19 CLIMATE CHANGE

19.1 ENVIRONMENTAL SETTING

This chapter provides the necessary context to determine the potential impacts of the Homewood Mountain Resort (HMR) Ski Area Master Plan (Project) greenhouse gas (GHG) emissions. It first summarizes relevant information on global climate change and then describes the characteristics, sources, and units used to quantify the six GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). The chapter analyzes Project-related GHGs in relation to State, national, and global GHG emissions inventories. Conventional air pollutants (e.g. ozone precursors (ROG and NO_x), carbon monoxide, and particulate matter) are addressed in Chapter 12 – Air Quality.

19.1.1 Global Climate Change

Global climate change is caused in large part by anthropogenic (human caused) emissions of GHGs released into the atmosphere through the combustion of fossil fuels and by other activities that affect the global GHG budget, such as deforestation and land use change. According to the California Energy Commission (CEC), GHG emissions in California are attributable to human activities associated with industrial/manufacturing, utilities, transportation, residential, and agricultural sectors as well as natural processes (California Energy Commission 2006a).

GHGs play a critical role in the Earth's radiation budget by trapping infrared radiation emitted from the Earth's surface, which could have otherwise escaped to space. Prominent GHGs contributing to this process include water vapor, CO_2, N_2O, CH_4, ozone (O_3), certain HFCs and PFCs, and SF_6. This phenomenon, known as the "greenhouse effect," keeps the Earth's atmosphere near the surface warmer than it would otherwise be and allows for successful habitation by humans and other forms of life. The combustion of fossil fuels and removal of vegetation releases carbon that has been stored underground or in biomass into the active carbon cycle, thus increasing concentrations of GHGs in the atmosphere. Emissions of GHGs in excess of natural ambient concentrations are thought to be responsible for the enhancement of the greenhouse effect and to contribute to what is termed "global warming," a trend of unnatural warming of the Earth's natural climate.

GHG emissions have long atmospheric lifetimes, which mean they tend to persist in the atmosphere and can accumulate at much greater concentrations than criteria pollutants, such as ozone. Moreover, GHGs are global pollutants, unlike criteria air pollutants (such as ozone precursors) and toxic air contaminants (TACs), which are primarily pollutants of regional and local concern. Given this, emission reduction strategies can be undertaken on a global scale whereby the mitigation of local GHG emissions can be offset by distant GHG reduction activities.

The Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization and United Nations Environment Programme in 1989 to assess scientific, technical, and socioeconomic information relevant for the understanding of climate change, its potential impacts, and options for adaptation and mitigation. The IPCC predicts substantial increases in global temperatures between 1.1 and 6.4° Celsius (depending on scenario) by the year 2100 (Intergovernmental Panel on Climate Change 2007a).

Climate change could potentially impact the natural environment in California and the world in the following ways:

- Rising sea levels along the California coastline, particularly in San Francisco and the Sacramento–San Joaquin River Delta (Delta) due to ocean thermal expansion and melting of glacial ice, could cause flooding and saltwater intrusion in low-lying areas;
- Changing extreme-heat conditions, such as heat waves and very high temperatures, which could last longer and become more frequent;
- Increasing wildfire frequency and intensity;
- Increasing heat-related human deaths, infectious diseases, and increasing risk of respiratory problems caused by deteriorating air quality;
- Decreasing snow pack and stream flow in the Sierra Nevada mountains, decreasing winter recreation opportunities and summer water supplies;
- Increasing severity of winter storms, causing higher peak stream flows and increased flooding;
- Changing growing season conditions that could affect California agriculture, causing variations in crop quality and yield; and
- Changing 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.

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 2005). As such, the number of people potentially affected by climate change as well as the amount of anthropogenic GHG emissions expected under a "business as usual" (BAU) scenario is expected to increase. In this chapter, the term BAU will refer to GHG emissions that would occur without implementing emission reduction measures.

As a consequence of worldwide GHG emissions altering the global climate, the Project area may be subject to increased vulnerability to the following impacts:

- Reduced water supply;
- Increased risk of heat-related human deaths;
- Increased spread of infectious diseases and non-native invasive species;
- Increased risk of respiratory problems associated with deteriorating air quality; and
- Increased vulnerability to catastrophic wildfire and decreased snow pack.

19.1.2 Greenhouse Gases

The characteristics, sources, and units used to quantify the six GHGs listed in California Assembly Bill (AB) 32 (CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6) are documented in this section, in order of abundance in the atmosphere. Note that water vapor, although the most abundant GHG is not included in AB 32 because natural concentrations and fluctuations far outweigh anthropogenic influences. AB 32 is described below in Section 19.2 - Regulatory Setting.

In order to simplify reporting and analysis, methods have been set forth to describe emissions of GHGs in terms of a single gas. The most commonly accepted method to compare GHG emissions is the "global warming potential" (GWP) methodology defined in the IPCC reference documents (Intergovernmental Panel on Climate Change 1996 and 2001). The IPCC defines the GWP of various GHG emissions in terms of CO_2 equivalents (CO_2e), which compares the GHG in question to that of the same mass of CO_2 (by definition, CO_2 has a GWP of 1.0). The GWP potential is dependent on the atmospheric lifetime and the absorption potential of the gas. GHGs can persist in the atmosphere for long periods. This lifetime is different for each gas and must be reflected in the GWP calculation. In addition, a GHG has the most warming effect if it absorbs radiation at wavelengths where the atmosphere is relatively transparent. Thus, a high GWP represents a long atmospheric lifetime and large absorption potential, which in turn correlates to a powerful GHG.

Table 19-1 lists the GWP, lifetime, and abundance of GHGs in the atmosphere in parts per trillion (ppt).[1] Per international reporting standards established under the United Nations Framework Convention on Climate Change (UNFCCC), GWPs quantified by the IPCC's Second Assessment Report (SAR) are used in this analysis (UNFCCC 2003). Collectively, HFCs, PFCs, and SF_6 are referred to as high global warming potential gases (HGWPG) Generally, GHG emissions are quantified in terms of metric tons of CO_2e emitted per year, whereby the total GHG emissions for each gas are multiplied by their respective GWP and then summed.

Carbon Dioxide

CO_2 accounts for more than 75% of 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 after GHG mitigation efforts to reduce GHG concentrations are implemented (Intergovernmental Panel on Climate Change 2007b). Increasing concentrations of CO_2 in the atmosphere are largely due to emissions from the burning of fossil fuels, gas flaring, cement production, and land use changes such as vegetation removal and large-scale agriculture. Fossil fuel burning accounts of 75% of anthropogenic CO_2 emissions, and land use changes account for 25% (Intergovernmental Panel on Climate Change 2007a). CO_2 emissions attributed to California activities are mainly associated with in-State fossil fuel combustion (including transportation and energy production) and out-of-State fuel use by power plants that supply California with electricity. Other activities that produce CO_2 emissions include mineral production, waste combustion, and land use changes that reduce vegetation.

Anthropogenic emissions of CO_2 have increased concentrations in the atmosphere most notably since the Industrial Revolution; the concentration of CO_2 has increased from about 280 to 379 ppm over the last 250 years (Intergovernmental Panel on Climate Change 2007a). The IPCC estimates that current atmospheric concentration of CO_2 is likely the highest of the past 20 million years (Intergovernmental Panel on Climate Change 2007a; Intergovernmental Panel on Climate Change 2001).

Methane

CH_4, the main component of natural gas, is the second largest contributor to anthropogenic GHG emissions and has a GWP of 21 (Association of Environmental Professionals 2007; Intergovernmental Panel on Climate Change 1996).

[1] Units commonly used to describe the concentration of GHGs in the atmosphere are parts per million (ppm), parts per billion (ppb) and ppt, which refer to the number of molecules of the GHG in a sampling of one million, one billion or one trillion molecules of air, respectively.

Table 19-1

Lifetimes and Global Warming Potentials of Several Significant GHGs

Gas	Global Warming Potential (100 years)	Lifetime (years)[1]	1998 Atmospheric Abundance (ppt)[2]
CO_2	1	50–200	365,000,000
CH_4	21	9–15	1,745
N_2O	310	120	314
HFC-23	11,700	264	14
HFC-134a	1,300	14.6	7.5
HFC-152a	140	1.5	0.5
CF_4	6,500	50,000	80
C_2F_6	9,200	10,000	3
SF_6	23,900	3,200	4.2

Source: Intergovernmental Panel on Climate Change 1996, 2001 (pages 388-390).

Notes:
[1]Represents the length of time by which the pollutant can persist in the atmosphere.
[2]1 ppt is a mixing ratio unit indicating the concentration of a pollutant in parts per trillion by volume.

Anthropogenic emissions of CH_4 are the result of growing rice, raising cattle, combusting natural gas, and mining coal (National Oceanic and Atmospheric Administration 2005). Atmospheric CH_4has increased from a preindustrial concentration of 715 to 1,775 parts per billion in 2005 (Intergovernmental Panel on Climate Change 2007a). Although it is unclear why, atmospheric concentrations of CH_4 have not risen as quickly as anticipated (National Oceanic and Atmospheric Administration 2005).

Nitrous Oxide

N_2O is a powerful GHG, with a GWP of 310 (Intergovernmental Panel on Climate Change 1996). Anthropogenic sources of N_2O include agricultural processes, nylon production, fuel-fired power plants, nitric acid production, and vehicle emissions. N_2O is used in rocket engines and racecars and as an aerosol spray propellant. Agricultural processes that result in anthropogenic N_2O emissions are fertilizer use and microbial processes in soil and water (Association of Environmental Professionals 2007).

N_2O concentrations in the atmosphere have increased from preindustrial levels of 270 ppb to 319 ppb in 2005 (Intergovernmental Panel on Climate Change 2007a).

Hydroflourocarbons

HFCs are human-made chemicals used in commercial, industrial, and consumer products and have high GWPs (Environmental Protection Agency 2006a). HFCs are generally used as substitutes for ozone-depleting substances (ODS) in automobile air conditioners and refrigerants. The most abundant HFCs, in order from most to least abundant, are HFC-134a (35 ppt), HFC-23 (17.5 ppt), and HFC-152a (3.9 ppt) (Table 19-1).

Concentrations of HFCs have risen from zero to current levels. Because these chemicals are human-made, they do not exist naturally in ambient conditions.

Perfluorocarbons

The most abundant PFCs include 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 only destroyed by very high-energy ultraviolet rays, which result in the very long lifetimes of these chemicals, as shown in Table 19-1 (Environmental Protection Agency 2006a).

Sulfur Hexafluoride

SF_6, another human-made chemical, is used as an electrical insulating fluid for power distribution equipment, in the magnesium industry, in semiconductor manufacturing, and as a trace chemical for study of oceanic and atmospheric processes (Environmental Protection Agency 2006a). In 1998, atmospheric concentrations of SF_6 were 4.2 ppt and steadily increasing in the atmosphere.

SF_6 is the most powerful GHG listed in IPCC studies with a GWP of 23,900 (Intergovernmental Panel on Climate Change 1996).

19.1.3 GHG Inventories

A GHG inventory is a quantification of GHG emissions and sinks within a selected physical and/or economic boundary over a specified time. GHG inventories can be performed on a large scale (i.e., for global and national entities) or on a small scale (i.e., for a particular building or person).

Many GHG emission and sink specifications are complicated to evaluate because natural processes may dominate the carbon cycle. Though some emission sources and processes are easily characterized and well understood, some components of the GHG budget (i.e., the balance of GHG sources and sinks) are not known with accuracy. Because protocols for quantifying GHG emissions from many sources are currently under development by international, national, State, and local agencies, ad-hoc tools must be developed to quantify emissions from certain sources and sinks in the interim.

The following sections outline the global, national, and Statewide GHG inventories to contextualize the magnitude of Project-related emissions.

IPCC 2004 Global GHG Inventory

The most recent global GHG annual emission inventory analyzed emissions in 2004 and was conducted by the IPCC. According to the IPCC, global anthropogenic GHG emissions were estimated at 49 gigatons of CO_2e in 2004, which is 24% greater than 1990 emissions levels. Table 19-2 presents global GHG emissions by sector, as defined in the IPPC report. The largest GHG contributing to these emissions was CO_2, which accounted for 76.7% of the total.

Table 19-2

Annual Global GHG Emissions from the IPCC 2004 Inventory

Sector	CO_2e Emissions (gigatons)
Energy	12.69
Industry	9.50
Forestry	8.53
Agriculture	6.61
Transportation	6.41
Residential and Commercial Buildings	3.87
Waste and Wastewater	1.37
Total Emissions	49

Source: Adapted from Intergovernmental Panel on Climate Change 2007c, p. 5.

National 2007 GHG Inventories

The U.S. Environmental Protection Agency (EPA) estimates that total U.S. GHG emissions in 2007 amounted to 7,150.1 MMT of CO_2e, which is 17% greater than 1990 levels (Environmental Protection Agency 2009a). Table 19-3 summarizes the U.S. GHG emissions in 2007, based on CO_2 equivalents (Environmental Protection Agency 2009a).

Table 19-3

Annual U.S. Greenhouse Gas Emissions from the EPA 2007 Inventory

Sector	2007 CO_2e Emissions (million metric tons)
Energy	6,170.3
Industrial Processes	353.8
Solvent and Other Product Use	4.4
Agriculture	413.1
Land Use, Land-Use Change, and Forestry	42.9
Waste	165.6
Total Emissions	7,150.1

Source: U.S. Environmental Protection Agency 2009a, p. ES-11.

The Energy Information Administration (EIA) also conducted an inventory on 2007 GHG emissions. The results of their analysis were similar to those of the EPA, with total U.S. GHG emissions amounting to 7,282.4 MMT ofCO_2e. This represents a 1.4 percent increase above the

2006 total (Energy Information Administration 2008). Table 19-4 summarizes total GHG emissions by sector, as defined in the EIA report (Energy Information Administration 2008).

Table 19-4

Annual U.S. Greenhouse Gas Emissions from the 2007 EIA Inventory

Sector	CO_2e (million metric tons)
Industry	2,610
Transportation	2,036
Commercial	1,355
Residential	1,281
Total Emissions	7,281

Source: Energy Information Administration 2008.

Total emissions growth—from 2006 to 2007—was largely the result of a 75.9-MMTCO_2e-increase in CO_2 emissions. This increase resulted primarily from two factors: unfavorable weather conditions, which increased demand for heating and cooling in buildings; and a drop in hydropower availability that led to greater reliance on fossil energy sources (coal and natural gas) for electricity generation, increasing the carbon intensity of the power supply (Energy Information Administration 2008). CH_4 emissions increased in the energy, waste management, and agriculture sectors. The increase in N_2O is attributed primarily to an increase of emissions from nitrogen fertilization of agricultural soils.

Statewide 2004 and 2006 GHG Inventories

The CEC's *Inventory of Greenhouse Gas Emissions and Sinks: 1990–2004* estimates that California is the second largest emitter of GHG emissions in the United States (California Energy Commission 2006a). The commission further estimates that in 1990, California's gross GHG emissions were between 425 and 452 MMT of CO_2e, while in 2004, California's gross GHG emissions were 492 MMT of CO_2e. Similar to the global and national inventories, CO_2 represented the largest percentage of the State's GHG emissions inventory. Statewide. Table 19-5 summarizes 2004 Statewide GHG emissions by sector, as defined in the CEC report (California Energy Commission 2006a).

Table 19-5

Annual Statewide Greenhouse Gas Emissions from the 2004 CEC Inventory

Sector	CO_2e (million metric tons)
Transportation	200
Electrical Power	109
Industry	101
Agriculture and Forestry	41
Other	41
Total Emissions	492

Source: Adapted from California Energy Commission 2006a.

The California Air Resources Board (ARB) recently completed a GHG inventory of California's 2006 GHG emissions. Their report states that 1990 emissions amounted to 433.3 MMT of CO_2e, while 2006 emissions levels rose to 483.9 MMT of CO_2e (California Air Resources Board 2009a). Based on California's 2006 population of 37,114,598, this amounts to approximately 13 metric tons of CO_2e per person (State of California, Department of Finance 2008). Table 19-6 summarizes Statewide GHG emissions by sector, as defined in the ARB report.

Table 19-6

Annual Statewide Greenhouse Gas Emissions from the 2006 ARB Inventory

Sector	CO_2e (million metric tons)[1]
Transportation	188.721
Electricity Generation	106.458
Industry	101.619
Agriculture and Forestry	29.034
Residential	29.034
Commercial	14.517
Other	14.517
Total	483.9

Source: Adapted from California Air Resources Board 2009a.

Notes:
[1] Emissions inventory includes estimates for CO_2, CH_4, N_2O, SF_6, HFCs, and PFCs.

19.1.4 Existing Emissions Sources at HMR and Trends in the LTAB

The Project area is currently used as a ski resort and includes three major buildings—two base lodges and a temporary tent structure at mid-mountain. Existing GHG emissions from these facilities, as well as smaller secondary buildings, are primarily generated by natural gas and electricity usage. Air conditioning, landscaping activities, and water usage generate small amounts of GHG emissions. In addition, fuel usage from vehicles traveling to and from the resort represent a significant source of HMR generated GHG emissions. GHG emissions from these sources were estimated using a variety of methods, which are described in section 19-3. Based on this analysis, existing GHG emissions from HMR are 1,859 metric tons CO_2e per year.

TPPA's 2008 Regional Transportation Plan identifies emissions from motor vehicles as the leading source of GHG emission in the basin. The RTP categorizes future projects in terms of their potential to increase or decrease GHG emissions from transportation. It is estimated that approximately 57% of projects included in the 2008 RTP will reduce GHG emissions. Projects that will likely increase GHG emissions account for 1% of total projects, and projects whose effect is unclear make up 42%. Although GHG impacts from a large portion of future projects are still unclear, the RTP's overall policy direction is to reduce future dependence on the automobile and GHG emissions (Tahoe Metropolitan Planning Organization 2008). Existing strategies have been successful as historic traffic volumes on SR 28 have decreased by approximately 1% to 2.3% from 1999 to 2008 (see Chapter 11 – Transportation, Parking, and Circulation, Table 11-4).

19.2 REGULATORY SETTING

Climate change has only recently been widely recognized as an imminent threat to the global climate, economy, and population. Thus, the climate change regulatory setting—nationally, Statewide, and locally—is complex and evolving. The following section identifies key legislation, executive orders, and seminal court cases relevant to the environmental assessment of project GHG emissions.

19.2.1 Federal

Currently, there is no federal legislation requiring reductions in GHG emissions. Rather, the United States Environmental Protection Agency (EPA) administers a variety of voluntary programs and partnerships with GHG emitters in which the EPA partners with industries producing and utilizing synthetic GHGs to reduce emissions of particularly potent GHGs. There are federal actions requiring increasing automobile efficiency, an endangerment finding for CO_2, and a recently finalized regulation requiring large sources of GHG emissions to report their emissions to the EPA.

Federal Action on Greenhouse Gas Emissions

In 2002, President George W. Bush set a national policy goal of reducing the GHG emission intensity (tons of GHG emissions per million dollars of gross domestic product) of the U.S. economy by 18% by 2012. No binding reductions were associated with the goal. Rather the EPA administers a variety of voluntary programs and partnerships with GHG emitters in which the EPA collaborates with industries producing and utilizing synthetic gases to reduce emissions of these particularly potent GHGs.

On September 30, 2009, the EPA proposed a new rule that would establish significance thresholds for six GHGs. The rule would define when Clean Air Act (CAA) permits under the New Source Review (NSR) and Title V operation permit programs would be required for new and existing facilities. The proposed threshold is 25,000 tons of CO_2e per year. Facilities exceeding this threshold would be required to obtain a permit that would demonstrate they are using Best Management Practices (BMPs). The EPA estimates that 14,000 large sources would need to obtain permits, the majority of which would be municipal solid waste landfills. The EPA is currently evaluating the proposal and will issue final guidance once a ruling has been made (Environmental Protection Agency 2009b).

Massachusetts et al. vs. Environmental Protection Agency et al

In Massachusetts et al. vs. Environmental Protection Agency et al. (April 2, 2007) the U.S. Supreme Court ruled that the EPA was authorized by the Clean Air Act (CAA) to regulate CO_2 emissions from new motor vehicles. The Supreme Court did not mandate that the EPA enact regulations to reduce GHG emissions, but found that EPA could avoid taking action only if it found that GHGs do not contribute to climate change or EPA offered a “reasonable explanation” for not determining that GHGs contribute to climate change.

Energy Independence and Security Act of 2007

On December 19, 2007, the Energy Independence and Security Act of 2007 (EISA) was signed into law, which requires an increased Corporate Average Fuel Economy (CAFE) standard of 35 miles per gallon for the combined fleet of cars and light trucks by model year 2020. EISA requires establishment of interim standards (from 2011 to 2020) that will be the “maximum feasible average fuel economy” for each fleet. EISA also includes several other provisions:

- Renewable Fuel Standard (Section 202);
- Appliance and Lighting Efficiency Standards (Section 301–325);
- Building Energy Efficiency (Sections 411–441).

Additional requirements of the EISA address energy savings in government and public institutions and promote research for alternative energy, carbon capture, international energy programs, and the creation of “green jobs.”

EPA Proposed Rule—Mandatory GHG Reporting

On March 10, 2009, the EPA proposed a rule that requires mandatory reporting of emissions of GHGs from large sources within the United States. The proposed rule includes emissions of CO_2, CH_4, N_2O, HFCs, PFCs, SF_6, nitrogen trifluoride (NF_3), hydrofluorinated ethers (HFE), and selected other fluorinated compounds. 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 would be required to report annual emissions to the EPA. The rule was approved in September 2009 and will go into effect January 1, 2010. The first annual reports for the largest emitting facilities, covering calendar year 2010, will be submitted to EPA in 2011.

EPA Finding of Endangerment

On December 7, 2009, the EPA Administer found that current and projected concentrations of CO_2, CH_4, N_2O, HFCs, PFCs, and SF_6 threaten the public health and welfare of current and future generations. Additionally, the Administrator found that combined emissions of CO_2, CH_4, N_2O, and HFCs from motor vehicles contribute to the atmospheric concentrations and thus to the threat of climate change. Although the Endangerment Finding in itself does not place requirements on industry, it is an important step in the EPA’s process to develop regulation of GHGs.

The EPA has prepared various documents in support of the endangerment finding including, *Summary of the Science Supporting EPA’s Finding that Greenhouse Gases Threaten Public Health and Welfare* (Environmental Protection Agency 2009c). The summary notes, “[c]limate change is expected to worsen regional ozone pollution, with associated risks in respiratory infection, aggravation of asthma, and premature death. The impact on particulate matter remains less certain."

Update on Corporate Average Fuel Economy Standards

On May 19, 2009, President Obama issued a requirement to automakers to increase fuel efficiency of cars manufactured in the United States to 35.5 mpg by 2016, four years ahead of the schedule set by the EISA of 2007. The new CAFE standards incorporate stricter fuel economy standards promulgated by the State of California (discussed below) into one uniform standard. Additionally, automakers are required to cut GHG emissions in new vehicles by roughly 25%.

19.2.2 State

A variety of legislation has been enacted in California relating to climate change, much of which sets aggressive goals for GHG reductions within the State. However, none of this legislation provides definitive direction regarding the treatment of climate change in environmental review documents.

AB 32 Chapter 488, Statutes of 2006

The California Global Warming Solutions Act of 2006, widely known as AB 32, requires the ARB to develop and enforce regulations for the reporting and verification of Statewide GHG emissions. The ARB is directed to set a GHG emissions limit, based on 1990 levels, to be achieved by 2020. The bill sets a timeline for adopting a scoping plan for achieving reductions in a technologically and economically feasible manner.

The heart of the bill is the requirement that Statewide GHG emissions must be reduced to 1990 levels by the year 2020. California needs to reduce GHG emissions by approximately 29% BAU (based on compliance with requirements in effect under applicable federal and State law) of year 2020 GHG emissions to achieve this goal. The bill requires the ARB to adopt rules and regulations in an open public process to achieve the maximum technologically feasible and cost-effective GHG reductions. Key AB 32 milestones are as follows:

- June 30, 2007—Identification of discrete early action GHG emissions reduction measures. On June 21, 2007, the ARB satisfied this requirement by approving three early action measures. On October 25, 2007, the ARB expanded this list to nine.

- January 1, 2008—Identification of the 1990 baseline GHG emissions level and approval of a Statewide limit equivalent to that level. Adoption of reporting and verification requirements concerning GHG emissions. On December 6, 2007, the ARB approved a Statewide limit on GHG emissions levels for the year 2020 consistent with the determined 1990 baseline.

- January 1, 2009—Adoption of a scoping plan for achieving GHG emission reductions. On December 11, 2008, the ARB adopted *Climate Change Proposed Scoping Plan: A Framework for Change*. The *Scoping Plan i*s describe in detail below.

- January 1, 2010—Adoption and enforcement of regulations to implement the "discrete" actions.

- January 1, 2011—Adoption of GHG emissions limits and reduction measures by regulation.

- January 1, 2012—GHG emissions limits and reduction measures adopted in 2011 become enforceable.

AB 32 Scoping Plan

A Scoping Plan for AB 32 was developed by the ARB and released in October 2008 (California Air Resources Board 2008a). It contains the main strategies California will use to reduce GHG from BAU emissions projected for 2020 back down to 1990 levels. BAU is the projected emissions in 2020, including increases in emissions caused by growth, without GHG reduction measures. The Scoping Plan has a range of GHG reduction actions, which include direct regulations, compliance mechanisms, monetary and non-monetary incentives, voluntary actions, and market-based mechanisms such as a cap-and-trade system. The Scoping Plan was approved at the ARB's hearing on December 12, 2008. It now requires the ARB and other State agencies to develop and adopt regulations and other initiatives reducing GHGs to be in place by 2012.

As directed by AB 32, the ARB approved a Statewide GHG emissions limit. On December 6, 2007, ARB staff resolved an amount of 427 MMT of CO_2e as the total Statewide GHG 1990 emissions level and 2020 emissions limit. The limit is a cumulative Statewide limit, not a sector- or facility-specific limit.

The ARB is conducting rulemaking, culminating in rule adoption by January 1, 2011, for reducing GHG emissions to achieve the emissions cap by 2020. The rules must take effect no later than 2012. In designing emission reduction measures, the ARB must aim to minimize costs, maximize benefits, improve and modernize California's energy infrastructure, maintain electric system reliability, maximize additional environmental and economic co-benefits for California, and complement the State's efforts to improve air quality.

As part of this rulemaking, the ARB adopted the following "Early Action Measures" on June 21, 2007:

- **Group 1:** Three new GHG-only regulations are proposed to meet the narrow legal definition of "discrete early action greenhouse gas reduction measures" in Section 38560.5 of the Health and Safety Code. These include the Governor's Low Carbon Fuel Standard, reduction of refrigerant losses from motor vehicle air conditioning maintenance, and increased methane capture from landfills. These actions are estimated to reduce GHG emissions between 13 and 26 MMT of CO_2e annually by 2020 relative to projected levels. If approved for listing by the Governing Board, these measures will be brought to hearing in the next 12 to 18 months and take legal effect by January 1, 2010.

- **Group 2:** The ARB is initiating work on another 23 GHG emissions reduction measures during 2007–2009, with rulemaking to occur as soon as possible where applicable. These GHG measures relate to the following sectors: agriculture, commercial, education, energy efficiency, fire suppression, forestry, oil and gas, and transportation.

- **Group 3:** ARB staff has identified 10 conventional air pollution control measures that are scheduled for rulemaking in the 2007–2009 periods. These control measures are aimed at criteria and toxic air pollutants, but will have concurrent climate co-benefits through reductions in CO_2 or non-Kyoto pollutants (i.e., DPM, other light-absorbing compounds, and/or ozone precursors) that contribute to global warming.

In October 2007, the ARB expanded the above early actions items to include the following measures:

- **Group 1: Discrete Early Actions.** Reductions in SF_6 emissions from the non-electricity sector, consumer products; and PFC emissions from semiconductor industry; implementation of the Smartway Truck Efficiency Program (requires existing trucks and trailers to be retrofitted with devices that reduce aerodynamic drag); increased tire inflation regulations (requires tune-up and oil change technicians to ensure proper tire inflation as part of overall service); and expansion of Green ports (allows docked ships to shut off their auxiliary engines by plugging into shoreside electrical outlets or other technologies).

- **Group 2: Other Early Actions.** Refrigerant tracking; reporting and recovery programs; increased energy efficiency in California cement facilities; more blended cements; enhanced anti-idling enforcement; and expanded research on nitrogen land application efficiency.

Since October 2007, CARB has taken the following actions concerning Early Action Measures:

- **Low Carbon Fuel Standard:** The ARB approved for adoption regulations establishing a low-carbon fuel standard on April 23, 2009. The intent of the standard is to reduce the carbon intensity of transportation fuels by an average of ten percent by 2020. The ARB finalized rule-making for regulations to take effect in January 2010.

- **Landfill Methane Capture:** On June 25, 2009, the ARB approved for adoption regulations for control of methane emissions from municipal solid waste (MSW) landfills. The regulations will require the installation and proper operation of gas collection and control systems at active, inactive, and closed MSW landfills having 450,000 tons of greater of waste-in-place and that received waste after January 1, 1977. The regulations contain performance standards for the gas collection and control system, and specify monitoring requirements to ensure that that the system is being maintained and operated in a manner to minimize methane emissions. The regulations include a leak standard for gas collection and control system components, a monitoring requirement for wellheads, methane destruction efficiency requirements for most control devices, surface methane emission standards, and reporting requirements. The ARB is presently considering several modifications and clarifications to the regulations. The ARB intends to finalize rule-making for regulations to take effect by January 1, 2010.

- **Small Containers of Automotive Refrigerant:** On January 22, 2009, the ARB approved for adoption regulations associated with do-it-yourself (DIY) recharging of motor vehicle air conditioning (MVAC) systems. This regulation is intended to help reduce GHG emissions attributable to small containers of automotive refrigerant largely by establishing certification requirements that require containers to be equipped with self-sealing valves, and by establishing a small container deposit and return and refrigerant recovery program. Other components of the regulation include improved container labels and consumer educational materials to promote consumer education of proper MVAC charging practices and of the environmental consequences of releasing refrigerant to the environment. On September 1, 2009, the Office of Administrative Law (OAL) approved the majority of the regulations, but disapproved the portion of the regulatory filing for adjustment of the refrigerant container deposit. The ARB intends to finalize rule-making for regulations to take effect by January 1, 2010.

- **Semiconductor Perfluorocarbon Emissions:** On February 26, 2009, the ARB approved for adoption regulations related to semiconductor operations. The regulation applies to an owner or operator of a semiconductor or related devices operation that uses fluorinated gases or fluorinated heat transfer fluids. The regulation includes emission standards, and reporting and recordkeeping requirements. Final rule-making has not yet been completed.

- **Sulfur Hexafluoride Reduction:** On February 26, 2009, the ARB approved for adoption regulations related to the reduction of SF_6 from non-semiconductor and non-utility applications. This regulation would achieve GHG emission reductions from SF_6 applications through a phase-out of use over the next several years in the non-semiconductor and non-utility sectors. Several modifications to the adopted regulation are currently under consideration.

- **High Global Warming Potential Gases in Certain Consumer Products:** On September 24, 2009 the ARB approved for adoption regulations concerning toxic compounds, aromatics and high GWP gases in certain consumer products.

  The amendments are designed to reduce volatile organic compound (VOC) emissions, but would prohibit compounds with high GWP in multi-purpose solvent, paint thinner, and double-phase aerosol air fresheners, which are the three categories of consumer products proposed for regulation. Final rule-making has not yet been completed.

- **Heavy-Duty Vehicle GHG Emission Reduction Regulation:** On December 11, 2008, the ARB approved for adoption regulations concerning long-haul Heavy Duty Vehicle (HDV) fuel efficiency. A more efficient HDV uses less fuel, and as a result, emits less GHG emissions. A HDV consists of a heavy-duty tractor (tractor) and a trailer. The regulation requires new and existing long-haul on-road tractors (of a certain size), which operate on California highways, to be equipped with SmartWay approved aerodynamic technologies and low-rolling resistance tires. The regulation contains a phased implementation and includes several exemptions (such as for emergency vehicles).

- **Tire Pressure:** On March 26, 2009, the ARB approved for adoption regulations to reduce GHG emissions from vehicles operating with under inflated tires. The regulation requires Automotive Service Providers perform a tire inflation service (check and inflate) on passenger vehicles that are brought into a facility for service or repair. Final rule-making has not yet been completed.

- **Shore Power:** On December 6, 2007, the ARB approved for adoption regulations to reduce emissions from diesel auxiliary engines on ocean-going vessels while at berth in California. The regulation requires operators of vessels meeting specified criteria to turn off their auxiliary engines for most of their stay in port. The ARB anticipates that such vessels would then receive their electrical power from the shore, or use an alternative, but equally effective, means of emission reductions. Although the measure is intended to reduce NO_x and particulate matter emissions, the measure will produce a co-benefit of reducing CO_2 emissions. The regulation took effect on January 2, 2009.

Executive Order S-03-05 (2005)

California Executive Order S-03-05 (June 1, 2005) mandates a reduction of GHG emissions to 2000 levels by 2010, to 1990 levels by 2020, and to 80% below 1990 levels by 2050. Although the 2020 target is the core of AB 32, and has effectively been incorporated into AB 32, the 2050 target remains the goal of the Executive Order.

Executive Order S-01-07 Low Carbon Fuel Standard

Executive Order S-01-07 (January 18, 2007) requires a 10% or greater reduction in the average fuel carbon intensity for transportation fuels in California regulated by the ARB. The ARB identified the Low Carbon Fuel Standard (LCFS) as a Discrete Early Action item under AB 32. On April 23, 2009, ARB adopted regulations implementing the LCFS.

Senate Bill 1368 (Perata), Emissions of Greenhouse Gases, Chapter 598, Statutes of 2006

Senate Bill (SB) 1368 prohibits any retail seller of electricity in California from entering into a long-term financial commitment for baseload generation if the GHG emissions are higher than those from a combined-cycle natural gas power plant. This performance standard applies to electricity generated out-of-State, in-State, and to publicly owned as well as investor-owned electric utilities.

SB 1078/SB 107—Renewable Portfolio Standard

Established in 2002 under SB 1078 and accelerated in 2006 under SB 107, California's Renewable Portfolio Standard (RPS) obligates investor-owned utilities (IOUs), energy service providers (ESPs) and community choice aggregators (CCAs) to procure an additional 1% of retail sales per year from eligible renewable sources until 20% is reached, no later than 2010. The California Public Utilities Commission (CPUC) and CEC are jointly responsible for implementing the program.

AB 1493 (Pavely), Greenhouse Gases, Chapter 200, Statutes of 2002

AB 1493 (Pavely) requires the ARB to adopt regulations by January 1, 2005, to reduce GHG emissions from noncommercial passenger vehicles and light-duty trucks of model year 2009 and thereafter. For this mandate to take effect the ARB was required to obtain a federal waiver from EPA to allow California to deviate from the national car and light duty truck standards set by EPA under the CAA. This waiver, generally referred to as the "Pavley Waiver" after the principal author of AB 1493, was initially requested in 2004; the federal government declined to regulate GHG under the CAA.

California and other States sued the federal government in an attempt to compel EPA to regulate GHG under the CAA and take action on the waiver request, which was being sought by several other States. In April 2007, the U.S. Supreme Court ruled in *Massachusetts et al. v. Environmental Protection Agency et al.* (discussed above) that EPA has authority to regulate GHG emissions as pollutants. Nevertheless, the EPA denied the Pavley Waiver request in December 2007.

In January 2008, the State Attorney General filed a new lawsuit against the EPA for denying California's request for the Pavley Waiver to regulate and limit GHG emissions from these automobiles. On June 30, 2009, EPA granted California's waiver of CAA preemption to enforce new GHG emission standards for new motor vehicles beginning with the 2009 model year (Environmental Protection Agency 2009d).

SB 375 (Steinberg), Statutes of 2008

SB 375 (Steinberg) provides for a new planning process to coordinate land use planning and regional transportation plans and funding priorities in order to help California meet the GHG reduction goals established in AB 32. SB 375 requires regional transportation plans, developed by Metropolitan Planning Organizations (MPOs), to incorporate a "sustainable communities strategy" in their regional transportation plans that will achieve GHG emission reduction targets set by the ARB. SB 375 includes provisions for streamlined CEQA review for some infill project such as transit-oriented development. SB 375 will be implemented over the next several decades.

On June 30, 2010, the ARB released draft emissions targets for MPOs around the State. These targets identify how much regions throughout California should reduce GHG emissions from passenger vehicles and light duty trucks. On September 23, 2010, the ARB approved GHG Targets for all of the 18 MPO areas. For the Tahoe Metropolitan Planning Organization (TMPO), ARB adopted a seven percent reduction in per-capita emissions by the year 2020 and a five percent reduction target for 2035. Once adopted, the MPOs around the State must prepare revised Regional Transportation Plans and a Sustainable Community Strategy (SCS) that account for their respective reduction goals.

Energy Conservation Standards (Title 24)

Energy Conservation Standards for new residential and nonresidential buildings were adopted by the California Energy Resources Conservation and Development Commission in June 1977 and are periodically revised (Title 24, Part 6 of the CCR). Title 24 requires the design of building shells and building components to conserve energy. Title 24 measures compliance based on a time dependant valuation (TDV) methodology. TDV considers not only the type of energy that is used (electricity, natural gas, or propane), but when it is used. Energy saved during periods when California is likely to have a Statewide system peak is worth more than energy saved at times when supply exceeds demand. Therefore, calculations of TDV weights energy used at different times at different values. The standards are updated periodically to allow for consideration and possible incorporation of new energy efficiency technologies and methods. Although new building energy efficiency standards were adopted in April 2008, these standards do not go into effect until August 2010, and were not in effect at the time of adoption of the AB 32 Scoping Plan (discussed above).

The 2006 Appliance Efficiency Regulations (Title 20, CCR Sections 1601 through 1608), dated December 2006, were adopted by the CEC on October 11, 2006, and approved by the California Office of Administrative Law on December 14, 2006. The regulations include standards for both federally regulated appliances and non-federally regulated appliances. While these regulations are now often seen as BAU, and compliance with these standards is part of the ARB Scoping Plan Base Year (2008), they do exceed the standards imposed by any other State and reduce GHG emissions by reducing energy demand.

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 (Title 24, California Code of Regulations). 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.

SB 97 (Dutton)/ Office of Planning and Research 2010 CEQA Guidelines

SB 97 requires that Office of Planning and Research (ORP) 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. In response this bill, the Natural Resources Agency amended the State CEQA Guidelines on December 31, 2009 to include Section 15064.4, which requires the determination of impact significance from GHG emissions. These amendments became effective on March 18, 2010.

No significance threshold is included in the amendments, but they emphasize the necessity of having a consistent threshold available to analyze projects, and that analyses should be proofed based on the best available information. The amendments provide the following recommendations for determining the significance of GHG emissions under section CEQA Guidelines 15064.4:

> The determination of the significance of GHG emissions calls for a careful judgment by the lead agency consistent with the provisions in Section 15064. A lead agency should make a good-faith effort, based on available information, to describe, calculate or estimate the amount of GHG emissions resulting from a project. A lead agency shall have discretion to determine, in the context of a particular project, whether to:
>
> 1) Use a model or methodology to quantify GHG emissions resulting from a project, and which model or methodology to use. The lead agency has discretion to select the model it considers most appropriate provided it supports its decision with substantial evidence. The lead agency should explain the limitations of the particular model or methodology selected for use; and/or
>
> 2) Rely on a qualitative analysis or performance based standards.
>
> (b) A lead agency may consider the following when assessing the significance of impacts from GHG emissions on the environment:
>
> 1) The extent to which a project may increase or reduce GHG emissions as compared to the existing environmental setting;
>
> 2) Whether a project's emissions exceed a threshold of significance that the lead agency determines applies to the project; and
>
> 3) The extent to which a project complies with regulations or requirements adopted to implement a Statewide, regional, or local plan for the reduction or mitigation of GHG emissions. Such regulations or requirements must be adopted by the relevant public agency through a public review process and must include specific requirements that reduce or mitigate a project's incremental contribution of GHG emissions. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, an EIR must be prepared for a project.

19.2.3 Local

The Project is located within the Placer County portion of the Lake Tahoe Air Basin (LTAB). Air quality within Placer County is managed by the Placer County Air Pollution Control District (PCAPCD). The Tahoe Regional Planning Agency (TRPA) also has authority for overseeing and managing air quality within the LTAB. Currently, the PCAPCD and the TRPA do not have published guidelines for determining CEQA impacts related to GHGs and climate change.

19.3 EVALUATION CRITERIA WITH POINTS OF SIGNIFICANCE

19.3.1 Significance Criteria

Neither the PCAPCD nor the TRPA have quantitative thresholds for the evaluation of GHG emissions in CEQA documents. Therefore, Appendix G of the 2010 State CEQA Guidelines and guidance provided by PCAPCD and TRPA were used to evaluate significance. A discussion of whether emissions will result in a significant project-level impact is presented in section 19.4.2. However, because GHG emissions are most appropriately evaluated on a regional and global scale, project-level emissions are concluded to be less than significant. This approach is in accordance with the 2010 CEQA Guidelines, which requires the evaluation of significance be conducted on the cumulative level. The Project was therefore considered to have a significant cumulative impact on climate change if it were to:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or

- Conflict with any applicable plan, policy, or regulation of an agency adopted for reducing GHG emissions.

Scientific studies (as best represented by the IPCC's periodic reports) demonstrate that climate change is already occurring due to past GHG emissions. Evidence concludes that global emissions must be reduced below current levels. Given the seriousness of climate change, the PCAPCD and TRPA have determined that for the purposes of this analysis, any substantial increase in HMR-generated GHG emissions relative to existing conditions would result in the Project having a "significant impact on the environment" (Finely, Chang, and Landry pers. comm.).

19.4 ENVIRONMENTAL IMPACTS AND RECOMMENDED MITIGATION

This section describes the Project's effects on GHGs and climate change. Consistent with Section 15064.4(a) of the 2010 CEQA Guidelines, it begins with a discussion of analysis limitations.

19.4.1 Analysis Limitations

This analysis utilizes PCAPCD and ARB recommended modeling procedures for the quantification of GHG emissions. Specific limitations must be understood to apply the conclusions of this report. This section briefly identifies those limitations. Additional data gaps and limitations on a sector-by-sector basis are provided in the impact analysis.

Lack of Detailed Information: Although considerable efforts were made to obtain activity data for the Proposed Project (Alternative 1) and Alternatives 3, 4, 5, and 6, in some cases, this data was unavailable and estimates had to be made. For example, expected demand for natural gas and electricity was only available for the Proposed Project (Alternative 1). Given the similar land uses, these data were assumed to accurately represent Alternatives 3, 5, and 6. In addition, some of the data obtained were based on State averages projected to the local level because Project-specific information was unknown. In each of these cases, GHG estimates were made based on accepted information and methodologies.

Data Projections: This analysis is based on Project operations at buildout, which is 2021. Because information on the Project's uses (e.g. energy, vehicle trips, water, etc.) in 2021 is not known, assumptions had to be made. These values were drawn from a number of sources, including Fehr & Peers, Beaudin and Ganze, and Snowmakers Inc. The emission estimates for 2021 were assumed to remain constant throughout the Project lifetime. This assumption was necessary based on the availability and reliability of long-term future data sets. It is important to note that estimates for 2021 will most likely not remain constant over time. For example, the number of guests may be reduced or increased by future unknown economic conditions. In addition, emissions associated with energy consumption are based on emissions factors for the most recent year in which complete data is available (2007) and are assumed to remain constant through 2021. However, it is likely emission factors will actually decrease over time as energy generators decrease their carbon content through efficiency measures and increased reliance on renewable energy sources.

Population Flux: Given the nature of the Project, population and employment at the resort will be seasonal, which would result in higher GHG emissions during the winter season and lower GHG emissions during the summer season. When possible, this seasonal flux in population was taken into account. For example, emissions from transportation were calculated using both summer and winter VMT. However, this approach could overestimate emissions associated with spring and fall conditions. In some cases, information was not available to calculate the emissions under both summer and winter conditions (e.g. water and sanitary sewer discharge). In these cases, the emissions under the peak population (i.e. winter conditions) were assumed to occur throughout the entire year. This assumption likely overestimates total annual emissions as summer conditions would result in lower emissions. In addition, implementation of the Project may result in minor increases in secondary vacation homes and associated emissions. However, it is currently unknown by what factor use of these homes will increase.

Qualitative Analyses: This report does not include a quantitative estimate of emissions from land use change, waste generation, embodied emissions, and increased use of recreational water craft and vacation homes. The following discussion provides a rational for omission of these sectors.

GHG emissions from land use change would occur with Project development. Land near the South Base area and Mid-Mountain Base area contains forested areas, which will be removed (Tirman pers. comm. (A)). According to Chapter 8 – Biological Resources, 193 trees have been identified for removal under Proposed Project (Alternative 1) (please see Table 8-6). This forest cover serves as both a source and sink of GHGs. The decomposition of organic matter releases CO_2 on an annual basis. For example, it is estimated that 50% of the total biomass of a tree is carbon, which can be released when the tree dies or is burned (Climate Action Reserve 2009). However, existing vegetation continually sequesters carbon from the atmosphere, effectively serving as a GHG sink. Estimating emissions of these sources on a Project-specific level is far more uncertain and speculative than for other classes of emissions discussed above. Consequently, emissions resulting from land use change were not included in the Project's inventory data. It should be noted, however, that any sequestration potential lost because of the Project would be relatively minor in given the large number of trees within the Project area. In addition, Mitigation Measure BIO-10 requires the preparation of a Forest Plan, which will increase the overall health of the forest.

The deposition of solid waste generated by HMR into landfills will result in the production of CH_4 and CO_2 when anaerobic bacteria degrade the material (U.S. Environmental Protection Agency 2006b). Since CO_2 is produced during the natural degradation process, it is generally not considered in waste stream analyses. Rather, emissions of CH_4 are considered the primary result of land filling waste. An analysis of CH_4 emissions from the Project would require a detailed waste stream profile, which is beyond the scope of this document. Consequently, GHG emissions associated with waste generation were not estimated.

Embodied, or lifecycle, GHG emissions are created during the extraction, processing, transportation, construction, and disposal of building materials and during landscape disturbance or alteration of biomass (King County Department of Development and Environmental Services 2007). There is a large uncertainty involved in estimating the magnitude, sources, and signs (whether they are positive or negative; i.e., sources or sinks) of embodied emissions associated with aspects of a project. The California Air Pollution Control Officers Association (CAPCOA) recommends against including certain types of embodied emissions in GHG inventories due to the speculative nature of such analysis (California Air Pollution Control Officers Association 2008). For this reason, embodied GHG emissions were not included in the HMR GHG emissions inventory.

Implementation of the Project will increase tourism in the LTAB. While a large portion of incoming guests are expected to stay at HMR, it is likely that occupancy at local hotels and vacation homes will increase. With more tourists, use of recreational watercraft, such as boats and jet skis, may increase. While GHG emissions associated with these activities will be produced, it is not currently known by what factor use of watercraft and local hotels will increase because of the Project. A quantitative analysis of these emissions would therefore be considered speculative.

19.4.2 Impacts

The cause of global climate change is generally accepted to be increased emission of GHGs from human activities, among other factors. Estimated HMR GHG emissions are minuscule in comparison to current and estimated future global GHG emissions. Attributing any observed climate change to HMR emissions is, therefore, speculative. The following discussion describes Project-level GHG emissions, while section 19-5 discuses Project GHG emissions in a cumulative context.

Impact: **CC-1. Will the Project Result in a Significant Project-Level Impact on Climate Change?**

Analysis: *No Impact; No Project (Alternative 2)*

No Project (Alternative 2) will not include any changes to the existing HMR Project area or structures. Therefore, there will be no additional GHG emitted with No Project (Alternative 2). There would therefore be no impact. No further analysis is required.

Mitigation: No mitigation is required.

Analysis: *Less than Significant Impact; Proposed Project (Alternative 1) and Alternatives 3, 4, 5, and 6*

Project Construction

Construction emissions were calculated using the construction activity estimates and land use assumptions summarized in Chapter 12 - Air Quality and Appendix N. GHG emissions from construction activities are primarily the result of fuel use by construction equipment, as well as worker and vendor trips. It was assumed that construction of the Proposed Project (Alternative 1) and Alternatives 3, 5, and 6 would occur in four phases beginning in May 2011 and ending in December 2020. Phases 1a and 1b/c will take approximately 5.5 years to complete and would include the construction of the North Base area and Mid-Mountain Base area. Phases 2a and 2b will take approximately 4.5 years and would include the construction of South Base area land uses. Construction of

Alternative 4 is unknown since it would involve construction by others, but is assumed to be complete between May and October 2011 (see Appendix N for more information on assumptions).

The URBEMIS2007 model (version 9.2.4) was used to calculate CO_2 emissions associated with construction. URBEMIS2007 accounts for CO_2 emissions resulting from fuel use by construction equipment and worker commutes. Emission calculations were based on activity estimates and land use assumptions summarized in Chapter 12 – Air Quality and Appendix N. Equipment inventories, load factors, and horsepower (Hp) were based on default values generated by URBEMIS2007 for the specified land uses. Appendix M summarizes the equipment assumptions used in the modeling. Complete URBEMIS2007 outputs are provided in Appendix O.

URBEMIS2007 does not quantify CH_4 and N_2O emissions, although construction equipment emits these two pollutants. CH_4 and N_2O emissions associated with construction emissions from off-road equipment were determined by scaling the construction CO_2 emissions predicted by URBEMIS2007 by the ratio of CH_4/CO_2 and N_2O/CO_2 emissions expected per gallon of diesel fuel according to the Climate Action Registry General Reporting Protocol Version 3.1 (California Climate Registry 2009). The California Climate Action Registry (CCAR) emission factor for CO_2 is 10.15 kilogram (kg) CO_2 per gallon of diesel fuel. Construction equipment using diesel fuel emits 0.58 gram CH_4 per gallon and 0.26 gram N_2O per gallon (California Climate Action Registry 2009). The ratios of CH_4 and N_2O to CO_2 per gallon of diesel fuel are 0.00006 and 0.00003, respectively. CO_2 emissions from off-road diesel sources (Appendix O) were multiplied by these ratios to estimate CH_4 and N_2O emissions from construction equipment operation. These emissions were then converted to CO_2e using the GWPs of each gas (Table 19-1).

Construction worker and vendor commutes produce GHGs. However, because employees typically commute in gasoline powered vehicles, the previous methodology for calculating CH_4 and N_2O from diesel-powered equipment is inappropriate. For on-road, gasoline powered vehicles, the EPA recommends if CH_4, N_2O, and HFC emissions account for 5% of total emissions, accounting for their GWPs (Environmental Protection Agency 2005). To quantify these GHGs, the annual CO_2 emissions from construction worker and vendor commutes (Appendix O) were therefore divided by 0.95.

Table 19-7 through Table 19-10 list the annual GHG emissions that would be generated by construction of the Proposed Project (Alternative 1). Since the Proposed Project (Alternative 1) and Alternative 3 do not differ with regards to land use assumptions, the number and types of construction equipment required would be the same. Consequently, GHG emissions generated by construction of the Proposed Project (Alternative 1) and Alternative 3 will be similar.

Table 19-7

Estimated GHG Emissions from Construction Activities for the Proposed Project (Alternative 1) and Alternative 3 (metric tons)

Year	Off-road Emissions[1]			On-Road Emissions[2]		Total Emissions (CO_2e)
	CO_2	CH_4	N_2O	CO_2	Other GHGs (CO_2e)	
2011	140	0.008	0.004	129	6.780	276.96
2012	192	0.011	0.005	332	17.460	542.88
2013	203	0.012	0.005	329	17.299	550.68
2014	108	0.006	0.003	31	1.611	141.22
2015	106	0.006	0.003	73	3.858	183.89
2016	114	0.006	0.003	74	3.893	192.51
2017	108	0.006	0.003	28	1.496	138.91
2018	114	0.007	0.003	68	3.602	187.06
2019	140	0.008	0.004	35	1.847	178.58
2020	199	0.011	0.005	86	4.512	291.49
Total	**1,424**	**0.081**	**0.036**	**1,185**	**62.357**	**2,684.00**

Source: URBEMIS2007; California Climate Action Registry 2009; Environmental Protection Agency 2005; Appendices M and N.

Notes:
[1] From construction equipment (diesel).
[2] From construction worker and vendor commutes (mix of fuels). Other GHGs include CH_4, N_2O, and HFCs, which represent 5% of total GHG emissions from on-road sources (calculated by dividing CO_2 emissions by 0.95 and multiplying the resulting number by 0.05).

Table 19-8

Estimated GHG Emissions from Construction Activities for Alternative 4 (metric tons)

Year	Off-road Emissions[1]			On-Road Emissions[2]		Total Emissions (CO_2e)
	CO_2	CH_4	N_2O	CO_2	Other GHGs (CO_2e)	
2011	112	0.006	0.003	5.082	0.267	119

Source: URBEMIS2007; California Climate Action Registry 2009; Environmental Protection Agency 2005; Appendices M and N.

Notes:
[1] From construction equipment (diesel).
[2] From construction worker and vendor commutes (mix of fuels). Other GHGs include CH_4, N_2O, and HFCs, which represent 5% of total GHG emissions from on-road sources (calculated by dividing CO_2 emissions by 0.95 and multiplying the resulting number by 0.05).

Table 19-9

Estimated GHG Emissions from Construction Activities for Alternative 5 (metric tons)

Year	Off-road Emissions[1]			On-Road Emissions[2]		Total Emissions (CO_2e)
	CO_2	CH_4	N_2O	CO_2	Other GHGs (CO_2e)	
2011	140	0.008	0.004	96	5.051	242.39
2012	192	0.011	0.005	245	12.901	451.70
2013	201	0.011	0.005	243	12.804	458.80
2014	140	0.008	0.004	114	5.981	261.26
2015	192	0.011	0.005	294	15.499	503.67
2016	203	0.012	0.005	292	15.372	512.79
2017	108	0.006	0.003	4	0.202	113.03
2018	114	0.006	0.003	4	0.199	118.57
2019	68	0.004	0.002	3	0.164	72.19
2020	0	0.000	0.000	0	0.000	0.00
Total	**1,359**	**0.078**	**0.035**	**1,295**	**68.172**	**2,734**

Source: URBEMIS2007; California Climate Action Registry 2009; Environmental Protection Agency 2005; Appendices M and N.

Notes:

[1] From construction equipment (diesel).

[2] From construction worker and vendor commutes (mix of fuels). Other GHGs include CH_4, N_2O, and HFCs, which represent 5% of total GHG emissions from on-road sources (calculated by dividing CO_2 emissions by 0.95 and multiplying the resulting number by 0.05).

Transportation

Traffic CO_2 emissions were estimated using URBEMIS2007 and the traffic data provided by Fehr & Peers (Harned pers. comm. (A) and (B)). Detailed traffic information is provided in Chapter 11 – Transportation, Parking, and Circulation. URBEMIS2007 estimates mobile source emissions based on the vehicular emissions typically associated with the proposed land uses. URBEMIS2007 utilizes the latest emission rate program to produce emissions estimates. The traffic data used in this analysis does not account for reductions from alternative modes of transportation. These reductions will be discussed in Section 19-5. Trip rates were adjusted to account for internal trips completed by guests already at HMR. Data for the adjustment calculations were provided by Fehr & Peers (Harned pers. comm. (A) and (B)). Appendix P contains the trip generation rates used in the modeling.

The traffic data provided by Fehr & Peers indicated that VMT would be higher during the winter ski season than summer months. Consequently, summer and winter mobile emissions were modeled separately and then combined to obtain total yearly emissions.[2]

[2] It is likely that VMT during the spring and fall seasons would be less than VMT during summer and winter. This assumption therefore provides a conservative analysis in that it may overestimate actual annual emissions from transportation.

Table 19-10

Estimated GHG Emissions from Construction Activities for Alternative 6 (metric tons)[1]

Year	Off-road Emissions[1]			On-Road Emissions[2]		Total Emissions (CO_2e)
	CO_2	CH_4	N_2O	CO_2	Other GHGs (CO_2e)	
2011	140	0.008	0.004	92	4.859	238.55
2012	192	0.011	0.005	235	12.394	441.56
2013	201	0.011	0.005	234	12.304	448.70
2014	140	0.008	0.004	74	3.912	219.89
2015	192	0.011	0.005	190	9.989	393.45
2016	201	0.012	0.005	189	9.937	401.86
2017	108	0.006	0.003	4	0.202	113.03
2018	114	0.006	0.003	4	0.199	118.57
2019	108	0.006	0.003	28	1.458	138.16
2020	113	0.006	0.003	66	3.482	183.32
Total	**1,509**	**0.086**	**0.039**	**1,116**	**58.735**	**2,697**

Source: URBEMIS2007; California Climate Action Registry 2009; Environmental Protection Agency 2005; Appendices M and N.

Notes:

[1] From construction equipment (diesel).

[2] From construction worker and vendor commutes (mix of fuels). Other GHGs include CH_4, N_2O, and HFCs, which represent 5% of total GHG emissions from on-road sources (calculated by dividing CO_2 emissions by 0.95 and multiplying the resulting number by 0.05).

Based on information from Fehr & Peers, summer time traffic in Tahoe goes from June through September, with peak traffic usually occurring in August. Winter time traffic goes from December through March (Harned pers. comm. (C)). Fehr & Peers developed traffic counts for each season through comprehensive evaluation of the land uses and the interaction between the Proposed Project (Alternative 1) and surrounding community (Fehr & Peers 2009). For ease of analysis, each season was assumed to be 182.5 days. Complete model outputs are provided in Appendix L.

CH_4 emissions from transportation were estimated using the EMFAC2007 model. The vehicle fleet profile and VMT generated by the URBEMIS2007 simulations were used to calculate total CH_4 emissions based on the EMFAC2007 running exhaust and starting emissions factors. Since URBEMIS2007 provides fleet data in five-year increments, the year 2020 was used in this analysis. Table 19-11 describes the fleet profile in this analysis.

Table 19-11

Fleet Profile by Vehicle Class

Vehicle Class	Percent Vehicle Type
Light Auto	32.7
Light Truck 1	24.3
Light Truck 2	19.8
Medium Truck	9.2
Light Heavy Duty Truck 1	2.5
Light Heavy Duty Truck 2	1.2
Medium Heavy Duty Truck	0.9
Heavy Duty Truck	0.8
Line Haul	0.1
Urban Bus	0.0
Motorcycle	6.4
School Bus	0.1
Motor Home	2.0
Total	**100.0**

Source: URBEMIS2007.

Emissions of N_2O were calculated using the fleet information in Table 19-11 and the EMFAC model. EMFAC produced estimates of miles traveled per gallon of fuel by vehicle type for gasoline and diesel in 2021. Annual fuel use by vehicle type was then used to determine N_2O emissions per gallon of fuel using the ARB 2006 emission factors for diesel and gasoline, which represent the most recent year of available data. The ARB emission factors for 2006 were 0.332 grams of N_2O per gallon of diesel for all vehicle types and 0.668, 0.661, 1.36 and 2.38 grams N_2O per gallon of gasoline for passenger cars, light duty trucks, heavy duty trucks, and motorcycles, respectively (California Air Resources Board 2009b-h). Emissions of N_2O per gallon of fuel used were assumed to remain constant over time to represent a worst-case emissions scenario. EMFAC outputs are attached in Appendix DD.

GHG emissions from the two (2) hybrid-diesel water taxis proposed under the Proposed Project (Alternative 1) and Alternatives 3, 5, and 6 were estimated using the ARB's OFFROAD2007 emission model. OFFROAD calculates emissions based on technology types, seasonal conditions, proposed regulations, and activity assumptions. For the purposes of this analysis, it was assumed that each water taxi would have twin 225 Hp diesel engines, and that hybrid power would reduce emissions by 70% (please refer to Air Quality Chapter 12.3 for an expanded discussion of these assumptions). Emissions were calculated using the equation presented in Air Quality Chapter 12.3. Emissions calculations are summarized in Appendix Q.

GHG emissions from transportation are presented in Table 19-12. Since the Proposed Project (Alternative 1) and Alternative 3 do not differ with regard to traffic volumes and land use patterns, they were analyzed as a single unit (Harned pers. comm. (A)). These emissions represent a conservative estimate of Project-related emissions because the emission factors produced by EMFAC2007 do not include the reductions in mobile-source GHG emissions that would result from implementation of AB 1493 or AB 32. For these reasons, the emissions from transportation presented in this analysis are likely an overestimate.

Area Sources

URBEMIS2007 (version 9.2.4) was used to calculate operational GHG emissions. URBEMIS2007 accounts for CO_2 emissions resulting from stationary and area sources and from landscaping activities. Emission calculations were based on URBEMIS2007 defaults for the land use type and size summarized in Table 12-8. Existing sources emitting CO_2 at HMR are landscaping activities, wood hearth combustion (existing conditions only), natural gas combustion, and diesel back-up generators for the chairlifts. According to JMA Ventures, LLC, two (2) wood stoves currently operate at HMR for 120 days per year. These devices would not be included in the Proposed Project (Alternative 1) and Alternatives 3, 4, 5, and 6 (Tirman pers. comm. (A)). Landscape emissions are based on the URBEMIS2007 default summer length of 180 days.

NV Energy will supply natural gas to HMR. To obtain a more specific estimate of GHG emissions, natural gas combustion was calculated independent of the URBEMIS2007 model using consumption rates provided by Beaudin Ganze Inc., JMA Ventures, LLC, and the EIA (Beaudin Ganze 2007; Tirman pers. comm. (B); EIA 2009b and 2009c). GHG emission factors for CO_2, CH_4, and N_2O were obtained from NV Energy and CCAR (Soyars pers. comm.; California Climate Action Registry 2009). These emissions are included in the "Electricity and Natural Gas Use" section.

GHG emissions from existing landscaping activities and wood stoves were estimated using URBEMIS2007. Emissions of CH_4 and N_2O were not estimated because URBEMIS2007 is not able to calculate these emissions and any other reliable methodology is currently unavailable. However, area source emissions of CH_4 and N_2O emissions are expected to be trivial compared to tailpipe and energy related to GHG emissions. The area source URBEMIS2007 output is provided in Appendix O.

Table 19-12

Annual (2021) Mobile Source Emissions from Transportation (metric tons)[1]

Scenario	CO_2	CH_4	N_2O	Total CO_2e
Existing (2008)				
On-Road Traffic	987	0.160	0.091	1,018
Proposed Project (Alternative 1) and Alternative 3				
On-Road Traffic	1,845	0.135	0.156	1,896
Water Taxi	7	0.003	0	7
No Project (Alternative 2)[2]				
On-Road Traffic	981	0.081	0.088	1,010
Alternative 4[2]				
On-Road Traffic	400	0.030	0.033	411
Alternative 5[3]				
On-Road Traffic	1,671	0.124	0.140	1,717
Water Taxi	7	0.003	0	7
Alternative 6				
On-Road Traffic	1,626	0.121	0.137	1,671
Water Taxi	7	0.003	0	7

Source: URBEMIS2007; EMFAC2007; California Air Resources Board 2009b-h; Harned pers. comm. (A) and (B); OFFROAD2007.

Notes:

1 Daily traffic emissions from the winter and summer seasons were multiplied by 182.5.

2 No water taxis are proposed under No Project (Alternative 2) and Alternative 4.

3 As discussed in Chapter 12, the summer VMT estimates for Alternative 5 did not include trips associated with the 12 workforce housing units (estimated to equal about 25 total daily trips). The emissions presented above will therefore be slightly higher with the inclusion of these units.

CO_2 emissions from the five back-up diesel generators for the chairlifts were estimated using URBEMIS2007 and information provided by JMA Ventures, LLC (Tirman pers. comm. (C)). The URBEMIS2007 technical appendix provides default emission factors. The CO_2 factor remains constant regardless of the engine horsepower and is 420.920 grams/break horsepower-hours (Jones and Stokes 2007). CO_2 emissions were calculated using the equation presented in section 12-3. It was assumed that the generators would operate for 48 hours per year (Tirman pers. comm. (C)). No generators were assumed to operate under Alternative 4. Emissions of CH_4 and N_2O were calculated using the ratios of CH_4 and N_2O to CO_2 per gallon of diesel fuel described above. Emissions calculations are presented in Appendix R.

Table 19-13 presents the annual area source GHG emissions during Project operation. Since the Proposed Project (Alternative 1) and Alternative 3 do not differ with regard to land use patterns, they were analyzed as a single unit.

High Global Warming Potential Gases

The CEC estimates that California emissions of HGWPGs are largely the result of refrigerants and, to a lesser extent, electric utility transmission and distribution equipment (California Energy Commission 2006a). According to the EIA, HGWPG emissions for 2007 accounted for 2.4% of total emissions (Energy Information Administration 2008). HGWPG emissions in the Project area are predominantly associated with refrigerants, air conditioning (AC), and transmission lines. Emissions of SF_6 from transmission lines resulting from electricity transmission and distribution are included in the electricity emissions analysis below.

Refrigerants and AC are sources of HFCs. HFCs are used as substitute refrigerants for chlorofluorocarbons (CFCs) that have been phased out of use under the Montreal Protocol. GHG emissions from refrigerants and AC were calculated for the Proposed Project (Alternative 1) and Alternatives 3, 4, 5, and 6 using recent studies of HFC sources and GHG inventories of HFCs from refrigeration and AC equipment, as well as documented refrigerant types, GWPs, charge sizes, and leak rates (Intergovernmental Panel on Climate Change/Technology & Economic Assessment Panel 2005; World Bank 2007; United Nations Environment Programme 2006). Table 19-14 and Table 19-15 present the assumptions regarding HFC usage based on the Project building type.

The assumptions presented in Table 19-14 and Table 19-15 were used to determine annual emissions of HFCs from Project operation. Annual emissions by building type were calculated by multiplying the number of equipment pieces by the charge size, leak rate, and GWP of the associated HFC refrigerant installed in both refrigeration and AC units. It was assumed that residential land uses would have the same number of refrigerators. AC to these units would be supplied by centralized air, except in the 16 townhomes in the Proposed Project (Alternative 1) and Alternative 3, which would have individual AC units (Tirman pers. comm. (D)). It was assumed that the hotel would have ice and vending machines on each floor). No AC is planned in the workforce housing units (the Proposed Project [Alternative 1] and Alternatives 3, 5, and 6) or maintenance facilities (Tirman pers. comm. (D)). One general supermarket was assumed to operate at the North Base area and Mid-Mountain Base area. Estimated annual emissions are presented in Table 19-16.

Table 19-13

Annual (2021) Area Source GHG Emissions (metric tons)

Scenario/Source	CO_2	CH_4[1]	N_2O[1]	CO_2e
Proposed Project (Alternative 1) and Alternative 3[2]				
Landscape	1.38	N/A	N/A	1.38
Diesel Generator [3]	16.13	0.0009	0.0004	16.28
No Project (Alternative 2)				
Hearth[4]	9.67	N/A	N/A	9.67
Landscape	0.46	N/A	N/A	0.46
Diesel Generator[3]	16.13	0.0009	0.0004	16.28
Alternative 4[2, 5]				
Landscape	0.55	N/A	N/A	0.55
Alternative 5[2]				
Landscape	1.47	N/A	N/A	1.47
Diesel Generator[3]	16.13	0.0009	0.0004	16.28
Alternative 6[2]				
Landscape	1.23	N/A	N/A	1.23
Diesel Generator[3]	16.13	0.0009	0.0004	16.28

Source: Tirman pers. comm. (C); URBEMIS2007; Jones & Stokes 2007.

Notes:
1 Area source CH_4 and N_20 emissions for landscape and wood hearth unavailable
2 No wood hearth sources were assumed under the Proposed Project (Alternative 1) and Alternatives 3, 4, 5, and 6.
3 Five diesel generators operating for 48 hours per year were assumed.
4 Two wood stoves operating for 120 days per year were assumed.
5 No diesel generators would operate under Alternative 4.

Table 19-14

Assumptions for Annual Project-Related Emissions of HFCs from Refrigeration (metric tons)

Building Type	Number	Equipment Type	Unit	Refrigerant	GWP	Charge Size (kg)	Leak Rate (%)	Annual Emissions per Unit (CO_2e)
Condo	1	refrigerators/freezers	unit	R-134a	1,430	0.10	0.90	0.001
Townhouse	1	refrigerators/freezers	unit	R-134a	1,430	0.10	0.90	0.001
Apartment	1	refrigerators/freezers	unit	R-134a	1,430	0.10	0.90	0.001
Supermarket	1	large parallel unit (DX)	supermarket	R-404A/R-507A	3,953.3	1,800.00	10.00	711.594
	12	stand alone units	supermarket	R-404A/R-507A	3,953.3	0.60	0.90	0.256
	35	display cases	supermarket	R-404A/ R-507A	3,953.3	0.50	0.90	0.623
	15	walk-in refrigerators	supermarket	R-404A/R-507A	3,953.3	3.00	8.00	14.232
	35	cold storage room	supermarket	R-404A/ R-507A	3,953.3	3.00	8.00	33.208
High Turnover Restaurant	6	stand alone units	restaurant	R-404A/R-507A	3,953.3	0.60	0.90	0.128
	2	cold storage room	restaurant	R-404A/ R-507A	3,953.3	3.00	8.00	8.539
	2	refrigerators/freezers	restaurant	R-134a	1,430.0	0.25	0.90	0.006
Single Family Home	1.6	refrigerators/freezers	house	R-134a	1,430	0.1	0.90	0.002
Hotel	1	small refrigerator	room[1]	R-134a	1,430.0	0.05	0.90	0.075
	9	stand alone units	hotel	R-404A/R-507A	3,953.3	0.60	0.90	0.192
	9	cold storage room	hotel	R-404A/ R-507A	3,953.3	3.00	8.00	8.539
	1	ice machine	floor [2]	R-134a	1,430.0	0.10	0.90	0.002
	4	refrigerators/freezers	hotel	R-134a	1,430.0	0.10	0.90	0.005
	1	vending machine	floor [2]	R-134a	1,430.0	0.60	0.90	0.016
Stand Alone Lodge	1	vending machine	lodge	R-134a	1,430.0	0.60	0.90	0.008
Detached Services Building [3]	–	–	–	–	–	–	–	–
General Office Building	1	refrigerators/freezers	per floor [2]	R-134a	1,430.0	0.10	0.90	0.002

Source: Chapter 3; Intergovernmental Panel on Climate Change/Technology & Economic Assessment Panel 2005; World Bank 2007; United Nations Environment Programme 2006

Notes

[1] Assumed 75 rooms under Proposed Project (Alternative 1) and Alternative 3.

[2] Assumed 2 floors.

[3] No refrigerant usage assumed in the detached skier services buildings.

Table 19-15

Assumptions for Annual Project-Related Emissions of HFCs from Air Conditioning (metric tons)

Building Type	Number	Equipment Type	Unit (per)	Refrigerant	GWP	Charge Size (kg)	Leak Rate (%)	Annual Emissions per Unit (CO_2e)
Condo/Mixed Use	1	centrifugal chiller	building	R-134a	1,430	450	1.00	6.435
Townhouse	1	commercial unitary AC	unit	R-410A	2,087.5	10	4.00	0.835
Apartment[1]	–	–	–	–	–	–	–	–
Supermarket	1	screw or scroll chiller	market	R-134a	1,430	200	1.00	2.86
High Turnover Restaurant	1	commercial unitary AC	restaurant	R-410A	2,087.5	10	4.00	0.835
Single Family Home	1	residential unitary AC	house	R-410A	2,087.5	2	4.00	0.167
Hotel	1	centrifugal chiller	hotel	R-134a	1,430	450	1.00	6.435
Stand Alone Lodge	1	centrifugal chiller	building	R-134a	1,430	450	1.00	6.435
Detached Services Building	1	commercial unitary AC	building	R-410A	2,087.5	10	4.00	0.835
General Office Building	1	centrifugal chiller	building	R-134a	1,430	450	1.00	6.435

Source: Chapter 3; Intergovernmental Panel on Climate Change/Technology & Economic Assessment Panel 2005; World Bank 2007; United Nations Environment Programme 2006.

Notes

1 No AC planned for the workforce housing units.

Table 19-16

Annual (2021) Project-Related Emissions of HFCs from Refrigeration and Air Conditioning (metric tons)

Building Type with AC/Refrigeration	Total Annual Emissions per Building Type	Number of Each Building Type	Total Annual Emissions (CO_2e)
Proposed Project (Alternative 1) and Alternative 3			
Condo/Mixed Use	6.436	155 units[1], 7 buildings[2]	45.200
Townhouse	0.836	16 units	13.381
Apartment	0.001	13 units	0.017
Supermarket	762.772	1[3]	762.772
High Turnover Restaurant	9.509	2[4]	19.017
Hotel	15.264	1[5]	15.264
Mid-Mountain Base Area Lodge	6.443	1	6.443
Detached Services Building	0.835	0	0
Total Proposed Project (Alternative 1) and Alternative 3	**N/A**	**N/A**	**862**
No Project (Alternative 2)			
High Turnover Restaurant	9.509	2[6]	19.017
South Base Area and North Base Area Lodges	6.443	2	12.885
Detached Services Building	0.835	1	0.835
Total Alternative 2	**N/A**	**N/A**	**33**
Alternative 4			
Single Family Home	0.169	16[7]	2.705
General Office Building	6.437	1[8]	6.437
Total Alternative 4	**N/A**	**N/A**	**9**
Alternative 5			
Condo/Townhouse	6.436	225 units; 3 buildings	19.530
Supermarket	762.772	1[3]	762.772
Apartment	0.001	12 units	0.015
High Turnover Restaurant	9.509	2[4]	19.017
Single Family Home	0.169	16[7]	2.705
Hotel	15.264	1	15.264
Mid-Mountain Base Area Lodge	6.443	1	6.443
Detached Services Building	0.835	1	0.835
Total Alternative 5	**N/A**	**N/A**	**827**
Alternative 6			
Condo/Townhouse	6.436	195 units; 3 buildings	19.500

Building Type with AC/Refrigeration	Total Annual Emissions per Building Type	Number of Each Building Type	Total Annual Emissions (CO_2e)
Supermarket	762.772	12 units	0.015
Apartment	0.001	1 (1)	762.772
High Turnover Restaurant	9.509	2 (2)	19.017
Single Family Home	0.169	14 (3)	2.367
Hotel	15.264	1	15.264
Mid-Mountain Base Area Lodge	6.443	1	6.443
Detached Services Building	0.835	1	0.835
Total Alternative 6	**NA**	**NA**	**826**

Source: Chapter 3; Table 19-13 and Table 19-14.

Notes:

1 Includes 135 residential condos and 20 fractional units.

2 Includes buildings A, C, D, and E at the North Base area, and buildings A1, A, and B at the South Base area.

3 One general supermarket assumed to be included at the North Base area.

4 One restaurant/bar assumed to be included at the North Base area and Mid-Mountain Base area.

5 The 30 penthouse condos would be located in the hotel building (Building B).

6 Two restaurants assumed to be included at the North Base area and South Base area.

7 Assumed that one single family home would be constructed on each of the 16 residential lots.

Electricity and Natural Gas Usage

Residential, commercial, and recreational electricity consumption was estimated using a variety of resources and methodologies, which are described below. In 2007, Beaudin Ganze Inc. completed a natural gas and electric energy use estimates for the Proposed Project (Alternative 1) (Beaudin Ganze Inc. 2007). According to JMA Ventures, LLC, these estimates accurately represent consumption patterns for Alternatives 3, 5, and 6 given the similar land uses (refer to Table 12-8 in Chapter 10) (Tirman pers. comm. (E)). Electricity and natural gas consumption for No Project (Alternative 2) was provided by JMA Ventures, LLC (Tirman pers. comm. (B)). Electricity and natural gas consumption for Alternative 4 was not provided. This data was therefore estimated from 2007 average consumptive data for residential and commercial customers in California (Dillard pers. comm.; Energy Information Association 2009a, 2009b, and 2009c).

Buildings in the Project area result in indirect GHG emissions associated with electricity demand. The Project would receive electricity generated by NV Energy. Currently, NV Energy has third party verified emission factors for CO_2 only. According to NV Energy staff, the 2007 CO_2 emission factor for electricity delivered to customers was 1,443 pounds per megawatt-hour (Soyars pers. comm.).

State-specific emission factors for CH_4 and N_2O in 2007 were obtained from CCAR (California Climate Action Registry 2009). Since data regarding the change in the rate of emissions for CH_4 and N_2O with respect to CO_2 reduction efforts is unclear, CH_4 and N_2O emissions per kilowatt-hour of electricity generated were assumed to remain constant through 2021. It is likely that CH_4 and N_2O emission will decline as CO_2 emissions decline; however, because the direct relation is unclear, a worst-case scenario in which efficiencies of these emissions do not improve was assumed.

Electricity transmission lines release SF_6 over time. Statewide SF_6 emissions in 2007 were used to identify an emission factor per megawatt-hour by dividing total SF_6 emissions by the total electricity generation in California (California Air Resources Board 2009i; California Energy Commission 2009). Once the per-unit emission factor of 0.00032 pounds of SF_6 per megawatt-hour was obtained, it was multiplied by the estimated electricity consumption at HMR to obtain total SF_6 emissions associated with electricity delivery to the Project. The emission factor was assumed to remain constant over time to represent a worst-case scenario.

According to Beaudin Ganze Inc., total electricity consumption for the Proposed Project (Alternative 1) and Alternatives 3, 5, and 6 equates to 44,593,658 kilowatt-hours per year. Statistics provided by JMA Ventures, LLC indicate that existing conditions (No Project [Alternative 2]) at HMR consume approximately 1,372,000 kilowatt-hours per year (Tirman pers. comm. (B)). These statistics include electricity consumption from residential and commercial land uses and snowmaking. Electricity consumption for Alternative 4 is based on average demand in California in 2007. According to NV Energy, the average annual monthly electricity usage per single family home is 755 kilowatt-hours. According to the EIA, average monthly electricity usage per commercial customer in California is 5,772 kilowatt-hours (Energy Information Association 2009a). Assuming 16 single family homes and one 15,000 square foot commercial/retail building will be constructed at HMR, total electricity consumption for Alternative 4 was assumed to be 214,224 kilowatt-hours per year. Total GHG emissions resulting from electricity consumption in 2021 are listed in Table 19-17.

Annual natural gas usage for the Proposed Project (Alternative 1) and Alternatives 3, 5, and 6 was obtained from Beaudin Ganze Inc. and was assumed to be 1,064,000 therms per year (Beaudin Ganze Inc. 2007). Annual natural gas usage for existing conditions (No Project [Alternative 2]) was provided by JMA Ventures, LLC and was assumed to be 11,000 therms (Tirman pers. comm. (B)). Natural gas usage for Alternative 4 was calculated using average consumption rates for residential and commercial customers in California (Energy Information Association 2009b and 2009c). According to the EIA, average annual natural usage per residential household and commercial customer was 485 therms and 5,777 therms, respectively (Energy Information Association 2009c). Assuming 16 single family homes and one 15,000 square foot commercial/retail building will be construed at HMR, total natural gas consumption for Alternative 4 would be 13,535 therms per year.

The Project area would receive natural gas from Southwest Gas, which currently has no third party verified emission factors. Consequently, natural gas emission factors for CO_2, CH_4, and N_2O were obtained CCAR and are listed in Table 19-18. It was assumed that these factors would remain constant over time to represent a worst-case scenario.

Annual GHG emissions were calculated by multiplying the emissions factors presented above by annual natural gas usage estimates. Table 19-19 summarizes total annual GHG emissions from natural gas use.

Table 19-17

Total Emissions Associated with Annual (2021) Electricity Consumption (metric tons)

	Use (kilowatt-hour per year)[1]	CO_2[2]	CH_4[3]	N_2O[4]	SF_6[5]	CO_2e
Proposed Project (Alternative 1) and Alternatives 3, 5, & 6	44,594,000	23,120	0.611	0.164	0.006	23,338
No Project (Alternative 2)[6]	1,372,000	711	0.019	0.005	0.000	718
Alternative 4[7]	214,224	111	0.003	0.001	0.000	118

Sources: Beaudin Ganze Inc. 2007 ; Tirman pers. comm. (B); Energy Information Administration 2009a; Soyars pers. comm.; California Climate Action Registry 2009; California Air Resources Board 2009i; California Energy Commission 2009; Dillard pers. comm.

Notes:

1 Beaudin Ganze Inc. 2007; Tirman pers. comm. (B); Dillard pers. comm.; EIA 2009a

2 Based on NV Energy 2007 emission factor of 1,443 pounds per megawatt-hour (Soyars pers. comm.).

3 Based on CCAR 2007 emission factor of 0.0302 pounds per megawatt-hour (CCAR 2009).

4 Based on CCAR 2007 emission factor of 0.0081 pounds per megawatt-hour (CCAR 2009).

5 SF_6 emissions were calculated by dividing overall SF_6 emissions for the State of California in 2007 (0.99 MMT of CO_2) (California Air Resources Board 2009i, page 19) by total California electricity consumption in 2007 (281,200 million kilowatt-hours) (California Energy Commissions 2009) and multiplying the resulting emission factor of 0.00032 pounds per megawatt-hour by the estimated electricity consumption for HMR.

6 Emission factors and consumption assumed to remain constant between 2008 and 2021.

7 16 single-family homes and one 15,000 square foot commercial/retail building were assumed to operate with buildout.

Table 19-18

GHG Emission Factors for Residential and Commercial Natural Gas Combustion (metric tons)

GHG	Natural Gas Emissions Factor (kilograms per million British thermal unit)
CO_2	53.0600
CH_4	0.0050
N_2O	0.0001

Sources: California Climate Action Registry 2009 pg. 101 and 103; Energy Information Administration 2009.

Table 19-19

Total Emissions Associated with Annual (2021) Natural Gas Consumption (metric tons)

	Use (cubic feet per year)[1]	CO_2	CH_4	N_2O	CO_2e
Proposed Project (Alternative 1) and Alternatives 3, 5, and 6	103,501,946[2]	5,651	0.532	0.011	5,666
No Project (Alternative 2)[3]	1,070,039[2]	58	0.006	0.000	59
Alternative 4[4]	1,316,672	72	0.007	0.000	72

Sources: Beaudin Ganze Inc.; Tirman pers. comm. (B); EIA 2009a and 2009b; Energy Information Administration 2009; California Climate Action Registry 2009 pages 101 and 103

Notes:

1 Beaudin Ganze Inc.; Tirman pers. comm. (B); EIA 2009a and 2009

2 Usage converted from therms assuming 1 therm = 100,000 British thermal units and 1,028 British thermal units = 1,000 cubic foot of natural gas.

3 Emission factors and consumption assumed to remain constant between 2008 and 2021.

4 16 single-family homes and one 15,000 square foot commercial/retail building were assumed to operate at full build..

Water Supply and Distribution

Energy is required to treat and deliver water. Domestic water for HMR is supplied by the Madden Creek Water Company (MCWC) and Tahoe City Public Utility District (TCPUD). According to JMA Ventures, LLC, current water usage is 4.8 million gallons per year (Tirman pers. comm. (B)). This statistic includes both domestic and snowmaking water usage, but was collected over the past two seasons when the HMR owned and operated well used for snowmaking was not functioning. During normal well operation, snowmaking uses approximately 17.5 million gallons per year (Homewood Mountain Resort Snowmaking Plan 2009). Estimated annual domestic water consumption for the Proposed Project (Alternative 1) from residential, commercial, and irrigation uses was provided by Nichols Consulting Engineers and was assumed to be 62 acre feet, or 20.2 million gallons per year (Nichols Consulting Engineers 2010). Water consumption from snowmaking operations was obtained from Snowmakers Inc. (2009) and was estimated to be 70.5 million gallons per year. It was assumed that these figures would represent total water usage for the Proposed Project (Alternative 1) and Alternatives 3, 5, and 6 (Tirman pers. comm. (D)).

Water consumption for Alterative 4 was not provided. Information on the number and type of fixtures in each building, as well as the occupancy/employment rate at the commercial facility would be necessary to develop an estimate of water consumption for Alternative 4. This information is currently unavailable. Consequently, an estimate of domestic water consumption for Alternative 4 was based on average values obtained from the United States Department of Agriculture (USDA) and the United States Geological Survey (USGS) (USDA 2009; USGS 2009). Specifically, the following assumptions were made:

- **Residential Water Consumption**: According to the USDA, an average California household uses one-half to one acre-foot (0.16 – 0.33 million gallons) of water per year (USDA 2009). It was therefore assumed that each single family home would use 0.33 million gallons of water for a total demand of 5.2 million gallons per year.

- **Commercial Water Consumption**: According to the USGS, an individual uses between 80-100 gallons of water per day (USGS 2009). Assuming employees spend one-third of their day at work, 33 gallons of water per individual would be consumed at the commercial facility. Based on the daily trip rate for the commercial lot, it is estimated that 30 individuals will be employed at the facility. If employees work 250 days per year, domestic water consumption would be 0.25 million gallons per year.

Total water consumption for Alternative 4 was therefore estimated to be 5.5 million gallons per year.

The estimated water-energy proxy for water supplied by the TCPUD service district is 2,320 kilowatt-hours per million gallons (Laliotis pers. comm.). Based on Snowmakers Inc. (2009), it was assumed that an energy load of 3,145 horsepower and a pumping capacity of 3,400 gallons per minute would be required to generate adequate snow at HMR. Assuming a 0.746 kilowatt per horsepower rating, the estimated water-energy proxy for the snowmaking is 11,610 kilowatt-hours per million gallons .

Indirect GHG emissions associated with water supply were calculated by multiplying the expected domestic and snowmaking water demand by the estimated water-energy proxies. These values were then multiplied by the same emissions factors for electricity generation described in the "Electricity and Natural Gas Use" section above. It was assumed that the HMR owned and operated wells would supply water for snowmaking and that domestic water would be supplied by TCPUD

Table 19-20 details expected water demand, associated energy use, and indirect GHG emissions resulting from the supply of water to HMR. Water demand was assumed to remain constant through Project buildout.

Wastewater Treatment

Wastewater from HMR is treated by the Tahoe-Truckee Sanitation Agency (T-TSA). Wastewater can produce CH_4 and N_2O when treated anaerobically. CO_2 emissions from wastewater are considered biogenic (i.e. produced by life processes) in origin and therefore are not included in estimates of anthropogenic emissions (Intergovernmental Panel on Climate Change 2006). Wastewater will break down under anaerobic conditions in the T-TSA systems and during the wastewater treatment process, which will produce CH_4 as a byproduct. Tertiary treatment will remove some nitrogen from the reclaimed water and dried solids.

Table 19-20

Annual Water Supply Intensity and Resulting GHG Emissions (metric tons)

	Use (million gallons per year)		kilowatt -hours per year	CO_2	CH_4	N_2O	SF_6	CO_2e
Proposed Project (Alternative 1) and Alternatives 3, 5, and 6	Domestic	20.2	46,860	24.300	0.0006	0.0002	0.0000	24.530
	Snowmaking	70.4	818,543	424	0.0112	0.0030	0.0001	428.386
No Project (Alternative 2)	Domestic	4.8	11,136	5.774	0.0002	0.0000	0.0000	5.828
	Snowmaking	17.5	203,184	105	0.0028	0.0007	0.0000	106.337
Alternative 4 (2)	Domestic	5.46	12,667	6.567	0.0002	0.0000	0.0000	6.629

Source: Nichols Consulting Engineers 2009; Snowmakers Inc. 2009, Tirman pers. comm. (B); USDA 2009; USGS 2009; Laliotis pers. comm.

Notes:

1 This statistic includes a minor amount of water used for snowmaking. Since the percent breakdown of domestic to snowmaking water usage could not be obtained, it was assumed the entire 4.8 million gallons was used for domestic purposes as a worst case scenario.

2 No snowmaking would occur under Alternative 4.

Emissions from wastewater treatment were calculated using Statewide ARB emission rates for CH_4 and N_2O. The ARB estimates 2006 yearly emissions resulting from domestic wastewater treatment in the State of California were 522 g of CH_4 and 85.6 g of N_2O per person (California Air Resources Board 2009j and 2009k). According to Beaudin Ganze, sanitary sewer discharge for Alterative 1 is 70,400 gallons per day (Beaudin Ganze 2007). This estimate was assumed to represent sewer discharge from Alternatives 3, 5, and 6 (Tirman pers. comm. (D)). Sewer discharge for No Project (Alternative 2) was assumed to equal domestic water intake, which was estimated at 24% of the total water usage provided by JMA Ventures, LLC (above) (Tirman pers. comm. (B)). Sewer discharge for Alternative 4 was assumed to equal domestic water usage, or 15,280 gallons per day. The one to one ratio of domestic water to sewer discharge is based on the assumption that sewer flow will be near the daily building cold water usage (Beaudin Ganze 2007).

Use of the ARB emission rates for CH_4 and N_2O, which are recorded in grams per person, requires a detailed inventory of the population at HMR. This information is currently unavailable. Consequently, an estimate of the permanent and visitor population at HMR was calculated using the best available information.

From Chapter 7 – Population, Employment, and Housing, implementation of the Proposed Project (Alternative 1) and Alternative 3 will result in 471 permanent residents. Alternatives 4 would accommodate a population increase of 42 persons. Alternatives 5 and 6 will provide housing for 627 and 413 residents, respectively. These statistics assume 100% occupancy and represent a worst-case scenario.

Based on the most recent EPA GHG inventory, it was assumed that the average individual produces 100 gallons of wastewater per day (Environmental Protection Agency 2009e). Wastewater production from permanent residents was therefore calculated by multiplying the expected population by 100 gallons. The remaining wastewater was assumed to be produced by employees and visitors. It was assumed that these individuals would spend one-third to one-half of their day at HMR, contributing roughly 50 gallons of wastewater per day. Total HMR population was therefore calculated using the following equations:

Visitor/ Employee Wastewater = (Total wastewater) - ((Full-time residents) X (100 gallons/day))

Visitor/Employee Population = (Visitor/Employee wastewater) / (50 gallons per day)

Total HMR Population = (Visitor/Employee population) + (Full-time residents)

Where:

Total wastewater = Statistics provided by Beaudin Ganze, JMA Ventures LLC, and USGS/USDA

Full-time residents = Estimates in Chapter 7 – Population, Employment, and Housing.

Emissions of CH_4 and N_2O from sanitary sewer discharge at HMR were calculated by multiplying the total population by the ARB emission factors for both CH_4 and N_2O. It was assumed the population would remain constant through Project buildout. The population estimates calculated using the above methodology assume each individual will produce the same amount of wastewater. In addition, it does not take into account the seasonal population flux, which would result in higher population estimates during the winter season and lower population estimates during the summer season. However, the calculations represent a good faith effort at calculating the average population at HMR based on Project-specific sanitary sewer information and average wastewater production values. Moreover, because annual wastewater emissions from the part-time population (e.g. visitors and employees) presented in Table 19-21 were multiplied by a factor of 365, this analysis likely overestimates total emissions from sanitary sewer discharge.

The total annual GHG emissions from wastewater associated with the project are presented in Table 19-21.

Summary of Project Level Emissions

Table 19-22 presents construction emissions. Because construction emissions are a one-time event, these emissions are considered short-term in comparison to ongoing GHG emissions associated with Project operations.

Table 19-23 lists existing and with Project annual GHG emissions by source. Emission factors associated with transportation and energy usage are likely to decrease over time. Therefore, emissions calculations for Project operation (2021) likely overestimate future annual emissions.

Implementation of the Proposed Project (Alternative 1) and Alternatives 3, 5, and 6 would result in a net increase in local GHG emissions above existing conditions. Alternative 4 would result in a net reduction in GHGs from the Project area. GHG emissions tend to accumulate in the atmosphere because of their relatively long lifespan. As a result, their impact on the atmosphere is mostly independent of the point of emission. Therefore, GHG emissions are more appropriately evaluated on a regional, State, or even national scale than on an individual project level. Further, it is unlikely that the GHGs emitted as part of the Project would have an individually discernable effect on global climate change.

Mitigation: No mitigation is required.

Table 19-21

Population Estimates, Sanitary Sewer Discharge, and Resulting GHG Emissions (metric tons)

Scenario	Full-time Residents	Visitors and Employees[1]	Sanitary Sewer (gallons per year)[2]	CO_2[3]	CH_4	N_2O	CO_2e
Proposed Project (Alternative 1) and Alternative 3	471	466	25,696,000	0.00	179	29	12,825
No Project (Alternative 2)	0	63	1,152,000	0.00	12	0	253
Alternative 4	42	30[4]	5,577,200	0.00	14	2	985
Alternative 5	627	154	25,696,000	0.00	149	24	10,689
Alternative 6	413	582	25,696,000	0.00	190	31	13,618

Source: California Air Resources Board 2009j and 2009k; Beaudin Ganze 2007; Tirman pers. comm. (B); Environmental Protection Agency 2009e.

Notes:

1 Chapter 7 describes employment expected at HMR with the Project. The difference between this number and the figure presented in Table 19-21 represents the estimated number of guests contributing to the sanitary sewer discharge. gallons per day by 365.

3 CO_2 emissions considered biogenic and were not calculated.

4 Based on calculates completed for commercial water usage (see "Water Supply and Distribution" above).

Table 19-22

Total GHG Emissions Associated with Construction of HMR (metric tons)

Scenario	CO_2e
Proposed Project (Alternative 1) and Alternative 3	2,684
No Project (Alternative 2)	0
Alternative 4	119
Alternative 5	2,734
Alternative 6	2,697

Source: Section 19.4.1 – Construction GHG Emission.

Table 19-23

Annual Operational GHG Emissions Associated with HMR (metric tons)

Scenario	Source	CO_2e
Existing (2008)	Transportation	1,018
	Area Source	26
	Refrigeration/AC	33
	Electricity Usage	718
	Natural Gas Combustion	59
	Water Supply	112
	Wastewater Treatment	253
	Total Existing Conditions	**2,220**
Proposed Project (Alternative 1) and Alternative 3	Transportation	1,903
	Area Source	18
	Refrigeration/AC	862
	Electricity Usage	23,338
	Natural Gas Combustion	5,666
	Water Supply	453
	Wastewater Treatment	12,825
	Total Proposed Project (Alternative 1) and Alternative 3	**45,064**
No Project (Alternative 2)	Transportation	1,010
	Area Source	26
	Refrigeration/AC	33
	Electricity Usage	718
	Natural Gas Combustion	59
	Water Supply	112
	Wastewater Treatment	253
	Total No Project (Alternative 2)	**2,212**
Alternative 4	Transportation	411
	Area Source	1
	Refrigeration/AC	9
	Electricity Usage	118
	Natural Gas Combustion	72
	Water Supply	7
	Wastewater Treatment	985
	Total Alternative 4	**1,602**
Alternative 5	Transportation[1]	1,724
	Area Source	18
	Refrigeration/AC	827
	Electricity Usage	23,338
	Natural Gas Combustion	5,666
	Water Supply	453

Scenario	Source	CO_2e
	Wastewater Treatment	10,689
	Total Alternative 5	**42,715**
Alternative 6	Transportation	1,678
	Area Source	18
	Refrigeration/AC	826
	Electricity Usage	23,338
	Natural Gas Combustion	5,666
	Water Supply	453
	Wastewater Treatment	13,618
	Total Alternative 6	**45,597**

Source: Section 19.4.1 – Construction GHG Emissions, Section 19.4.2, Operational GHG Emissions.

Notes

1. As discussed in Chapter 12, the summer VMT estimates for Alternative 5 did not include trips associated with the 12 workforce housing units. The emissions presented above will therefore be slightly higher with the inclusion of these units.

19.5 CUMULATIVE IMPACTS AND MITIGATION MEASURES

In accordance with the 2010 CEQA Guidelines, this section discusses Project GHG emissions within a cumulative context. Reduction strategies already committed to by the Project Applicant, as well as additional mitigation measures to further reduce GHG emissions are identified.

Impact: **CC-C1. Will the Project Generate GHG Emissions, Either Directly or Indirectly, that may Have a Significant Impact on the Environment?**

Analysis: *No Impact; No Project (Alternative 2)*

No Project (Alternative 2) will not include any changes to the existing HMR Project area or structures. Therefore, there will be no new GHG emissions. There would therefore be no impact. No further analysis is required.

Mitigation: No mitigation is required.

Analysis: *Less than Significant Impact; Alternative 4*

Implementation of Alternative 4 is expected to reduce GHG emissions by 618 metric tons per year compared to existing conditions (Table 19-23). Consequently, this impact is considered a less than significant cumulative contribution of GHGs and to climate change.

Mitigation: No mitigation is required.

Analysis: *Significant Impact; Proposed Project (Alternative 1) and Alternatives 3, 5, and 6*

Unlike criteria pollutant impacts, which are local and regional in nature, climate change impacts occur at a global level. The relatively long lifespan and persistence of GHGs (Table 19-1) require that climate change be considered a cumulative and global impact. It is unlikely that that any increase in global temperature or sea level could be attributed to the emissions resulting from a single project. Rather, it is more appropriate to conclude Project-related GHG emissions will combine with emissions across California, the U.S., and the globe to cumulatively contribute to global climate change.

To put the Project in perspective, total estimated GHG emissions were compared to the most recent global, national, and State GHG inventories. Construction emissions, which will be produced during Project development but not during Project operation, were amortized assuming a 40-year Project lifetime and included in the emissions totals. Based on the estimates presented in Table 19-24, the Project and alternatives would have a miniscule impact on State, federal, and international emissions of GHGs.

While GHG emissions from the Project may be negligible relative to total State, national, and global emissions, scientific consensus concludes that given the seriousness of climate change, small contributions of GHGs may be cumulatively considerable. When compared to existing emissions, the Proposed Project (Alternative 1) and Alternatives 3, 5, and 6 would result in net increases of GHGs. Based on consultation with the PCAPCD, Placer County, and the TRPA, the magnitude of these emissions would result in the Project having a significant cumulative impact on the environment (Clark, Chang, and Landry pers. comm.).

Table 19-24

Annual HMR GHG Emissions in California, U.S., and Global Context

Emissions Type	CO_2e (metric tons)		
2006 ARB Statewide GHG Emissions	483,900,000	–	–
2007 EPA National GHG Emissions	7,510,100,000	–	–
2004 IPCC Global GHG Emissions	49,000,000,000	–	–
Scenario	**HMR % of ARB Statewide**	**HMR % of EPA National**	**HMR % of IPCC Global**
Existing Annual HMR GHG Emissions	0.000407%	0.000026%	0.000004%
Proposed Project (Alternative 1) and Alternative 3 Annual HMR GHG Emissions[1]	0.009327%	0.000601%	0.000092%
No Project (Alternative 2) Annual HMR GHG Emissions	0.000457%	0.000029%	0.000005%
Alternative 4 Annual HMR GHG Emissions[1]	0.000332%	0.000021%	0.000003%
Alternative 5 Annual HMR GHG Emissions[1]	0.008841%	0.000570%	0.000087%
Alternative 6 Annual HMR GHG Emissions[1]	0.009437%	0.000608%	0.000093%

Sources: IPCC 2006c; EPA 2009a; ARB 2009a.

Notes:
[1] Construction emissions have been amortized over a 40-year period.

Project Commitments

The Project Applicant has committed to numerous GHG reduction strategies through participation in the LEED for Neighborhood Development Pilot Program (LEED-ND). Unlike traditional LEED programs, LEED-ND evaluates not just individual buildings, but the overall project design. The LEED-ND rating system is divided into three primary categories: Smart Location, Neighborhood Pattern, and Green Infrastructure. These categories have prerequisites that are required for all projects, as well as additional credits that reward performance. The final project score is reflected in the certification level, which include “certified” (40 points), “silver” (50 points), “gold” (60 points), and “platinum” (80 points).

The North Base area will be designed under the Pilot Program and the South Base area will be constructed using the LEED criteria as a template. In addition, HMR has developed an Alternative Transportation Program (Transportation Program) to reduce reliance on the automobile. The North Base has been accepted into the program with a pre-certification estimate of 68 points (“gold level”). Table 19-25 identifies the GHG reduction strategies committed to by the Project Applicant through LEED certification and the Transportation Program.

There is limited research on the CO_2 reduction potentials of individual LEED strategies. Instead, several documents have quantified the net energy, water, and waste savings resulting from LEED certification. According to the U.S. Green Building Council (USGBC), green buildings can reduce energy use by 24%-50%, water use by 40%, and solid waste by 70% (USGBC 2009). With regards to total CO_2 emissions, recent case studies on certified green buildings revealed an average reduction of 33%-39% (GSA Public Buildings Services 2008; Kats 2003).

The Bay Area Air Quality Management District (BAAQMD), Sacramento Metropolitan Air Quality Management District (SMAQMD), and San Joaquin Valley Air Pollution Control District have published various guidance documents with pre-quantified reduction potentials for mitigation measures used in the Bay Area, Sacramento Metropolitan Area, and San Joaquin Valley (EDAW 2009; SMAQMD 2008; SJVAPCD 2009). When appropriate, Table 19-25 lists these reductions to provide an approximation of the potential CO_2 reductions that may be achieved by the identified HMR LEED-ND strategies. Note that the reduction potentials have not been scaled to Project-specific emissions or resource sectors (e.g. natural gas, electricity).[3]

[3] “Reduction potentials should be scaled proportionally to their sector of project-generated emissions. For example, if a measure would result in a 50 percent reduction in residential natural gas consumption, but only 20 percent of a project’s emissions are associated with natural gas consumption, and only 10 percent of a project’s emissions are from residential land uses, then the scaled reduction would equal one percent (50% * 20% * 10% = 1%) (EDAW 2009).”

Table 19-25

Greenhouse Gas Reduction Strategies and Associated Reduction Potentials

GHG Reduction Strategy	Potential Reduction[1]	Comments and Notes
Smart Location and Linkage[2]		
Preferred Location		
Reduced Automobile Dependence[3]	2%	Credit awarded based on LEED checklist application that 100% of dwelling units will be within 0.25 mile of transit stops. Note that additional reductions would be achieved from other measures included in this strategy (EDAW 2009, USGBC 2007).
Bicycle Network	1%-5%	The Center for Clean Air Policy (CCAP) guidebook attributes a 1% to 5% reduction associated with the use of bicycles, which reflects the assumption that their use is typically for shorter trips (SMAQMD 2008).
Housing and Jobs Proximity		
Steep Slope Protection		
Site Design for Habitat or Wetlands Conservation		
Restoration of Habitat or Wetlands		
Conservation Management of Habitat/Wetlands		
Neighborhood Pattern and Design[2]		
Open Community		
Compact Development	0.20%	Credit awarded based on LEED Rating System that 1 point achieves a Floor to Area Ratio (FAR) of 0.75-1. Reduction based on SMAQMD FAR with planned bus service (USGBC 2007, SJVAPCD 2009).
Diversity of Uses		Project would result in 50% of the dwelling units being located within 1/2 mile of ten mixed-uses (USGBC 2007).
Diversity of Housing Types		
Affordable Rental Housing	0-4%	Reduction applies to the mobile source sector (EDAW 2009).
Reduced Parking Footprint[4]	0-50%	Reduction applies to the mobile source sector (EDAW 2009).
Walkable Streets	0.25%-0.50%	Based on SJVAPCD credit for projects orientated toward bike and pedestrian facilities. Note that additional reductions would be achieved by other measures included in this strategy (SJVAPCD 2009).
Transit Facilities	0-15%	Reductions apply to mobile source sector (EDAW 2009).

GHG Reduction Strategy	Potential Reduction[1]	Comments and Notes
Transportation Demand Management[5]	25% of transit service reduction	Reduction credit given for free transit passes and only applies to resident/employee trips. Reductions apply to mobile source sector. Additional reductions would be achieved by the transit service provided in this strategy (EDAW 2009).
Access to Surrounding Vicinity		
Access to Public Spaces	1%	Based on SMAQMD credit for projects located within 0.25 mile of civic uses. According to the LEED Rating System, the Project will be designed so that parks and green plazas will be within 1/6 mile walk distance to 90% of planned dwelling units (SJVAPCD 2009, USGBC 2007).
Access to Active Public Spaces		Reduction included under "Access to Public Spaces."
Universal Accessibility		
Community Outreach and Involvement		
Local Food Production		
Green Construction & Technology[2]		
Construction Activity Pollution Prevention		
LEED Certified Green Buildings		
Energy Efficient in Buildings		Based on LEED Rating System, the Project will demonstrate a 20% reduction in building performance compared to baseline or comply with ENERGY STAR ratings (USGBC 2007).
Reduced Water Use		Based on LEED Rating System, this strategy may achieve an aggregate water reduction of 20% when compared to building baseline conditions (USGBC 2007).
Minimize Site Disturbance through Site Design		
Minimize Site Disturbance during Construction		
Stormwater Management		Based on the LEED Rating System and application, the Project will implement a plan that infiltrates, reuse, or evapotranspirates at least 0.75 inches of rain (USGBC 2007).
Heat Island Reduction		
On-Site Energy Generation		Based on LEED Rating System, the Project will develop on-site energy generation system(s) with peak electrical generating capacity of at least 5% of the Project's specified electrical service load (USGBC 2007).
Infrastructure Energy Efficiency		Based on LEED Rating System, the Project will achieve a 15% annual energy reduction beyond an estimated baseline energy use for infrastructure (USGBC 2007).
Recycled Content for Infrastructure		

GHG Reduction Strategy	Potential Reduction[1]	Comments and Notes
Construction Waste Management		Based on LEED Rating System, 50% of non-hazardous construction and demolition debris will be recycled and/or salvaged (USGBC 2007).
Comprehensive Waste Management		
Light Pollution Reduction		
Innovation and Design Process[2]		
LEED Accredited Professional		
Transportation Management Program[6]		
Extension of West Shore Bike Trail		Reduction of 1%-5% attributed to bicycle strategies. See "Bicycle Network."
Bicycle Share Service		Reduction of 1%-5% attributed to bicycle strategies. See "Bicycle Network."
Intercept Existing Vehicle Trips		
Transportation Information Strategies		
Regional Transportation Solutions		
Summer Boat Parking		

Source: LEED Application; Homewood Transportation Newsletter; SMAQMD 2008; SJVAPCD 2009; EDAW 2009; USGBC 2007.

Notes

1 Potential GHG reductions represent an approximation. They have not been scaled to the individual Project or sectors.

2 Strategies obtained from the LEED for Neighborhood Development Pilot Project Checklist, which was submitted by the project applicant during the pre-review submittal phase.

3 Overlaps with several strategies outlined in the Transportation Program (e.g. electric/hybrid car rental and transit services).

4 Overlaps with the Day Skier Parking Control strategy outlined in the Transportation Program.

5 Overlaps with several of the strategies outlined in the Transportation Program. These include an employee shuttle bus, bus fares, scheduled shuttle service, North-South base area shuttle series, skier intercept shuttle, West Shore dial-a-ride, and water taxi service.

6 Strategies obtained from the HMR Alternative Transportation Newsletter provided by LLC Ventures. Those measures that overlap with LEED strategies identified above have not been included in this list.

Based on the pre-applicant checklist completed for HMR, the project is expected to achieve gold certification. Implementation of Mitigation Measure CC-1 is required to document and verify project certification.

Mitigation: **CC-1: Document and Verify Implementation of the Project GHG Reduction Commitments**

The project applicant shall document and verify the project commitments outlined in Table 19-25 have been incorporated into the final project design. Copies of the pre-certification plan (Stage 2 in the LEED-ND process) shall be provided to PCAPCD and TRPA. Once the project is complete, the final LEED-ND certification that verifies the north base has achieved all of the prerequisites and credits required for Gold certification shall be submitted to the air districts.

CC-2: Implement Project Design Features to Further Reduce Project Contribution to Climate Change

A recent report by the California Attorney General's (AG) office, *The California Environmental Quality Act: Addressing Global Warming at the Local Agency Level,* identifies various example measures to reduce GHG emissions at the project level (State of California Department of Justice 2008). The following Project design features were compiled from the California AG's Office report and are intended to provide additional strategies that could be incorporated into HMR Master Plan, especially at the South Base, to further reduce GHG emissions. Note that majority of the AG's strategies have been removed from the list below as they overlapped with actions already committed to by the Project Applicant (Table 19-25), or are inapplicable to the Project because they address emissions from different types of projects.

The final project design shall incorporate the following applicable AG measures. A standard note indicating these requirements will be included on building plans approved in association with this project shall be included on building permits.

Energy Efficiency

- Use solar heating, automatic covers, and efficient pumps and motors for pools and spas.

Renewable Energy

- Install solar or wind power systems and solar hot water heaters. Educate consumers about existing incentives.
- Install solar panels on carports and over parking areas.

Water Conservation and Efficiency

- Install water-efficient irrigation systems and devices, such as soil moisture-based irrigation controls.
- Restrict watering methods (e.g., prohibit systems that apply water to non-vegetated surfaces) and control runoff.
- Restrict the use of water for cleaning outdoor surfaces and vehicles.
- Provide education about water conservation and available programs and incentives.

Solid Waste Measures

- Provide education and publicity about reducing waste and available recycling services.

Transportation and Motor Vehicles

- Limit idling time for commercial vehicles, including delivery and construction vehicles.
- Use low or zero-emission vehicles, including construction vehicles.
- Increase the cost of driving and parking private vehicles by, e.g., imposing tolls and parking fees.
- Institute a low-carbon fuel vehicle incentive program.

- Provide information on options for individuals and businesses to reduce transportation-related emissions. Provide education and information about public transportation.

After Mitigation: *Significant and Unavoidable Impact; Proposed Project (Alternative 1) and Alternatives 3 5, and 6*

While the above measures will not eliminate Project GHG emissions, their inclusion will result in lower GHG emissions levels than had they not been incorporated. For example, green buildings have the potential to reduce CO_2 emissions associated with building operations by 33%-39% (GSA Public Buildings Services 2008; Kats 2003). In addition future State actions taken pursuant to AB 32 including requirements for lower carbon-content in motor vehicle fuels, improved vehicle mileage standards (provided California is not barred due to federal action), and an increased share of renewable energy in electricity generation will serve, in time, to further reduce GHG emissions.

The majority of development at HMR will include transferred tourist accommodation units (TAUs) and residential accommodation units (RAUs). Consequently, GHG emissions generated by these structures are not new to the Lake Tahoe Basin and would be emitted regardless of the Project. The transfer of existing TAUs and RAUs to the Project site may even reduce basin-wide GHG emissions, as the existing units are older and less efficient than those being constructed. While some new TAUs and RAUs will be required as part of the Project, they will be obtained from TRPA bonus inventory, which is analyzed in the TRPA Regional Plan. Consequently, new HMR-generated GHG emissions have been accounted for in previous planning documents. Please see Chapter 7 – Population, Employment, and Housing for more information on TAUs/RAUs. The mitigation measures and reduction strategies identified above will reduce Project-related GHG emissions, and the Project is being developed through existing and bonus TAUs and RAUs. However, it is unknown the extent to which climate change will be affected by GHG emissions from HMR. The possibility exists that the Project will contribute to global GHG emissions and global climate change. Therefore, the Project's cumulative impact to climate change after mitigation is considered significant and unavoidable.

Impact: CC-C2. Will the Project Conflict with any Applicable Plan, Policy or Regulation of an Agency Adopted for the Purpose of Reducing the Emissions of GHGs?

Analysis: *No Impact; No Project (Alternative 2)*

No Project (Alternative 2) will not include any changes to the existing HMR Project area or structures. Therefore, there will be no additional GHG emitted as result of No Project (Alternative 2). It will therefore not conflict with any plans to reduction GHG emissions. There would be no impact. No further analysis is required.

Mitigation: No mitigation is required.

Analysis: *Less than Significant Impact; Alternative 4*

Implementation of Alternative 4 is expected to reduce GHG emissions by 617 metric tons per year, relative to existing conditions (Table 19-22). Consequently, Alternative 4 will compliment and assist plans in reducing regional GHG emissions. This impact is considered less than significant.

Mitigation: No mitigation is required.

Analysis: *Significant Impact; Proposed Project (Alternative 1) and Alternatives 3, 5, and 6*

The State has adopted several polices and regulations for reducing GHG emissions (as discussed in Section 19.2). The most stringent of these is AB 32, which is designated to reduce Statewide GHG emissions to 1990 levels by 2020. The TMPO has outlined a serious of goals and polices geared towards reducing VMT and GHG emission from Transportation.

As shown in Table 19-23, the Proposed Project (Alternative 1) and Alternatives 3, 5, and 6 would result in substantial net increases of GHG and vehicle trips in comparison to existing conditions. Thus, Project-generated GHG emissions may conflict with the State goals listed in AB 32 and polices outlines in the 2008 RTP. This impact is considered significant.

Mitigation: **CC-1: Document and Verify Implementation of the Project GHG Reduction Commitments**

CC-2: Implement Project Design Features to Further Reduce Project Contribution to Climate Change

After Mitigation: *Significant and Unavoidable Impact; Proposed Project (Alternative 1) and Alternatives 3, 5, and 6*

Mitigation Measures CC-1 and CC-2 will result in lower GHG emissions levels than had it not been incorporated, but it is unlikely to achieve reductions consistent with the requirements of AB 32. The possibility exists that the Project will contribute to global GHG emissions and therefore conflict with existing and future actions to reduce GHG emissions. Thus, this impact is considered significant and unavoidable.

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