3.8 GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE

This section describes the existing physical and regulatory setting related to climate change and greenhouse gas (GHG) emissions and discusses the potential effects of the EA Alternatives related to GHG emissions.

3.8.1 Regulatory Framework

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

On February 18, 2010 the CEQ proposed for the first time draft guidance on how Federal agencies could evaluate the effects of climate change and GHG emissions for NEPA documentation (CEQ, 2010). Specifically, if a proposed action emits 25,000 MT of CO_2e or more on an annual basis, agencies could consider this an indicator that a quantitative and qualitative assessment may be meaningful to decision makers and the public. CEQ does not propose this reference point as an indicator of a level of GHG emissions that may significantly affect the quality of the human environment, but notes that it serves as a minimum standard for reporting emissions under the CAA.

In the analysis of the direct effects of a proposed action, the CEQ proposes that it would be appropriate to: 1) quantify cumulative emissions over the life of the project; 2) discuss measures to reduce GHG emissions, including consideration of reasonable alternatives; and 3) qualitatively discuss the link between such GHG emissions and climate change. However, the CEQ states that it is not currently useful for the NEPA analysis to attempt to link specific climatological changes or environmental impacts to proposed GHG emissions, as such direct linkage is difficult to isolate and to understand.

Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance"

EO 13514 requires GHG management and each Federal agency must comply with the regulations including reporting to the CEQ Chair and Office of Management and Budget (OMB) Director and establishing the target, considering reductions associated with reducing agency building energy intensity, increasing agency renewable energy use and on-site projects, and reducing agency use of fossil fuels. VA has completed the aforementioned EO 13514 requirements in the form of the VA Strategic Sustainability Performance Plan (SSPP), described in detail below. The VA SSPP would be adhered to with implementation of the chosen EA Alternative.

VA Strategic Sustainability Performance Plan

The VA SSPP responds to Section 8 of EO 13514, which requires Federal agencies to "develop, implement, and annually update an integrated Strategic Sustainability Performance Plan that will prioritize agency actions" for meeting sustainability goals identified in statutes, regulations, and executive orders. The VA SSPP identifies VA's sustainability goals and defines VA's policy and strategy for achieving these goals (VA, 2010).

By FY 2020, VA is targeting a 29% reduction in GHG emissions below the FY 2008 baseline. A 26% reduction in emissions is projected to come from meeting the FY 2015 alternative fuel use, petroleum reduction, energy intensity reduction, and on-site renewable electricity targets as set forth in the Energy Policy Act of 2005.

Facility-level and regional strategies include energy conservation measures, retro-commissioning, installation of alternative fueling stations, and on-site renewable electricity generation. Projects funded at the department level include additional alternative fueling stations as well as additional on-site renewable electricity generation through technologies such as solar and renewably fueled combined heat and power.

For FY 2020, VA has set a GHG emissions reduction target of 10% below the FY 2008 baseline. VA is relying on a combination of strategies and technology advances that include meeting existing targets (such as energy intensity and pollution prevention); improving fuel economy based on Corporate Average Fuel Economy standards; implementing innovative commuting strategies; and developing an action plan that will address non-commuting emissions, such as telework and alternate work schedules.

3.8.2 Greenhouse Effect, Global Warming, and Climate Change

As Earth absorbs high-frequency solar radiation, its surface gains heat and then re-radiates lower frequency infrared radiation back into the atmosphere.[1] Some solar radiation is also reflected by the atmosphere back toward space. Most solar radiation passes through the atmosphere; however, infrared radiation is selectively absorbed by GHGs. Specifically, GHGs affect the radiative forcing of the atmosphere,[2] which in turn affects Earth's average surface temperature. This phenomenon, the greenhouse effect, keeps the earth's atmosphere near the surface warmer than it would be otherwise and allows successful habitation by humans and other forms of life.

Increases in GHGs lead to increased absorption of infrared radiation by Earth's atmosphere and thus increased temperatures and evaporation rates near the surface. Variations in natural phenomena such as volcanoes and solar activity produced most of the global temperature increase during preindustrial times; however, increasing atmospheric GHG concentrations resulting from human activity have been responsible for most of the observed global temperature increase.[3] With the accelerated increase of fossil fuel combustion and deforestation since the Industrial Revolution of the 19th century, concentrations of GHGs have increased exponentially in the atmosphere. This enhanced greenhouse effect has contributed to global warming, an increased rate of warming of Earth's average surface temperature.[4] Global warming affects global atmospheric circulations and temperatures; oceanic circulations and temperatures; wind and weather patterns; average sea level; ocean acidification; chemical reaction rates; precipitation rates, timing, and form; snowmelt timing and runoff flow; water supply; wildfire risks; and other phenomena. The manner in which it affects all these phenomena is commonly referred to as climate change.

Intergovernmental Panel on Climate Change Temperature Prediction

The Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization and United Nations Environment Programme to assess scientific, technical, and socioeconomic

[1] Frequencies at which bodies emit radiation are proportional to temperature. Earth has a much lower temperature than the sun and emits lower frequency (longer wavelength) radiation than the high-frequency (short wavelength) solar radiation emitted by the sun.

[2] This is the change in net irradiance at the tropopause after allowing for stratospheric temperatures to re-adjust to radiative equilibrium, but with surface and tropospheric temperatures and state held fixed at the unperturbed values.

[3] These basic conclusions have been endorsed by more than 45 scientific societies and academies of science, including all of the national academies of science of the major industrialized countries. Since 2007, no scientific body of national or international standing has maintained a dissenting opinion.

[4] This is the result of Earth having to work harder to maintain its radiation budget, because (under the condition of more GHGs in the atmosphere) Earth must force emission of additional infrared radiation out into the atmosphere.

information relevant to the understanding of climate change, its potential impacts, and options for adaptation and mitigation. Warming of the climate system is now considered to be unequivocal (IPCC, 2007a), with global surface temperature increasing approximately 1.33 degrees Fahrenheit (°F) over the last 100 years. The IPCC predicts increases in global average temperature of between 2° and 11°F over the next 100 years (depending on scenario) (IPCC, 2007b).

Greenhouse Gases and Global Emission Sources

Prominent naturally occurring GHGs in Earth's atmosphere are water vapor, CO_2, methane, nitrous oxide, and ozone (O_3). Anthropogenic (i.e., human-caused) emissions include additional releases of these GHGs plus releases of human-made, high global warming potential gases (high GWP gases) (sulfur hexafluoride [SF_6], PFCs, HFCs, and ozone-depleting substances [ODSs]) into Earth's atmosphere. Water vapor, although the most abundant GHG, is not discussed below because natural concentrations and fluctuations far outweigh anthropogenic influences. Ozone is not included because it does not directly affect radiative forcing. ODSs, which include chlorofluorocarbons, halons, carbon tetrachloride, methyl chloroform, and hydrochlorofluorocarbons, are not included, because they have been primarily replaced by HFCs and PFCs. The other GHGs are discussed below.

Each GHG has a different potential for contributing to global warming. The most commonly accepted method to compare GHG emissions is the global warming potential (GWP) (IPCC, 2001). The IPCC defines the GWP of various GHG emissions on a normalized scale that recasts all GHG emissions in terms of carbon dioxide equivalents (CO_2e), which compares the gas in question to that of the same mass of CO_2 (CO_2 has a GWP of 1 by definition). As such, a high GWP represents high infrared radiation absorption and long atmospheric lifetime compared to CO_2. One must also select a time horizon to convert GHG emissions to equivalent CO_2 emissions to account for chemical reactivity and lifetime differences among various GHG species. The standard time horizon for climate change analysis is 100 years. Generally, GHG emissions are quantified in terms of metric tons (MT) of CO_2e emitted per year. By far the largest component of worldwide CO_2e is CO_2 emissions, followed by methane, nitrous oxide, and high GWP gases in order of decreasing contribution to CO_2e.

Carbon Dioxide

The most important anthropogenic GHG is CO_2, accounting for more than 75% of all anthropogenic GHG emissions. Its long atmospheric lifetime (on the order of decades to centuries) ensures that atmospheric concentrations of CO_2 will remain elevated for decades after GHG mitigation efforts to reduce GHG concentrations are promulgated (Olivier et al., 2005, 2006 in IPCC 2007c. Increasing concentrations of CO_2 in the atmosphere are largely attributable to emissions from the burning of fossil fuels, gas flaring, cement production, and land use changes. Three quarters of the current radiative forcing is likely caused by anthropogenic CO_2 emissions that are the result of fossil fuel burning (and to a very small extent, cement production), and approximately one quarter of the current radiative forcing is the result of land use change (IPCC, 2007d). The concentration of CO_2 has increased from about 280 ppm to 379 ppm over the last 250 years, an increase of more than 35% (IPCC, 2007d). The IPCC estimates that the present atmospheric concentration of CO_2 has not been exceeded in the last 650,000 years and is likely to be the highest ambient concentration in the last 20 million years (IPCC, 2007b). The other GHGs of concern in order of their contribution to CO_2e are included in Table 3.8-1.

Table 3.8-1: Characteristics of GHGs in Order of Contribution to CO_2e

Greenhouse Gas	GWP	Source	Preindustrial Concentration	Recent Concentration
Methane	21	growing rice, raising cattle, combusting natural gas, and mining coal (NOAA, 2008)	715 ppb	1,775 ppb (2005)
Nitrous Oxide	310	agricultural processes (fertilizer use and microbial processes in soil and water), nylon production, fuel-fired power plants, nitric acid production, vehicle emissions, rocket engines, racecars, and as an aerosol spray propellant	270 ppb	319 ppb (2005)
HFCs	140 to 11,700	human-made chemicals used in commercial, industrial, and consumer products, and as substitutes for ODSs in automobile air conditioners and refrigerants	0 ppT	0.5 -14 ppT (2000)
PFCs	7,390 to 17,700	human-made chemicals are emitted largely from aluminum production and semiconductor manufacturing processes	0 ppT	70 ppT (2000)
Sulfur Hexafluoride	23,900	human-made chemical 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 (EPA, 2006)	0 ppT	4.2 ppT (1998)

Note:
CO_2e = carbon dioxide equivalent; GWP = global warming potential; ppb = parts per billion; ppT = parts per trillion; HFCs = hydroflurocarbons; PFCs = perfluorocarbons
Source: Data compiled by AECOM in 2012

Global Climate Change Issue

Climate change is a global problem because GHGs are global pollutants with long atmospheric lifetimes (several years to several thousand years). Whereas criteria air pollutants and hazardous air pollutants are pollutants of regional and local concern with relatively short atmospheric lifetimes (about one day). The GHGs persist in the atmosphere long enough to be dispersed around the globe. Although the exact lifetime of any particular GHG molecule depends on multiple variables and cannot be pinpointed, more CO_2 is currently emitted into the atmosphere than is sequestered (CO_2 sinks, or reservoirs, include vegetation and the ocean, which absorb CO_2 through photosynthesis and dissolution, respectively). Of the total annual human-caused CO_2 emissions, approximately 54% is sequestered through ocean uptake, Northern Hemisphere forest regrowth, and other terrestrial sinks within a year, whereas the remaining 46% of human-caused CO_2 emissions remain stored in the atmosphere (Seinfeld and Pandis, 1998).

The quantity of GHGs that it takes to ultimately result in climate change is not precisely known; suffice it to say that the quantity is enormous, and no single project would be expected to measurably contribute to a noticeable incremental change in the global average temperature, or to global, local, or microclimate. Emissions of GHGs have the potential to adversely affect the environment, because such emissions contribute, on a cumulative basis, to global climate change.

Global climate change has the potential to result in sea level rise (resulting in flooding of low-lying areas), to affect rainfall and snowfall (leading to changes in water supply), to affect temperatures and habitats (affecting biological resources and public health), and to result in many other adverse environmental consequences. Although the international, national, State, and regional communities are beginning to address GHGs and the potential effects of climate change, it is expected that worldwide GHG emissions will continue to rise over the next several years.

Climate and Topography

Climate is the accumulation of daily and seasonal weather events over a long period of time, whereas weather is defined as the condition of the atmosphere at any particular time and place (Ahrens, 2003). For a detailed discussion of climate and topography, see Section 3.2 (Air Quality).

3.8.3 Affected Environment

Existing Greenhouse Gas Emissions

The effects of GHG emissions are by nature global and cumulative impacts, as individual sources of GHG emissions are not large enough to have an appreciable effect on global atmospheric GHG concentrations or climate change. Therefore, the impact of proposed GHG emissions to climate change is also discussed in the context of cumulative impacts in Chapter 4 of this EA.

U.S. Greenhouse Gas Inventory

Total U.S. GHG emissions in 2007 were 1.4% above the 2006 total (DOE, 2008). Figure 3.8-1 presents 2007 U.S. GHG emissions, including percentages, by type of gas.

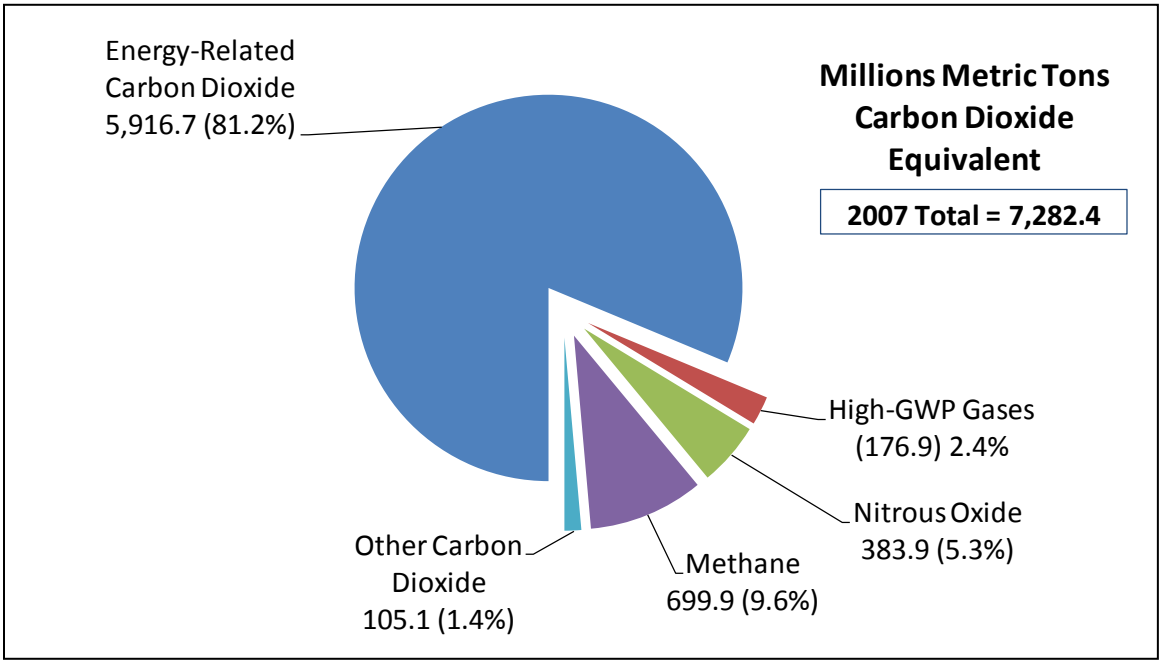
Total emissions growth—from 7,179.7 million metric tons carbon dioxide equivalent ($MMTCO_2e$) in 2006 to 7,282.4 $MMTCO_2e$ in 2007—was largely the result of an increase in CO_2 emissions of 75.9 $MMTCO_2e$. There were larger percentage increases in emissions of other GHGs, but their absolute contributions to total emissions growth were relatively small: 13.0 $MMTCO_2e$ for methane, 8.2 $MMTCO_2e$ for nitrous oxide, and 5.6 $MMTCO_2e$ for high-GWP gases (DOE, 2008).

California Greenhouse Gas Inventory

As the second largest emitter of GHG emissions in the U.S. and 12th to 16th largest in the world, California contributes a significant quantity of GHGs to the atmosphere (CEC, 2006). In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation (ARB, 2010) (Figure 3.8-2). Emissions of methane and nitrous oxide are generally associated with anaerobic microbial activity resulting from agricultural practices, flooded soils, and landfills.

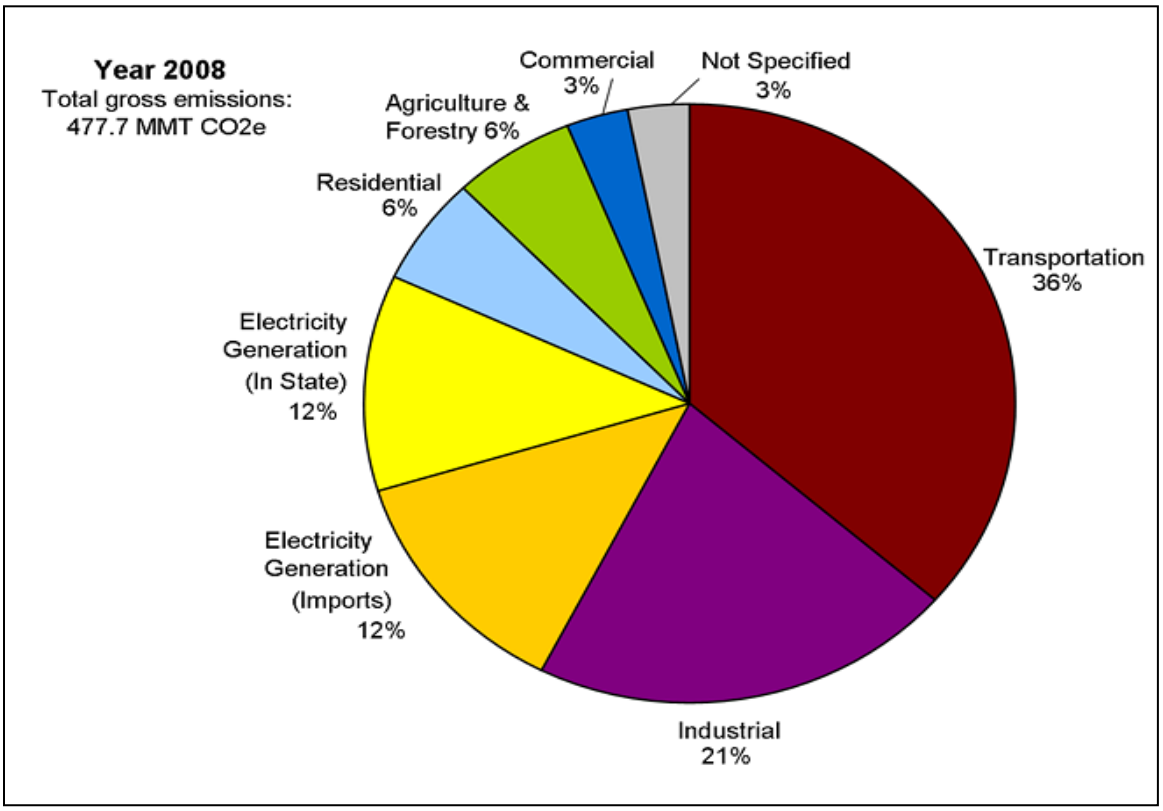
BAAQMD Greenhouse Gas Inventory

The BAAQMD published a GHG inventory for the Bay Area, which provides an estimate of GHG emissions in the base year 2007 for all seven counties located in BAAQMD's jurisdiction: Alameda, Contra Costa, Marin, San Francisco, San Mateo, Santa Clara, Napa, and the southern portions of Solano and Sonoma Counties (BAAQMD,



Source: DOE, 2008.
Note: High global warming potential gases include hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride .

Figure 3.8-1: 2007 U.S. Greenhouse Gas Emissions by Gas



Source: ARB, 2010

Figure 3.8-2: 2008 California Greenhouse Gas Emissions by Sector (2000–2008 Emissions Inventory)

2010). This GHG inventory is based on the standards for criteria pollutant inventories and is intended to support BAAQMD's climate protection activities. The regional

Bay Area and local (county, project location) 2007 GHG emissions from existing direct and indirect sources are shown in Table 3.8-2. The estimated GHG emissions are presented in CO_2e, which weights each GHG by its GWP. The GWPs used in the BAAQMD inventory are from the Second Assessment Report of the IPCC.

Table 3.8-2: 2007 Estimated Regional and Local Greenhouse Gas Emissions

Emissions Source	Emissions in Metric Tons of CO_2e per Year (2007)	
	Bay Area	**Alameda County**
Transportation	34,870,000 (36.41%)	8,400,000
Industrial/Commercial	34,860,000 (36.40%)	3,300,000
Electricity/Cogeneration[1]	15,200,000 (15.87%)	2,000,000
Residential Fuel Usage	6,820,000 (7.12%)	1,300,000
Off-Road Equipment	2,920,000 (3.05%)	600,000
Agricultural/Farming	1,110,000 (1.16%)	100,000
Total Emissions	**95,780,000 (100%)**	**15,700,000**

Note:
CO_2e = carbon dioxide equivalent
[1] Includes imported electricity emissions of 7,100,000 metric tons of carbon dioxide equivalent.
Source: BAAQMD, 2010

In 2007, Alameda County GHG emissions accounted for about 16.3 % of the total Bay Area GHG emissions (BAAQMD, 2010). Transportation is the largest GHG emissions sector in the Bay Area and in Alameda County proper, followed by industrial/commercial, electricity generation and cogeneration, and residential fuel usage.

Sea Level Rise

With respect to the VA Transfer Parcel, the most critical climate change problem is the potential for a substantial increase in mean sea level (msl). Such a rise may result from a combination of (a) the volumetric expansion of existing seawater as water temperatures rise substantially and (b) the increase in total (liquid) seawater as large ice deposits on land (e.g., in Antarctica, in Greenland, and worldwide in large glaciers) melt into the sea. Sea level rise refers to an increase in msl with respect to a land benchmark. Local sea level rise is affected by global sea level rise plus geotectonic land mass movements and subsidence.

Atmospheric pressure, ocean currents, and local ocean temperatures also affect local rates of sea level rise. Sea level has risen approximately 400 feet since the peak of the last Ice Age about 18,000 years ago, but the bulk of that occurred before 6,000 years ago (Axelrod, 1981). From 3,000 years ago to the start of the 19th century, the rate of sea level rise was held almost constant; however, rates of sea level rise appeared to increase worldwide in the 20th century (e.g., 8.4 inches per century or 4.2 inches every 50 years near San Francisco). In the last century, the measured rate of sea level rise near San Francisco is 8.4 inches per century or 4.2 inches every 50 years.

Most climate scientists agree that global warming will cause the sea level rise to increase. In 2001, the IPCC released a report with projections of global sea level rise over the next century. More recent studies project

different rates of sea level rise for specific regions of the globe. These regional projections are considered more reliable on a region-by-region basis than the IPCC projections. The IPCC model range of estimates for global sea level average rise by 2060 is predicted to be between 2.4 and 15.6 inches. However, the models used by the IPCC do not predict uniform global sea level rise, and there are substantial regional variations. The IPCC model predictions for the eastern Pacific indicate a range of sea level rise of 3.6 to 19.2 inches by 2100, which is on the lower end of the global range noted above. Assuming net rise between 1990 and 2060 to be half of the net rise between 1990 and 2100, the geographic prediction for 2060 from the IPCC models for the eastern Pacific would be 1.8 to 9.6 inches.

The Delta Vision Blue Ribbon Task Force established by Governor Schwarzenegger to develop a management plan for the Sacramento–San Joaquin Delta employed an independent science board to review literature and provide recommendations on sea level rise. Based on their findings, the Independent Science Board recommended adopting an estimated rise in sea level of 55 inches by 2100. California Climate Action Team–funded research for the 2009 California Climate Adaptation Strategy Report estimates that sea level rise will increase in California between 12 and 16 inches by 2050 and between 20 and 55 inches by 2099 (BCDC, 2009). In addition, the California Department of Water Resources supports a range in sea level rise of 7 to 55 inches along California's coast by 2100 (DWR, 2008). Furthermore, the most recent climate science report, the 2009 Copenhagen Diagnosis, estimates that global sea level rise will increase up to approximately 78.7 inches by 2100 (Allison et al., 2009).

VA Transfer Parcel and VA Development Area

The topography of the VA Transfer Parcel and the VA Development Area is primarily flat and rises from 0 msl to approximately 10 feet above msl (CH2M Hill, 2011).

3.8.4 Environmental Consequences

Assessment Methods

To estimate GHG emissions associated with construction of individual development components, URBEMIS 2007, Version 9.2.4 (URBEMIS), a land use emissions model approved by the California Air Resources Board, was used. The BAAQMD Greenhouse Gas Model (BGM) model was used to estimate operational GHG emissions. URBEMIS is designed to model construction emissions for individual development components based on building size, land use and type, and disturbed acreage and allows for the input of project-specific information. BGM was developed for use with URBEMIS, and calculates operational GHG emissions associated with a project at buildout. Operational emissions calculated include those resulting from transportation (trip generation), electricity use, natural gas use, solid waste generation, water and wastewater use, and other area sources (hearth and landscaping).

Construction-generated GHG emissions were modeled based on the Alternatives and default BAAQMD-recommended settings and parameters attributable to the proposed land use type and site location. URBEMIS only provides estimates of emissions of CO_2. Although emissions of other GHGs, such as methane and nitrous oxide, are important with respect to global climate change, the emission levels of these other GHGs from on- and

off-road vehicles used during construction are about two to three orders of magnitude smaller than CO_2 emissions, even when factoring in the relatively larger GWPs of methane and nitrous oxide (CCAR, 2009).

The GHG emissions associated with the operation of the EA Alternatives were modeled using BGM Version 1.1.9 beta, with default Bay Area values for temperature, humidity, and vehicle fleet characteristics as well as rates of energy consumption, waste generation, water use, and wastewater generation for various land uses. All modeling assumptions and output summaries are contained in Appendix F (Air Quality and Greenhouse Gas Emissions Data).

The potential effects of proposed GHG emissions are by nature global and cumulative in their impacts, since individual sources of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, an appreciable impact on global climate change would only occur when proposed GHG emissions combine with GHG emissions from other human-made activities on a global scale.

Global Climate Change

The impacts of global climate change on the EA Alternatives are described in terms of sea level rise, because local/regional projections of specific climate change effects (such as regionally downscaled versions of global climate models) that have been developed for the Bay Area are limited to sea level rise and corresponding inundation areas. Scientific findings related to sea level rise for the EA Alternatives are summarized and discussed below. Thus, this section includes an overview of the potential impacts of the EA Alternatives in the context of global climate change related to sea level rise, and the potential impact associated with the effect of an alternative in the context of sea level rise is determined based on proposed land development elevations in comparison to BCDC's findings on sea level rise inundation for San Francisco Bay.

Alternative 1

Construction

GHG missions resulting from the initial phase of construction (i.e., VHA OPC, VBA Outreach Office, Conservation Management Office, first phase of NCA National Cemetery, and associated infrastructure) would total 16,720 MT of CO_2e. Emissions related to construction of subsequent phases of the NCA Cemetery would total 11,147 MT of CO_2e per occurrence through 2116 (see Table 3.8-3). Daily GHG emissions would vary over this time depending on the intensity of construction activities each day.

Construction-related GHG emissions would cease following construction of Alternative 1, and therefore would not be a continuous source over the lifetime of the project. Furthermore, as discussed in Chapter 2 (Alternatives), and discussed further below, the proposed outpatient clinic would be built to meet Leadership in Energy and Environmental Design (LEED) Silver certification. As part of the minimum requirements of LEED Silver, Alternative 1 would implement measures associated with "material and resources," which typically includes the use of recycled or local materials, or materials with low-volatile organic compound off-gassing potential. Thus, the selected building materials would have less GHG emissions embedded in their manufacturing life cycle and/or would come from local providers to reduce transportation emissions. Therefore, Alternative 1 would also implement best construction management practices to reduce GHG emissions embedded within materials or required to deliver materials to the project site.

Table 3.8-3: Construction Greenhouse Gas Emissions (Metric Tons of Carbon Dioxide Equivalent) (Alternative 1 and 2)

	Grading	Trenching	Building Construction	Asphalt Paving	Arch. Coating	Truck Emissions	SOV Emissions	TOTAL
Initial Phase of Construction	724	71	340	132	2	15,097	355	16,7220
Subsequent Phases of Cemetery Expansion	482	47	226	88	1	10,065	237	11,147

Notes:
Arch. = Architectural; SOV = Single Occupancy Vehicle
Emissions may not appear to add exactly due to rounding.

Operation

Under full buildout, Alternative 1 total GHG operational emissions would total 13,907 MT of CO_2e per year. Mobile-source emissions related to the operation of the VA facilities would total 10,976 MT of CO_2e per year. Area-source and indirect emissions (e.g., electricity, natural gas, area sources, water, wastewater, and solid waste) associated with operation of the VA facilities would total 2,931 MT of CO_2e per year (see Table 3.8-4).

Table 3.8-4: Operational Greenhouse Gas Emissions (Metric Tons of Carbon Dioxide Equivalent) per Year after Full Buildout (Alternative 1 and 2) [1]

Transportation	Area	Electricity [2]	Natural Gas [2]	Water and Wastewater	Solid Waste	TOTAL
10,976	*231*	*808*	*667*	*19*	*1,206*	***13,907***

Notes:
[1] Annual operational presented include GHG emissions from the conservation management office, outpatient clinic, and cemetery.
[2] Electricity and natural gas emissions include emission reductions associated with VA's Strategic Sustainability Performance Plan.
Totals may not appear to add exactly due to rounding.
Source: Data calculations by AECOM in 2012 (Appendix F)

In addition, it should be noted that there would be periods when operational emissions associated with Alternative 1 facility operations and subsequent cemetery phase construction would occur simultaneously. In these situations, annual emissions associated with Alternative 1 could total up to 25,054 MT CO_2e. It should be noted that this emissions estimate (25,054 MT CO_2e) is the combination of the full buildout of the proposed outpatient clinic, conservation management office, and first phase of the cemetery with subsequent cemetery expansions, which represents a worst-case scenario. In reality, the operational emissions occurring simultaneously with subsequent cemetery expansion emissions would be less than those shown in Table 3.8-4. In other words, before full buildout of Alternative 1 when subsequent cemetery expansions are still occurring, operational emissions would not reach the level shown in Table 3.8-4. Alternative 1 would also include several features that would reduce long-term operational GHG emissions. As stated in Chapter 2.0 (Alternatives), the proposed outpatient clinic would achieve LEED Silver certification. As part of the LEED certification, the proposed outpatient clinic would need to fulfill minimum requirements in a variety of categories including sustainable sites, water efficiency, energy and atmosphere, material and resources, and indoor environmental quality. Fulfilling the requirements in each of these categories would reduce Alternative 1's long-term operational emissions and potentially the life-cycle emissions associated with construction materials. Thus, Alternative 1 would comply with and surpass the minimum

requirements of LEED (i.e., LEED Silver rather than just LEED Certified) to reduce long-term operational GHG emissions associated with new buildings. LEED designation is a nationally and internationally accepted and recognized program for achieving sustainable design in projects, which helps reduce and/or more efficiently utilize natural resources (e.g., energy, water, wastewater, solid waste, building materials) and reduce long-term GHG emissions. Therefore, Alternative 1 would comply with best management and operation practices for new buildings to reduce GHG emissions.

Furthermore, as stated earlier, VA's SSPP target is to reduce GHG emissions by 29.6% from baseline 2008 emissions by the year 2020. A majority of these emissions reductions (26.2%) are anticipated to come from meeting the Energy Policy Act of 2005's targets for energy and fuel use. Therefore, a reduction gap of 3.4% would be required to achieve VA's SSPP goal. The outpatient clinic's LEED Silver certification would also contribute to long-term GHG reductions from transportation-, energy-, water-, wastewater-, and solid waste–related emissions. In addition, because the project site is located in California, several Statewide initiatives as part of the Assembly Bill (AB) 32 Scoping Plan would reduce Alternative1's future GHG emissions. For example, the Low Carbon Fuel Standard (LCFS) is anticipated to reduce GHG emissions associated with the life cycle of all fuels by 10% by 2020 (ARB, 2011). The Pavley I and Pavley II fuel standards would also reduce the GHG emissions associated with Alternative 1's vehicle fleet (i.e., outpatient clinic) as well as all vehicles that would be visiting the project site. In addition to Alternative 1's VA SSPP actions, project design features, and Statewide AB 32 Scoping Plan measures, the overall vehicle fleet turnover and increases in emissions technology from year 2008 to 2020 would also contribute to the overall reduction in GHG emissions. Thus, considering that the LEED Silver certification would reduce some portion of GHG emissions from all of Alternative 1's operational GHG emission sources (Table 3.8-4), that California Statewide measures associated with the AB 32 Scoping Plan (e.g., Pavley I, Pavley II, and LCFS) would reduce transportation emissions, and natural turnover in the vehicle fleet and increases in emissions technology would further reduce transportation emissions, which are the largest contributor to Alternative 1's annual operational emissions (79%), it is reasonable to expect that the 3.4% reduction gap would be achieved to reach a 29.6% reduction from baseline 2008 emissions by the year 2020.

The potential effects of proposed GHG emissions are by nature global and cumulative in their impacts, since individual sources (i.e., the Proposed Action) of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, an appreciable impact on global climate change would only occur when proposed GHG emissions from an action combine with GHG emissions from other human-made activities on a global scale. Since GHG emissions from the Proposed Action would equate to such a minimal amount of the U.S. inventory, they would not substantially contribute to global climate change.

Impact of Climate Change

Based on sea level rise predictions of 16 inches by 2050 and 55 inches by 2099 (BCDC, 2009), sea level rise could cause flooding in some of the coastal areas of Alameda Island, including the VA Transfer Parcel and the VA Development Area. Specifically, under Alternative 1, the VA Development Area would be located in an area identified as potentially exposed to up to 11.2 feet above msl of inundation due to a combination of approximately

55 inches of sea level rise by 2099 plus the 100-year stillwater elevation[5] (BCDC, 2011) (see Figure 3.8-3). However, as part of construction of VA facilities, the ground elevation would be raised to 12.5 feet above msl for the proposed Conservation Management Office and roadways and to 13.5 feet above msl for the proposed VHA OPC and NCA Cemetery. Thus, the proposed development location would be at a higher elevation (12.5 to 13.5 feet above msl) than both the Pacific Ocean (0 feet above msl) and the high-end sea level rise prediction in 2099 (55 inches or 4.6 feet above msl). As a result, there would be no climate change–related sea level rise impacts at the proposed facilities (including infrastructure) in the VA Development Area under Alternative 1 through the year 2099. Therefore, the Proposed Action would be prepared for inevitable environmental changes that are anticipated to occur from climate change, and climate change thus is not anticipated to result in harm to persons or property or degradation of natural resources or ecosystems at the VA Transfer Parcel. No impact is expected to occur on the proposed development related to the potential effects of projected sea level rise.

Alternative 2 (Preferred Alternative)

Construction

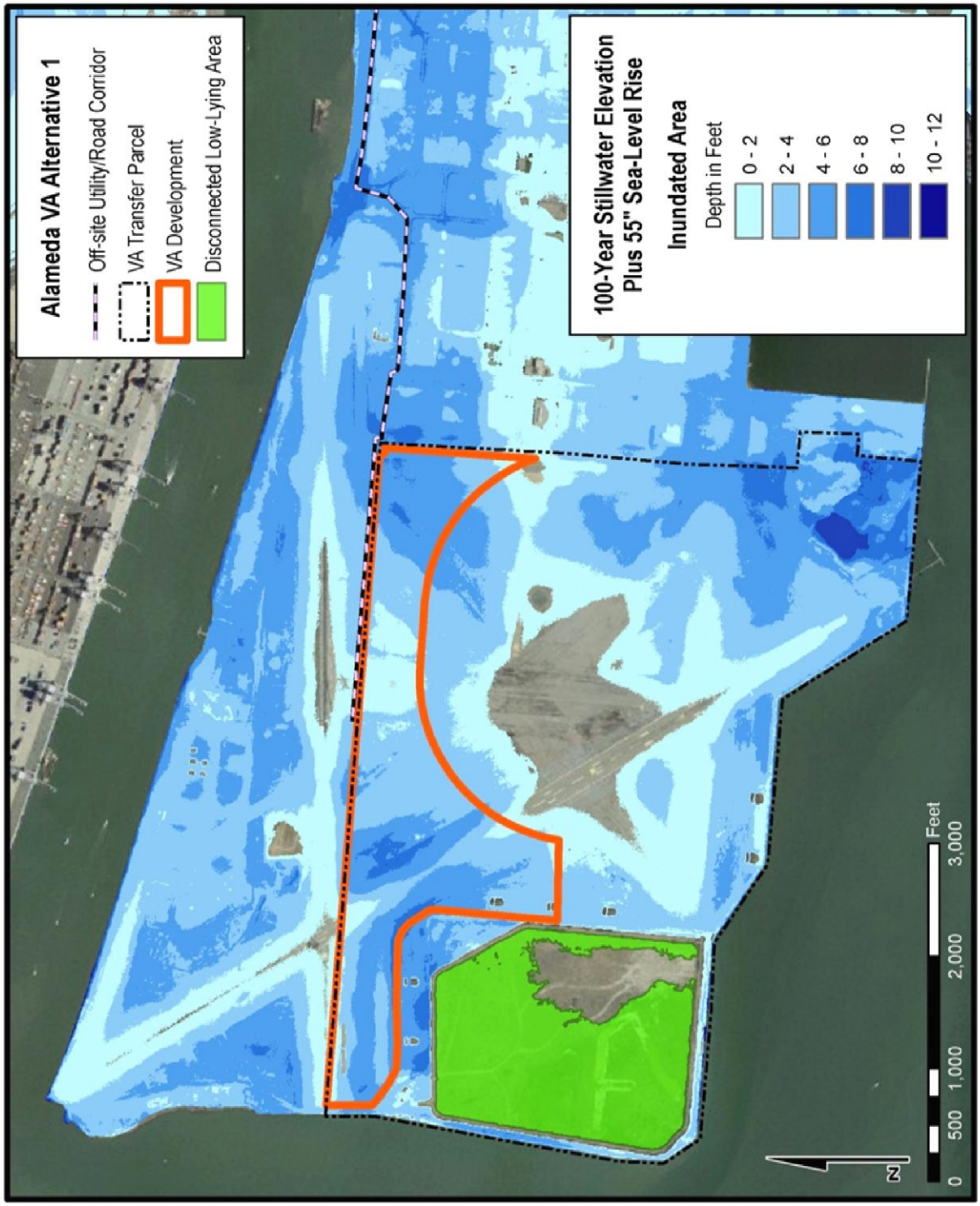
Under Alternative 2, emissions related to construction would be similar to Alternative 1 (Table 3.8-3). Thus, construction activities would not exceed the CEQ reference point of 25,000 MT of CO_2e, which serves as a minimum standard for reporting emissions under the CAA.

Operation

Operational GHG emissions under Alternative 2 would be similar to those under Alternative 1. Therefore, all operational emissions would be the same as those shown in Table 3.8-5. In addition to the GHG reduction programs identified in Chapter 2.0 (Alternatives) and in Alternative 1 above (e.g., LEED Silver certification, VA's SSPP, etc.), the design of the OPC, under Alternative 2, would include the following design features to reduce GHG emissions and energy use:

1. Load-Reducing Passive architectural strategies:
    - Building orientation to respond to climate conditions, views, and desired solar access.
    - High performance envelope (appropriate window to wall ratio, high performance glazing, good insulation).
    - Shading and glare control strategies combined with day-lighting.
2. Load Reducing Active Building systems:
    - HVAC systems: Air Handling Units that expand the time spent in "free cooling" by being able to reset the supply air temperature up to 65 degrees Fahrenheit. Efficient Cooling & Heating Systems (90+% efficiency condensing boilers).

[5] The determination of the 100-year stillwater elevation is accomplished through the statistical analysis of historical tide and water level data or by the use of a numerical storm surge model. Several factors can contribute to the 100-year stillwater elevation in a coastal area. The most important factors include offshore bathymetry, astronomical tide, wind setup (rise in water surface as strong winds blow water toward the shore), pressure setup (rise in water surface from low atmospheric pressure), wave setup (rise in water surface inside the surf zone from the presence of breaking waves), and seiches.



Source: Data compiled by AECOM in 2013

Figure 3.8-3: Projected Sea Level Rise Inundation Areas at Former NAS Alameda (Alternative 1)

- Efficient indoor and outdoor lighting systems (lower lighting power density, occupancy sensors, & LED fixtures where applicable) combined with daylight harvesting sensors.

3. Renewables:

- Shading structure in the parking lot with a photovoltaic system that supplies on-site energy generation to offset 10.5% of the annual electrical energy use.
- Solar Hot Water system that supplies 30% of the domestic hot water use demand.

4. Metering & Verification: The project is planned to have appropriate metering in place to monitor and refine actual energy use after occupied.

Through the implementation of these measures, the Proposed Action meets applicable guidance and follows best practices for reducing energy use and GHG emissions. Further, the potential effects of proposed GHG emissions are by nature global and cumulative in their impacts, since individual sources (i.e., thr Proposed Action) of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, an appreciable impact on global climate change would only occur when proposed GHG emissions from an action combine with GHG emissions from other human-made activities on a global scale. Since GHG emissions from the Proposed Action would equate to such a minimal amount of the U.S. inventory, they would not substantially contribute to global climate change.

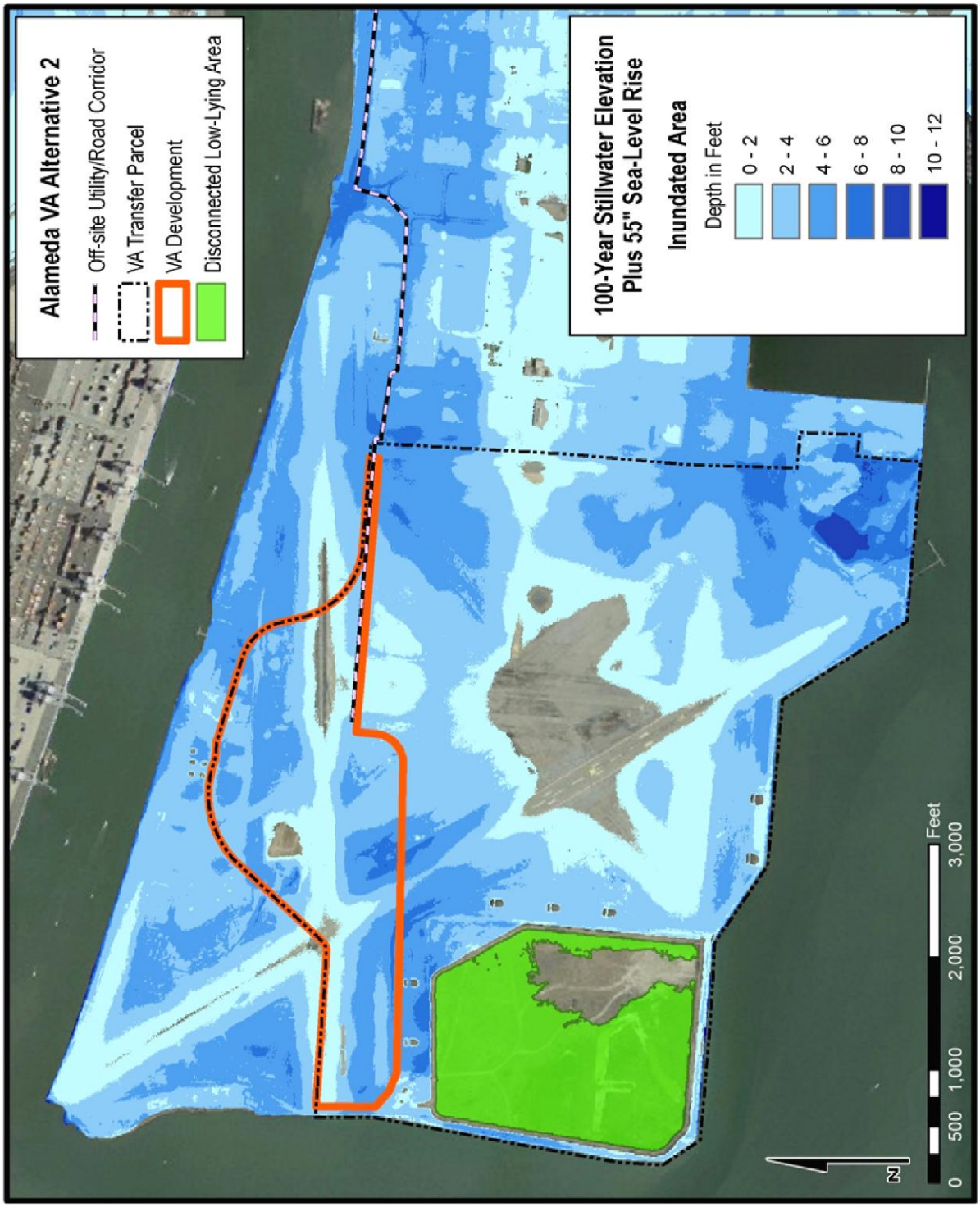
Impact of Climate Change

Based on sea level rise predictions of 16 inches by 2050 and 55 inches by 2099 (BCDC, 2011), sea level rise could cause flooding in some of the coastal areas of Alameda Island, including the VA Transfer Parcel and the VA Development Area. Specifically, under Alternative 2, the VA Development Area would be located in an area identified as potentially exposed to up to 11.2 feet above msl of inundation due to a combination of approximately 55 inches of sea level rise by 2099 plus the 100-year stillwater elevation (BCDC, 2011) (see Figure 3.8-4). However, as part of construction of VA facilities, the ground elevation would be raised to 12.5 feet above msl for the proposed Conservation Management Office and roadways and to 13.5 feet above msl for the proposed VHA OPC and NCA Cemetery. Thus, the proposed development location would be at a higher elevation (12.5 to 13.5 feet above msl) than both the Pacific Ocean (0 feet above msl) and the high-end sea level rise prediction in 2099 (55 inches or 4.6 feet above msl). As a result, there would be no climate change–related sea level rise impacts at the proposed VA facilities (including infrastructure) under Alternative 2 through 2099. Therefore, the proposed VA development under Alternative 2 would be prepared for inevitable environmental changes that are anticipated to occur from climate change, and thus, climate change is not anticipated to result in harm to persons or property or degradation of natural resources or ecosystems at the VA Transfer Parcel. No impact is expected to occur on the proposed development related to the potential effects of projected sea level rise.

No Action Alternative

Construction

Under the No Action Alternative, the Fed-to-Fed transfer would not take place, and no VA facilities would be constructed. Therefore, no impacts would occur.



Source: Data compiled by AECOM in 2013

Figure 3.8-4: Projected Sea Level Rise Inundation Areas at Former NAS Alameda (Alternative 2)

Operation

Under the No Action Alternative, the Fed-to-Fed transfer would not take place, and no VA facilities would be operated on the property. The property would be retained by Navy in caretaker status until another action on the property is taken. Therefore, no operational-related impacts would occur.

Impact of Climate Change

Because there would be no VA development at Alameda Point that could be adversely affected by climate change under the No Action Alternative, no impact of climate change would occur.

3.8.5 References

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