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11 Greenhouse Gases and Climate Change

This chapter provides an overview of the environmental setting for greenhouse gases (GHGs) and climate change, based on Appendix C. The American Meteorological Society refers to climate change as any systematic change in the long-term statistics of climate elements (such as temperature, pressure, or winds) sustained over several decades or longer. The Society also indicates that climate change may be due to natural external forcings, such as changes in solar emission or slow changes in the Earth's orbital elements; natural internal processes of the climate system; or anthropogenic forcing (AMS 2012). The climate system can be influenced by changes in the concentration of various GHGs in the atmosphere that affect the Earth's absorption of radiation. This chapter concludes with an evaluation of the Proposed Program's contribution to GHG emissions.

11.1 Environmental Setting

11.1.1 Global Climate Change

Climate change refers to any measurable alteration of climate lasting for an extended period of time – several decades or longer – and includes recordable changes in temperature, precipitation, or wind patterns. The average temperature of the Earth has increased about 0.7 to 1.5°F (0.4 to 0.8°C) over the past century, and is projected to rise another 2 to 11.5°F (1.1 to 6.4°C) over the next 100 years (IPCC 2001; USEPA 2012d). Seemingly, small changes in the average temperature of the planet can translate to large and potentially hazardous shifts in climate and weather. Climate change is suspected as the cause of changes in rainfall amounts and distribution that can result in flooding, droughts, or more frequent and severe heat waves. Also, oceans are warming and becoming more acidic, polar ice caps are melting, glaciers are receding, and sea levels are rising due to thermal expansion and ice loss. Long-term studies indicate that ocean surface temperatures have been rising at an average rate of 0.13°F (0.07°C) per decade and since 1901, average sea level has increased by about 8 inches (20 centimeters) during the same period, and average pH has decreased (acidified) by about 0.05 pH units since the mid-1980s. Late summer Arctic Ocean sea ice coverage has decreased by half since 1979, and glaciers have receded and lost significant mass since the 1970s (USEPA 2012d). As climate change progresses in the coming decades, it will likely present challenges to society and the environment.

11.1.1.1 Local Climate

The Program Area climate is characterized by moderately wet winters and dry summers. About 90 percent of the annual total rainfall is received in the November through April period. Between June and September, normal rainfall is typically less than 0.6 inch (1.5 centimeters). Temperatures in the Program Area average about 60°F (15°C) annually, with average summer highs in the 70 to 80°F (21 to 27°C) range and average winter lows in the 40 to 50°F (4 to 10°C) range. Precipitation averages about 23 inches (58 centimeters) per year, although annual precipitation can vary significantly from year to year. Annual average wind speeds in the Program Area are about 8 miles per hour (3.6 meters per second). The predominant direction of air pollution transport in the Program Area is inland from the coastal areas (BAAQMD 2010a; World Climate 2012; NOAA 2008).

11.1.2 The Greenhouse Effect

Over the past century, human activities have released large amounts of carbon dioxide (CO_2) and other GHGs into the atmosphere. The majority of GHGs are the by-product of burning fossil fuels to release energy in the form of heat, although deforestation, industrial processes, and some agricultural practices also emit GHGs into the atmosphere. GHGs trap solar energy in the atmosphere and cause it to warm. This phenomenon is called the greenhouse effect and is necessary to support life on Earth; however,

excessive buildup of GHGs can change Earth's climate and result in undesirable effects on ecosystems, which affect human health and welfare. (USEPA 2012d)

In its *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2011* (USEPA 2012e), the USEPA provides summary information on the work of the United Nations Framework Convention on Climate Change (UNFCCC 2009) and the Intergovernmental Panel on Climate Control (IPCC 1990-2007); key information from that report is summarized below – more details may be found in the cited source documents.

The UNFCCC defines climate change as "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (UNFCCC 2009). In its *Second Assessment Report* of the science of climate change, the IPCC concluded "human activities are changing the atmospheric concentrations and distributions of greenhouse gases and aerosols" (IPCC 1995). These changes can produce a radiative forcing by changing either the reflection or absorption of solar radiation, or the emission and absorption of terrestrial radiation." Building on this conclusion, the IPCC *Third Assessment Report* (IPCC 2001) asserted "concentrations of atmospheric greenhouse gases and their radiative forcing have continued to increase as a result of human activities."

The IPCC reports the global average surface temperature of the Earth has increased by 1.1 ± 0.4°F (0.6 ± 0.2°C) over the 20th century. This value is about 0.27°F (0.15°C) larger than that estimated by the Second Assessment Report, which reported for the period up to 1994, "owing to the relatively high temperatures of the additional years (1995 to 2000) and improved methods of processing the data."

While the *Second Assessment Report* concluded, "the balance of evidence suggests there is a discernible human influence on global climate," the *Third Assessment Report* more directly connects the influence of human activities on climate. IPCC concluded, "In light of new evidence and taking into account the remaining uncertainties, most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations."

In its most recent *Fourth Assessment Report*, IPCC stated warming of Earth's climate is unequivocal, and that warming is very likely attributable to increases in atmospheric GHGs caused by human activities (IPCC 2007). IPCC further stated changes in many physical and biological systems, such as increases in global temperatures, more frequent heat waves, rising sea levels, coastal flooding, loss of wildlife habitat, spread of infectious disease, and other potential environmental impacts, are linked to changes in the climate system, and some changes might be irreversible.

The mobile sources used in mosquito and vector control activities emit GHGs and, therefore, contribute incrementally to climate change; however, as described in Section 11.2.2, these emissions comprise a very small fraction of the Bay Area, California, and national GHG inventories. This fact precludes any meaningful analysis of quantitative effects that mosquito and vector control operations may specifically have on climate, although taken together with regional, national, and worldwide GHG emissions, global effects are as described above.

11.1.3 Greenhouse Gases and Their Emissions

11.1.3.1 The Atmosphere

Air is a mixture of constituent gases and its composition varies slightly with location and altitude. For 20th century scientific and engineering purposes, it became necessary to define a standard composition known as the US Standard Atmosphere. In addition to the common gases (nitrogen, oxygen, CO_2, methane [CH_4], hydrogen, nitrous oxide [N_2O]), the atmosphere contains noble or inert gases (argon, neon, helium, krypton, xenon). Radon is also present in low concentrations near ground level in limited geographic areas where it is naturally emitted from certain types of rock and soil. Table 11-1 shows the typical composition of dry

standard air, which is over 99 percent nitrogen and oxygen (UIG 2008; USEPA 2012e). The apparent molecular weight of dry standard air is 28.966 grams per mole (Jennings 1970; du Pont 1971).

Table 11-1 Standard Composition of Dry Air

Principal Gas	Chemical Symbol	Gas MW g/mole	Concentration ppmv	Fraction Percent	Fraction MW g/mole
Nitrogen	N_2	28.014	780,805.00	78.080500	21.873471
Oxygen	O_2	31.998	209,440.00	20.944000	6.701661
Argon	Ar	39.948	9,340.00	0.934000	0.373114
Carbon Dioxide	CO_2	44.009	387.69	0.038769	0.017062
Neon	Ne	20.183	18.21	0.001821	0.000368
Helium	He	4.003	5.24	0.000524	0.000021
Methane	CH_4	16.043	1.81	0.000181	0.000029
Krypton	Kr	83.800	1.14	0.000114	0.000096
Hydrogen	H_2	2.016	0.50	0.000050	0.000001
Nitrous Oxide	N_2O	44.013	0.32	0.000032	0.000014
Xenon	Xe	31.300	0.09	0.000009	0.000003
Totals			**1,000,000.00**	**100.000**	**28.966**

Sources: UIG 2008 ; USEPA 2012e ; du Pont 1971 ; Jennings 1970

Notes:

MW = molecular weight, g/mole

ppmv = parts per million by volume (10^{-6})

The atmosphere consists of five basic altitude zones: troposphere (sea level to 8 miles), stratosphere (8 to 32 miles), mesosphere (32 to 50 miles), thermosphere (50 to 350 miles), and exosphere (350 to 500 miles). Within the stratosphere is the ozone layer (9 to 22 miles), which absorbs ultraviolet wavelengths; and within the mesosphere is the ionosphere (62 to 190 miles), which reflects shortwave radio signals and produces auroras. These approximate altitude ranges vary with latitude, season, solar activity, and turbulence. GHGs persist mainly in the troposphere and stratosphere – some in the mesosphere – for different lengths of time, ranging from less than 5 years to over 50,000 years, long enough to become well-mixed, meaning that atmospheric concentrations are about the same all over the world, regardless of source locations (USEPA 2012f). Thus, the homogeneous composition of the lower atmosphere is the global setting for climate change.

11.1.3.2 Greenhouse Gases

Gases that trap heat in the atmosphere are called GHGs. Principal GHGs include CO_2, CH_4, N_2O, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride (SF_6), and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. GHGs occur naturally because of volcanoes, forest fires, and biological processes such as enteric fermentation and aerobic decomposition. They are also produced by combustion of fuels, industrial processes, agricultural operations, waste management, and land use changes such as loss of farmland to urbanization. The most common GHG from human activity (fuel combustion) is CO_2, followed by CH_4 and N_2O. (USEPA 2012f)

Concentration, or abundance, is the amount of a particular gas in the air. Larger GHG emissions lead to higher concentrations in the atmosphere. GHG concentrations are measured in units of parts per million (ppm), parts per billion (ppb), and parts per trillion (ppt). One ppm is equivalent to 1 cubic

centimeter (cc) of pure gas diluted in 1 cubic meter of air. Similarly, 1 ppb is 1 cc diluted in 1,000 cubic meters, and 1 ppt is 1 cc diluted in 1,000,000 cubic meters. (USEPA 2012f)

11.1.3.2.1 Carbon Dioxide

CO_2 enters the atmosphere through burning fossil fuels (coal, natural gas, and petroleum products), decomposition of solid waste, trees and wood products, fermentation, and also as a result of certain chemical reactions, such as manufacture of cement. CO_2 is removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biologic carbon cycle. In the carbon cycle, carbon in various molecular forms is cycled among atmospheric, oceanic, land biotic, marine biotic, and mineral reservoirs. Atmospheric CO_2 is part of this global carbon cycle. CO_2 concentrations in the atmosphere have increased from about 280 ppm in preindustrial times to about 390 ppm today, a 39 percent increase. The IPCC notes that “this concentration has not been exceeded during the past 420,000 years, and likely not during the past 20 million years. The rate of increase over the past century is unprecedented, at least during the past 20,000 years.” The IPCC definitively states that “the present atmospheric CO_2 increase is caused by anthropogenic emissions of CO_2.” (USEPA 2012f; IPCC 2007)

Global Warming Potential (GWP) is a quantified measure of the globally averaged relative radiative forcing impacts of a particular GHG. It is defined as the cumulative radiative forcing both direct and indirect effects integrated over a period of time from the emission of a unit mass of gas relative to a reference gas. CO_2 is the reference gas with a GWP of unity (1). Carbon dioxide equivalents (CO_2e) are calculated by summing the products of mass GHG emissions by species times their respective USEPA official GWP coefficients. The persistence of CO_2 in the atmosphere is estimated to be in the range of 50 to 200 years, depending on variations in the carbon cycle. (USEPA 2012e, f)

11.1.3.2.2 Methane

CH_4 is primarily produced through anaerobic decomposition of organic matter in biological systems. Agricultural processes such as wetland rice cultivation, enteric fermentation in ruminant animals (e.g., cows), and the decomposition of animal wastes emit CH_4, as does the decomposition of municipal solid wastes. CH_4 is also fugitively emitted during the production and distribution of natural gas and petroleum, and is released as a by-product of coal mining and incomplete fossil fuel combustion. Pipeline-quality natural gas is over 90 percent CH_4 by volume and is considered a “clean fuel” by industry with CO_2 and water vapor as its main combustion by-products. Atmospheric concentrations of CH_4 have increased by about 160 percent since preindustrial times, although the rate of increase has been declining. The IPCC has estimated that slightly more than half of the current CH_4 flux to the atmosphere is anthropogenic, from human activities such as agriculture, fossil fuel use, and waste disposal. The USEPA’s official GWP coefficient of CH_4 is 21, and its persistence in the atmosphere is estimated to be about 9 to 15 years. (USEPA 2012e, f)

11.1.3.2.3 Nitrous Oxide

N_2O is emitted during agricultural and industrial activities, as well as during combustion of fossil fuels and solid waste. Anthropogenic sources of N_2O emissions include agricultural soils, especially the use of synthetic and manure fertilizers; fossil fuel combustion, especially from mobile combustion; adipic (nylon) and nitric acid production; wastewater treatment and waste combustion; and biomass burning. The atmospheric concentration of N_2O has increased by about 19 percent since 1750, from a preindustrial value of about 270 to about 320 ppb today, a concentration that has not been exceeded during the last thousand years. The USEPA’s official GWP coefficient of N_2O is 310, and its persistence in the atmosphere is estimated to be about 110 to 120 years. (USEPA 2012e, f)

11.1.3.2.4 Fluorinated Gases

Hydrofluorocarbons, perfluorocarbons, and SF_6 are synthetic, powerful GHGs that are emitted from a variety of industrial processes. Fluorinated gases are sometimes used as substitutes for ozone-depleting substances (e.g., chlorofluorocarbons, hydrochlorofluorocarbons, and halons). In the electric utility industry, SF_6 is used as a dielectric gas in high-voltage equipment, such as switchgear and circuit breakers. As man-made gas, SF_6 in the atmosphere has increased from 0 to about 7 ppt in modern times. Due to their expense, all of these fluorinated gases are typically emitted (lost) in small quantities relative to combustion by-products, but because they are potent GHGs, they are sometimes referred to as "High GWP gases" with estimated persistence in the atmosphere ranging from 1.5 to 50,000 years. Of these, SF_6 is the most potent, with an USEPA official GWP of 23,900 and an estimated persistence of about 3,200 years. (USEPA 2012e, f)

11.1.3.3 Emission Sources

The USEPA tracks GHG emissions in the US and publishes the *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, which is updated annually (USEPA 2012e). This detailed report contains estimates of the total national GHG emissions and removals associated with human activities in all 50 states. From the current report, the main sources of GHG emissions in the US are identified below (USEPA 2012f):

> Electric power generation

> Transportation

> Industry

> Commercial and residential

> Agriculture

Land Use and Forestry offsets (absorbs or sequesters) about 15 percent of GHG emissions nationwide. Land areas can act as GHG sinks (absorbing CO_2 from the atmosphere) or GHG sources. Since 1990, well-managed forests and other lands have absorbed more CO_2 from the atmosphere than they emit.

11.1.3.4 Mobile Sources

While stationary sources such as power plants and oil refineries emit large quantities of GHGs, mobile sources, due to their sheer numbers nationwide, also emit significant amounts. Mobile sources include onroad vehicles (e.g., automobiles, trucks, motorcycles), offroad equipment (e.g., earthmovers, cranes, portable pumps, and generators), trains (e.g., freight, passenger, light rail), vessels (e.g., boats, ships, watercraft), and aircraft (e.g., general aviation, commercial, military). Mobile source fuels include gasoline, diesel, heavy fuel oil (large marine vessels), and jet fuel, all of which emit GHGs when combusted.

Mobile sources used in mosquito and/or vector control activities include onroad fleet vehicles (light- and medium-duty trucks, vans, passenger cars), offroad ATVs, watercraft (motorboats, airboats), aircraft (helicopters and fixed-wing), portable equipment (pumps, sprayers, generators), and small equipment (handheld sprayers, foggers, dusters). Except for 2-stroke engines used in small lightweight equipment (spark ignition, 50:1 gas/oil mix), engines are 4-stroke gasoline (spark ignition) or diesel fuel (compression ignition). The dominant fuel used for these mobile sources is motor gasoline along with some diesel fuel (larger trucks) , aviation gasoline (fixed-wing aircraft), and jet fuel (turbine-powered helicopters). Light trucks, vans, and passenger cars are normally used for responding to public service requests and disease surveillance. Typical GHG contents of common fuels are presented in Table 11-2.

Table 11-2 Typical GHG Contents of Common Fuels

Fuel	CO_2 kg/mmBTU	CH_4 kg/mmBTU	N_2O kg/mmBTU	CO_2e lb/mmBTU	Energy BTU/gal	CO_2e lb/gal
Diesel Fuel No. 2	73.96	0.0105	0.0006	163.97	138,300	22.68
Kerosene	73.19	0.0105	0.0006	162.27	138,700	22.51
Jet Fuel	72.23	0.0105	0.0006	160.17	135,000	21.62
Motor Gasoline	71.35	0.0105	0.0006	158.23	122,600	19.40
Aviation Gasoline	69.15	0.0105	0.0006	153.38	120,200	18.44
Propane	62.22	0.0053	0.0001	137.49	91,300	12.55
Pipeline Natural Gas	53.02	0.0053	0.0001	117.20	—	—

Sources: USEPA 2012e, 2011a

Notes:

kg/mmBTU = kilogram(s) per million British Thermal Units

lb/mmBTU = pound(s) per million British Thermal Units

BTU = the amount of energy (heat) required to raise 1 pound of liquid water 1 degree Fahrenheit from 39 to 40°F

11.1.3.5 Sensitive Receptors

Certain population groups are considered more sensitive to air pollution and odors than others; in particular, children, elderly, and acutely ill and chronically ill persons, especially those with cardiorespiratory diseases such as asthma and bronchitis. Sensitive receptors (land uses) indicate locations where such individuals are typically found, namely schools, daycare centers, hospitals, convalescent homes, residences of sensitive persons, and parks with active recreational uses, such as youth sports.

None of the GHGs described in Section 11.2.2 are considered toxic; however, all are classified as asphyxiants. Thus, in high enough concentrations in confined spaces they can displace the oxygen in air and present hazards to industrial workers, however, GHG concentrations in ambient air (see Table 11-1) are far below any danger levels. Therefore, no risk to sensitive receptors or the general public is posed by GHGs emitted to outdoor air, either from stationary or mobile sources.

11.1.4 California Climate Impacts

Climate change is already affecting California. Average temperatures have increased, leading to more extreme hot days and fewer cold nights. Shifts in the water cycle have been observed, with less winter precipitation falling as snow, and both snowmelt and rainwater running off earlier in the year. Sea levels have risen. Wildland fires are becoming more frequent and intense due to dry seasons that start earlier and end later. These climate-driven changes affect resources critical to the health and prosperity of California. (CEC 2010)

If the state takes no action to reduce or minimize expected impacts from future climate change, the costs could be severe. In November 2008, the Governor directed the California Natural Resources Agency to develop a climate adaptation strategy for California. The Natural Resources Agency coordinated with ten state agencies, multiple scientists, a consulting team, and stakeholders to develop the first statewide, multisector adaptation strategy in the country. The resulting report, *2009 California Climate Adaptation Strategy*, summarizes the best-known science to assess the vulnerability of the state to climate change impacts, and outlines possible solutions that can be implemented within and across state agencies to promote resiliency. This strategy is the first step in an evolving process to reduce California's vulnerability to climate change impacts. (CEC 2010)

11.1.4.1 State Policies

The Global Warming Solutions Act of 2006 (Assembly Bill [AB] 32) (see Appendix C) required CARB to prepare a Scoping Plan to achieve substantial GHG emissions reductions, both from within the state and from "exported" emissions, such as importing electric power generated at coal-fired power plants located in neighboring western states. The 2008 Scoping Plan outlines a wide range of strategies for reducing statewide GHG emissions to 1990 levels by 2020. This goal will be achieved by cutting about 30 percent from business-as-usual emission levels projected for 2020, or about 15 percent from 2008 levels. Allowing for population growth, the goal is to reduce annual per capita emissions from 14 metric tonnes (MT) CO_2e down to about 10 MT CO_2e per capita by 2020. (CARB 2008b)

11.1.5 Emissions Inventories

The bulk of mosquito and vector control activity emissions would occur in the Bay Area, and only minor amounts would occur in northern Sonoma and northern Monterey counties. Therefore, the comprehensive 2007 Bay Area GHG inventory is used as the regional benchmark for comparison purposes.

Table 11-3 shows aggregated national, state, and regional GHG emissions for all sources on a gross basis (i.e., CO_2e emissions only, not including CO_2 sinks such as forestry and agriculture). As shown, California accounts for about 7 percent of gross CO_2e emissions in the US annually, and the Bay Area accounts for about 20 percent of gross CO_2e emissions in California.

Table 11-3 Greenhouse Gas Emissions Inventories - Gross Basis

Summary Year	National MMT CO_2e	California MMT CO_2e	Bay Area MMT CO_2e
2005	7,204	482.5	—
2006	7,159	481.9	—
2007	7,253	488.8	95.8
2008	7,048	484.7	—
2009	6,608	456.8	—
5-Year Average	**7,054**	**478.9**	—
Average Annual Variation	**2.6%**	**1.8%**	—

Sources: USEPA 2012e; CARB 2011; BAAQMD 2010b

Notes:

MMT = million metric tonnes (annual)

1 metric tonne = 1,000 kilograms or 2,204.6 pounds

2009 is most recent CARB published data; Bay Area for 2007 only

Tables 11-4, 11-5, 11-6, and 11-7 present progressively focused Bay Area GHG emissions inventory data for 2007 broken down by sectors, counties, and applicable subsectors. This information will be used as a basis for comparisons with estimated mosquito and vector control activity emissions for the nine Districts presented in Section 11.2.2.

Table 11-4 Bay Area GHG Emissions by Sector

End-Use Sector	District Emissions Percent	District Emissions MMT CO_2e
Industrial / Commercial	36.4%	34.9
Residential Fuel Use	7.1%	6.8
Local Electric Power Generation	8.5%	8.1
Imported Electric Power Generation	7.4%	7.1
Offroad Equipment	3.0%	2.9
Transportation	36.4%	34.9
Agriculture / Farming	1.2%	1.1
Totals	**100.0%**	**95.8**

Source: BAAQMD 2010b

Notes:

MMT = million metric tonnes (annual)

1 metric tonne = 1,000 kilograms or 2,204.6 pounds

Table 11-5 Bay Area GHG Emissions by County

County	District Emissions Percent	District Emissions MMT CO_2e
Alameda	16.4%	15.7
Contra Costa	32.9%	31.5
Marin	2.8%	2.7
Napa	1.8%	1.7
San Francisco	7.4%	7.1
San Mateo	8.9%	8.5
Santa Clara	19.6%	18.8
Solano (within BAAQMD)	5.9%	5.7
Sonoma (within BAAQMD)	4.3%	4.1
Totals	**100.0%**	**95.8**

Source: BAAQMD 2010b

Notes:

MMT = million metric tonnes (annual)

1 metric tonne = 1,000 kilograms or 2,204.6 pounds

Table 11-6 Mobile Sectors GHG Emissions by County

County	Offroad MT CO_2e	Transportation MT CO_2e
Alameda	569,000	8,351,000
Contra Costa	406,000	4,998,000
Marin	99,000	1,286,000
Napa	50,000	917,000
San Francisco	415,000	2,673,000
San Mateo	270,000	4,850,000
Santa Clara	790,000	7,859,000
Solano (within BAAQMD)	147,000	1,834,000
Sonoma (within BAAQMD)	175,000	2,103,000
Totals	**2,921,000**	**34,871,000**

Source: BAAQMD 2010b

Notes:

MMT = million metric tonnes (annual)

1 metric tonne = 1,000 kilograms or 2,204.6 pounds

Values rounded to nearest 1,000 tonnes

"Offroad" is offroad equipment category

Table 11-7 Offroad Subsectors GHG Emissions by County

County	Utility MT CO_2e	Commercial MT CO_2e	Combined MT CO_2e
Alameda	29,800	49,900	79,700
Contra Costa	20,300	26,900	47,200
Marin	7,900	12,300	20,200
Napa	2,900	4,300	7,200
San Francisco	14,200	43,900	58,100
San Mateo	14,200	27,200	41,400
Santa Clara	32,900	56,500	89,400
Solano (within BAAQMD)	3,900	6,800	10,700
Sonoma (within BAAQMD)	7,800	13,500	21,300
Totals	**133,900**	**241,300**	**375,200**

Source: BAAQMD 2010b

Notes:

MMT = million metric tonnes (annual)

1 metric tonne = 1,000 kilograms or 2,204.6 pounds

Values rounded to nearest 100 tonnes

"Utility" is small landscaping equipment selected for comparisons to Districts' activities

"Commercial" is light commercial equipment selected for comparisons to Districts' activities

11.1.6 Potential for Mitigation

With respect to mosquito and vector control activities, BMPs include fuel conservation, which minimizes GHG emissions by the Program. Mitigation Measures GHG-1, GHG-2, and GHG-3 apply, as described in Section 11.2.11.

11.1.7 Regulatory Setting

Currently, no local, state, or federal regulatory standards directly apply to GHG emissions from temporary or intermittent mobile sources such as mosquito and vector control activities. However, in the context of the Scoping Plan discussed in Section 11.1.4.1, implementation of Low Carbon Fuel Standard (Executive Order S-1-7, below) would indirectly apply to mosquito and vector control activities via fuel usage. Summaries of principal federal, state, and local GHG statutes, regulations, and programs that affect other types of sources are presented in Appendix C and below:

11.1.7.1 Federal

> 40 CFR Part 98 – Greenhouse Gas Reporting

> General Conformity

11.1.7.2 State

> Global Warming Solutions Act

> Cap and Trade

> Assembly Bill 939

> Senate Bill 1368

> Senate Bill 97

> Senate Bill 375

> Senate Bills 1078 and 10

> Executive Order S-20-04

> Executive Order S-3-05

> Executive Order S-1-07

> Executive Order S-13-08

11.1.7.3 Local

11.1.7.3.1 BAAQMD CEQA Guidelines

On June 2, 2010, the BAAQMD adopted new CEQA Air Quality Guidelines (BAAQMD 2012b) for consideration by lead agencies tasked with evaluating the air quality and climate change impacts of proposed new projects. The proposed Guidelines superseded the December 1999 Guidelines. As guidelines, they did not comprise enforceable rules or regulations per se; nevertheless, the guidelines established the following quantitative thresholds of significance for GHG emissions:[1]

> Stationary Sources: 10,000 MT CO_2e per year

> Other than Stationary Sources: 1,100 MT CO_2e per year or 4.6 MT CO_2e per SP per year

> Plans: 6.6 MT CO_2e per SP per year

However, on March 5, 2012, Alameda County Superior Court issued a judgment finding that the BAAQMD had failed to comply with CEQA when it adopted the thresholds of significance. The court did not determine whether the thresholds were valid on the merits, but found that the adoption of the thresholds was a project under CEQA. The court issued a writ of mandate ordering the BAAQMD to set aside the 2010 thresholds and cease dissemination of them until it had complied with CEQA. The BAAQMD is no longer recommending that the 2010 thresholds be used as a generally applicable measure of a project's significance. Lead agencies may continue to rely on the 1999 CEQA thresholds and may continue to make determinations regarding the significance of an individual project's air quality impacts based on the substantial evidence in the record for that project.

Neither NSCAPCD nor MBUAPCD have applicable CEQA thresholds for GHGs. Since the 1999 BAAQMD thresholds apply only to criteria pollutants, not GHGs, no GHG thresholds currently apply (BAAQMD 1999, 2012b). Notwithstanding the writ of mandate, Program status would have been as follows under the 2010 Bay Area CEQA Guidelines:

> Mosquito and vector control activities do not meet the regulatory definition of a stationary source of air contaminants; therefore, the 10,000 MT CO_2e per year stationary source GHG threshold would not apply.

> For nonstationary source land use development projects, BAAQMD's adopted "bright-line" threshold of significance differs from other proposed GHG thresholds currently under consideration in California. Under this threshold, to conclude that a project's GHG impacts are less than significant, a project would need to be in compliance with a "Qualified Greenhouse Gas Reduction Strategy," emit less than 1,100 MT CO_2e per year, or emit less than 4.6 MT CO_2e per year per capita SP (residents + employees). However, the Program does not qualify as a land use development project; therefore, these GHG thresholds would not apply.

> No GHG thresholds exist for temporary construction emissions from mobile and portable sources, neither daily nor annual, whether for stationary or nonstationary source projects. Since mosquito and vector control activities comprise mobile and portable sources similar to construction, no quantitative GHG significance thresholds would apply to the Program since activities such as mosquito and vector control are not specified, defined, or addressed in the guidelines.

[1] MT = metric tonne, 1,000 kilograms or 2,204.6 pounds; SP = Service Population, residents + employees

11.2 Environmental Impacts and Mitigations Measures

11.2.1 Evaluation Concerns and Criteria

The environmental concerns are those identified below from the CEQA Guidelines and from public scoping. The public identified the following issues:

> Address impacts of GHG emissions and climate change

The focus in this chapter is on the use of equipment to perform all Program activities and the resulting emissions impacts to generation of GHGs. The CEQA Guidelines cover the issues from public scoping.

As described in Section 11.1.7, no promulgated standards of significance exist for GHG impacts established under CEQA for mobile sources such as mosquito and vector control activities. The PEIR addresses the following qualitative criteria are used as standards of significance and are based on CEQA Guidelines Appendix G, Environmental Checklist Form, Section VII. Would the project:

> Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

> Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the greenhouse gas emissions?

Determinations made with respect to significance criteria are documented in Sections 11.2.3 through 11.2.8.

See Section 11.1.7.3.1 for a discussion of CEQA thresholds of significance for GHGs.

11.2.2 Evaluation Methods and Assumptions

As described in Section 11.1.3, operation of onroad fleet vehicles, offroad all-terrain vehicles, watercraft, aircraft, portable equipment, and small equipment would result in GHG emissions in engine exhaust. Detailed lists of equipment, estimated usage, and emission calculations are provided in Appendix C. Equipment lists and annual activity schedules were provided by the nine Districts. Emission calculations were performed using the most recent and applicable emission factors published by CARB (2008a) and USEPA (2011a, 2012e).

Table 11-8 shows Program alternatives applicability by percentage as selected by the nine Districts: surveillance, physical control, vegetation management, biological control, chemical control, or other nonchemical control. Table 11-9 shows land uses associated with selected alternatives: residential, commercial, industrial, agricultural, and open space. As shown in Tables 11-8 and 11-9, not all alternatives or land uses are applicable in all Districts, nor are all options or activities under any applicable alternative.

As described in Section 11.1.7, no promulgated standards of significance exist for GHG impacts established under CEQA for mobile sources such as mosquito and vector control activities. Thus, Program emissions are compared against existing GHG inventories for context. The existing Program activities are the basis for the quantitative evaluation and if compared strictly to existing activities at the time the NOP was published, the impact would be no change.

Table 11-8 CCMVCD Selected Alternatives Applicability

Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical
16%	0.07%	0.13%	0.07%	61%	23%

Sources: Appendix C, CCMVCD

Table 11-9 Land Uses Associated with Selected Alternatives

Residential	Commercial	Industrial	Agricultural	Open Space
•	•	•	•	•

Sources: Appendix C, CCMVCD

Tables 11-10 through 11-15 show estimated ongoing annual GHG emissions as CO_2e by alternative and district. Table 11-16 shows estimated combined annual emissions across all nine Districts. On the local level, the combined "grand total" of 2,600 MT CO_2e per year comprises only 0.7 percent of the 375,200 MT CO_2e per year in the utility and commercial offroad subsectors (see Table 11-7); this amount is within USEPA limits of precision of -2 to +5 percent for fossil fuel combustion (USEPA 2012e). On the regional level, this is less than 0.003 percent of aggregate GHG emissions from the Bay Area (see Table 11-4). At the state and national levels, these emissions are negligible: 0.0005 and 0.00004 percent, respectively (see Table 11-3). Since the combined emissions of the nine Districts would not be cumulatively considerable, neither would the incremental contribution of each District.

Table 11-10 Estimated Annual GHG Emissions for Surveillance Alternative

CO_2 MT/year	CH_4 MT/year	N_2O MT/year	CO_2e MT/year
21.1	0.0012	0.0005	21.3

Sources: CARB 2008a; USEPA 2011a, 2012c

Table 11-11 Estimated Annual GHG Emissions for Physical Control Alternative

CO_2 MT/year	CH_4 MT/year	N_2O MT/year	CO_2e MT/year
0.1	0.0000	0.0000	0.1

Sources: CARB 2008a; USEPA 2011a, 2012c

Table 11-12 Estimated Annual GHG Emissions for Vegetation Management Alternative

CO_2 MT/year	CH_4 MT/year	N_2O MT/year	CO_2e MT/year
0.2	0.0000	0.0000	0.2

Sources: CARB 2008a; USEPA 2011a, 2012c

Table 11-13 Estimated Annual GHG Emissions for Biological Control Alternative

CO_2 MT/year	CH_4 MT/year	N_2O MT/year	CO_2e MT/year
0.1	0.0000	0.0000	0.1

Sources: CARB 2008a; USEPA 2011a, 2012c

Table 11-14 Estimated Annual GHG Emissions for Chemical Control Alternative

CO_2 MT/year	CH_4 MT/year	N_2O MT/year	CO_2e MT/year
81.8	0.0046	0.0019	82.4

Sources: CARB 2008a; USEPA 2011a, 2012c

Table 11-15 Estimated Annual GHG Emissions for other Nonchemical Alternative

CO_2 MT/year	CH_4 MT/year	N_2O MT/year	CO_2e MT/year
32.4	0.0018	0.0007	32.7

Sources: CARB 2008a; USEPA 2011a, 2012c

11.2.3 Surveillance Alternative

The Surveillance Alternative would be a continuation of existing activities currently practiced by the District using applicable techniques, equipment, vehicles, and watercraft. Surveillance involves monitoring mosquito and/or vector populations and habitat, their disease pathogens, and the human/vector interactions. Field counting/sampling and trapping are common mechanisms for surveillance. The environmental impact concerns are phrased as questions as follows for the Surveillance Alternative:

Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

GHG emissions from the Surveillance Alternative would not be expected to exceed average emissions shown in Table 11-10. The Surveillance Alternative would emit approximately 21.1 MT CO_2e per year, which is below the presumptive 1,100 MT per year threshold and would be less than significant (LS). Due to its small scale and GHG mitigations, the Surveillance Alternative would not individually affect the environment or impede the state's ability to meet its 2020 GHG emission reduction goal because the incremental cumulative impact would not be considerable

> **Impact GHG-1:** Based on estimated annual CO_2e emissions, the Surveillance Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of the District. Impacts would be **less than significant** and no mitigation is required.

Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the greenhouse gas emissions?

On a statewide basis, agencies in California are in the process of implementing strategies to reduce GHG emissions pursuant to the Global Warming Solutions Act of 2006 (AB 32, Núñez, Chapter 488, Statutes of 2006), which requires that California reduce its statewide GHG emissions to 1990 levels by 2020. AB 32 required CARB to develop the Scoping Plan (2008b) in coordination with the California Energy Commission's (CEC's) Climate Action Team (2010). The Scoping Plan defines a comprehensive set of emission reduction measures such as energy efficiency, renewable energy, cap-and-trade, transportation measures, low-carbon fuels, and targeted GHG fees. Due to its small scale, the Surveillance Alternative would not conflict with state and local plans, policies, or regulations aimed at curbing GHG emissions.

> **Impact GHG-2:** Based on the general inclusion of Surveillance Alternative emissions in the local and statewide GHG emission inventories, the Surveillance Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.

11.2.4 Physical Control Alternative

The Physical Control Alternative would be a continuation of existing activities currently practiced by the District using applicable techniques, equipment, vehicles, and watercraft. This alternative involves managing vector habitat using source control and permanent control methods that do not use biological agents or chemical pesticides, such as ditch maintenance, debris removal in natural channels, and blockage of access points. The environmental impact concerns are phrased as questions as follows for the Physical Control Alternative:

Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

GHG emissions from the Physical Control Alternative would not be expected to exceed average emissions shown in Table 11-11. The Physical Control Alternative would emit approximately 0.1 MT CO_2e per year, which is below the presumptive 1,100 MT per year threshold and would be less than significant (LS). Due to its small scale and GHG mitigations, the Physical Control Alternative would not individually affect the environment or impede the state's ability to meet its 2020 GHG emission reduction goal because the incremental cumulative impact would not be considerable.

> **Impact GHG-3:** Based on estimated annual CO_2e emissions, the Physical Control Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.

Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the greenhouse gas emissions?

On a statewide basis, agencies in California are in the process of implementing strategies to reduce GHG emissions pursuant to the Global Warming Solutions Act of 2006 (AB 32, Núñez, Chapter 488, Statutes of 2006), which requires that California reduce its statewide GHG emissions to 1990 levels by 2020. AB 32 required CARB to develop the Scoping Plan (2008b) in coordination with the CEC's Climate Action Team (2010). The Scoping Plan defines a comprehensive set of emission reduction measures such as energy efficiency, renewable energy, cap-and-trade, transportation measures, low-carbon fuels, and targeted GHG fees. Due to its small scale, the Physical Control Alternative would not conflict with state and local plans, policies, or regulations aimed at curbing GHG emissions.

> **Impact GHG-4:** Based on the general inclusion of Physical Control Alternative emissions in the local and statewide GHG emission inventories, the Physical Control Alternative would

not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.

11.2.5 Vegetation Management Alternative

The Vegetation Management Alternative would be a continuation of existing activities currently practiced by the District using applicable techniques, equipment, vehicles, and watercraft. Vegetation management is used to reduce the habitat value for mosquitoes and other vectors. The District uses hand tools and sometimes heavy equipment to remove vegetation primarily in aquatic habitats. The District may also apply herbicides to remove vegetation. The environmental impact concerns are phrased as questions as follows for the Vegetation Management Alternative:

Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

GHG emissions from the Vegetation Management Alternative would not be expected to exceed average emissions shown in Table 11-12. The Vegetation Management Alternative would emit approximately 0.2 MT CO_2e per year, which is below the presumptive 1,100 MT per year threshold and would be less than significant (LS). Due to its small scale and GHG mitigations, the Vegetation Management Alternative would not individually affect the environment or impede the state's ability to meet its 2020 GHG emission reduction goal because the incremental cumulative impact would not be considerable.

> **Impact GHG-5:** Based on estimated annual CO_2e emissions, the Vegetation Management Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.

Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the greenhouse gas emissions?

On a statewide basis, agencies in California are in the process of implementing strategies to reduce GHG emissions pursuant to the Global Warming Solutions Act of 2006 (AB 32, Núñez, Chapter 488, Statutes of 2006), which requires that California reduce its statewide GHG emissions to 1990 levels by 2020. AB 32 required CARB to develop the Scoping Plan (2008b) in coordination with the CEC's Climate Action Team (2010). The Scoping Plan defines a comprehensive set of emission reduction measures such as energy efficiency, renewable energy, cap-and-trade, transportation measures, low-carbon fuels, and targeted GHG fees. Due to its small scale, the Vegetation Management Alternative would not conflict with state and local plans, policies, or regulations aimed at curbing GHG emissions.

> **Impact GHG-6:** Based on the general inclusion of Vegetation Management Alternative emissions in the local and statewide GHG emission inventories, the Vegetation Management Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.

11.2.6 Biological Control Alternative

The Biological Control Alternative would be a continuation of existing activities currently practiced by the District using applicable techniques, equipment, vehicles, watercraft, and aircraft. It currently involves the use of mosquito predators, i.e., mosquitofish (*Gambusia affinis*) as these are the only commercially available biological control agents at this time. The environmental impact concerns are phrased as questions as follows for the Biological Control Alternative:

Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

GHG emissions from the Biological Control Alternative would not be expected to exceed average emissions shown in Table 11-13. The Biological Control Alternative would emit approximately 0.1 MT CO_2e per year, which is below the presumptive 1,100 MT per year threshold and would be less than significant (LS). Due to its small scale and GHG mitigations, the Biological Control Alternative would not individually affect the environment or impede the state's ability to meet its 2020 GHG emission reduction goal because the incremental cumulative impact would not be considerable.

> **Impact GHG-7:** Based on estimated annual CO_2e emissions, the Biological Control Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.

Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the greenhouse gas emissions?

On a statewide basis, agencies in California are in the process of implementing strategies to reduce GHG emissions pursuant to the Global Warming Solutions Act of 2006 (AB 32, Núñez, Chapter 488, Statutes of 2006), which requires that California reduce its statewide GHG emissions to 1990 levels by 2020. AB 32 required CARB to develop the Scoping Plan (2008b) in coordination with the CEC's Climate Action Team (2010). The Scoping Plan defines a comprehensive set of emission reduction measures such as energy efficiency, renewable energy, cap-and-trade, transportation measures, low-carbon fuels, and targeted GHG fees. Due to its small scale, the Biological Control Alternative would not conflict with state and local plans, policies, or regulations aimed at curbing GHG emissions.

> **Impact GHG-8:** Based on the general inclusion of Biological Control Alternative emissions in the local and statewide GHG emission inventories, the Biological Control Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.

11.2.7 Chemical Control Alternative

The Chemical Control Alternative would be a continuation of existing activities currently practiced by the District using applicable techniques, equipment, vehicles, watercraft, and aircraft. It involves the application of insecticides and rodenticides to reduce populations of pest species. The environmental impact concerns are phrased as questions as follows for the Chemical Control Alternative:

Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

GHG emissions from the Chemical Control Alternative would not be expected to exceed average emissions shown in Table 11-14. The Chemical Control Alternative would emit approximately 83 MT CO_2e per year, which is below the presumptive 1,100 MT per year threshold and would be less than significant (LS). Due to its small scale and GHG mitigations, the Chemical Control Alternative would not individually affect the environment or impede the state's ability to meet its 2020 GHG emission reduction goal because the incremental cumulative impact would not be considerable.

> **Impact GHG-9:** Based on estimated annual CO_2e emissions, the Chemical Control Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.

Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the greenhouse gas emissions?

On a statewide basis, agencies in California are in the process of implementing strategies to reduce GHG emissions pursuant to the Global Warming Solutions Act of 2006 (AB 32, Núñez, Chapter 488, Statutes of 2006), which requires that California reduce its statewide GHG emissions to 1990 levels by 2020. AB 32 required CARB to develop the Scoping Plan (2008b) in coordination with the CEC's Climate Action Team (2010). The Scoping Plan defines a comprehensive set of emission reduction measures such as energy efficiency, renewable energy, cap-and-trade, transportation measures, low-carbon fuels, and targeted GHG fees. Due to its small scale, the Chemical Control Alternative would not conflict with state and local plans, policies, or regulations aimed at curbing GHG emissions.

> **Impact GHG-10:** Based on the general inclusion of Chemical Control Alternative emissions in the local and statewide GHG emission inventories, the Chemical Control Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.

11.2.8 Other Nonchemical Control/Trapping Alternative

As applicable, the Other Nonchemical Control/Trapping Alternative would be a continuation of existing activities currently practiced by the District using applicable techniques, equipment, and vehicles. An example of these types of activities would be trapping and euthanizing skunks with CO_2 (equal to approx. one MT per year) and trapping of rodents for disease surveillance. The environmental impact concerns are phrased as questions as follows for the Other Nonchemical Control/Trapping Alternative:

Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

GHG emissions from the Other Nonchemical Control/Trapping Alternative would not be expected to exceed average emissions shown in Table 11-15. The Other Nonchemical Control/Trapping Alternative would emit approximately 33 MT CO_2e per year, which is below the presumptive 1,100 MT per year threshold and would be less than significant (LS). Due to its small scale and GHG mitigations, the Other Nonchemical Control/Trapping Alternative would not individually affect the environment or impede the state's ability to meet its 2020 GHG emission reduction goal because the incremental cumulative impact would not be considerable.

> **Impact GHG-11:** Based on estimated annual CO_2e emissions, the Other Nonchemical Control/Trapping Control Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.

Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the greenhouse gas emissions?

On a statewide basis, agencies in California are in the process of implementing strategies to reduce GHG emissions pursuant to the Global Warming Solutions Act of 2006 (AB 32, Núñez, Chapter 488, Statutes of 2006), which requires that California reduce its statewide GHG emissions to 1990 levels by 2020. AB 32 required CARB to develop the Scoping Plan (2008b) in coordination with the CEC's Climate Action Team (2010). The Scoping Plan defines a comprehensive set of emission reduction measures such as energy efficiency, renewable energy, cap-and-trade, transportation measures, low-carbon fuels, and targeted GHG fees. Due to its small scale, the Other Nonchemical Control/Trapping Control Alternative would not conflict with state and local plans, policies, or regulations aimed at curbing GHG emissions.

> **Impact GHG-12:** Based on the general inclusion of Other Nonchemical Control/Trapping Control Alternative emissions in the local and statewide GHG emission inventories, the Other Nonchemical Control/Trapping Control Alternative would not conflict with applicable

plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.

11.2.9 Cumulative Impacts

Cumulative impacts from Program alternative GHG emissions are discussed in Section 13.9. Cumulative impacts were assessed in a qualitative manner by determining if the Program alternatives, in conjunction with other projects throughout the Program Area, would have the potential to contribute to a long-term cumulative impact on climate change. Given that GHG emissions and climate change are global issues, a statewide framework or cumulative approach for consideration of environmental impacts may be most appropriate. Virtually every project in the state of California, as well as those outside the state, would have GHG emissions.

In developing thresholds of significance, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. Therefore, if a project would result in an increase in emissions at or above applicable mass thresholds, then it would be deemed to have a cumulatively considerable impact. Conversely, if a project would not exceed the significance thresholds, then its emissions would not be cumulatively considerable. (BAAQMD 2011).

In summary, all six Program alternatives combined would generate GHG emissions and incrementally contribute to climate change, however minor. When all Program emissions are viewed in combination with global emissions levels that are contributing to the existing cumulative impact on global climate change, the incremental contribution of the Program emissions would not be cumulatively considerable because they occur intermittently on a very small scale (i.e., not stationary sources) and at 136 MT per year are nevertheless below the presumptive 1,100 MT per year threshold. Therefore, **the Program alternatives would not have a cumulatively considerable impact on global climate change**. BMPs (see Section 11.2.11) as implemented will reduce Program impacts even further.

11.2.10 Environmental Impacts Summary

Table 11-16 presents a summary of GHG impacts associated with the six alternatives in comparison to existing conditions defined as existing GHG inventories as well as existing conditions as of May-June 2012. The GHG impact callouts correspond to those in Sections 11.2.3 through 11.2.8.

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Table 11-16 Summary of Alternative Greenhouse Gas Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Effects on GHG						
Impact GHG-1: Based on estimated annual CO2e emissions, the Surveillance Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of the District. Impacts would be **less than significant** and no mitigation is required.	LS	na	na	na	na	na
Impact GHG-2: Based on the general inclusion of Surveillance Alternative emissions in the local and statewide GHG emission inventories, the Surveillance Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.	LS	na	na	na	na	na
Impact GHG-3: Based on estimated annual CO2e emissions, the Physical Control Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.	na	LS	na	na	na	na
Impact GHG-4: Based on the general inclusion of Physical Control Alternative emissions in the local and statewide GHG emission inventories, the Physical Control Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.	na	LS	na	na	na	na
Impact GHG-5: Based on estimated annual CO2e emissions, the Vegetation Management Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.	na	na	LS	na	na	na
Impact GHG-6: Based on the general inclusion of Vegetation Management Alternative emissions in the local and statewide GHG emission inventories, the Vegetation Management Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.	na	na	LS	na	na	na

Table 11-16 Summary of Alternative Greenhouse Gas Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Impact GHG-7: Based on estimated annual CO2e emissions, the Biological Control Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.	na	na	na	LS	na	na
Impact GHG-8: Based on the general inclusion of Biological Control Alternative emissions in the local and statewide GHG emission inventories, the Biological Control Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.	na	na	na	LS	na	na
Impact GHG-9: Based on estimated annual CO2e emissions, the Chemical Control Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.	na	na	na	na	LS	na
Impact GHG-10: Based on the general inclusion of Chemical Control Alternative emissions in the local and statewide GHG emission inventories, the Chemical Control Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.	na	na	na	na	LS	na
Impact GHG-11: Based on estimated annual CO2e emissions, the Other Nonchemical Control/Trapping Control Alternative would not result in a cumulatively considerable amount of GHGs, and neither would the incremental contribution of each District. Impacts would be **less than significant** and no mitigation is required.	na	na	na	na	na	LS

Table 11-16 Summary of Alternative Greenhouse Gas Impacts

Impact Statement	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
Impact GHG-12: Based on the general inclusion of Other Nonchemical Control/Trapping Control Alternative emissions in the local and statewide GHG emission inventories, the Other Nonchemical Control/Trapping Control Alternative would not conflict with applicable plans, policies, or regulations for reducing GHG emissions. Impacts would be **less than significant** and no mitigation is required.	na	na	na	na	na	LS

LS = Less-than-significant impact

N = No impact

na = Not applicable

SM = Potentially significant but mitigable impact

SU = Significant and unavoidable impact

11.2.11 Mitigation and Monitoring

All impacts are less than significant (LS) compared to existing conditions and require no mitigation. Notwithstanding significance, BMPs pursuant to California Air Toxics Control Measures (13 CCR Section 2485) and In-Use Offroad Diesel Vehicle Regulations (13 CCR Section 2449 et seq.) would also minimize criteria pollutant and GHG emissions from diesel and gasoline engine exhaust. The following BMPs are being implemented at present by the District and its contractors as part of the Program:

> Engine idling times will be minimized either by shutting equipment and vehicles off when not in use or reducing the maximum idling time to 5 minutes. Clear signage will be provided for workers at all access points. Correct tire inflation will be maintained in accordance with manufacturer‘s specifications on wheeled equipment and vehicles to prevent excessive rolling resistance. All equipment and vehicles will be maintained and properly tuned in accordance with manufacturer‘s specifications. All equipment will be checked by a certified, visible emissions evaluator if visible emissions are apparent to onsite staff. (Table 2-9, BMP A14)

Also, where practicable and available, the Program could use alternatively fueled equipment, such as compressed natural gas (CNG), liquefied natural gas (LNG), liquefied petroleum/propane gas (LPG), or biodiesel.