007, the U.S. Supreme Court held that the EPA has the authority to regulate GHG emissions as pollutants pursuant to the CAA. However, at the time of the ruling, the court did not decide whether the EPA is required to regulate GHG emissions, or may exercise discretion to not regulate at this time.

Energy Independence and Security Act of 2007

The Energy Independence and Security Act of 2007 mandates a host of actions that would aid in the reduction of GHG emissions. These include (but are not limited to): fuel economy standard of 35 miles per gallon (mpg) by 2020; improved energy efficiency in lighting and appliances; and investments in efficiency and renewable energy use (White House 2008).

Update to Corporate Average Fuel Economy (CAFE) Standards (2009)

The new CAFE standards incorporate stricter fuel economy standards promulgated by the State of California into one uniform standard. Additionally, automakers are required to cut GHG emissions in new vehicles by roughly 25 percent by 2016. Rule-making to adopt these new standards is still in process and thus the standards are not yet in effect. When the national program takes effect, California has committed to allowing automakers who show compliance with the

national program to also be deemed in compliance with state requirements (EPA 2010).

HR 2454: American Clean Energy and Security Act of 2009

On June 26, 2009, the U.S. House of Representatives passed the American Clean Energy and Security Act, also known as the Waxman-Markey Clean Energy Bill. The bill's centerpiece is the establishment of a cap and trade program for GHGs and includes the following key provisions: (1) requirement that electric utilities meet 20 percent of their demand with renewable sources of power by 2020; (2) investments of $190 billion in clean energy technologies and energy efficiency; (3) mandates for new energy saving standards for buildings, appliances, and industry; and (4) goal set to reduce GHG emissions from U.S. sources by 17 percent before 2020 and 80 percent by 2050.

The passage of the legislation marked the first time that either house of Congress passed a bill limiting the emissions of GHGs. On July 7, 2009, the bill was placed on the Senate Legislative Calendar. At the writing of this document, a companion bill has been drafted by Senators Barbara Boxer and John Kerry (S. 1733: Clean Energy Jobs and American Power Act). The bill was approved by the Committee on Environment and Public Works in November of 2009 but has not yet been debated by the Senate. Recent news reporting has indicated that action by the U.S. Senate is not likely to occur in 2010.

EPA Rule: Mandatory Reporting of GHGs (2009)

Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions are required to report annual emissions to the EPA. The first annual reports for the largest emitting facilities, covering calendar year 2010, will be submitted to the EPA in 2011. The mandatory reporting rule does not limit GHG emissions but establishes a standard framework for emissions reporting and tracking of large emitters (EPA 2010).

EPA "Endangerment Finding" and "Cause or Contribute Finding" (2009)

In its "Endangerment Finding," the Administrator of the EPA found that GHGs in the atmosphere, as described above, threaten the public health and welfare of current and future generations. The Administrator also found that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens public health and welfare. Although the Endangerment Finding does not place requirements on industry, it is an important step in the EPA's process to develop regulation. This action is a prerequisite to finalizing the EPA's proposed GHG emission standards for light-duty vehicles, which were jointly proposed by EPA and the Department

of Transportation's National Highway Safety Administration on September 15, 2009 (EPA 2010).

In its "Cause or Contribute Finding" the Administrator found that the combined emissions of these well-mixed GHGs from new motor vehicles and new motor vehicle engines contribute to the GHG pollution that threatens the public health and welfare (EPA 2010).

Council on Environmental Quality (CEQ) NEPA Guidance on Consideration of Effects of Climate Change and GHG Emissions (2010)

This guidance was intended to help explain how agencies of the Federal government should analyze the environmental effects of GHG emissions and climate change when they describe the environmental effects of a proposed agency action in accordance with Section 102 of NEPA and the CEQ Regulations for Implementing the Procedural Provisions of NEPA, 40 CFR 1500–1508. The guidance affirmed the requirements of the statute and regulations and their applicability to GHGs and climate change impacts. CEQ proposed to advise federal agencies that they should consider opportunities to reduce GHG emissions caused by proposed federal actions and adapt their actions to climate change impacts throughout the NEPA process and address these issues in their agency NEPA procedures.

The guidance advised federal agencies to consider whether analysis of the direct and indirect GHG emissions from their proposed actions may provide meaningful information to decision makers and the public. The guidance identified a "reference point" of 25,000 metric tons of direct CO_2-equivalent GHG emissions as an "indicator" that the proposed federal action's anticipated GHG emissions warrant detailed consideration in a NEPA review. For indirect GHG emissions (i.e., GHG emissions that have a causal nexus to, but are not directly emitted by, or the direct result of, the project), the guidance did not propose a reference point indicating when such indirect emissions are significant, and cautioned that any consideration of indirect GHG emissions needed to recognize the limits of feasibility in evaluating upstream and downstream effects of proposed federal actions.

The guidance did not propose this reference point as an indicator of a level of GHG emissions that may significantly affect the quality of the human environment, but rather as a minimum standard for reporting emissions under the Clean Air Act.

State

The State of California has adopted legislation, and regulatory agencies have enacted policies, addressing various aspects of climate change and GHG emissions mitigation. Much of this legislation and policy activity is not directed at citizens or jurisdictions but rather establishes a broad framework for the state's

long-term GHG mitigation and climate change adaptation program. This program includes research, energy conservation and infrastructure, transportation, emissions reporting protocols, the role of local governments, and adaptation planning. Additionally, the Governor has issued several executive orders related to the state's evolving climate change policy

SB 1078/SB 107—Renewable Portfolio Standard

Senate Bills (SB) 1078 and 107—California's Renewable Portfolio Standard (RPS)— obligate investor-owned utilities (IOUs), energy service providers (ESPs), and Community Choice Aggregations (CCAs) to procure an additional 1 percent of retail sales per year from eligible renewable sources until 20 percent is reached, no later than 2010. The California Public Utilities Commission (CPUC) and CEC are jointly responsible for implementing the program.

EO S-14-08 set forth a longer range target of procuring 33 percent of retail sales by 2020. The Air Resources Board is considering adopting regulation concerning the 33 percent requirement presently. At the same time, the California legislature is considering new legislation (SB 722) mandating the 33 percent requirement.

AB 1493—Greenhouse Gas Emission Standards for Automobiles

Known as "Pavley I," Assembly Bill (AB) 1493 standards are the nation's first GHG standards for automobiles. AB 1493 requires CARB to adopt vehicle standards that will lower GHG emissions from new light duty autos to the maximum extent feasible beginning in 2009. Additional strengthening of the Pavley standards (Pavley II) has been proposed for vehicle model years 2017–2020. Together, the two standards are expected to increase average fuel economy to roughly 43 mpg by 2020 and reduce GHG emissions from the transportation sector in California by approximately 14 percent. In June 2009, the EPA granted California's waiver request enabling the state to enforce its GHG emissions standards for new motor vehicles beginning with the current model year. The new federal CAFE standards, described above, are the analogous national policy.

Executive Order S-3-05—Greenhouse Gas Emission Reduction Targets

In 2005, Governor Schwarzenegger issued California Executive Order S-3-05 establishing the following GHG emission reduction targets for California:

- reduce GHG emissions to 2000 levels by 2010;
- reduce GHG emissions to 1990 levels by 2020; and,
- reduce GHG emissions to 80 percent below 1990 levels by 2050.

Executive Orders are binding only on State agencies. Accordingly, S-3-05 will guide state agencies' efforts to control and regulate GHG emissions, but have no direct binding effect on local efforts.

AB 32—The Global Warming Solutions Act of 2006

AB 32 codified the state's GHG emissions target by requiring that the state's global warming emissions be reduced to 1990 levels by 2020. Since being adopted, the CARB, CEC, CPUC, and Building Standards Commission have been developing regulations that will help meet the goals of AB 32 and EO S-03-05. The Scoping Plan for AB 32 identifies specific measures and actions to reduce GHG emissions to 1990 levels by 2020, and requires CARB and other state agencies to develop and enforce regulations and other initiatives for reducing GHGs.

AB 32 Draft Scoping Plan

A Scoping Plan for AB 32 (CARB 2008a) was adopted by CARB in December 2008 and identifies measures to reduce GHG emissions to 1990 levels, which is approximately 30 percent less than BAU emission levels projected for 2020, or about 15 percent less than current levels as they were in 2008. The Scoping Plan includes GHG reduction strategies in the following focus areas: a cap and trade program with other western states, vehicle fuel economy, building energy efficiency, renewable power sources, carbon intensity of transport fuels, agriculture, forestry, mass transit, industrial sources, water, waste, and recycling. The Scoping Plan has a range of GHG reduction actions, including direct regulations, alternative compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system. It requires CARB and other state agencies to develop and enforce regulations and other initiatives reducing GHGs by 2012. The complete AB 32 Scoping Plan as well as additional information about individual programs can be found through the AB 32 Scoping Plan website: (http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm).

Senate Bill 97 Chapter 185, Statutes of 2007

Senate Bill 97 (SB 97) requires that Office of Planning and Research (OPR) to prepare guidelines to submit to the California Resources Agency regarding feasible mitigation of GHG emissions or the effects of GHG emissions as required by CEQA. The Natural Resources Agency adopted Amendments to the CEQA Guidelines for GHG emissions on December 30, 2009. On February 16, 2010, the Office of Administrative Law approved the Amendments, and filed them with the Secretary of State for inclusion in the California Code of Regulations. The Amendments became effective on March 18, 2010. The adopted guidelines recommend quantification of GHG emissions, assessment of their significance, and adoption of feasible mitigation of GHG emissions when significant impacts are identified.

Executive Order S-01-07

Executive Order S-01-07 was enacted by Governor Schwarzenegger on January 18, 2007. 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 in California.

Senate Bill 375—Sustainable Communities Strategy, Chapter 728, Statues of 2008

SB 375 provides for a new planning process that coordinates land use planning, regional transportation plans, and funding priorities in order to help California meet the GHG reduction goals established in AB 32. Further, SB 375 provides incentives to locate housing developments closer to where people work and go to school, allowing them to reduce vehicle miles traveled (VMT) every year.

SB 375 requires regional transportation plans, developed by metropolitan planning organizations (MPOs) relevant to the project area, including MTC, to incorporate a "sustainable communities strategy" (SCS) in their Regional Transportation Plans (RTPs). The goal of the SCS is to reduce regional VMT through land use planning and consequent transportation patterns. The CARB will set regional GHG reduction targets that will focus each SCS. The regional targets are scheduled to be released by the CARB in September 2010. SB 375 also includes provisions for streamlined CEQA review for some infill projects such as transit-oriented development. However, those provisions will not become effective until an SCS is adopted. MTC has not yet developed an SCS and is not expected to adopt an RTP incorporating an SCS until the next RTP update in 2013.

California Energy Efficiency Standards for Residential and Non-Residential Buildings (Title 24)

Energy Conservation Standards for new residential and nonresidential buildings were adopted by California Energy Resources Conservation and Development Commission in June 1977 and most recently revised in 2008 (24 CCR 6). Title 24 requires that building shells and building components be designed to conserve energy. The standards are updated periodically to allow consideration and possible incorporation of new energy efficiency technologies and methods. This program has been partially responsible for keeping California's per capita energy use approximately constant over the past 30 years.

On July 17, 2008, the California Building Standards Commission adopted the nation's first green building standards. The California Green Building Standards Code (proposed Part 11, Title 24) was adopted as part of the California Building Standards Code (24 CCR). Part 11 establishes voluntary standards that will become mandatory in the 2010 edition of the code, including planning and design for sustainable site development, energy efficiency (in excess of the California

Energy Code requirements), water conservation, material conservation, and internal air contaminants.

Assembly Bill 939, Titles 14, 17, and 27 (Chapter 1095, Statutes of 1989)

GHG emissions from landfills are regulated under AB 939, as set out in Titles 14, 17, and 27 of the CCR. AB 939 mandated local jurisdictions to meet waste diversion goals of 25 percent by 1995 and 50 percent by 2000. In addition, AB 939 established an integrated statewide system for compliance and program implementation. Titles 14 and 27 contain detailed rules on daily operations, handling of specific waste types, monitoring, closure, and record-keeping.

At its June 25, 2009, public hearing, the CARB approved for adoption CCR, title 17, article 4, sub-article 6, sections 95460 to 95476, Methane Emissions from Municipal Solid Waste Landfills. This regulation is a discrete early action GHG reduction measure, as described in the California Global Warming Solutions Act of 2006 (AB 32; Stats. 2006, chapter 488). It will reduce methane emissions from landfills primarily by requiring owners and operators of certain uncontrolled landfills to install gas collection and control systems, and by requiring existing and newly installed gas collection and control systems to operate optimally.

CARB Mandatory GHG Reporting Rule (Title 17)

In December of 2007, the CARB approved a rule requiring mandatory reporting of GHG emissions from certain sources, pursuant to AB 32. Facilities subject to the mandatory reporting rule must report their emissions from the calendar year 2009 and have those emissions verified by a third party in 2010. In general the rule applies to facilities emitting more than 25,000 metric tons of CO_2e in any given calendar year or electricity generating facilities with a nameplate generating capacity greater than 1 megawatt (MW) and/or emitting more than 2,500 metric tons CO_2e per year. Additional requirements also apply to cement plants and entities that buy and sell electricity in the state.

CARB Local Government Operations Protocol

On September 25, 2008, the Local Government Operations Protocol (LGOP) was adopted by CARB. The protocol, prepared by the CARB, California Climate Action Registry, ICLEI—Local Governments for Sustainability, and the Climate Registry, provides methods and techniques for the preparation of GHG emissions inventories for local government municipal operations. The adopted protocol does not contain recommendations for GHG reductions by local governments (The Climate Registry 2008). The protocol was updated in May 2010 (The Climate Registry 2010).

Proposition 23 (2010)

Proposition 23, a ballot initiative qualified for the November 2010 statewide election, proposes to suspend regulatory action under AB 32 until state unemployment levels reach 5.5 percent. The initiative would prevent state regulatory bodies from adopting new regulations pursuant to the authority of AB 32, and would suspend implementation of prior regulations adopted pursuant to AB 32. Regulations adopted in the past or in the future pursuant to separate legislative authority from AB 32 would be unaffected. The initiative would not change requirements under CEQA to analyze GHG emissions.

Local

Union City Programs

In 2000, the Union City Public Works Department installed a Compressed Natural Gas (CNG) system at the Corporation Yard. Since the system was installed, the City has been committed to purchasing new vehicles that run on CNG. In the year 2000, the City adopted an "Alternative Fuel Path" for its vehicle fleets, committing to the California Air Resources Board (CARB) that future replacements or expansions of high mileage vehicles would be powered by an alternative fuel. To date, the City owns 33 compressed natural gas (CNG) vehicles, 20 are high mileage vehicles; 19 vehicles are operated by Union City Transit, including 12 fixed-route buses, and 6 paratransit vans; and 14 are owned by various departments in the City, including 2 CNG street sweepers.

The City adopted Resolution No. 3742-09 establishing a City GHG emission reduction goal to reduce emissions 30 percent below 2005 levels by 2020.

The City is preparing a Climate Action Plan presently and the plan will include feasible local measures for GHG reductions under the City's authority to meet the City's reduction goal. That plan is scheduled for completion in October 2010.

Environmental Setting

This environmental setting provides a background on GHG emissions, climate change, and global, California, County, and City GHG emissions.

Greenhouse Effect and Climate Change

According to the federal Environmental Protection Agency (EPA), a GHG is any gas that absorbs infrared radiation in the atmosphere. This absorption traps heat within the atmosphere, maintaining Earth's surface temperature at a level higher than would be the case in the absence of GHGs. GHGs include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), halogenated chlorofluorocarbons (HCFCs), ozone (O_3), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs). Naturally occurring GHGs include water vapor,

CO_2, CH_4, N_2O, and O_3. Human activities add to the levels of most of these naturally occurring gases. The sources and sinks of each GHG are discussed later in this section.

Increasing levels of GHG in the atmosphere result in an increase in the temperature of the Earth's lower atmosphere, a phenomenon which is commonly referred to as *global warming.* Warming of the Earth's lower atmosphere induces a suite of additional changes including changes in: global precipitation patterns; ocean circulation, temperature, and acidity; global mean sea level; species distribution and diversity; and changes in the timing of biological processes. These large-scale changes are collectively referred to as *climate change*.

The Intergovernmental Panel on Climate Change (IPCC) has been established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation. As the leading authority on climate change science, their best estimates are that the average global temperature rise between 2000 and 2100 could range from 0.6°C (with no increase in GHG emissions above 2000 levels) to 4.0°C (with substantial increase in GHG emissions) (IPCC 2007b). Large increases in global temperatures could have massive deleterious impacts on the natural and human environments.

Since the industrial revolution (approximately 1800), the concentration of CO_2 in the Earth's atmosphere has increased from 270 ppm to roughly 379 ppm. Atmospheric concentrations of CH_4 and N_2O have similarly increased since the beginning of the industrial age. Over this same time period, global average surface temperature has increased by 0.6ºC, global average sea level has increased by nearly 60 mm, and northern hemisphere snow cover (data available since 1920) has decreased nearly 3 million square kilometers. These recently recorded changes can be attributed with a high degree of certainty to increased concentrations of GHGs in the atmosphere (IPCC 2007c). Sinks of CO_2[1] (which remove, rather than emit, CO_2), include uptake by vegetation and dissolution into the ocean. Global GHG emissions greatly exceed the removal capacity of natural sinks. As a result, concentrations of GHG in the atmosphere are increasing (California Energy Commission 2006).

GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors) and TACs. Criteria air pollutants, such as O_3 precursors and TACs, are pollutants solely of regional and local concern, and local concentrations respond to locally implemented control measures. The long atmospheric lifetimes of GHGs allow them to be transported long distances from sources and to become well-mixed, unlike criteria air pollutants, which typically exhibit strong concentration gradients away from point sources.

[1] A CO_2 sink is a resource that absorbs CO_2 from the atmosphere. The classic example of a sink is a forest in which vegetation absorbs CO_2 and produces oxygen through photosynthesis.

Greenhouse Gases

The greenhouse gases listed by the IPCC (CO_2, CH_4, N_2O, HFCs, PFCs, and sulfur hexafluoride [SF_6]) are documented in this section, in order of abundance in the atmosphere. Water vapor, although the most abundant GHG, is not included in this list because, natural concentrations and fluctuations far outweigh anthropogenic influences. The sources and sinks of each of these gases are discussed in detail below.

To simplify reporting and analysis, methods have been set forth to describe emissions of GHGs in terms of a single gas, CO_2. Generally, GHG emissions are quantified in terms of metric tons of carbon dioxide equivalents (CO_2e) emitted per year. GHGs are compared in terms of their respective global warming potentials (GWP), that is, the warming capacity per molecule given an atmospheric lifetime of 100 years. The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of CO_2e, which compares the gas in question to that of the same mass of CO_2 (CO_2 has a GWP of 1 by definition).

The atmospheric residence time of a gas is equal to the total atmospheric abundance of the gas divided by its rate of removal. The atmospheric residence time of a gas is, in effect, a half-life measurement of how long a gas is expected to persist in the atmosphere when taking into account removal mechanisms such as chemical transformation and deposition. Table 3.4-2 lists the GWP of each GHG, its lifetime, and abundance in the atmosphere in parts per trillion (ppt), parts per billion (ppb) or parts per million (ppm).

Table 3.4-2. Lifetimes, Global Warming Potentials, and Abundances of Several Significant Greenhouse Gases

Gas	Global Warming Potential (100 years)	Lifetime (years)	2005 Atmospheric Abundance (ppm)
CO_2	1	50–200	379
CH_4	21	9–15	1.7
N_2O	310	120	0.32
HFC-23	11,700	264	1.8×10^{-5}
HFC-134a	1,300	14.6	3.5×10^{-5}
HFC-152a	140	1.5	3.9×10^{-6}
CF_4	6,500	50,000	7.4×10^{-5}
C_2F_6	9,200	10,000	2.9×10^{-6}
SF_6	23,900	3,200	5.6×10^{-6}

Notes: CF_4 and C_2F_6 are PFCs. The GWP values presented above are based on the IPCC Second Assessment Report (SAR) and United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines (IPCC 1996). Although the IPCC Fourth Assessment Report (AR4) presents different GWP estimates, the current inventory standard relies on SAR GWPs to comply with reporting standards and consistency with regional and national inventories (EPA 2010).
Sources: IPCC 1996, 2001, 2007c.

Carbon Dioxide

CO_2 is the most important anthropogenic GHG and accounts for more than 75 percent of all anthropogenic GHG emissions. Its long atmospheric lifetime (on the order of decades to centuries) ensures that atmospheric concentrations of CO_2 will remain elevated for decades even after GHG mitigation efforts to reduce GHG concentrations are promulgated (IPCC 2007b).

Primary sources of anthropogenic CO_2 in the atmosphere are the burning of fossil fuels (including motor vehicles), gas flaring, cement production, and land use changes, including deforestation. CO_2 emissions due to the burning of fossil fuels represent nearly 60 percent of total GHG emissions worldwide, of which approximately 23 percent is from the transportation sector. In California the percentage of transportation-related CO_2 emissions is approximately 39 percent.CO_2 emissions resulting from deforestation are the second largest source of GHGs worldwide (17 percent).

Methane

CH_4, the main component of natural gas, is the second most abundant GHG and has a GWP of 21 (IPCC 1996). Sources of anthropogenic emissions of CH_4 include growing rice, raising cattle, combusting natural gas, landfill outgassing, and mining coal (NOAA 2005). Atmospheric CH_4 has increased from a pre-industrial concentration of 715 ppb to 1,775 ppb in 2005 (IPCC 2007a).

Nitrous Oxide

N_2O is a powerful GHG, with a GWP of 310 (IPCC 1996). Anthropogenic sources of N_2O include agricultural processes, nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions. N_2O also is used in rocket engines, racecars, and as an aerosol spray propellant. More than 70 percent of U.S. N_2O emissions are related to agricultural soil management practices, particularly fertilizer application. N_2O concentrations in the atmosphere have increased from pre-industrial levels of 270 ppb to 319 ppb in 2005, an 18 percent increase (IPCC 2007a).

Hydrofluorocarbons

HFCs are human-made chemicals used in commercial, industrial, and consumer products and have high GWPs (EPA 2006). HFCs generally are used as substitutes for ozone-depleting substances (ODS) in automobile air conditioners and refrigerants. As seen in Table 4.4-1, the most abundant HFCs, in order from most abundant to least, are HFC-134a (35 ppt), HFC-23 (17.5 ppt), and HFC-152a (3.9 ppt). Concentrations of HFCs have risen from zero to current levels since pre-industrial times.

Perfluorocarbons (PFCs)

The most abundant PFCs are CF_4 (PFC-14) and C_2F_6 (PFC-116). These human-made chemicals are emitted largely from aluminum production and semiconductor manufacturing processes. PFCs are extremely stable compounds that are destroyed only by very high-energy ultraviolet rays, which results in the very long lifetimes of these chemicals, as shown in Table 4.4-1 (EPA 2010).

Sulfur Hexafluoride

SF_6, another human-made chemical, is used as an electrical insulating fluid for power distribution equipment, in the magnesium industry, and in semiconductor manufacturing; and also as a trace chemical for the study of oceanic and atmospheric processes (EPA 2010).

In 1998, atmospheric concentrations of SF_6 were 4.2 ppt and steadily increasing in the atmosphere. SF_6 is the most powerful of all GHGs listed in IPCC studies, with a GWP of 23,900 (IPCC 1996).

Climate Change Impacts in California

Increases in the globally averaged atmospheric concentration of GHGs will cause the lower atmosphere to warm, in turn inducing a myriad of changes to the global climate system. These large scale changes will have unique and potentially severe impacts in the western United States, California, and the region surrounding the city. Current research efforts coordinated through the CARB, California Energy Commission (CEC), California EPA (Cal/EPA), University of California (UC) system, and others are examining the specific changes to California's climate that will occur as the Earth's surface warms.

Existing evidence indicates that climate change could impact the natural environment in California in the following ways, among others:

- Rising sea levels along the California coastline, particularly in San Francisco and the San Joaquin Delta due to ocean expansion;
- Extreme-heat conditions, such as heat waves and very high temperatures, which could last longer and become more frequent;
- An increase in heat-related human deaths, infection diseases and a higher risk of respiratory problems caused by deteriorating air quality;
- Reduced snow pack and stream flow in the Sierra Nevada mountains, affecting winter recreation and water supplies;
- Potential increase in the severity of winter storms, affecting peak stream flows and flooding;
- Changes in growing season conditions that could affect California agriculture, causing variations in crop quality and yield;

- Changes in distribution of plant and wildlife species due to changes in temperature, competition from colonizing species, changes in hydrologic cycles, changes in sea levels, and other climate-related effects (CEC 2009).

These changes in California's climate and ecosystems are occurring at a time when California's population is expected to increase from 34 million to 59 million by the year 2040 (California Energy Commission [CEC], 2006). As such, the number of people potentially affected by climate change, as well as the amount of anthropogenic GHG emissions is expected to significantly increase. Similar changes as those noted above for California also would occur in other parts of the world, with regional variations in resources affected and vulnerability to adverse effects.

Emissions Summary

California Emissions

CARB estimates that 1990 gross emission were 433 $MMTCO_2e$. Factoring in the reduction in GHG emissions due to the functioning of existing forests and rangeland as carbon sinks, California's GHG emissions in 1990 were 427 $MMTCO_2e$ (CARB 2010).

Worldwide, California is presently estimated to be the 12th to 16th largest emitter of CO_2 (California Energy Commission, 2006) and is responsible for approximately 2 percent of the world's CO_2 emissions (California Energy Commission, 2006). The California Energy Commission estimates that California is the second largest emitter of GHG emissions of the United States (only Texas emits more GHG). However, California has relatively low carbon intensity when considering per capita GHG emissions or GHG emissions per unit gross state product.

In the year 2008, transportation was estimated to be responsible for 37 percent of the state's GHG emissions, followed by electricity generation (25 percent), the industrial sector (21 percent), agriculture and forestry (6 percent) and other sources (12 percent). California GHG emissions in 2008 (exclusive of land use changes and forestry) totaled approximately 478 MMT of CO_2e (CARB 2010). In general, California's sectoral emissions are similar to the pattern of emissions at the national level. Emissions associated with electricity generation for California customers (25 percent) are slightly less than those for the U.S as a whole (34 percent), due to the diminished role of coal in California's power mix. Emissions from the residential and commercial sectors are primarily due to onsite combustion of fossil fuels (i.e., natural gas) for heating or cooking.

CARB forecasts California's business-as-usual (BAU) 2020 net GHG emissions will amount to 596 $MMTCO_2e$, representing an approximately 30 percent increase from 1990 emissions (CARB 2010).

Bay Area and Alameda County

In 2006 the Bay Area Air Quality Management District (BAAQMD) released *Source Inventory of Bay Area Greenhouse Gas Emissions* based on the emissions from 2002. The inventory was updated in 2010 and was based on emissions produced in the year 2007. The inventory includes GHG emitted directly and indirectly from transportation, power plants, landfills, agriculture, domestic, commercial forestry, and industrial land uses from the nine Bay Area Counties (Napa, Contra Costa, Sonoma, San Mateo, Santa Clara, Marin, San Francisco, Solano, and Alameda). According to the inventory, approximately 36 percent of all GHGs from within the Bay Area are from each the transportation and industrial/commercial sectors, with 15.9 percent from electricity production and co-generation, 7 percent from residential fuel use (including natural gas), 3 percent from off-road equipment, and 1 percent from agriculture and farming. According to the report, Alameda County accounts for approximately16 percent of all of the GHG emitted within the nine Bay Area Counties. Of the GHG emissions emitted from within Alameda County, approximately 54 percent of GHG emissions are from transportation, 21 percent from industrial/commercial land uses, 8 percent from residential fuel, 3 percent from offroad equipment, and less than one percent from agriculture and farming (BAAQMD 2010b).

Union City

Union City has an inventory of 2005 GHG emissions and a forecast of 2020 emissions completed by ICLEI (*Union City Baseline Greenhouse Gas Emissions Inventory Report Base Year 2005 Conducted by ICLEI's Cities for Climate Protection® Campaign In partnership with Union City*).

In 2005, Union City emitted approximately 373,128 tons of CO_2e from the residential, commercial/industrial, transportation and waste sectors. Table 3.4-3 below shows Union City's total GHG emissions from all major sources for the year 2005.

Burning fossil fuels in vehicles and for energy use in buildings and facilities is a major contributor to Union City's GHG emissions. Energy consumption in the transportation sector is the single biggest source of emissions, contributing 43 percent of total emissions.

The residential and commercial/industrial sectors represent emissions that result from electricity and natural gas used in both private and public sector buildings and facilities. The transportation sector includes emissions from private, commercial and fleet vehicles driven within the City's geographical boundaries as well as the emissions from transit vehicles and the city-owned fleet. Because approximately 75 percent of the methane produced from Union City's solid waste is estimated to be recovered (either captured perpetually under the liner of the landfill or captured and then flared), waste emissions appear to be slightly negative. However, because the inventory model does not capture the emissions credit achieved through the City's recycling efforts, this negative number will be zeroed out.

Table 3.4-3. Union City Community Emissions Summary

Potential Sources	CO_2e (tons)	Percent
Residential	81,632	22 %
Commercial/Industrial	132,271	35 %
Transportation	159,226	43 %
Total	**373,128**	
Source: ICLEI 2007.		

Based on the community emissions inventories developed for Union City for the base year 2005, future emissions were forecasted for the year 2020. The emission forecast represents a BAU prediction of how GHG emissions may change in Union City over time for the community.

The forecast projects the growth (or reduction) in GHG emissions that will occur in a given future year. Projections are based on the assumption that energy consumption will grow as population increases. For the community, the forecast was conducted by applying population growth factors to Union City's base year residential, commercial/industrial, and transportation data. Table 3.4-4 provides an emissions summary for Union City's base year and forecast year.

Table 3.4-4. Union City Community BAU Emissions Forecast (2020)

Year	2005	2020
Indicators used to generate forecast	1.06% (Population growth rate based on ABAG 2000 and 2020 data)	
CO_2e emissions (tons)	373,128	432,560
Source: ICLEI 2007		

Impact Analysis

Thresholds of Significance

The new State CEQA Guidelines, which became effective in March 2010, require a discussion of the significance of impacts from GHG emissions on the environment. Specifically, Section 15064.4(a) states that "a *lead agency should make a good-faith effort, based on available information, to describe, calculate or estimate the amount of greenhouse gas emissions resulting from a project."*

The California Resources Agency, with input from OPR and the public, recently adopted revisions to the State CEQA Guidelines that address GHG impacts in the context of CEQA documents. While the new State CEQA Guidelines do not specifically establish significance thresholds, they do describe some of the factors that agencies should consider in determining whether GHG impacts are

significant. Specifically, a Lead Agency should consider the following factors, among others, when assessing the significance of GHG emissions:

- the extent to which a project may increase or reduce GHG emissions as compared to the existing environment;
- whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project; and
- the extent to which the project complies with regulations or requirements adopted to implement a statewide, regional or local plan for GHG reduction or mitigation.

Based on the first of these three factors, lead agencies should undertake a project-by-project analysis to determine the GHG impacts of the project and whether such impacts are cumulatively considerable. Based on the second of the above factors, the project emissions should be compared to an established threshold of significance that the lead agency determines to be applicable to the project.

The CEQA guidelines are silent on the issue of potential impacts of climate change on a project, through changes in sea level for example. Union City considers if appropriate that a CEQA lead agency should consider whether climate change would significantly impact the proposed project. In conducting such an evaluation, the evaluation should focus on the long-term impacts of the project that are more likely to experience the effects of climate change in the future.

In summary, the project would result in a significant impact relative to greenhouse gas emission or climate change if it would:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment.
- Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing GHG emissions.
- Expose property and persons to the physical effects of climate change, including but not limited to flooding, public health, wildfire risk, or other impacts resulting from climate change.

In determining the significance of the project, the recently (June 2010) adopted BAAQMD CEQA thresholds for GHG emissions from land use development projects were used (BAAQMD 2010a). However, it is the BAAQMD policy that the new thresholds only apply to projects for which a Notice of Preparation is published, or environmental analysis begins, on or after the applicable effective date (BAAQMD 2010a). The Notice of Preparation (NOP) for the Proposed Project was issued on April 17, 2008, and the environmental analysis began soon thereafter. As such, the Proposed Project is not required to comply with the new GHG thresholds. However, in order to provide an analysis consistent with an already established methodology and thresholds of significance, the BAAQMD GHG thresholds are used in the following analysis.

According to the BAAQMD, a project would result in a less than significant impact with respects to GHG emissions if a project:

- is in compliance with a Qualified GHG Reduction Strategy, or
- annual emissions are less than 1,100 metric tons of CO_2e per year, or
- annual emissions are less than 4.6 metric tons of CO_2e per service population.

Service-population is defined as the total number of residents and employees within a mixed-use project area. At a state level, considering the AB 32 reduction goal for 2020 and the projected population in 2020, the AB 32 goal is equivalent to approximately 4.6 $MTCO_2e$ per service population (BAAQMD 2010a). With respects to the proposed project, if GHG emissions would be more efficient (i.e. less emissions per service population) than the statewide equivalent, then the project can be deemed to not result in GHG emissions that would have a significant effect on the environment.

Methods

Emissions of GHGs are anticipated to occur with the Proposed Project from the following sources: vehicular emissions resulting from the combustion of gasoline or diesel fuel in motor vehicles; area source emissions resulting from the burning of fuel in fireplaces as well as from landscaping activities of commercial and residential facilities; indirect emissions associated with the purchase of electricity; emissions associated with the burning of natural gas for water and space heating; indirect energy consumption related to the conveyance, supply and treatment of water and wastewater, and; emissions associated with the transport and off-site landfilling of solid waste.

Project-related GHG emissions were estimated using the following methodology:

- URBEMIS2007 was utilized to calculate project-related CO_2 emissions from on-road mobile and area sources (not including natural gas), and
- The BAAQMD Greenhouse Gas Model (BGM) was used to estimate direct and indirect GHG emissions associated with natural gas, electricity, water, wastewater, and solid waste. BGM was also used to calculate non-CO_2 emissions resulting from on-road mobile sources.

Impacts and Mitigation Measures

Impact CLI-1: Emission of Greenhouse Gases During Construction and Operation

Project construction would result in short term GHG emissions during the 10 year infrastructure and development phases. The infrastructure phase includes improvements in the public right-of-way, including utilities, public streets, sidewalks, lighting and landscaping. The development phase includes the

buildout of Blocks 2 and 3. The GHG emissions from the infrastructure and development phase would result from the following construction related activities: (1) construction equipment emissions, (2) emissions from workers' vehicles traveling to and from the construction sites, and (3) emissions from construction material deliveries to and spoils hauling from the construction sites. The primary emissions occur as CO_2 from gasoline and diesel combustion, with more limited vehicle tailpipe emissions of CH_4 and N_2O as well as other GHG emissions related to vehicle cooling systems. An estimate of construction emissions was not prepared as this would necessitate a detailed inventory of all construction equipment and activity, which would be too speculative at this time. Although GHG emissions such as CO_2 can persist in the atmosphere for decades, construction emissions are a one-time event. Thus, the one-time emissions associated with construction are limited in comparison to ongoing GHG sources.

As noted in Section 3.2, *Air Quality*, the Proposed Project inherently includes various design features that reduce motor vehicle trips. Based on information provided by the traffic engineers (Fehr and Peers 2010), trip generation rates for the Proposed Project's land uses were calculated based on the design of the Project. The trip generation rates applied within the URBEMIS model reflect the high-density and transit-oriented nature of the Proposed Project that will reduce overall motor vehicle trips compared to low-density residential development. In addition, the following measures were applied to the unmitigated Project scenario in URBEMIS to reflect the favorable location relative to transit and alternate transportation opportunities:

- 500 housing units within a ½ mile radius of the project (not including the Project's residential units);
- The presence of local-serving retail;
- 100 percent of sidewalks within ½ mile of the project site with sidewalks on both sides; and
- 50 percent of arterials/collectors with bike lanes.

Table 3.4-5 presents the project onsite operations-period GHG emissions in metric tons of CO_2e per year assuming project buildout in opening year 2022. As shown in Table 3.4-5, the Proposed Project would result in an increase in GHG emissions as the Proposed Project would create more motor vehicle trips and increased energy consumption from within the project area. The majority of project-related GHG emissions would be from motor vehicles (56 percent), electricity (18 percent), natural gas (14 percent) and solid waste (10 percent). Note that it is assumed that there are currently no GHG emissions emitted from the project area, as the project is an unutilized parcel. Therefore, project GHG emissions shown below represent the net increase in GHG emissions.

As shown in Table 3.4-5, buildout of the Proposed Project would result in emissions that are significantly more efficient that BAAQMD's threshold of 4.6 $MTCO_2e$ per service population. As a result, the impacts caused by emissions from the proposed project are considered to be less than significant and the cumulative contribution of the project to climate change would be less than significant and no mitigation would be required.

Table 3.4-5. Estimate of Operational Greenhouse Gas Emissions

Emission Source	CO_2e [a]	CO_2e [b]
Transportation	4,657	3,753
Area Source	6	6
Electricity	1,519	1,519
Natural Gas	1,181	1,181
Water and Wastewater	116	116
Solid Waste	835	835
Total Project Emissions	**8,313**	**7,409**
Total Service Population[c]	*2181*	*2181*
$MTCO_2e$ per Service Population	*3.8*	*3.4*
Significant?	*No*	*No*

Notes:

[a] Global Warming Potential is 21 for CH_4 and 310 for N_2O, General Reporting Protocol, California Climate Action Registry, January 2009. Calculation: $CO_2e = (CO_2 \times 1) + (CH_4 \times 21) + (N_2O \times 310)$

[b] This column includes transportation emissions reductions from Pavley (AB 1493) and LCFS which are state mandates.

[c] Service Population for the Proposed Project is the estimated buildout resident population of 2,181. Although there is a commercial component of the project, no employment was included in this calculation and thus the actual SP would be slightly higher and GHG emissions/SP would be slightly less than shown above.

Emissions calculation worksheets are provided in Appendix E.

Source: URBEMIS2007 and BGM modeling, ICF Jones & Stokes, July 2010.

Cumulative Impacts

Because global warming is the result of GHG emissions, and GHGs are emitted by innumerable sources worldwide, global climate change is clearly a significant cumulative impact. GHG emissions from the project could contribute to cumulative GHG emissions in California and to the potential adverse environmental impacts of climate change.

Unlike conventional residential developments that cause urban sprawl and auto-dependency, the Proposed Project would be developed in the Intermodal Station District, which is a center for public transit. The location of the Proposed Project would provide future residents and employees of the commercial space with access to numerous modes of public transit, including Bay Area Rapid Transit (BART), AC Transit, Union City Transit and ultimately Capitol Corridor, Altamont Commuter Express (ACE), Dumbarton Rail. Although the Proposed Project would emit GHG during the construction phase, upon completion, it would reduce the average energy consumption of residents compared to business as usual development by providing alternative modes of mass transit and high-density structures.

There are a number of features included in the Proposed Project that would reduce future GHG emissions, including the following:

- **Compact Development—**By concentrating residential, commercial, and retail development closer to public transit, commercial centers, and services in Union City, the Proposed Project would likely reduce overall vehicle miles traveled (VMT) compared to a more spread out pattern of single-family development.
- **Energy Efficiency**—The Proposed Project is required to comply with Chapter 15.76, Green Building and Landscaping Practices, of the Municipal Code. This Chapter requires the Proposed Project to meet a minimum Leadership in Energy and Environmental Design (LEED™) Silver rating and be so certified by the U.S. Green Building Council.
- **Non-Vehicle Transportation Opportunities**—The Proposed Project's location in the Station District would provide convenient access to regional and local public transit, which would offset some emissions that would otherwise occur due to vehicle trips.

Although the Proposed Project would generate GHG during construction and operational phases, GHG generation during construction represents a one-time contribution, and GHG generated during the operation phase would be offset by the location of alternative modes of transportation and implementation of GHG reduction features. GHG emissions from the Proposed Project would be substantially less than emission from a comparable project of similar size and configuration that would not be near a public transit hub.

As noted above, the City is currently preparing its Climate Action Plan and will be adopting an overall goal to reduce GHG emissions below current levels.

Because GHG from construction activities would be limited and GHG emissions from project operations would be substantially less than from a business as usual project due to project features, and because Union City is engaging in a comprehensive approach to reduce GHG emissions below current levels, overall City emissions are expected to be substantially reduced below BAU levels and thus the impacts related to the project's emission of GHGs are considered to be less than cumulatively considerable.

Impact CLI-2: Consistency with AB 32

The Climate Change Scoping Plan prepared by the ARB outlines the proposed plan to meet the goals set forth by AB 32. Although the document does not outline a plan to reduce GHG levels through land use practices, it does state strong support for in-fill, transit oriented, and mix-use developments like the Proposed Project. Below is a quote from the document that states:

> While improved vehicle technology and lower carbon fuels provide most of the transportation reductions in 2020, additional reductions can be achieved by making the connection between transportation and land use. This scenario reflects an increased emphasis on urban infill

development: more mixed use communities, improved mobility options, and better designed suburban environments.

The Proposed Project is consistent with AB 32 because it would provide alternative modes of public transit, consume less energy than conventional residential developments, and consist of a mix of residential, commercial, and retail land uses. In addition, the project would result in emissions that are below BAAQMD's adopted efficiency threshold, as discussed under Impact CC-1 above. Therefore, impacts related to consistency with AB 32 are considered less than significant and less than cumulatively considerable.

Impact CLI-3 Impacts of Climate Change on the Project

Although the new CEQA Guidelines are silent on whether CEQA evaluations should address the potential impacts of climate change on a project, the City has evaluated this potential.

As noted earlier, climate change impacts in California include, but are not limited to: sea level rise; extreme heat events; increase in infectious diseases and respiratory illnesses; reduced snowpack and water supplies, and potential increase in wildfires.

The project site is not estimated to be inundated by a predicted rise of up to 1.4 meters in sea level rise by 2100 (California Climate Change Center 2009). The project is in the middle of the urban core and thus is not subject to immediate wildfire risks.

While regional water supplies are subject to potential future climate change effects that could affect both local and distant water supplies, each of the Project' proposed residential units would be equipped with water-efficient plumbing fixtures that may include high efficiency toilets, washers, water heaters, showerheads, faucet aerators, etc. Additionally, the Proposed Project is required to incorporate water-efficient landscape features in accordance with the City's Water Efficient Landscape Ordinance (see Section 3.12, *Public Services, Utilities, and Recreation*), which will help to reduce per-capita water demand, thus helping to alleviate demand for scarce statewide water resources.

There are a range of other potential effects of climate change to which the citizens of Union City may be subject to including increased temperatures and heat stress days, for example, but the new Mixed-Use Development will not exacerbate those potential effects nor create a particular hazard to those potential effects. Thus, the project would not result in a significant exposure of property or persons to the potential effects of climate change. This impact is considered to be less than significant.