# VAN NESS AVENUE BUS RAPID TRANSIT AIR QUALITY IMPACT REPORT

**Prepared for**

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# 1.0 SUMMARY OF FINDINGS

Terry A. Hayes Associates Inc. has completed an air quality analysis for the proposed Van Ness Bus Rapid Transit (BRT) Project. Key findings are listed below.

- Construction emissions associated with each of the alternatives would comply with Bay Area Air Quality Management District (BAAQMD) guidelines to control emissions. Regional emissions would result in a less-than-significant impact with mitigation incorporated.

- None of the alternatives would increase regional operational emissions. Regional emissions would not result in a significant impact.

- Localized carbon monoxide (CO) concentrations associated with each of the alternatives would not exceed the State ambient air quality standards. Localized CO concentrations would not result in a significant impact.

- None of the alternatives would expose sensitive receptors to significant emissions of toxic air contaminants (TAC) as a result of activities associated with project construction or operations. TAC emissions would not result in a significant impact.

- None of the alternatives would expose people to objectionable odors.

- Build Alternatives 2 through 4 would result in less greenhouse gas (GHG) emissions than baseline conditions, and would result in a beneficial global warming impact.

- All of the alternatives would be consistent with the BAAQMD regional air quality plans.

- Build Alternatives 2 through 4 would comply with regional and local transportation conformity guidelines.

- Construction and operation of each of the alternatives would not result in any adverse impacts under the National Environmental Policy Act.

# 2.0 INTRODUCTION

## 2.1 PURPOSE OF REPORT

The purpose of this report is to evaluate the potential air quality impacts of the Van Ness BRT Project under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Potential air quality impacts are analyzed for construction and operation of the proposed project. Mitigation measures are recommended, where necessary.

## 2.2 PROJECT DESCRIPTION

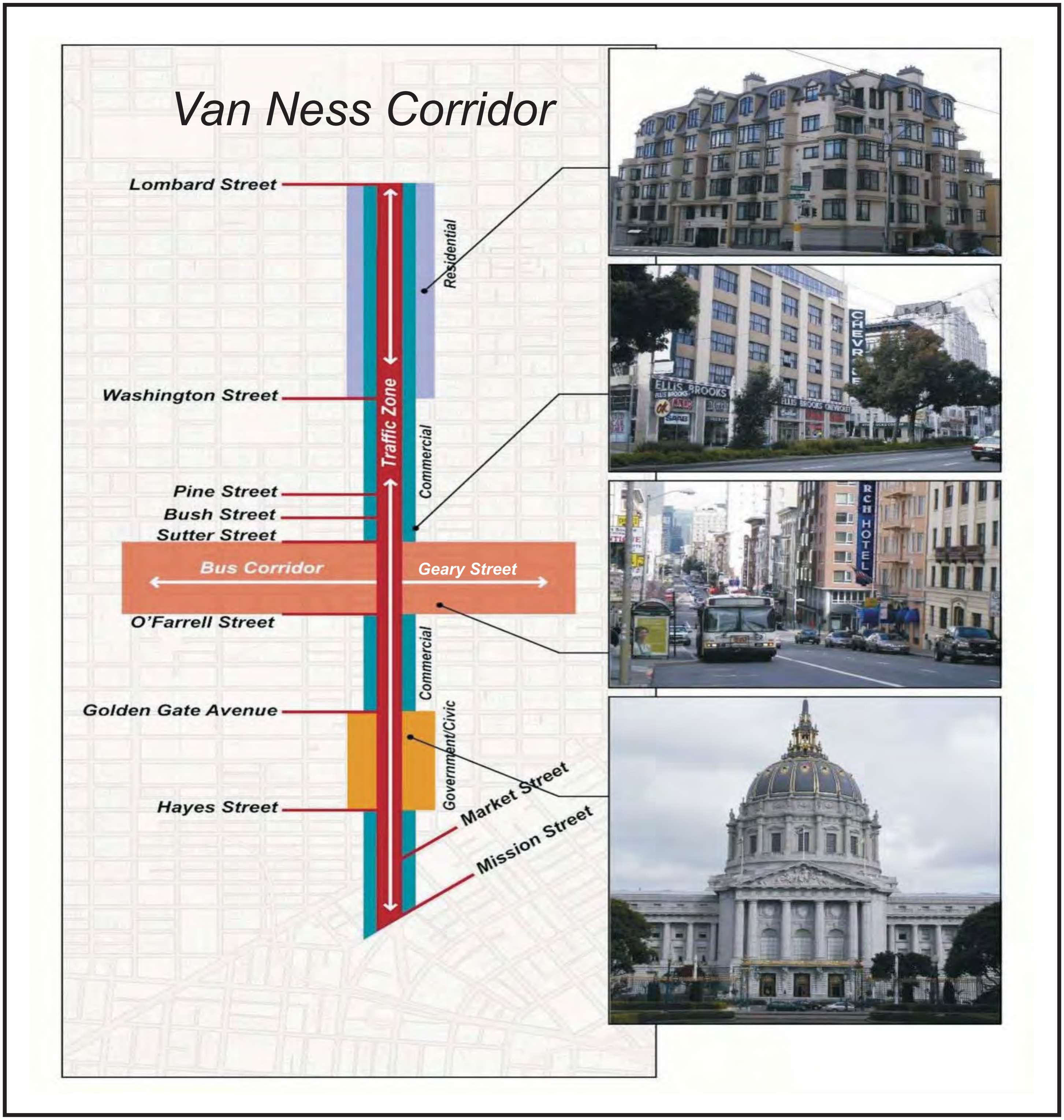
The San Francisco County Transportation Authority (SFCTA or Authority), in cooperation with the Federal Transit Administration (FTA) and the San Francisco Municipal Transportation Agency (SFMTA), proposes to implement BRT improvements along Van Ness Avenue in San Francisco. Van Ness Avenue is one of San Francisco's key north-south arterials and is also designated as US 101, connecting freeway entrances and exits to the south of the City with Lombard Street and the Golden Gate Bridge that provide access north of the City. Van Ness Avenue is a six-lane arterial that carries a mix of cars, trucks, transit, pedestrians and bicycles. The proposed BRT would be implemented along a 2.2 mile stretch of Van Ness Avenue (including a one-block portion of South Van Ness Avenue) in San Francisco, from Mission Street at the south to Lombard Street at the north. The existing overhead contact system (OCS) and supporting poles/streetlights would be replaced from Mission Street in the south to North Point Street in the north. **Figure 2-1** provides a map showing the project alignment. Project improvements would be confined largely within the right-of-way along Van Ness Avenue.

As part of the environmental review process four alternatives have been defined for the proposed project, including one no-build alternative and three build alternatives. The project alternatives are described below.

### 2.2.1 Alternative 1: No-Build (Baseline Alternative)

Alternative 1, the No-Build alternative, would not include a BRT service and instead assumes the existing roadway and transit services in the 2.2 mile Van Ness Avenue corridor would continue and be supplemented by funded improvement projects planned to occur within the near-term horizon year of 2015. These transportation system and infrastructure improvements are planned to occur regardless of implementation of any proposed BRT build alternative. The transportation system and infrastructure improvements include:

- Pavement rehabilitation;
- OCS and support pole/streetlight replacement;
- Traffic signal infrastructure for real time traffic management;
- Pedestrian Countdown Signals;
- Curb Ramp Upgrades;
- High-quality bus vehicles with low floor boarding;
- On Bus Proof of payment/all-door boarding; and
- NextMuni real time passenger information.




SOURCE: ARUP, Project Construction Plan, July 10, 2009.

FIGURE 2-1

PROJECT SEGMENTS

### 2.2.2 Build Alternatives

Each build alternative proposes BRT operating along a dedicated transit lane, or transitway, for the 2.2 mile project corridor. Under each build alternative, two mixed flow traffic lanes (one southbound and one northbound) would be removed to accommodate the creation of two dedicated transit lanes (one southbound and one northbound). In other words, the existing mixed flow traffic lanes would be reduced from three to two lanes in each direction to accommodate the BRT transitway. The build alternatives would occur entirely within the existing street right-of-way and no property acquisition would be required. None of the build alternatives would require reduction in sidewalk width. Curbside parking would generally be maintained under each build alternative, although some loss of street parking would occur at locations throughout the project corridor under each of the three proposed build alternatives. Project features common to each of the alternatives are summarized below.

- *High-quality Bus Vehicles with Level Boarding.* The build alternatives would involve an upgrade from the existing buses to higher capacity, higher performance bus vehicles. The proposed BRT vehicles would offer increased passenger capacity over the Muni 47 line buses that presently operate in the Van Ness Avenue corridor. The proposed BRT vehicle fleet under each build alternative would be an approximate 50 percent split between 60 feet electric trolley coaches and 60 feet diesel hybrid motor coaches. The proposed BRT fleet would replace the existing Muni bus lines 47 and 49 which currently operate an approximate 50 percent split between 40 feet diesel motor coaches and 60 feet electric trolleys, respectively. The maximum number of BRT buses operating in the corridor would be equivalent to the current combined schedule of Routes 47 and 49 of approximately 15 to 16 buses per hour in the peak hour in both northbound and southbound directions. The design vehicle would be low floor and the bus station platform design would provide level boarding from bus to station platform, reducing dwell times and improving service reliability over the existing conditions.

- *Dedicated Bus Lanes (Transitway).* BRT buses would operate in an exclusive, dedicated bus lane on the street surface. The BRT transitway would accommodate both MTA and Golden Gate Transit vehicles which currently operate along the corridor, and would be available for use by emergency response vehicles. The bus lane would be distinguished from mixed flow traffic lanes by colored pavement or other special markings. A curb or other physical means of separation from the mixed flow traffic

- *Pavement Rehabilitation and Resurfacing*. Under the Build Alternatives, Van Ness Avenue would undergo curb-to-curb rehabilitation and resurfacing. This work would be planned in coordination with the Caltrans SHOPP plans for pavement rehabilitation as described for the No-Build Alternative.

- *High-quality Stations*. The BRT stations proposed under each build alternative would include a platform, canopy, landscaped planter, and station amenities. The station would sit upon a concrete bus pad elevated above the sidewalk curb height of six inches, to 10 to 12 inches above the street grade. Stations would be approximately 150 feet in length, with a platform length of 130 feet in order to accommodate two 60 feet articulated BRT vehicles. The platform provides the area for passenger waiting, boarding, and station amenities. The station platform would range from 10 to 25 feet in width, depending on the project alternative and the need for a platform to accommodate single direction travel, or both southbound and northbound travel. The station canopy would provide shelter from sun and rain, and would be approximately 8 to 11 feet in height, depending on the incorporation of decorative architectural features and/or solar paneling, which would be determined during final design. Stations amenities would include ticket vending machines (TVM), seating, lighting, a canopy and wind screens, garbage receptacles, and wayfinding information (maps/signage). In Alternative 2, a landscaped planter would be incorporated to beautify the stations and buffer bus patrons from adjacent pedestrian or vehicular traffic. Stations would be designed to comply with Americans with ADA requirements. The stations would feature active data display and audio capability to indicate bus arrival time as required by ADA. Protective railings would be incorporated as appropriate for safety requirements.

- *Platform Proof of Payment/All-door Boarding*. As described for the No-Build alternative, the build alternatives would operate with all-door boarding BRT service, allowing passengers with proof of payment, such as a Clipper Card, to board through any door. In the build Alternative, SFMTA will have the BRT platforms function as proof-of-payment areas, and passengers would swipe their fare cards on receptors before the buses arrive, further helping to reduce dwell time.

- *NextMuni Real Time Passenger Information*. As described for the No-Build Alternative, the BRT stations under the build alternatives would be equipped with NextMuni, providing real-time bus arrival information displays.

- *Transportation System Management (TSM) Capabilities*. The proposed BRT service under each build alternative would utilize advanced traffic and transit system management technologies, like those proposed under SFgo, including:

  - *Traffic Signal Infrastructure for Real Time Traffic Management*. Traffic signal poles would be upgraded to mast armed poles. Signal controllers and interconnects would be replaced with modern controllers and a new fiber optic signal interconnect communications network that would allow for real time traffic management. Variable real-time message signs and traffic cameras would also be installed to manage traffic conditions and special events. The interconnects and controllers allow for active monitoring and adjusting of traffic signal timings.

  - *GPS-based Transit Signal Priority*. Under the proposed build alternatives Transit Signal Priority (TSP) hardware would be installed on the traffic signal masts. TPS provides advance and extended green light time for buses approaching signals, to reduce bus delay caused by red lights. The proposed BRT stations would be located on the far side of signalized intersections as feasible to optimize the capability of TSP. Buses would be granted a green light to travel through the intersection and then subsequently stop at a station, benefiting transit travel time and reliability.

  - *Automatic Vehicle Location*. Automatic Vehicle Location (AVL) would be utilized under the build alternatives to manage transit route operations in real-time.

- *Median Upgrades/Nose Cones for Pedestrian Safety*. Median refuges would be modified and widened where feasible to reduce the distance pedestrians must cross during one light cycle, improving pedestrian safety at those locations. Nose cones would be installed where feasible to provide a protective buffer between pedestrians and automobile traffic. All upgrades to intersections would comply with ADA standards.

- *Curb Ramp Upgrades*. Curb ramps would be installed at all intersections along Van Ness Avenue. Curb ramps would meet current City standards and ADA requirements to provide access by people in wheelchairs as well as providing easier travel for those with strollers, carts, and the like.

- *Landscaping*. Medians would be landscaped to promote a unified, visual concept for the Van Ness Corridor. BRT stations would include landscaped planters, and landscaping would be incorporated as feasible to provide a buffer between bus patrons and adjacent auto and pedestrian traffic. Also, the discontinuation of existing MUNI bus stops and removal of bus shelters as proposed under the build alternatives would open up additional sidewalk space at these locations. This would enhance the pedestrian environment at these locations and offer opportunities for tree planting, landscaping or streetscape features.

- *Curb Bulbs*. Curb bulbs are proposed at most signalized intersections to improve pedestrian safety by improving visibility between motorists and pedestrians, shortening the crossing distance across Van Ness Avenue, and reducing the speed of right-turning traffic.

- *Pedestrian Countdown Signals*. Pedestrian countdown signals would be installed on all crosswalk legs at all signalized intersections in the project corridor as part of the proposed Build Alternatives.

- *Accessible Pedestrian Signals (APS)*. APS would be installed at all signalized intersections in the project corridor as part of the proposed build alternatives.

- *OCS support pole/streetlight replacement*. Under the proposed build alternatives the OCS overhead wire and support pole system would be replaced and upgraded, as described for the No-Build Alternative, along with the associated street lighting.

**Build Alternative 2: Side Lane BRT with Street Parking**

Build Alternative 2 would provide a dedicated bus lane, or transitway, in the right most lane of Van Ness Avenue located adjacent to the existing curbside street parking area. The transitway would extend from Mission Street to Lombard Street in northbound and southbound directions. The transitway would be traversable for mixed flow traffic which would enter the transitway in order to complete a right turn, or to parallel park. Under Build Alternative 2, BRT stations would be located within the curbside parking area as curb extensions, eliminating the need for buses to exit the transitway to pick up passengers. Golden Gate Transit vehicles that currently operate on Van Ness Avenue would operate in the transitway and use BRT stations exclusively, thus eliminating the existing Golden Gate Transit Turk Street station. A planter with trees and shrubs would be located along the sidewalk side of the BRT station platform to serve as a buffer between bus patrons and sidewalk pedestrians. Build Alternative 2 would include all the project features described above and would involve minimal modification to the existing median.

**Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians**

Build Alternative 3 would provide a transitway comprised of two side-by-side, dedicated bus lanes located in the center of the roadway, inside two medians. The transitway would be separated from mixed flow traffic by a 4-foot wide median and a 9-foot wide median. Golden Gate Transit vehicles that currently operate on Van Ness Avenue would operate in the transitway and use BRT stations exclusively, thus eliminating the existing Golden Gate Transit Turk Street station. BRT stations would be located on the 9-foot median, allowing right-side boarding. Build Alternative 3 would require removal of much of the existing medians, including existing trees and landscaping, in order to construct the dual median, center lane transitway.

*Center Lane Alternative Design Option B*

Both center running alternatives contain a design option referred to as the Center Lane Alternative Design Option B. This design option would eliminate all northbound left turns, and all but one southbound left turn (at Broadway Street) in the project corridor. Center Lane Alternative Design Option B would reduce conflicts at intersections with turning vehicles, and increase the green light time available to BRT buses for through movement. The removal of left-turn pockets would allow for more street parking at certain locations.

**Build Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median**

Build Alternative 4 would provide a transitway in the center of the roadway comprised of a single, 14-foot median flanked by dedicated northbound and southbound dedicated bus lanes. Station platforms would be located on the single center median, requiring left-side passenger boarding and alighting. All stations would be of this single median design, with the exception of BRT stations proposed at Geary/O'Farrell which would utilize a dual median configuration similar to that proposed under Alternative 3, in order to accommodate Golden Gate Transit buses that are strictly right-side boarding. As with the other build alternatives, Golden Gate Transit would operate exclusively in the transitway. Outside of the Geary/O'Farrell station, all other Golden Gate Transit stops along the BRT corridor would be consolidated. Golden Gate Transit vehicles operating along the Van Ness BRT corridor would make an additional stop at the corner of Chestnut Street and Van Ness Avenue in order to provide access in the northern end of the corridor. This would require routing Golden Gate Transit buses along Chestnut Street instead of Lombard Street between Laguna Street and Van Ness Avenue.

Thus Build Alternative 4 would require BRT vehicles with left side doors to allow for left-side boarding and alighting. All stations would be of this single median design, with the exception of BRT stations proposed at Geary/O'Farrell which would utilize a dual median configuration as proposed under Alternative 3, in order to accommodate Golden Gate Transit buses that are strictly right-side boarding.

*Center Lane Alternative Design Option B*

The Center Lane Alternative Design Option B is under consideration for Build Alternative 4. The design variation would eliminate all northbound left turns, and all but one southbound left turn (at Broadway Street).

# 3.0 AIR QUALITY

This section examines the degree to which the proposed project alternatives may cause significant adverse changes to air quality. Both short-term construction emissions occurring from activities such as site grading and haul truck trips, and long-term effects related to the ongoing operation are discussed in this section. This analysis focuses on air pollution from two perspectives: daily emissions and pollutant concentrations. “Emissions” refer to the quantity of pollutant released into the air, measured in pounds per day (ppd). “Concentrations” refer to the amount of pollutant material per volumetric unit of air, measured in parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$).

## 3.1 POLLUTANTS & EFFECTS

The California Air Resources Board (CARB) and the U.S. Environmental Protection Agency (USEPA) currently focus on the following air pollutants as indicators of ambient air quality: ozone (O3), particulate matter (PM), nitrogen dioxide ($NO_2$), carbon monoxide (CO), sulfur dioxide ($SO_2$), and lead (Pb). These “criteria air pollutants” are considered harmful to public health and the environment.[1] These pollutants are discussed below.

**Carbon Monoxide**. CO is an odorless, colorless gas formed by the incomplete combustion of fuels. The single largest source of CO in the San Francisco Bay Area Air Basin (SFBAAB) is motor vehicles. Emissions are highest during cold starts, hard acceleration, stop-and-go driving, and when a vehicle is moving at low speeds. New findings indicate that CO emissions per mile are lowest at about 45 miles per hour (mph) for the average light-duty motor vehicle and begin to increase again at higher speeds.[2] When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia, as well as fetuses. Even healthy people exposed to high CO concentrations can experience headaches, dizziness, fatigue, unconsciousness, and even death.

**Ozone**. $O_3$, or smog, is not emitted directly into the environment, but is formed in the atmosphere by complex chemical reactions between reactive organic gases (ROG) and nitrogen oxides ($NO_X$) in the presence of sunlight. Ozone formation is greatest on warm, windless, sunny days. The main sources of $NO_X$ and ROG, often referred to as ozone precursors, are combustion processes (including motor vehicle engines) the evaporation of solvents, paints, and fuels, and biogenic sources. Automobiles are the single largest source of ozone precursors in the SFBAAB.[3] Tailpipe emissions of ROG are highest during cold starts, hard acceleration, stop-and-go conditions, and slow speeds. They decline as speeds increase up to about 50 mph, then increase again at high speeds and high engine loads. ROG emissions associated with evaporation of unburned fuel depend on vehicle and ambient temperature cycles. Nitrogen oxide emissions exhibit a different curve; emissions decrease as the vehicle approaches 30 mph and then begin to increase with increasing speeds.[4]

Ozone levels usually build up during the day and peak in the afternoon hours. Short-term exposure can irritate the eyes and cause constriction of the airways. Besides causing shortness

[1]USEPA, http://www.epa.gov/air/criteria.html, accessed September 28, 2010.
[2]BAAQMD, *CEQA Air Quality Guidelines*, June 2010.
[3]*Ibid*.
[4]*Ibid*.

of breath, it can aggravate existing respiratory diseases such as asthma, bronchitis and emphysema. Chronic exposure to high ozone levels can permanently damage lung tissue. Ozone can also damage plants and trees, and materials such as rubber and fabrics.

**Nitrogen Dioxide**. $NO_2$ is a reddish-brown gas that is a by-product of combustion processes. Automobiles and industrial operations are the main sources of $NO_2$. Aside from being a major contributor to ozone formation, nitrogen dioxide can increase the risk of acute and chronic respiratory disease. It is an eye and lung irritant and high concentrations can cause difficulty breathing. Studies have linked short-term exposure to increased asthma symptoms, respiratory illness, more difficulty controlling asthma, and increased visits to emergency departments. In addition, $NO_2$ may be visible as a coloring component of a reddish-brown cloud on high pollution days, especially in conjunction with high ozone levels.

**Sulfur Dioxide**. $SO_2$ is a colorless acid gas with a pungent odor. It has potential to damage materials and it can have health effects at high concentrations. It is produced by the combustion of sulfur-containing fuels, such as oil, coal and diesel. $SO_2$ can irritate lung tissue and increase the risk of acute and chronic respiratory disease.

**Particulate Matter**. Particulate matter refers to a wide range of solid or liquid particles in the atmosphere, including smoke, dust, aerosols, and metallic oxides. Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as $PM_{10}$. $PM_{2.5}$ includes a subgroup of finer particles that have an aerodynamic diameter of 2.5 micrometers or less. Some particulate matter, such as pollen, is naturally occurring. In the SFBAAB most particulate matter is caused by combustion, factories, construction, grading, demolition, agricultural activities, and motor vehicles. Extended exposure to particulate matter can increase the risk of chronic respiratory disease. $PM_{10}$ is of concern because it bypasses the body's natural filtration system more easily than larger particles, and can lodge deep in the lungs. The USEPA and the State of California revised their PM standards several years ago to apply only to these fine particles. $PM_{2.5}$ poses an increased health risk because the particles can deposit deep in the lungs and contain substances that are particularly harmful to human health. Motor vehicles are currently responsible for about half of particulates in the SFBAAB. Wood burning in fireplaces and stoves is another large source of fine particulates.[5]

**Lead**. Pb is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phase-out of leaded gasoline, metal processing is currently the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers.

Twenty years ago, mobile sources were the main contributor to ambient lead concentrations in the air. In the early 1970s, the USEPA set national regulations to gradually reduce the lead content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. The USEPA banned the use of leaded gasoline in highway vehicles in December 1995. As a result of the USEPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector and levels of lead in the air decreased dramatically.

**Toxic Air Contaminants**. In addition to the criteria air pollutants listed above, another group of pollutants, commonly referred to as toxic air contaminants (TACs) or hazardous air pollutants

[5] *Ibid*.

can result in health effects that can be quite severe. Many TACs are confirmed or suspected carcinogens, or are known or suspected to cause birth defects or neurological damage. In addition, many TACs can be toxic at very low concentrations. For some chemicals, such as carcinogens, there are no thresholds below which exposure can be considered risk-free.

Industrial facilities and mobile sources are significant sources of TACs. The electronics industry, including semiconductor manufacturing, has the potential to contaminate both air and water due to the highly toxic chlorinated solvents commonly used in semiconductor production processes. Sources of TACs go beyond industry. Various common urban facilities also produce TAC emissions, such as gasoline stations (benzene), hospitals (ethylene oxide), and dry cleaners (perchloroethylene). Automobile exhaust also contains TACs such as benzene and 1,3-butadiene. Most recently, diesel particulate matter was identified as a TAC by the CARB. Diesel PM differs from other TACs in that it is not a single substance but rather a complex mixture of hundreds of substances. Bay Area Air Quality Management District (BAAQMD) research indicates that mobile source emissions of diesel PM, benzene, and 1,3-butadiene represent a substantial portion of the ambient background risk from TACs in the SFBAAB.[6]

**Greenhouse Gases**. Unlike emissions of criteria and toxic air pollutants, which have local or regional impacts, emissions of greenhouse gases (GHGs) that contribute to global warming or global climate change have a broader, global impact. Global warming is a process whereby GHGs accumulating in the atmosphere contribute to an increase in the temperature of the earth's atmosphere. The principal GHGs contributing to global warming are carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), and fluorinated compounds. These gases allow visible and ultraviolet light from the sun to pass through the atmosphere, but they prevent heat from escaping back out into space. Among the potential implications of global warming are rising sea levels, and adverse impacts to water supply, water quality, agriculture, forestry, and habitats. In addition, global warming may increase electricity demand for cooling, decrease the availability of hydroelectric power, and affect regional air quality and public health. Like most criteria and toxic air pollutants, much of the GHG production comes from motor vehicles.[7] GHG emissions can be reduced to some degree by improved coordination of land use and transportation planning on the city, county, and subregional level, and other measures to reduce automobile use. Energy conservation measures also can contribute to reductions in GHG emissions.

**California Greenhouse Gas Emissions Inventory**. Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the transportation, industrial/manufacturing, utility, residential, commercial and agricultural sectors. In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation. Emissions of $CO_2$ are byproducts of fossil fuel combustion. $CH_4$, a highly potent GHG, results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) is largely associated with agricultural practices and landfills. $N_2O$ is also largely attributable to agricultural practices and soil management. $CO_2$ sinks, or reservoirs, include vegetation and the ocean, which absorb $CO_2$ through sequestration and dissolution, respectively, two of the most common processes of $CO_2$ sequestration.

[6] *Ibid*.
[7] *Ibid*.

California produced 474 million gross metric tons (MMT) of $CO_2$ equivalent ($CO_2e$) averaged over the period from 2002 to 2004.[8] $CO_2e$ is a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the greenhouse effect. This potential, known as the global warming potential (GWP) of a GHG, is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, one ton of $CH_4$ has the same contribution to the greenhouse effect as approximately 23 tons of $CO_2$. Therefore, $CH_4$ is a much more potent GHG than $CO_2$. Expressing emissions in $CO_2e$ takes the contributions of all GHG emissions to the greenhouse effect and converts them to a single unit equivalent to the effect that would occur if only $CO_2$ were being emitted.

Combustion of fossil fuel in the transportation sector was the single largest source of California's GHG emissions in 2002 to 2004, accounting for 38 percent of total GHG emissions in the State. This sector was followed by the electric power sector (including both in-State and out-of-State sources) (18 percent) and the industrial sector (21 percent).[9]

**California Greenhouse Gas Emissions Projections**. The 1990 GHG emissions limit is approximately 430 million metric tons (MMT) $CO_2e$, which must be met in California by 2020 per the requirements of Assembly Bill (AB) 32 (discussed below in the Regulatory Setting). CARB's GHG inventory for all emissions sectors would require an approximate 28 percent reduction in GHG emissions from projected 2020 forecasts to meet the target emissions limit (equivalent to levels in 1990) established in AB 32.[10] The AB 32 Scoping Plan, discussed further below, is CARB's plan for meeting this mandate.

**Odors and Dust**. Other air quality issues of concern in the SFBAAB include nuisance impacts of odors and dust. Objectionable odors may be associated with a variety of pollutants. Common sources of odors include wastewater treatment plants, landfills, composting facilities, refineries and chemical plants. Similarly, nuisance dust may be generated by a variety of sources including quarries, agriculture, grading and construction. Odors rarely have direct health impacts, but they can be very unpleasant and can lead to anger and concern over possible health effects among the public. Each year the BAAQMD receives thousands of citizen complaints about objectionable odors.[11] Dust emissions can contribute to increased ambient concentrations of $PM_{10}$, and can also contribute to reduced visibility and soiling of exposed surfaces.

## 3.2 REGULATORY SETTING

### Federal Regulations

**United States Environmental Protection Agency**. At the federal level, USEPA has been charged with implementing national air quality programs. USEPA's air quality mandates are drawn primarily from the Federal Clean Air Act (FCAA), which was enacted in 1963. The FCAA was amended in 1970, 1977, and 1990.

The FCAA required USEPA to establish primary and secondary National Ambient Air Quality Standards (NAAQS). The FCAA also required each state to prepare an air quality control plan

[8] *Ibid*.
[9] *Ibid*.
[10] *Ibid*.
[11] *Ibid*.

referred to as a State Implementation Plan (SIP). The Federal Clean Air Act Amendments of 1990 (FCAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is periodically modified to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. USEPA has responsibility to review all state SIPs to determine conformation to the mandates of the FCAAA and determine if implementation will achieve air quality goals. If the USEPA determines a SIP to be inadequate, a Federal Implementation Plan (FIP) may be prepared for the nonattainment area that imposes additional control measures. Failure to submit an approvable SIP or to implement the plan within the mandated timeframe may result in sanctions being applied to transportation funding and stationary air pollution sources in the air basin.

**Transportation Conformity**. Transportation conformity is an analysis required under CAA section 176(c) (42 U.S.C. 7506(c)) to ensure that federally supported highway and transit project activities are consistent with the purpose of the State Implementation Plan (SIP). Regional conformity for a given project is analyzed by discussing if the proposed project is included in a conforming Regional Transportation Plan or Transportation Improvement Plan with substantially the same design concept and scope that was used for the regional conformity analysis. Project level conformity is analyzed by discussing if the proposed project would cause localized exceedances of CO, $PM_{2.5}$, and/or $PM_{10}$ standards, or of it would interfere with “timely implementation” of Transportation Control Measures called out in the State Implementation Plan.

## State Regulations

In 1992 and 1993, the CARB requested delegation of authority for the implementation and enforcement of specified New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAPS) to the following local agencies: Bay Area and South Coast Air Quality Management Districts. USEPA's review of the State of California's laws, rules, and regulations showed them to be adequate for the implementation and enforcement of these federal standards, and USEPA granted the delegations as requested.

**California Air Resources Board**. CARB is the agency responsible for coordination and oversight of State and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA), which was adopted in 1988. The CCAA requires that all air districts in the State endeavor to achieve and maintain the California Ambient Air Quality Standards (CAAQS) by the earliest practical date. The act specifies that districts should focus particular attention on reducing the emissions from transportation and area-wide emission sources, and provides districts with the authority to regulate indirect sources. CARB is primarily responsible for developing and implementing air pollution control plans to achieve and maintain the NAAQS. The CARB is primarily responsibility for Statewide pollution sources and produces a major part of the SIP. Local air districts are still relied upon to provide additional strategies for sources under their jurisdiction. The CARB combines this data and submits the completed SIP to USEPA. Other CARB duties include monitoring air quality (in conjunction with air monitoring networks maintained by air pollution control and air quality management districts), establishing CAAQS (which in many cases are more stringent than the NAAQS), determining and updating area designations and maps, and setting emissions standards for new mobile sources, consumer products, small utility engines, and off-road vehicles. The CAAQS and NAAQS are shown in **Table 3-1.**

**TABLE 3-1: STATE AND NATIONAL AMBIENT AIR QUALITY STANDARDS AND ATTAINMENT STATUS FOR THE BAY AREA AIR BASIN**

| Pollutant | Averaging Period | California | | Federal | |
|---|---|---|---|---|---|
| | | Standards | Attainment Status | Standards | Attainment Status |
| Ozone ($O_3$) | 1-hour | 0.09 ppm (180 µg/m$^3$) | Nonattainment | -- | -- |
| | 8-hour | 0.070 ppm (137 µg/m$^3$) | Nonattainment | 0.075 ppm (147 µg/m$^3$) | Nonattainment |
| Respirable Particulate Matter ($PM_{10}$) | 24-hour | 50 µg/m$^3$ | Nonattainment | 150 µg/m$^3$ | Unclassified |
| | Annual Arithmetic Mean | 20 µg/m$^3$ | Nonattainment | -- | -- |
| Fine Particulate Matter ($PM_{2.5}$) | 24-hour | -- | -- | 35 µg/m$^3$ | Nonattainment |
| | Annual Arithmetic Mean | 12 µg/m$^3$ | Nonattainment | 15 µg/m$^3$ | Attainment |
| Carbon Monoxide (CO) | 8-hour | 9.0 ppm (10 mg/m$^3$) | Attainment | 9 ppm (10 mg/m$^3$) | Attainment/ Maintenance |
| | 1-hour | 20 ppm (23 mg/m$^3$) | Attainment | 35 ppm (40 mg/m$^3$) | Attainment/ Maintenance |
| Nitrogen Dioxide ($NO_2$) | Annual Arithmetic Mean | 0.030 ppm (57 µg/m$^3$) | Attainment | 53 ppb (100 µg/m$^3$) /a/ | Attainment |
| | 1-hour | 0.18 ppm (338 µg/m$^3$) | -- | 100 ppb (188 µg/m$^3$) /a/ | Unclassified |
| Sulfur Dioxide ($SO_2$) | 24-hour | 0.04 ppm (105 µg/m$^3$) | Attainment | 0.14 ppm (365 µg/m$^3$) | Attainment |
| | 1-hour | 0.25 ppm (655 µg/m$^3$) | Attainment | 75 ppb (196 µg/m$^3$) | Attainment |
| | Annual Arithmetic Mean | -- | -- | 0.030 ppm (80 µg/m$^3$) | Attainment |
| Lead (Pb) | 30-day average | 1.5 µg/m$^3$ | Attainment | -- | -- |
| | Calendar Quarter | -- | -- | 1.5 µg/m$^3$ | Attainment |
| | Rolling 3-Month Average | -- | -- | 0.15 µg/m$^3$ | -- |
| Visibility Reducing Particles | 8-hour | Extinction coefficient of 0.23 per kilometer | Unclassified | No Federal Standards | |
| Sulfates | 24-hour | 25 µg/m$^3$ | Attainment | | |
| Hydrogen Sulfide | 1-hour | 0.03 ppm (42 µg/m$^3$) | Unclassified | | |
| Vinyl Chloride | 24-hour | 0.01 ppm (26 µg/m$^3$) | No Information Available | | |

/a/ The USEPA strengthened the $NO_2$ standard on January 22, 2010. USEPA has not classified attainment status for the new standards. However, CARB anticipates that the Bay Area Air Basin will be designated as an attainment area for the new $NO_2$ standards. USEPA is expected to issue final designations by January 22, 2012.

"n/a" = not available"—" = not applicable

**SOURCE**: CARB, *Ambient Air Quality Standards*, June 7, 2012. CARB, *Area Designation Maps,* June 23, 2011.

## Local Regulations

**Bay Area Air Quality Management District**. The BAAQMD attains and maintains air quality conditions in the SFBAAB through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The clean air strategy of the BAAQMD includes the preparation of plans for the attainment of ambient air quality standards, adoption and enforcement of rules and regulations concerning sources of air pollution, and issuance of permits for stationary sources of air pollution. The BAAQMD also inspects stationary sources of air pollution and responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements programs and regulations required by the FCAA, FCAAA, and the CCAA.

BAAQMD has jurisdiction over an approximately 5,600-square-mile area of the San Francisco Bay Area. This area includes all of Alameda County, Contra Costa County, Marin County, San Francisco County, San Mateo County, Santa Clara County, and Napa County, the southwestern portion of Solano County and the southern portion of Sonoma County (**Figure 3-1**).

The BAAQMD developed CEQA Guidelines to assist local jurisdictions and lead agencies in complying with the requirements of CEQA regarding potentially adverse impacts to air quality. These CEQA Guidelines were updated in June 2010 to include reference to thresholds of significance adopted by the BAAQMD Board on June 2, 2010. The Guidelines were further updated in May 2011. On March 5, 2012 the 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 of significance were valid on the merits, but found that the adoption of the thresholds of significance was a project under CEQA. The court issued a writ of mandate ordering the BAAQMD to set aside the thresholds of significance and cease dissemination of them until the BAAQMD had complied with CEQA. The BAAQMD has appealed the Alameda County Superior Court's decision. The appeal is currently pending in the Court of Appeal of the State of California, First Appellate District.

In view of the court's order, the BAAQMD no longer recommends that the thresholds of significance from the CEQA Guidelines (updated May 2011) be used as a generally applicable measure of a project's significant air quality impacts. Lead agencies may determine appropriate air quality thresholds of significance based on substantial evidence in the record. Lead agencies may rely on the CEQA Guidelines (updated May 2011) for assistance in calculating air pollution emissions, obtaining information regarding the health impacts of air pollutants, and identifying potential mitigation measures. Lead agencies may continue to rely on the BAAQMD's 1999 thresholds of significance 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.

**BAAQMD Air Quality Plans.** As stated above, the BAAQMD prepares plans to attain ambient air quality standards in the SFBAAB. The BAAQMD prepares ozone attainment plans (OAP) for the national ozone standard and clean air plans (CAP) for the California standard both in coordination with the Metropolitan Transportation Commission (MTC) and the Association of Bay Area Governments (ABAG). With respect to applicable air quality plans, the BAAQMD prepared the *2010 Clean Air Plan* to address nonattainment of the national one-hour ozone standard in the SFBAAB. The purpose of the 2010 Clean Air Plan is to:

1. Update the Bay Area 2005 Ozone Strategy in accordance with the requirements of the California Clean Air Act to implement “all feasible measures” to reduce ozone;
2. Consider the impacts of ozone control measures on particulate matter, air toxics, and greenhouse gases in a single, integrated plan;
3. Review progress in improving air quality in recent years; and
4. Establish emission control measures to be adopted or implemented in the 2009 to 2012 timeframe.

Similarly, the BAAQMD prepared the 2010 Clean Air Plan to address nonattainment of the CAAQS.


LEGEND:

San Francisco Bay Area Air Basin

State of California

APPROX. SCALE
0 75 150
MILES
N

SOURCE: California Air Resources Board, State and Local Air Monitoring Network Plan, October 1998

taha
Van Ness BRT Project
Air Quality Impact Report
taha 2010-025 PARSONS

FIGURE 3-1

SAN FRANCISCO BAY AREA AIR BASIN

## Toxic Air Contaminant Regulations

TACs, or in federal parlance under the FCAA, hazardous air pollutants (HAPs), are pollutants that result in an increase in mortality, a serious illness, or pose a present or potential hazard to human health. Health effects of TACs may include cancer, birth defects, and immune system and neurological damage.

TACs can be separated into carcinogens and noncarcinogens based on the nature of the physiological degradation associated with exposure to the pollutant. For regulatory purposes, carcinogens are assumed to have no safe threshold below
which heath impacts will not occur. Noncarcinogenic TACs differ in that there is a safe level in which it is generally assumed that no negative health impacts would occur. These levels are determined on a pollutant-by-pollutant basis.

It is important to understand that TACs are not considered criteria air pollutants and thus are not specifically addressed through the setting of ambient air quality standards. Instead, the USEPA and CARB regulate HAPs and TACs, respectively, through statutes and regulations that generally require the use of the maximum or best available control technology (MACT and BACT) to limit emissions. These in conjunction with additional rules set forth by the BAAQMD establish the regulatory framework for TACs.

**Federal Hazardous Air Pollutant Program**. Title III of the FCAAA requires the USEPA to promulgate national emissions standards for hazardous air pollutants (NESHAPs). The NESHAP may differ for major sources than for area sources of HAPs (major sources are defined as stationary sources with potential to emit more than 10 tons per year (TPY) of any HAP or more than 25 TPY of any combination of HAPs; all other sources are considered area sources). The emissions standards are to be promulgated in two phases. In the first phase (1992 to 2000), the USEPA developed technology-based emission standards designed to produce the maximum emission reduction achievable. These standards are generally referred to as requiring MACT. These federal rules are also commonly referred to as MACT standards, because they reflect the Maximum Achievable Control Technology. For area sources, the standards may be different, based on generally available control technology. In the second phase (2001 to 2008), the USEPA is required to promulgate health risk–based emissions standards where deemed necessary to address risks remaining after implementation of the technology-based NESHAP standards. The FCAAA required the USEPA to promulgate vehicle or fuel standards containing reasonable requirements that control toxic emissions, at a minimum to benzene and formaldehyde. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1,3-butadiene. In addition, §219 required the use of reformulated gasoline in selected U.S. cities (those with the most severe ozone nonattainment conditions) to further reduce mobile-source emissions.

**Mobile Source Air Toxics (MSAT).** The USEPA issued a Final Rule on Controlling Emissions of Hazardous Air Pollutants from Mobile Sources. 66 FR 17229 (March 29, 2001). This rule was issued under the authority in Section 202 of the CAA. In its rule, USEPA examined the impacts of existing and newly promulgated mobile source control programs, including its: reformulated gasoline program; national low emission vehicle standards; Tier 2 motor vehicle emissions standards and gasoline sulfur control requirements; proposed heavy duty engine and vehicle standards; and on-highway diesel fuel sulfur control requirements. Between 2000 and 2020, FHWA projects that even with a 64 percent increase in vehicle miles traveled (VMT), these programs will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 57 percent to 65 percent, and will reduce on-highway diesel particulate matter emissions by 87 percent. As a result, USEPA concluded that no further motor vehicle emissions standards or fuel standards were necessary to further control MSATs. The agency is preparing another rule under authority of CAA Section 202(l) that will address these issues and could make adjustments to the full 21 and the primary six MSATs.

The Federal Highway Administration (FHWA) published project-level MSAT assessment guidance in February 2006 as an air quality analysis tool for transportation projects.[12] MSATs are a subset of the 188 air toxics defined by the CAA. The MSATs are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

**State Toxic Air Contaminant Programs**. California regulates TACs primarily through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588). The Tanner Act sets forth a formal procedure for CARB to designate substances as TACs. This includes research, public participation, and scientific peer review before CARB can designate a substance as a TAC. To date, CARB has identified over 21 TACs, and adopted the USEPA's list of HAPs as TACs. Most recently, diesel exhaust particulate was added to the CARB list of TACs. Once a TAC is identified, CARB's then adopts an Airborne Toxics Control Measure for sources that emit that particular TAC. If there is a safe threshold for a substance at which there is no toxic effect, the control measure must reduce exposure below that threshold. If there is no safe threshold, the measure must incorporate TBACT to minimize emissions. None of the TACs identified by CARB have a safe threshold.

The Hot Spots Act requires that existing facilities that emit toxic substances above specified level:

1. Prepare a toxic emission inventory;
2. Prepare a risk assessment if emissions are significant;
3. Notify the public of significant risk levels; and
4. Prepare and implement risk reduction measure.

CARB has adopted diesel exhaust control measures and more stringent emission standards for various on-road mobile sources of emissions, including transit buses, and off-road diesel equipment (e.g., tractors, generators). In February 2000, CARB adopted a new public transit bus fleet rule and emission standards for new urban buses. These new rules and standards provide for more stringent emission standards for some new urban bus engines beginning with 2002 model year engines, zero-emission bus demonstration and purchase requirements applicable to transit agencies, and reporting requirements with which transit agencies must demonstrate compliance with the urban transit bus fleet rule. Milestones include the low sulfur diesel fuel requirement, and tighter emission standards for heavy-duty diesel trucks (2007) and off-road diesel equipment (2011) nationwide. Over time, the replacement of older vehicles will result in a vehicle fleet that produces substantially less TACs than under current conditions. Mobile-source emissions of TACs (e.g., benzene, 1-3-butadiene, diesel PM) have been reduced significantly over the last decade, and will be reduced further in California through a progression of regulatory measures (e.g., Low Emission Vehicle/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With implementation of CARB's Risk Reduction Plan, it is expected that diesel PM concentrations will be reduced by 75 percent in 2010 and 85

[12]FHWA, *Interim Guidance on Air Toxic Analysis in NEPA Documents*, February 3, 2006.

percent in 2020 from the estimated year 2000 level.[13] Adopted regulations are also expected to continue to reduce formaldehyde emissions from cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced.

**Bay Area Air Quality Management District**. The BAAQMD has regulated TACs since the 1980s. At the local level, air pollution control or management districts may adopt and enforce CARB's control measures. Under BAAQMD Regulation 2-1 (General Permit Requirements), Regulation 2-2 (New Source Review), and Regulation 2-5 (New Source Review), all nonexempt sources that possess the potential to emit TACs are required to obtain permits from BAAQMD. Permits may be granted to these operations if they are constructed and operated in accordance with applicable regulations, including new source review standards and air toxics control measures. The BAAQMD limits emissions and public exposure to TACs through a number of programs. The BAAQMD prioritizes TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions and the proximity of the facilities to sensitive receptors.

Naturally occurring asbestos (NOA) was identified as a TAC in 1986 by CARB. NOA is located in many parts of California and is commonly associated with ultramafic rocks, according to the California Department of Geology's special publication titled Guidelines for Geologic Investigations of Naturally Occurring Asbestos in California. BAAQMD's NOA program requires that the applicable notification forms from the Air District's website be submitted by qualifying operations in accordance with the procedures detailed in the air toxics control measures (ATCM) Inspection Guidelines Policies and Procedures. The Lead Agency shall reference BAAQMD's ATCM Policies and Procedures to determine which NOA Notification Form is applicable to the proposed project (NOA Notification Forms). The ATCM requires regulated operations engaged in road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas where NOA is likely to be found, to employ the best available dust mitigation measures to reduce and control dust emissions.

In addition, the BAAQMD has adopted Regulation 11, Rules 2 which addresses asbestos demolition renovation, manufacturing, and standards for asbestos containing serpentine (Appendix F). The purpose of Regulation 11, Rule 2 is to control emissions of asbestos to the atmosphere during demolition, renovation, milling and manufacturing and establish appropriate waste disposal procedures.[14] Some of the regulations listed in Regulation 11, Rule 2 include:

- Visible Emissions: There shall be no visible emissions to the outside air from any asbestos mill or from any operation involving the demolition, renovation, removal, manufacture or fabrication of any product containing asbestos.
- Demolition, Renovation, and Removal: To prevent emissions from asbestos containing material, a person responsible for scheduled, nonscheduled, or emergency demolition, renovation, or removal of any building elements containing any amount of RACM shall use the procedures specified in subsections 303.1 through 303.13. This shall not apply to maintenance or decontamination procedures where no removal takes place.
- Waste Disposal: To prevent emissions from asbestos-containing material, a person responsible for the collection, processing (including incineration and conversion), packaging, transporting, or disposition of any asbestos-containing waste material which is generated by manufacturing; fabricating; scheduled, nonscheduled, or emergency

[13]BAAQMD, *CEQA Air Quality Guidelines*, June 2010.
[14]BAAQMD, *Regulation 11, Rule 2*, October 1998.

demolition or renovation, whether notified or not; spraying operations; or asbestos milling, shall use procedures specified in Regulation 11, Rule 2, Standard 304.

- Waste Disposal Sites: There shall be no visible emissions to the outside air from a waste disposal site where asbestos-containing waste material has been or is being deposited.

## Federal Greenhouse Gas Regulations

**Supreme Court Ruling**. The USEPA is the federal agency responsible for implementing the CAA. The U.S. Supreme Court ruled in its decision in *Massachusetts et al. v. Environmental Protection Agency* et al. ([2007] 549 U.S. 05-1120), issued on April 2, 2007, that $CO_2$ is an air pollutant as defined under the CAA, and that USEPA has the authority to regulate emissions of GHGs.

**USEPA Actions**. In response to the mounting issue of climate change, USEPA has taken actions to regulate, monitor, and potentially reduce GHG emissions.

**Mandatory Greenhouse Gas Reporting Rule**. On September 22, 2009, USEPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the United States. In general, this national reporting requirement will provide USEPA with accurate and timely GHG emissions data from facilities that emit 25,000 metric tons or more of $CO_2$ per year. This publically available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial greenhouse gases along with vehicle and engine manufacturers will report at the corporate level. An estimated 85 percent of the total U.S. GHG emissions, from approximately 10,000 facilities, are covered by this final rule.[15]

**Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act**. On April 23, 2009, USEPA published their Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the CCA (Endangerment Finding) in the Federal Register. The Endangerment Finding is based on Section 202(a) of the CAA, which states that the Administrator (of USEPA) should regulate and develop standards for "emission[s] of air pollution from any class of classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." The proposed rule addresses Section 202(a) in two distinct findings. The first addresses whether or not the concentrations of the six key GHGs (i.e., $CO_2$, $CH_4$, $N_2O$, hydrofluorocarbons [HFCs], perflurorocarbons [PFCs], and sulfur hexafluoride [$SF_6$]) in the atmosphere threaten the public health and welfare of current and future generations. The second addresses whether or not the combined emissions of GHGs from new motor vehicles and motor vehicle engines contribute to atmospheric concentrations of GHGs and therefore the threat of climate change.

The Administrator proposed the finding that atmospheric concentrations of GHGs endanger the public health and welfare within the meaning of Section 202(a) of the CCA. The evidence supporting this finding consists of human activity resulting in "high atmospheric levels" of GHG emissions, which are very likely responsible for increases in average temperatures and other climatic changes. Furthermore, the observed and projected results of climate change (e.g., higher likelihood of heat waves, wild fires, droughts, sea level rise, and higher intensity storms)

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[15] BAAQMD, *CEQA Air Quality Guidelines*, June 2010.

are a threat to the public health and welfare. Therefore, GHGs were found to endanger the public health and welfare of current and future generations.

The Administrator also proposed the finding that GHG emissions from new motor vehicles and motor vehicle engines are contributing to air pollution, which is endangering public health and welfare. The proposed finding cites that in 2006, motor vehicles were the second largest contributor to domestic GHG emissions (24 percent of total) behind electricity generation. Furthermore, in 2005, the U.S. was responsible for 18 percent of global GHG emissions.[16] Therefore, GHG emissions from motor vehicles and motor vehicle engines were found to contribute to air pollution that endangers public health and welfare.

## State Greenhouse Gas Regulations

**Assembly Bill 1493 (2002)**. AB 1493 requires that CARB develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of greenhouse gases emitted by passenger vehicles and light-duty trucks and other vehicles determined by CARB to be vehicles whose primary use is noncommercial personal transportation in the State."

To meet the requirements of AB 1493, in 2004 CARB approved amendments to the California Code of Regulations (CCR) adding GHG emissions standards to California's existing standards for motor vehicle emissions. Amendments to CCR Title 13, Sections 1900 and 1961 (13 CCR 1900, 1961), and adoption of Section 1961.1 (13 CCR 1961.1) require automobile manufacturers to meet fleet-average GHG emissions limits for all passenger cars, light-duty trucks within various weight criteria, and medium-duty passenger vehicle weight classes (i.e., any medium-duty vehicle with a gross vehicle weight rating less than 10,000 pounds that is designed primarily for the transportation of persons), beginning with the 2009 model year. For passenger cars and light duty trucks with a loaded vehicle weight (LVW) of 3,750 pounds or less, the GHG emission limits for the 2016 model year are approximately 37 percent lower than the limits for the first year of the regulations, the 2009 model year. For light-duty trucks with LVW of 3,751 pounds to gross vehicle weight (GVW) of 8,500 pounds, as well as medium-duty passenger vehicles, GHG emissions would be reduced approximately 24 percent between 2009 and 2016.

In December 2004, a group of car dealerships, automobile manufacturers, and trade groups representing automobile manufacturers filed suit against CARB to prevent enforcement of 13 CCR Sections 1900 and 1961 as amended by AB 1493 and 13 CCR 1961.1 (*Central Valley Chrysler-Jeep et al. v. Catherine E. Witherspoon, in Her Official Capacity as Executive Director of the California Air Resources Board, et al.*). The auto-makers' suit in the U.S. District Court for the Eastern District of California, contended California's implementation of regulations that, in effect, regulate vehicle fuel economy violates various federal laws, regulations, and policies.

On December 12, 2007, the Court found that if California receives appropriate authorization from USEPA (the last remaining factor in enforcing the standard), these regulations would be consistent with and have the force of federal law, thus, rejecting the automakers' claim. This authorization to implement more stringent standards in California was requested in the form of a CAA Section 209, subsection (b) waiver in 2005. Since that time, USEPA failed to act on granting California authorization to implement the standards. Governor Schwarzenegger and Attorney General Edmund G. Brown filed suit against USEPA for the delay. In December 2007, USEPA Administrator Stephen Johnson denied California's request for the waiver to implement

[16] *Ibid*.

AB 1493. Johnson cited the need for a national approach to reducing GHG emissions, the lack of a "need to meet compelling and extraordinary conditions", and the emissions reductions that would be achieved through the Energy Independence and Security Act of 2007 as the reasoning for the denial.

The State of California filed suit against USEPA for its decision to deny the CAA waiver. The recent change in presidential administration directed USEPA to reexamine its position for denial of California's CAA waiver and for its past opposition to GHG emissions regulation. California received the waiver, notwithstanding the previous denial by USEPA, on June 30, 2009.

**Assembly Bill 32 (2006), California Global Warming Solutions Act**. AB 32 (Chapter 488, Statutes of 2006), the California Global Warming Solutions Act of 2006, which enacted Sections 38500–38599 of the California Health and Safety Code. AB 32 requires the reduction of Statewide GHG emissions to 1990 levels by 2020. This equates to an approximate 15 percent reduction compared to existing Statewide GHG emission levels or a 30 percent reduction from projected 2020 "business as usual" emission levels. The required reduction will be accomplished through an enforceable Statewide cap on GHG emissions.

To effectively implement the Statewide cap on GHG emissions, AB 32 directs CARB to develop and implement regulations that reduce Statewide GHG emissions generated by stationary sources. Specific actions required of CARB under AB 32 include adoption of a quantified cap on GHG emissions that represent 1990 emissions levels along with disclosing how the cap was quantified, institution of a schedule to meet the emissions cap, and development of tracking, reporting, and enforcement mechanisms to ensure that the State achieves the reductions in GHG emissions needed to meet the cap.

In addition, AB 32 states that if any regulations established under AB 1493 (2002) cannot be implemented then CARB is required to develop additional, new regulations to control GHG emissions from vehicles.

**AB 32 Climate Change Scoping Plan**. In December 2008, CARB adopted its *Climate Change Scoping Plan*, which contains the main strategies California will implement to achieve reduction of approximately 169 MMT of $CO_2e$, or approximately 30 percent from the State's projected 2020 emission level of 596 MMT of $CO_2e$ under a business-as-usual scenario (this is a reduction of 42 MMT $CO_2e$, or almost 10 percent, from 2002 to 2004 average emissions). The *Scoping Plan* also includes CARB-recommended GHG reductions for each emissions sector of the State's GHG inventory. The Scoping Plan calls for the largest reductions in GHG emissions to be achieved by implementing the following measures and standards:

- improved emissions standards for light-duty vehicles (estimated reductions of 31.7 MMT $CO_2e$)
- the Low-Carbon Fuel Standard (15.0 MMT $CO_2e$)
- energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems (26.3 MMT $CO_2e$)
- a renewable portfolio standard for electricity production (21.3 MMT $CO_2e$).

CARB has not yet determined what amount of GHG reductions it recommends from local government operations; however, the *Scoping Plan* does state that land use planning and urban growth decisions will play an important role in the State's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate population growth and the changing needs of their jurisdictions( meanwhile, CARB is also developing an additional protocol for community emissions). CARB further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. The *Scoping Plan* states that the ultimate GHG reduction assignment to local government operations is to be determined (CARB 2008). With regard to land use planning, the *Scoping Plan* expects approximately 5.0 MMT $CO_2$e will be achieved associated with implementation of SB 375, which is discussed further below.

**SBX1-2 (2011).** SBX1-2 requires that 33 percent of the state's energy comes from renewable sources by 2020. SBX1-2 requires California's electric utilities to reach the 33 percent goal in three compliance periods. By December 31, 2013, the utilities must procure renewable energy products equal to 20 percent of retail sales. By December 31, 2016, utilities must procure renewable energy products equal to 25 percent of retail sales, and by December 31, 2020, utilities must procure renewable energy products equal to 33 percent of retail sales and maintain that percentage in following years.

**Senate Bill 1368 (2006)**. SB 1368 is the companion bill of AB 32 required the California Public Utilities Commission (PUC) to establish a greenhouse gas emission performance standard for baseload generation from investor owned utilities by February 1, 2007. The California Energy Commission (CEC) established a similar standard for local publicly owned utilities. These standards cannot exceed the greenhouse gas emission rate from a baseload combined-cycle natural gas fired plant. The legislation further requires that all electricity provided to California, including imported electricity, must be generated from plants that meet the standards set by the PUC and CEC.

**Senate Bill 97 (2007)**. SB 97 2007 (Chapter 185, Statutes of 2007; Public Resources Code, Sections 21083.05 and 21097), acknowledges climate change is a prominent environmental issue that requires analysis under CEQA. This bill directed the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the California Resources Agency by July 1, 2009 guidelines for mitigating GHG emissions or the effects of GHG emissions, as required by CEQA. The California Resources Agency is required to certify and adopt these guidelines by January 1, 2010.

This bill also removes, both retroactively and prospectively, as legitimate causes of action in litigation any claim of inadequate CEQA analysis of effects of GHG emissions associated with environmental review for projects funded by the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006 (Proposition 1B) or the Disaster Preparedness and Flood Protection Bond Act of 2006 (Proposition 1E). This provision will be repealed by provision of law on January 1, 2010 at that time such projects, if any remain unapproved, will no longer enjoy protection against litigation claims based on failure to adequately address issues related to GHG emissions.

**Senate Bill 375 (2008)**. SB 375, signed in September 2008, aligns regional transportation planning efforts, regional GHG reduction targets, and land use and housing allocation. As part of the alignment, SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS) which prescribes land use allocation in that MPO's Regional Transportation Plan (RTP). The CARB, in consultation with MPOs, is required to provide each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in the region for the years 2020 and 2035. These reduction targets will be updated every eight years but can be updated every 4 years if advancements in emissions technologies affect the reduction strategies to achieve the targets. The CARB is also charged with reviewing each MPO's SCS or APS for consistency with its assigned GHG emission reduction targets. If MPOs do not meet the GHG reduction targets, transportation projects located in the MPO boundaries would not be eligible for funding programmed after January 1, 2012.

This bill also extends the minimum time period for the Regional Housing Needs Allocation (RNHA) cycle from five years to eight years for local governments located in an MPO that meets certain requirements. City or County land use policies (e.g., General Plans) are not required to be consistent with the RTP including associated SCSs or APSs. Qualified projects consistent with an approved SCS or APS and categorized as "transit priority projects" would receive incentives under new provisions of CEQA.

**Executive Order S-3-05 (2005)**. Executive Order S-3-05 proclaimed California is vulnerable to the impacts of climate change. The executive order declared increased temperatures could reduce snowpack in the Sierra Nevada Mountains, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the executive order established targets for total GHG emissions which include reducing GHG emissions to the 2000 level by 2010, to the 1990 level by 2020, and to 80 percent below the 1990 level by 2050.

The executive order also directed the secretary of the California Environmental Protection Agency to coordinate a multiagency effort to reduce GHG emissions to the target levels. The secretary will submit biannual reports to the governor and legislature describing progress made toward reaching the emission targets; impacts of global warming on California's resources; and mitigation and adaptation plans to combat impacts of global warming.

To comply with the executive order, the Secretary of the California Environmental Protection Agency created the California Climate Action Team which is made up of members from various State agencies and commissions. The California Climate Action Team released its first report in March 2006 of which proposed achieving the GHG emissions targets by building on voluntary actions of California businesses and actions by local governments and communities along with continued implementation of State incentive and regulatory programs.

**Executive Order S-13-08**. Executive Order S-13-08 directed California to develop methods for adapting to climate change through preparation of a Statewide plan. The executive order directs OPR, in cooperation with the California Resources Agency (CRA), to provide land use planning guidance related to sea level rise and other climate change impacts by May 30, 2009. The order also directs the CRA to develop a State Climate Adaptation Strategy by June 30, 2009 and to convene an independent panel to complete the first California Sea Level Rise Assessment Report. The assessment report is required to be completed by December 1, 2010 and required to include the following four items:

1. Project the relative sea level rise specific to California by taking into account issues such as coastal erosion rates, tidal impacts, El Niño and La Niña events, storm surge, and land subsidence rates;
2. Identify the range of uncertainty in selected sea level rise projections;
3. Synthesize existing information on projected sea level rise impacts to State infrastructure (e.g., roads, public facilities, beaches), natural areas, and coastal and marine ecosystems; and
4. Discuss future research needs relating to sea level rise in California.

**Executive Order S-1-07**. Executive Order S-1-07 proclaimed the transportation sector as the main source of GHG emissions in California. The executive order proclaims the transportation sector accounts for over 40 percent of Statewide GHG emissions. The executive order also establishes a goal to reduce the carbon intensity of transportation fuels sold in California by a minimum of 10 percent by 2020.

In particular, the executive order established a Low-Carbon Fuel Standard (LCFS) and directed the Secretary for Environmental Protection to coordinate the actions of the CEC, the CARB, the University of California, and other agencies to develop and propose protocols for measuring the "life-cycle carbon intensity" of transportation fuels. This analysis supporting development of the protocols was included in the State Implementation Plan for alternative fuels (*State Alternative Fuels Plan* adopted by CEC on December 24, 2007) and was submitted to CARB for consideration as an "early action" item under AB 32. The CARB adopted the LCFS on April 23, 2009.

### Local Greenhouse Gas Regulations

**Bay Area Air Quality Management District Climate Protection Program**. The BAAQMD established a climate protection program to reduce pollutants that contribute to global climate change and affect air quality in the SFBAAB. The climate protection program includes measures that promote energy efficiency, reduce vehicle miles traveled, and develop alternative sources of energy all of which assist in reducing emissions of GHG and in reducing air pollutants that affect the health of residents. BAAQMD also seeks to support current climate protection programs in the region and to stimulate additional efforts through public education and outreach, technical assistance to local governments and other interested parties, and promotion of collaborative efforts among stakeholders.

## 3.3 EXISTING AIR QUALITY

### 3.3.1 Air Pollution Climatology

The SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys, and bays, which distort normal wind flow patterns. The climate is dominated by the strength and location of a semi-permanent, subtropical high pressure cell. During the summer, the Pacific high pressure cell is centered over the northeastern Pacific Ocean resulting in stable meteorological conditions and a steady northwesterly wind flow. Upwelling of cold ocean water from below to the surface because of the northwesterly flow produces a band of cold water off the California coast. The cool and moisture-laden air approaching the coast from the Pacific Ocean is further cooled by the presence of the cold water band resulting in condensation and the presence of fog and stratus clouds along the Northern California coast. Generally in the winter, the Pacific high weakens and shifts southward, winds tend to flow offshore, upwelling ceases and storms occur. During the winter rainy periods, inversions (layers of warmer air over colder air; see below) are weak or nonexistent, winds are usually moderate and air pollution potential is low. The Pacific high does periodically become dominant, bringing strong inversions, light winds and high pollution potential.

#### Topography

The topography of the SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys and bays. This complex terrain, especially the higher elevations, distorts the normal wind flow patterns in the SFBAAB. The greatest distortion occur when low-level inversions are present and the air beneath the inversion flows independently of air above the inversion, a condition that is common in the summer time.

The only major break in California's Coast Range occurs in the SFBAAB. Here the Coast Range splits into western and eastern ranges. Between the two ranges lies San Francisco Bay. The gap in the western coast range is known as the Golden Gate and the gap in the eastern coast range is the Carquinez Strait. These gaps allow air to pass into and out of the SFBAAB and the Central Valley.

**Wind Patterns**

During the summer, winds flowing from the northwest are drawn inland through the Golden Gate and over the lower portions of the San Francisco Peninsula. Immediately south of Mount Tamalpais, the northwesterly winds accelerate considerably and come more directly from the west as they stream through the Golden Gate. This channeling of wind through the Golden Gate produces a jet that sweeps eastward and splits off to the northwest toward Richmond and to the southwest toward San Jose when it meets the East Bay hills.

Wind speeds may be strong locally in areas where air is channeled through a narrow opening, such as the Carquinez Strait, the Golden Gate or the San Bruno gap. For example, the average wind speed at San Francisco International Airport in July is about 17 knots (from 3 p.m. to 4 p.m.), compared with only 7 knots at San Jose and less than 6 knots at the Farallon Islands. The air flowing in from the coast to the Central Valley, called the sea breeze, begins developing at or near ground level along the coast in late morning or early afternoon. As the day progresses, the sea breeze layer deepens and increases in velocity while spreading inland. The depth of the sea breeze depends in large part upon the height and strength of the inversion. If the inversion is low and strong, and hence stable, the flow of the sea breeze will be inhibited and stagnant conditions are likely to result.

In the winter, the SFBAAB frequently experiences stormy conditions with moderate to strong winds, as well as periods of stagnation with very light winds. Winter stagnation episodes are characterized by nighttime drainage flows in coastal valleys. Drainage is a reversal of the usual daytime air-flow patterns; air moves from the Central Valley toward the coast and back down toward the Bay from the smaller valleys within the SFBAAB.

**Temperature**

Summertime temperatures in the SFBAAB are determined in large part by the effect of differential heating between land and water surfaces. Because land tends to heat up and cool off more quickly than water, a large-scale gradient (differential) in temperature is often created between the coast and the Central Valley, and small-scale local gradients are often produced along the shorelines of the ocean and bays. The temperature gradient near the ocean is also exaggerated, especially in summer, because of the upwelling of cold ocean bottom water along the coast. On summer afternoons the temperatures at the coast can be 35ºF cooler than temperatures 15 to 20 miles inland. At night this contrast usually decreases to less than 10º.

In the winter, the relationship of minimum and maximum temperatures is reversed. During the daytime the temperature contrast between the coast and inland areas is small, whereas at night the variation in temperature is large.

**Precipitation**

The SFBAAB is characterized by moderately wet winters and dry summers. Winter rains account for about 75 percent of the average annual rainfall. The amount of annual precipitation can vary greatly from one part of the SFBAAB to another even within short distances. In general, total annual rainfall can reach 40 inches in the mountains, but it is often less than 16 inches in sheltered valleys.

During rainy periods, ventilation (rapid horizontal movement of air and injection of cleaner air) and vertical mixing are usually high, and thus pollution levels tend to be low. However, frequent dry periods do occur during the winter where mixing and ventilation are low and pollutant levels build up.

**Air Pollution Potential**

The potential for high pollutant concentrations developing at a given location depends upon the quantity of pollutants emitted into the atmosphere in the surrounding area or upwind, and the ability of the atmosphere to disperse the contaminated air. The topographic and climatological factors discussed above influence the atmospheric pollution potential of an area. Atmospheric pollution potential, as the term is used here, is independent of the location of emission sources and is instead a function of factors described below.

**Wind Circulation**

Low wind speed contributes to the buildup of air pollution because it allows more pollutants to be emitted into the air mass per unit of time. Light winds occur most frequently during periods of low sun (fall and winter, and early morning) and at night. These are also periods when air pollutant emissions from some sources are at their peak, namely, commute traffic (early morning) and wood burning appliances (nighttime). The problem can be compounded in valleys, when weak flows carry the pollutants upvalley during the day, and cold air drainage flows move the air mass down-valley at night. Such restricted movement of trapped air provides little opportunity for ventilation and leads to buildup of pollutants to potentially unhealthful levels. Wind-roses provide useful information for communities that contain industry, landfills or other potentially odorous or noxious land uses. Each wind-rose diagram provides a general indication of the proportion of time that winds blow from each compass direction. The longer the vector length, the greater the frequency of wind occurring from that direction. Such information may be particularly useful in planning buffer zones. For example, sensitive receptors such as residential developments, schools or hospitals are inappropriate uses immediately downwind from facilities that emit toxic or odorous pollutants, unless adequate separation is provided by a buffer zone. Caution should be taken in using wind-roses in planning and environmental review processes. A site on the opposite side of a hill or tall building, even a short distance from a meteorological monitoring station, may experience a significant difference in wind pattern. Consult BAAQMD meteorologists if more detailed wind circulation information is needed.

**Inversions**

An inversion is a layer of warmer air over a layer of cooler air. Inversions affect air quality conditions significantly because they influence the mixing depth, i.e., the vertical depth in the atmosphere available for diluting air contaminants near the ground. The highest air pollutant concentrations in the SFBAAB generally occur during inversions.

There are two types of inversions that occur regularly in the SFBAAB. One is more common in the summer and fall, while the other is most common during the winter. The frequent occurrence of elevated temperature inversions in summer and fall months acts to cap the mixing depth, limiting the depth of air available for dilution. Elevated inversions are caused by subsiding air from the subtropical high pressure zone, and from the cool marine air layer that is drawn into the SFBAAB by the heated low pressure region in the Central Valley.

The inversions typical of winter, called radiation inversions, are formed as heat quickly radiates from the earth's surface after sunset, causing the air in contact with it to rapidly cool. Radiation inversions are strongest on clear, low-wind, cold winter nights, allowing the build-up of such pollutants as carbon monoxide and particulate matter. When wind speeds are low, there is little mechanical turbulence to mix the air, resulting in a layer of warm air over a layer of cooler air next to the ground. Mixing depths under these conditions can be as shallow as 50 to 100 meters, particularly in rural areas. Urban areas usually have deeper minimum mixing layers because of heat island effects and increased surface roughness. During radiation inversions downwind transport is slow, the mixing depths are shallow, and turbulence is minimal, all factors which contribute to ozone formation.

Although each type of inversion is most common during a specific season, either inversion mechanism can occur at any time of the year. Sometimes both occur simultaneously. Moreover, the characteristics of an inversion often change throughout the course of a day. The terrain of the SFBAAB also induces significant variations among subregions.

**Solar Radiation**

The frequency of hot, sunny days during the summer months in the SFBAAB is another important factor that affects air pollution potential. It is at the higher temperatures that ozone is formed. In the presence of ultraviolet sunlight and warm temperatures, reactive organic gases and oxides of nitrogen react to form secondary photochemical pollutants, including ozone.

Because temperatures in many of the SFBAAB inland valleys are so much higher than near the coast, the inland areas are especially prone to photochemical air pollution. In late fall and winter, solar angles are low, resulting in insufficient ultraviolet light and warming of the atmosphere to drive the photochemical reactions. Ozone concentrations do not reach significant levels in the SFBAAB during these seasons.

**Sheltered Terrain**

The hills and mountains in the SFBAAB contribute to the high pollution potential of some areas. During the day, or at night during windy conditions, areas in the lee sides of mountains are sheltered from the prevailing winds, thereby reducing turbulence and downwind transport. At night, when wind speeds are low, the upper atmospheric layers are often decoupled from the surface layers during radiation conditions. If elevated terrain is present, it will tend to block pollutant transport in that direction. Elevated terrain also can create a recirculation pattern by inducing upvalley air flows during the day and reverse downvalley flows during the night, allowing little inflow of fresh air.

The areas having the highest air pollution potential tend to be those that experience the highest temperatures in the summer and the lowest temperatures in the winter. The coastal areas are exposed to the prevailing marine air, creating cooler temperatures in the summer, warmer temperatures in winter, and stratus clouds all year. The inland valleys are sheltered from the marine air and experience hotter summers and colder winters. Thus, the topography of the inland valleys creates conditions conducive to high air pollution potential.

**Pollution Potential Related to Emissions**

Although air pollution potential is strongly influenced by climate and topography, the air pollution that occurs in a location also depends upon the amount of air pollutant emissions in the surrounding area or transported from more distant places. Air pollutant emissions generally are highest in areas that have high population densities, high motor vehicle use and/or industrialization. These contaminants created by photochemical processes in the atmosphere, such as ozone, may result in high concentrations many miles downwind from the sources of their precursor chemicals.

### 3.3.2 Local Climate

The peninsula region extends from northwest of San Jose to the Golden Gate. The Santa Cruz Mountains run up the center of the peninsula, with elevations exceeding 2000 feet at the southern end, decreasing to 500 feet in South San Francisco. Coastal towns experience a high incidence of cool, foggy weather in the summer. Cities in the southeastern peninsula experience warmer temperatures and fewer foggy days because the marine layer is blocked by the ridgeline to the west. San Francisco lies at the northern end of the peninsula. Because most of San Francisco's topography is below 200 feet, marine air is able to flow easily across most of the city, making its climate cool and windy.

The blocking effect of the Santa Cruz Mountains results in variations in summertime maximum temperatures in different parts of the peninsula. For example, in coastal areas and San Francisco the mean maximum summer temperatures are in the mid-60's, while in Redwood City the mean maximum summer temperatures are in the low-80's. Mean minimum temperatures during the winter months are in the high-30’s to low-40’s on the eastern side of the Peninsula and in the low 40’s on the coast.

Two important gaps in the Santa Cruz Mountains occur on the peninsula. The larger of the two is the San Bruno Gap, extending from Fort Funston on the ocean to the San Francisco Airport. Because the gap is oriented in the same northwest to southeast direction as the prevailing winds, and because the elevations along the gap are less than 200 feet, marine air is easily able to penetrate into the bay. The other gap is the Crystal Springs Gap, between Half Moon Bay and San Carlos. As the sea breeze strengthens on summer afternoons, the gap permits maritime air to pass across the mountains, and its cooling effect is commonly seen from San Mateo to Redwood City.

Annual average wind speeds range from 5 to 10 mph throughout the peninsula, with higher wind speeds usually found along the coast. Winds on the eastern side of the peninsula are often high in certain areas, such as near the San Bruno Gap and the Crystal Springs Gap. The prevailing winds along the peninsula's coast are from the west, although individual sites can show significant differences. For example, Fort Funston in western San Francisco shows a southwest wind pattern while Pillar Point in San Mateo County shows a northwest wind pattern. On the east side of the mountains winds are generally from the west, although wind patterns in this area are often influenced greatly by local topographic features.

Air pollution potential is highest along the southeastern portion of the peninsula. This is the area most protected from the high winds and fog of the marine layer. Pollutant transport from upwind sites is common. In the southeastern portion of the peninsula, air pollutant emissions are relatively high due to motor vehicle traffic as well as stationary sources. At the northern end of the peninsula in San Francisco, pollutant emissions are high, especially from motor vehicle congestion. Localized pollutants, such as carbon monoxide, can build up in "urban canyons." Winds are generally fast enough to carry the pollutants away before they can accumulate.

Within the proposed project site and its vicinity, the average wind speed, as recorded at the San Francisco/International Airport Wind Monitoring Station, is approximately 10.3 miles per hour. Wind in the vicinity of the proposed project site predominately blows from the northwest.

The annual average temperature in the proposed project area, as recorded at the San Francisco Mission Dolores Station, is approximately 57.3°F. The proposed project area experiences an average winter temperature of approximately 52.3°F and an average summer temperature of approximately 60.0°F. Total precipitation in the proposed project area averages approximately 21.1 inches annually. Precipitation occurs mostly during the winter and relatively infrequently during the summer.[17]

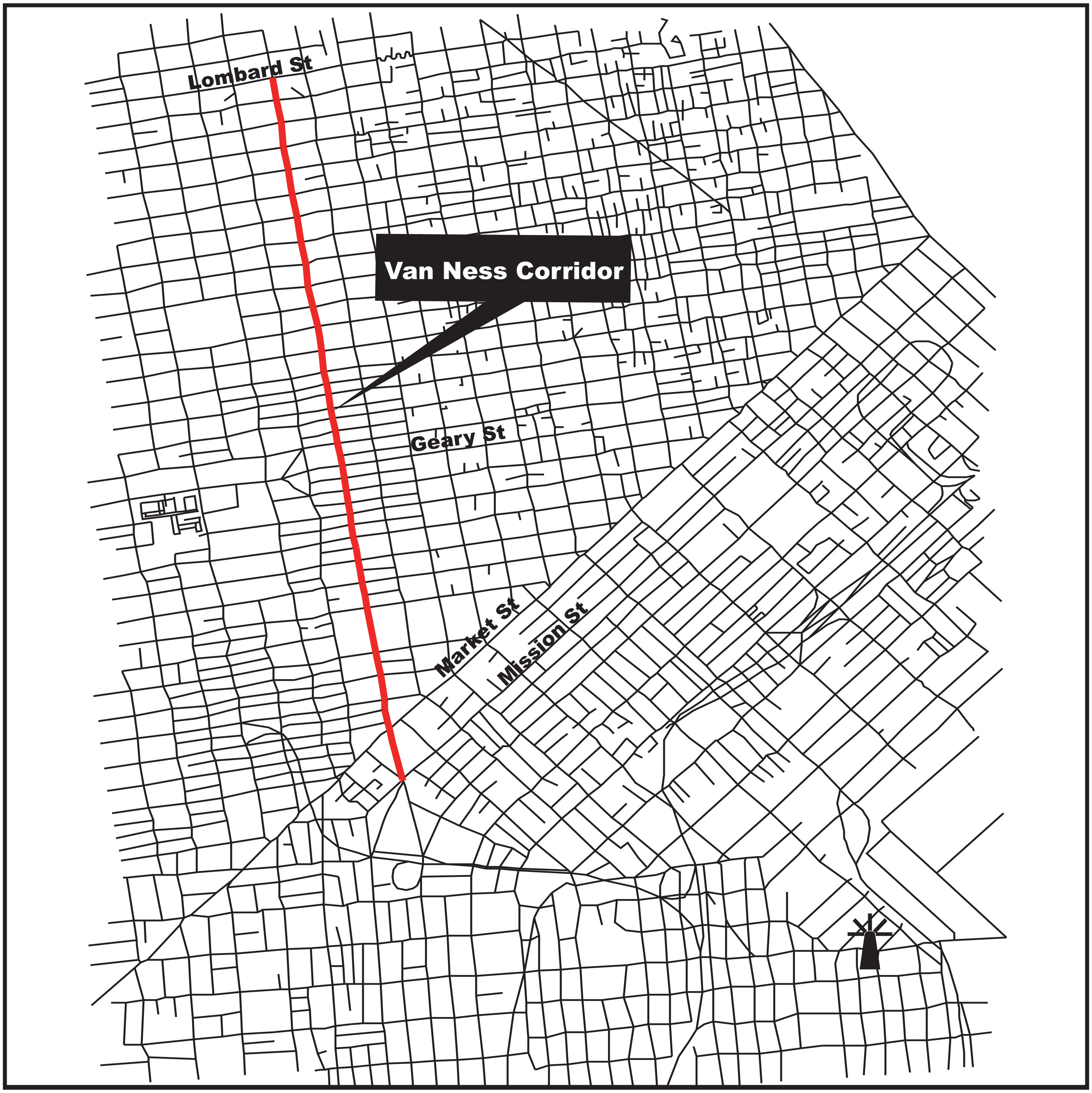
### 3.3.3 Air Monitoring Data

BAAQMD monitors air quality conditions at 23 locations throughout the Bay Area. The nearest air monitoring station to the proposed project site is the San Francisco Arkansas Street Monitoring Station (**Figure 3-2**). The Arkansas Street Monitoring Station is approximately 1.2 miles from the intersection of Van Ness Avenue and Mission Street, and 2.8 miles from the intersection of Van Ness Avenue and Lombard Street. The Arkansas Street Monitoring Station is representative of air quality conditions throughout the BRT corridor. Historical data from the Arkansas Street Monitoring Station was used to characterize existing conditions within the vicinity of the proposed project area and to establish a baseline for estimating future conditions with and without the proposed project. A summary of the data recorded at the Arkansas Street Monitoring Station is located in Appendix B. **Table 3-2** shows the number of violations recorded during the 2009 to 2011 period. As Table **3-2** indicates, the air quality monitoring data from 2009 to 2011 shows no exceedances of State or federal standards of any criteria pollutants.

[17] Western Regional Climate Center, 2010.

The San Francisco Department of Public Health has created a map that displays $PM_{2.5}$ concentrations resulting from vehicle emissions on City streets.[18] The map was created by SFDPH using the CARB's, EMFAC2007 vehicle emissions model and the USEPA approved CAL3QHCR Line Source Dispersion Model. CAL3QHCR is a Gaussian dispersion model which estimates air pollution concentrations based on physical characteristics of emissions, meteorology, topography, and receptor horizontal and vertical location. The map shows potential roadway exposure zone, which means those areas within the City and County of San Francisco which, by virtue of their proximity to freeways and major roadways, may exhibit high $PM_{2.5}$ concentration attributable to local roadway traffic sources. Based on dispersion model analysis, the Van Ness corridor currently has a relatively greater level of road traffic air pollution and associated air pollution health risks.

[18]City and County of San Francisco Department of Public Health Environmental Health Section, *Proportion of Streets with Annual Average Daily PM 2.5 Emissions 0.2 ug/m3 or Greater*, 2011.




LEGEND: San Francisco Arkansas Street Monitoring Station

N

SOURCE: Bay Area Air Quality Management District



FIGURE 3-2

AIR MONITORING STATION LOCATION

| TABLE 3-2: 2009-2011 AMBIENT AIR QUALITY DATA IN PROJECT VICINITY | | | | |
|---|---|---|---|---|
| | | **Number of Days Above State Standard** | | |
| **Pollutant** | **Pollutant Concentration & Standards** | **2009** | **2010** | **2011** |
| Ozone ($O_3$) | Maximum 1-hr Concentration (ppm) | 0.07 | 0.08 | 0.07 |
| | Days > 0.09 ppm (State 1-hr standard) | 0 | 0 | 0 |
| | Maximum 8-hr Concentration (ppm) | 0.06 | 0.05 | 0.05 |
| | Days > 0.07 ppm (State 8-hr standard) | 0 | 0 | 0 |
| | Days > 0.075 ppm (Federal 8-hr standard) | 0 | 0 | 0 |
| Carbon Monoxide (CO) | Maximum 1-hr concentration (ppm) | 3 | 1.8 | 1.8 |
| | Days > 20 ppm (State1-hr standard) | 0 | 0 | 0 |
| | Days > 35 ppm (Federal 1-hr standard) | 0 | 0 | 0 |
| | Maximum 8-hr concentration (ppm) | 2.9 | 1.4 | 1.2 |
| | Days > 9.0 ppm (State 8-hr standard) | 0 | 0 | 0 |
| | Days > 9.0 ppm (Federal 8-hr standard) | 0 | 0 | 0 |
| Nitrogen Dioxide ($NO_2$) | Maximum 1-hr Concentration (ppm) | 0.06 | 0.09 | 0.09 |
| | Days > 0.18 ppm (State 1-hr standard) | 0 | 0 | 0 |
| | Days > 0.100 (Federal 1-hr standard) | 0 | 0 | 0 |
| Respirable Particulate Matter ($PM_{10}$) | Maximum 24-hr concentration (µg/m$^3$) | 36.0 | 40 | 46 |
| | Estimated Days > 50 µg/m$^3$ (State 24-hr standard) | 0 | 0 | 0 |
| | Estimated Days > 150 µg/m$^3$ (Federal 24-hr standard) | 0 | 0 | 0 |
| Fine Particulate Matter ($PM_{2.5}$) | Annual Arithmetic Mean (µg/m$^3$) | */a/ | 11 | 10 |
| | Exceed State Standard (12 µg/m$^3$) | | No | No |
| | Exceed State Standard (15 µg/m$^3$) | | No | No |
| Sulfur Dioxide[3] | Maximum 24-hr Concentration (ppm) | */a/ | */a/ | */a/ |
| | Days > 0.04 ppm (State 24-hr standard) | | | |
| | Days > 0.14 ppm (Federal 24-hr standard) | | | |

/a/ Insufficient data.
**SOURCE**: BAAQMD, Historical Data by Year, available at http://gate1.baaqmd.gov/aqmet/aq.aspx, accessed March 27, 2013; CARB, Historical Data by Year, available at http://www.arb.ca.gov/adam/welcome.html, accessed March 27, 2013. (Appendix B).

### 3.3.4 Sensitive Receptors

Some land uses are considered more sensitive to changes in air quality than others, depending on the population groups and the activities involved. CARB has identified the following groups who are most likely to be affected by air pollution: children under 14, the elderly over 65 years of age, athletes, and people with cardiovascular and chronic respiratory diseases. Typically, sensitive receptors include residences, schools, playgrounds, child-care centers, athletic facilities, long-term health care facilities, rehabilitation centers, convalescent centers, and retirement homes. Some examples of sensitive receptors near the proposed project include:

- Sherman Elementary School
- Spring Valley Elementary School
- Redding Elementary School
- Stuart Hall High School

In addition to these, there are numerous other residential land uses, schools, parks, retirement homes, and religious institutions adjacent to the Van Ness Corridor.

## 3.4 METHODOLOGY AND SIGNIFICANCE CRITERIA

### 3.4.1 Methodology

**Regional Construction Emissions**. The BAAQMD recommends using the Sacramento Metropolitan Air Quality Management District's (SMAQMD) Road Construction Emissions Model (RoadMod) to quantify construction related emissions. Model inputs and assumptions were based on the construction details provided by the Project Construction Plan (PCP).[19] The BAAQMD also focuses on the implementation of effective and comprehensive control measures to reduce fugitive dust emissions. **Table 3-3** summarizes the construction approach and schedule for each build alternative.

**TABLE 3-3: CONSTRUCTION APPROACH AND SCHEDULE**

| Build Alternative | Construction Approach | Duration* |
|---|---|---|
| Alternative 2 | Construction along a single side of the street on multiple segments, simultaneously. | 19 months** |
| Alternative 3 | Construction along both sides of the street in multiple segments, simultaneously.*** | 21 months |
| Alternative 4 | Construction along both sides of the street in multiple segments, simultaneously. | 14 months |
| LPA | Construction along both sides of the street in multiple segments, simultaneously.**** | 20 months |

*To substantial completion

** Construction duration for Build Alternative 2 could be extended if a contraflow system is not implemented and construction activities requiring closure of a second lane in one direction would be restricted to nighttime.

***The duration for Build Alternative 3 construction would be longer than Build Alternative 4 due primarily to replacement of the sewer pipeline throughout the BRT alignment. Design Option B would not affect the construction schedule.

**** The duration for LPA construction is longer than Build Alternative 4 because it would require rebuilding of the median curb for the length of the corridor and also would require replacement of the sewer at station locations and in areas where the transitway would cause direct load on the sewer. .

Assumptions used for the construction calculations are as follows[20]:

**Phase 1 - Remove Existing Bulbouts and Undertake Utility Work** – Selected bulbouts are to be removed to allow mixed flow use of the curb parking lanes (except for Alternative 2). Utilities will be relocated during this phase. For Alternative 3, utility work would include applicable sewer replacement. For Alternative 4, this would include sewer relocation at platform locations. This work could be carried out at night with minimal disruption to traffic and pedestrians.

**Phase 2 - Build BRT Station/Platform Foundations** – BRT stations/platforms allow for level boarding into the vehicles. In total, twelve to 17 station platforms are planned along the corridor depending on the BRT alternative. The first step in this phase would be the demolition, followed by the utility work, and then platform/station facility foundation construction would be next. In the side-running BRT alternative (Alternative 2), a platform would be built as a sidewalk

[19] ARUP, *Project Construction Plan*, July 2009.
[20] *Ibid*.

extension. In the center-running, side platform alternative (Alternative 3), a far-side platform would be built along the outer median for right-side loading/unloading. For the center-running, center platform option (Alternative 4), center platforms would be built in the median for left-side door boarding (in most cases, platforms would be built on both sides of a given intersection to allow far-side boarding/alighting in a given direction). For all alternatives, staggered stations would typically be at the far-side of the intersection so the buses operations can benefit from transit signal priority.

**Phase 3 - Conduct Intersection/Corner Work and OCS Replacement** – Pedestrian bulbout construction would be carried out after the bus lanes are completed and the parking lane is restored. Intersection/corner work also includes signals. The Overhead Contact System (OCS) trench work and wiring would be undertaken at the same time as the intersection/corner work; however, OCS pole replacement could be undertaken in advance of Phase 3.

**Phase 4 - Build Bus Lanes and Enhanced Adjacent Road** – Roadway work would begin after the stations are complete and bulbouts removed. Plans call for dual bus lanes to be built. Modifications to traffic signals including intersections and corner work would be undertaken under this phase. Bus lane plans for each of the alternatives are described below:

- **Build Alternative 2: Side Lane BRT with Street Parking** - Dual side-running lanes would be implemented adjacent to the curb parking lane, although mixed flow traffic could still enter the lane to access the parking lane for parking or loading/unloading, or to make right-turns. Alternatives 2 and 4 would consist of a reworked asphalt pavement using mill-and-fill techniques in the bus lane, with Portland Cement Concrete (PCC) pavement at the stations (referred to as bus pads) and in the station approaches. PCC pavement at these locations is needed for increased strength during deceleration and stops. The mill-and-fill technique uses a two-step process to remove and replace the driving surface. The first step utilizes a mobile asphalt removal machine equipped to grind and remove the asphalt to a depth of two inches below the existing grade. The second step involves replacement of the two inches of removed asphalt with a two-inch thick layer of asphalt using track-mounted asphalt laydown paving machines followed by the use of a series of rolling equipment to compact the asphalt to the final driving surface.

- **Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians** – Dual bus lanes would be in the existing median with new, narrow landscaped medians separating the busway from mixed flow traffic. The bus lanes in Alternative 3 would consist of new PCC pavement along the entire length (including intersections) since it would be built in the existing median, instead of in the existing travel lanes. Center Lane Alternative Design Option B would not require any change in proposed construction.

- **Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median** – Dual bus lanes would be built in the inside lanes alongside the median, which would be retained for the most part. Similar to Alternative 2, the Alternative 4 bus lanes would consist of reworked asphalt pavement using mill-and-fill techniques with PCC pavement at stations and station approaches only.

**Phase 5 – Finish BRT Stations/Platforms** – Station and platform elements and passenger amenities would be installed including shelters, benches/seats, lighting, changeable message signs (NextMuni), fixed signage, railings, trash receptacles, and ticket vending machines (TVMs). Electrical and communications systems would be completed during this phase.

**Phase 6 - Handle Additional Infrastructure Elements** – Other key elements include replacement of the landscaping, as well as pavement striping and delineation, would be the last steps.

**Phase 7 – Curb-to-Curb Pavement Rehabilitation** – Curb-to-curb pavement rehabilitation under the State Highway Operation and Protection Program (SHOPP) would first entail spot concrete repair work in the middle and curb lanes on both sides of Van Ness, followed by mill-and-fill work to replace the existing asphalt concrete pavement with dense-graded asphalt concrete (DGAC). Rehabilitation would start at different points of the BRT construction process depending on the alternative. For Alternative 2, rehabilitation work would first start in the proposed BRT lane (in the curb lane), while rehabilitation work in the middle and curb lanes for Alternatives 3 and 4 would coincide with the completion of the median bus lane. Curb-to-curb pavement rehabilitation work would proceed and finish along one side of the street before proceeding to rehabilitate the other side. Concrete spot work would be done during the day and mill-and-fill work at night – again, this may entail the closure of one or both remaining travel lanes and/or detours on a given side of the street.

**Regional Operational Emissions**. Emissions are presented for the far-term (Year 2035) and Existing plus Project Conditions, consistent with the traffic analysis prepared for this project in which the 2015 Build scenarios are compared with the existing condition (CHS Consulting Group, 2011). Regional emissions were calculated based on the VMT presented in **Table 3-4**. Automobile emissions were calculated using light-duty vehicle emission factors obtained from the CARB EMFAC2011 Motor Vehicle Emissions Inventory Model. The on-road mobile source calculations assumed a system-wide vehicle speed of 20 miles per hour based on the average speed for the corridor as provided by the SFCTA.

**TABLE 3-4: CITYWIDE VEHICLE MILES TRAVELED**

| Scenario | Automobile |
|---|---|
| 2007 (Existing Condition) | 10,100,425 |
| 2007 Side BRT (Alternative 2) | 9,940,405 |
| 2007 Center Alternatives 3 & 4 without Design Option B | 9,939,510 |
| 2007 BRT Alternatives 3 & 4 with Design Option B | 9,965,954 |
| | |
| 2015 Side BRT (Alternative 2) | 10,260,445 |
| 2015 Center Alternatives 3 & 4 without Design Option B | 10,261,340 |
| 2015 BRT Alternatives 3 & 4 with Design Option B | 10,234,896 |
| | |
| 2035 Baseline (Alternative 1) | 11,965,507 |
| 2035 Side BRT (Alternative 2) | 11,891,952 |
| 2035 Center Alternatives 3 & 4 without Design Option B | 11,887,251 |
| 2035 BRT Alternatives 3 & 4 with Design Option B | 11,953,541 |

/a/ Due to the inability of the transportation models to distinguish between the center alternatives (3 and 4), the results are the same for VMT for both of these alternatives, as well as their design variations.
/b/ Existing condition is year 2007, consistent with the traffic analysis prepared for this project (CHS Consulting Group, 2011).
**SOURCE:** San Francisco Transportation Authority, July 2010.

**Operational Odor Emissions**. Land uses and industrial operations that are associated with odor complaints include agricultural uses, wastewater treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies and fiberglass molding. The impact discussion is based on land use and estimated odor potential.

**Greenhouse Gas (GHG) Emissions**. Greenhouse gas (GHG) emissions for automobiles were calculated using the same methodology as the regional operational emissions analysis. $CO_2$ emission rates were obtained from EMFAC2011.

**Transportation Conformity Impacts**. Transportation conformity is required under CAA section 176(c) (42 U.S.C. 7506(c)) to ensure that federally supported highway and transit project activities are consistent with the purpose of the State Implementation Plan (SIP). Regional conformity was analyzed by discussing if the proposed project was included in a conforming Regional Transportation Plan or Transportation Improvement Plan with substantially the same design concept and scope that was used for the regional conformity analysis. Project level conformity was analyzed by discussing if the proposed project would cause localized exceedances of CO, $PM_{2.5}$, and/or $PM_{10}$ standards, or of it would interfere with “timely implementation” of Transportation Control Measures called out in the State Implementation Plan.

### 3.4.2 Significance Criteria

The following are the significance criteria BAAQMD has established to determine project impacts under CEQA.

**Construction Significance Criteria**

BAAQMD’s approach to the CEQA analysis of construction impacts is to emphasize the implementation of effective and comprehensive control measures rather than detailed quantification of emissions. Particulate matter ($PM_{10}$ and $PM_{2.5}$) is the pollutant of greatest concern with respect to construction activities.[21] The BAAQMD provides feasible control measures for construction emissions of $PM_{10}$.[22] If the appropriate construction controls are to be implemented, then fugitive dust emissions for construction activities would be considered less-than-significant.

**Operational Significance Criteria**

SFCTA has determined that the proposed project would cause a significant impact if:

- Operations would cause a net increase in emissions[23];
- Increased traffic would generate CO concentrations at study intersections that exceed the State one- and eight-hour standards shown in **Table 3-5**;
- Operations would result in carcinogenic risk that exceeds 10 persons in one million;
- Operations would create an odor nuisance;

[21] Construction equipment emits ozone precursors. However, these emissions are included in the emission inventory, which are the basis for the regional air quality plan, and are not expected to impede attainment of ozone in the Bay Area.
[22] BAAQMD, *CEQA Guidelines - Assessing the Air Quality Impacts of Projects and Plans* , December 1999.
[23] BAAQMD, *Personal Communication,* August 11, 2010.

- Project alternatives would not be consistent with the BAAQMD air quality plans; and/or
- Operations would cause a net increase in GHG emissions.

**NEPA Adverse Impact Criteria**

According to the Council on Environmental Quality regulations (40 CFR §§ 1500-1508), the determination of a significant impact is a function of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Both short- and long-term effects are relevant. Intensity refers to the severity of impact. To determine significance, the severity of the impact must be examined in terms of the type, quality and sensitivity of the resource involved; the location of the proposed project; the duration of the effect (short- or long-term) and other consideration of context. Adverse impacts will vary with the setting of the proposed action and the surrounding area.

# 3.5 IMPACT DISCUSSION

## 3.5.1 CEQA Construction Phase Impacts

### 3.5.1.1 Regional Emissions

Construction of the proposed project has the potential to create air quality impacts through the use of heavy-duty construction equipment and through vehicle trips generated by construction workers traveling to and from the proposed project site. Worker commute emissions were estimated based on the RoadMod estimating tool and associated model default values. These emissions are minor compared to equipment and exhaust emissions. Fugitive dust emissions would primarily result from demolition and site preparation (e.g., grading) activities. $NO_X$ emissions would primarily result from the use of heavy-duty construction equipment. The assessment of construction air quality impacts considers each of these potential sources. Construction emissions can vary substantially from day to day, depending on the level of activity, the specific type of operation and the prevailing weather conditions.

Build Alternatives 2, 3, and 4 would result in lane closures and may affect vehicle speeds on Van Ness Avenue and parallel roadways. There is a direct correlation between decreased vehicle speeds and higher pollutant emissions at low vehicle speeds (e.g., 6 to 11 miles per hour). The construction analysis conservatively assumed that average daily traffic along Van Ness Avenue would be reduced by five miles per hour during construction activity. The increased emissions resulting from traffic delays were added into the emissions caused by general construction activity. The traffic analysis prepared for the proposed project identified Van Ness Avenue between Market Street and Fell Street as having the highest average daily traffic along the corridor.[24] To be conservative, this traffic volume was used to determine traffic delay emissions for the corridor during construction. For each alternative it was assumed that traffic would be delayed for up to 3 blocks.

***Alternative 1: No-Build (Baseline Alternative)***

The No-Build Alternative would include replacing the existing OCS and support poles/streetlights, traffic signal infrastructure improvements, new buses, sidewalk and street

[24]SFCTA, Transportation Analysis for the Van Ness Avenue BRT Project, August 2010.

lighting improvements, pavement resurfacing, and various bus infrastructure improvements described above. These projects would undergo individual environmental review and construction emissions would be analyzed, as necessary. This alternative would have a less-than-significant impact under CEQA.

***Build Alternative 2: Side Lane BRT with Street Parking***

As indicated in the PCP, the preferred construction method for Build Alternative 2 would be to work on the corridor in three block sections, on one side of the corridor at a time. This makes construction duration longer than working on the full corridor width at once, but enables more of Van Ness to be used during construction. As indicated in the PCP, this construction schedule represents the worst case scenario for Build Alternative 2, as the full-corridor schedule is not offered for this alternative. The advantage in regards to air quality impacts of working in three block sections, as opposed to full corridor (meaning both sides of the street), is that the amount of ground being disturbed per day is less. This creates less construction dust and exhaust emissions per day. These assumptions, along with equipment assumptions detailed in the PCP, were accounted for in the RoadMod model calculations.[25] **Table 3-5** shows construction exhaust emissions for informational purposes. The BAAQMD's approach to construction impacts is to emphasize implementation of effective and comprehensive control measures for particulate matter rather than detailed quantification of emissions. Construction equipment emits exhaust pollutants such as carbon monoxide and ozone precursors. These emissions are included in the emission inventory that is the basis for regional air quality plans, and are not expected to impede attainment or maintenance of ozone and carbon monoxide standards in the Bay Area. If all appropriate particulate matter control measures are implemented, then air pollutant emissions from construction activities would be considered a less-than-significant impact. However, without particulate matter control measures, construction activity from Build Alternative 2 would result in a significant impact under CEQA.

**TABLE 3-5: BUILD ALTERNATIVE 2 ESTIMATED DAILY CONSTRUCTION EMISSIONS - UNMITIGATED**

| | Pounds Per Day | | | |
|---|---|---|---|---|
| **Construction Year** | **ROG** | **$NO_X$** | **$PM_{10}$** | **$PM_{2.5}$** |
| Total Maximum Exhaust Emissions | 4 | 49 | 2 | 2 |
| **SOURCE**: TAHA, 2013 (Appendix C). | | | | |

***Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians***

The preferred construction method for Build Alternative 3 would be to work on the full corridor at once. Full corridor construction refers to construction occurring on both sides of the street, rather than one side of the street at a time. This makes construction duration shorter than working on block-by-block or three block one-side only segments, and enables the construction process to finish more quickly. The disadvantage in regards to air quality impacts of working on the entire corridor at once, as opposed to segments, is that the amount of ground being disturbed per day is greater, and the construction equipment required per day is greater. This creates more construction dust and exhaust emissions per day. These assumptions, along with equipment assumptions detailed in the PCP, were accounted for in the RoadMod model

[25] ARUP, *Project Construction Plan*, July 2009.

calculations.[26] **Table 3-6** shows construction exhaust emissions associated with Build Alternative 3 for informational purposes. Construction equipment emits exhaust pollutants such as carbon monoxide and ozone precursors. These emissions are included in the emission inventory that is the basis for regional air quality plans, and are not expected to impede attainment or maintenance of ozone and carbon monoxide standards in the Bay Area. However, without particulate matter control measures, construction activity from Build Alternative 3 would result in a significant impact under CEQA.

**TABLE 3-6: BUILD ALTERNATIVE 3 ESTIMATED DAILY CONSTRUCTION EMISSIONS - UNMITIGATED**

| Construction Year | Pounds Per Day | | | |
|---|---|---|---|---|
| | ROG | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ |
| Total Maximum Exhaust Emissions | 4 | 53 | 2 | 2 |

**SOURCE**: TAHA, 2013 (Appendix C).

***Build Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median***

Build Alternative 4 construction activity would be similar to the activity described in the Build Alternative 3 analysis; except Build Alternative 4 has different design features due to a single median configuration that would result in a shorter construction period compared with Build Alternative 3. The construction duration for Build Alternative 4 would be approximately seven months shorter than Build Alternative 3. **Table 3-6** shows construction exhaust emissions associated with Build Alternative 4 for informational purposes. Construction equipment emits exhaust pollutants such as carbon monoxide and ozone precursors. These emissions are included in the emission inventory that is the basis for regional air quality plans, and are not expected to impede attainment or maintenance of ozone and carbon monoxide standards in the Bay Area. However, without particulate matter control measures, construction activity from Build Alternative 4 would result in a significant impact under CEQA.

### 3.5.1.2 Toxic Air Contaminant (TAC) Emissions

#### Diesel Particulate Matter

Construction-related activities could result in the generation of TACs, specifically diesel PM, from on-road haul trucks and off-road equipment exhaust emissions. Due to the variable nature of construction activity, the generation of TAC emissions would be temporary; especially considering the short amount of time equipment is typically located near sensitive land uses. Build Alternative 3 represents the longest construction period of each alternative, which is 21 months. Current models and methodologies for conducting health risk assessments are associated with longer-term exposure periods of 9, 40, and 70 years, which do not correlate well with the temporary and highly variable nature of construction activities. This makes it difficult to produce accurate estimates of health risk.

An analysis was completed to assess the potential health risks associated with construction TAC emissions, despite the difficulties described above. On-site $PM_{2.5}$ emissions (e.g., equipment exhaust) were input into the AERMOD dispersion model approved by the United States Environmental Protection Agency. TAC concentrations along Van Ness Avenue were obtained using local meteorological conditions and adjacent sensitive receptors placed on both sides of construction activity. In addition, the concentrations obtained from AERMOD were modified using a Lifetime Exposure Adjustment factor because exposure to construction emissions would be short-term and intermittent as construction activity moves along Van Ness Avenue. The results indicate that the cancer risk would be less than one person in one million at residences along Van Ness Avenue and the annual $PM_{2.5}$ concentration would be 0.14 $\mu g/m^3$. The cancer risk would be below the ten persons in one million threshold and the annual $PM_{2.5}$ concentration would be 0.7 percent of the State standard, which would not be considered a significant increase in ambient concentration. Additionally, implementation of the BAAQMD Basic Construction Mitigation Measures, which are required for all project alternatives would reduce TAC emissions. Therefore, Build Alternatives 2 through 4 would result in a less-than-significant impact related to construction TAC exposure under CEQA.

**Demolition and Renovation of Asbestos-Containing Materials**

None of the proposed project alternatives would involve the demolition or renovation of any materials containing asbestos. As described above, the construction associated with each build alternative involves re-paving the corridor, and installing new transportation infrastructure to support the proposed project. Because BAAQMD Regulation 11, Rule 2 is in place, no further analysis about the demolition of asbestos-containing materials is needed in a CEQA document. BAAQMD does recommend that CEQA documents acknowledge and discuss BAAQMD Regulation 11, Rule 2 to support the public's understanding of this issue. The purpose of this Rule is to control emissions of asbestos to the atmosphere during demolition, renovation, milling and manufacturing and establish appropriate waste disposal procedures. Rule 2 prohibits the use of asbestos in surfacing roadways, insulating buildings, or as any sort of architectural coating. The Rule also identifies standards in the demolition or renovation of buildings containing asbestos.[27] Regulation 11, Rule 2 is included as Appendix F. Demolition and renovation of asbestos-containing materials would result in a less-than-significant impact for each alternative under CEQA.

**Naturally Occurring Asbestos**

The proposed project is located in an area near NOA, and the grading associated with each of the build alternatives has the potential to expose nearby residents. The implementation of the *Basic Construction Mitigation Measures*, which is recommended for all proposed projects, would control NOA exposure to the greatest extent feasible. Therefore, Build Alternatives 2 through 4 would result in a less-than-significant impact related to NOA under CEQA.

### 3.5.1.3 Odor Emissions

Equipment exhaust and paving activities would result in odor emissions for each of the build alternatives. Odors would be localized and generally confined to the construction area. Each alternative would utilize typical construction techniques, and the odors would be typical of most construction sites and temporary in nature. Construction activity would not cause an odor nuisance. Therefore, Build Alternatives 2 through 4 would result in a less-than-significant impact related to construction odors under CEQA.

[27] BAAQMD, *Regulation 11, Rule 2,* October 1998.

## Construction Phase Control Measures

**AQ1** Construction contractors shall implement the BAAQMD *Basic Construction Mitigation Measures* listed in **Table 3-7,** and the applicable measures in the *Additional Construction Mitigation Measures*. This includes Measure 10 in the *Additional Construction Mitigation Measures*.

**AQ2** Construction contractors shall comply with BAAQMD Regulation 11 (Hazardous Pollutants) Rule 2 (Asbestos Demolition, Renovation, and Manufacturing). The requirements for demolition activities include removal standards, reporting requirements, and mandatory monitoring and record keeping.

| TABLE 3-7: FEASIBLE CONTROL MEASURES FOR CONSTRUCTION EMISSIONS |
|---|
| **Basic Construction Mitigation Measures**. - The following controls should be implemented at all construction sites.<br><br>1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.<br>2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.<br>3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.<br>4. All vehicle speeds on unpaved roads shall be limited to 15 mph.<br>5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.<br>6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.<br>7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.<br>8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations. |
| **Additional Construction Mitigation Measures**. - The following measures are recommended for projects with construction emissions above the threshold.<br><br>1. All exposed surfaces shall be watered at a frequency adequate to maintain minimum soil moisture of 12 percent. Moisture content can be verified by lab samples or moisture probe.<br>2. All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.<br>3. Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.<br>4. Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.<br>5. The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.<br>6. All trucks and equipment, including their tires, shall be washed off prior to leaving the site.<br>7. Site accesses to a distance of 100 feet from the paved road shall be treated with a 6 to 12 inch compacted layer of wood chips, mulch, or gravel.<br>8. Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent.<br>9. Minimizing the idling time of diesel powered construction equipment to two minutes.<br>10. The project shall develop a plan demonstrating that the off-road equipment (more than 50 horsepower) to be used in the construction project (i.e., owned, leased, and subcontractor vehicles) would achieve a project wide fleet-average 20 percent $NO_X$ reduction and 45 percent PM reduction compared to the most recent ARB fleet |

average. Acceptable options for reducing emissions include the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available.

11. Use low VOC (i.e., ROG) coatings beyond the local requirements (i.e., Regulation 8, Rule 3: Architectural Coatings).
12. Requiring that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NOx and PM.
13. Requiring all contractors use equipment that meets CARB's most recent certification standard for off-road heavy duty diesel engines.

**SOURCE**: BAAQMD, *CEQA Air Quality Guidelines,* June 2010.

## Impacts After Control Measures

### *Build Alternative 2: Side Lane BRT with Street Parking*

Construction activity would result in a potentially significant impact without the utilization of applicable BAAQMD control measures. Mitigation Measure **AQ1** includes the *Basic Construction Mitigation Measures* in **Table 3-7**, and Measure 10 listed in the *Additional Construction Mitigation Measures*. Construction work will also conform to San Francisco Health Code Article 22B which requires all City projects of over a half acre in size to control dust from construction activities by preparing a dust plan approved by the San Francisco Department of Public Health, with the goal of minimizing visible dust and protecting sensitive receptors from dust exposure. The mitigation measures would reduce fugitive dust and equipment exhaust emissions. For informational purposes, **Table 3-8** presents construction emissions after implementation of mitigation measures. The fugitive dust and exhaust control measures would comply with the BAAQMD policy to control construction emissions; therefore, construction activity under Build Alternative 2 would result in a less-than-significant impact under CEQA.

**TABLE 3-8: BUILD ALTERNATIVE 2 ESTIMATED DAILY CONSTRUCTION EMISSIONS – MITIGATED**

| Build Alternative 2 | Pounds Per Day | | | |
|---|---|---|---|---|
| | ROG | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ |
| Total Maximum Exhaust Emissions | 4 | 37 | 1 | 1 |

**SOURCE**: TAHA, 2013 (Appendix C).

### *Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians*

Construction activity would result in a potentially significant impact without the utilization of applicable BAAQMD control measures. For informational purposes, **Table 3-9** presents construction emissions after implementation of mitigation measures. The fugitive dust and exhaust control measures would comply with the BAAQMD policy to control construction emissions; therefore, construction activity under Build Alternative 3 would result in a less-than-significant impact under CEQA.

**TABLE 3-9: BUILD ALTERNATIVE 3 ESTIMATED DAILY CONSTRUCTION EMISSIONS – MITIGATED**

| Build Alternative 3 | Pounds Per Day | | | |
|---|---|---|---|---|
| | ROG | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ |
| Total Maximum Exhaust Emissions | 4 | 40 | 1 | 1 |

**SOURCE**: TAHA, 2013 (Appendix C).

**Build Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median**

Construction activity would result in a potentially significant impact without the utilization of applicable BAAQMD control measures. Construction emissions would be similar to that shown in **Table 3-8** above. The fugitive dust and exhaust control measures would comply with the BAAQMD policy to control construction emissions; therefore, construction activity under Build Alternative 4 would result in a less-than-significant impact under CEQA.

## 3.5.2 NEPA Construction Phase Impacts

### 3.5.2.1 Regional Emissions

***Alternative 1: No-Build (Baseline Alternative)***

The No-Build Alternative would include replacing the existing OCS and trolley/streetlight poles along, traffic signal infrastructure improvements, new buses, sidewalk and street lighting improvements, pavement resurfacing, and various bus infrastructure improvements described above. These projects would undergo individual environmental review and construction emissions would be analyzed, as necessary. This alternative would not result in adverse construction impacts under NEPA.

***Build Alternative 2: Side Lane BRT with Street Parking***

As indicated in the PCP, the preferred construction method for Build Alternative 2 would be to work on the corridor in three block sections. This makes construction duration longer than working on the entire corridor at once, but enables some of Van Ness to be used during construction. The advantage in regards to air quality impacts of working in three block sections, as opposed to full corridor at once, is that the amount of ground being disturbed per day is less, and the construction equipment required per day is less. This creates less construction dust and exhaust emissions per day. Construction activity would generate regional emissions, TAC emissions, and odors. It would also increase localized pollutant concentrations. In addition, Build Alternative 2 would comply with local regulations and fugitive dust emissions control measures to lessen potential construction-related impacts. Build Alternative 2 construction emissions would be temporary and are not considered adverse under NEPA.

**Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians**

The preferred construction method for Build Alternative 3 would be to work on the full corridor at once. This makes construction duration shorter than working on in block-by-block or three block segments, but enables the construction process to finish more quickly. The disadvantage in regards to air quality impacts of working on the entire corridor at once, as opposed to segments, is that the amount of ground being disturbed per day is greater, and the construction equipment required per day is greater. This creates more construction dust and exhaust emissions per day. Construction activity would generate regional emissions, TAC emissions, and odors. It would also increase localized pollutant concentrations. In addition, Build Alternative 2 would comply with local regulations and fugitive dust emissions control measures to lessen potential construction-related impacts. Build Alternative 3 construction emissions would be temporary and are not considered adverse under NEPA.

**Build Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median**

Build Alternative 4 construction activity would be similar to the activity described in the Build Alternative 3 analysis. However, because Build Alternatives 3 and 4 utilize different design features, the construction duration for Build Alternative 4 would be approximately seven months shorter than Build Alternative 3. This would result in less mass regional construction emissions over the life of Build Alternative 4 construction activity when compared to Build Alternative 3. Construction activity would generate regional emissions, TAC emissions, and odors. It would also increase localized pollutant concentrations. In addition, Build Alternative 2 would comply with local regulations and fugitive dust emissions control measures to lessen potential construction-related impacts. Build Alternative 4 construction emissions would be temporary and are not considered adverse under NEPA.

## 3.5.3 CEQA Operational Phase Impacts

### 3.5.3.1 Regional Emissions - 2035

Regional operational emissions were estimated using EMFAC2011 emission rates. The city-wide average vehicle speed was assumed to be 20 miles per hour. The emission rates, in combination with the VMT provided in **Table 3-4**, provide City-wide emissions associated with the each project alternative. **Table 3-10** shows the total gross operational emissions for each alternative. **Table 3-11** shows the net change in emissions for each of the build alternatives compared to the 2035 No-Build Alternative. In addition, each alternative, including the No-Build Alternative, would replace current electric buses with new electric buses, and replace current diesel buses with lower emitting diesel hybrid buses. The EMFAC2011 model does not provide emission factors for diesel hybrid buses. However, SFMTA has stated that diesel hybrid buses emit 95 percent less particle matter and 40 percent less $NO_X$ than the buses they replace.

**TABLE 3-10: ESTIMATED GROSS OPERATIONAL EMISSIONS - 2035**

| | ROG | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|
| ***2035 Baseline*** | | | | |
| Pounds Per Day | 1,213 | 3,614 | 1,530 | 659 |
| Tons Per Year | 221 | 660 | 279 | 120 |
| | | | | |
| ***Build Alternative 2*** | | | | |
| Pounds Per Day | 1,206 | 3,592 | 1,521 | 655 |
| Tons Per Year | 220 | 655 | 278 | 120 |
| | | | | |
| **Build Alternatives 3 & 4 without Design Option B** | | | | |

**TABLE 3-10: ESTIMATED GROSS OPERATIONAL EMISSIONS - 2035**

| | | | | |
|---|---|---|---|---|
| Pounds Per Day | 1,206 | 3,590 | 1,520 | 655 |
| Tons Per Year | 220 | 655 | 277 | 120 |
| | | | | |
| **Build Alternatives 3 & 4 with Design Option B** | | | | |
| Pounds Per Day | 1,212 | 3,610 | 1,528 | 659 |
| Tons Per Year | 221 | 659 | 279 | 120 |
| **SOURCE**: TAHA, 2013 (Appendix D). | | | | |

**TABLE 3-11: ESTIMATED NET OPERATIONAL EMISSIONS - 2035**

| | ROG | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|
| ***Baseline vs. Build Alternative 2*** | | | | |
| Pounds Per Day | (7) | (22) | (9) | (1) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |
| Tons Per Year | (1) | (4) | (2) | (1) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |
| ***Baseline vs.* Build Alternatives 3 & 4 without Design Option B** | | | | |
| Pounds Per Day | (8) | (24) | (10) | (4) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |
| Tons Per Year | (1) | (4) | (2) | (1) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |
| ***Baseline vs.* Build Alternatives 3 & 4 with Design Option B** | | | | |
| Pounds Per Day | (1) | (4) | (2) | (1) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |
| Tons Per Year | (<1) | (1) | (<1) | (<1) |
| Net Emissions Increase? | No | No | No | No |
| **SOURCE**: TAHA, 2013 (Appendix D). | | | | |

### *Alternative 1: No-Build (Baseline Alternative)*

Alternative 1, the No-Build Alternative, would not include a BRT service. Alternative 1 considers projected demographic and land use characteristics in addition to proposed Transportation Systems Management (TSM) capabilities improvements expected to be implemented independent of the Van Ness Avenue BRT Project by the near-term horizon year 2015, or long-range horizon year 2035. It is important to note that the No-Build Alternative would neither increase nor decrease bus service on Van Ness Avenue. However, the proposed bus engine technology changes would reduce emissions below existing conditions, and Alternative 1 would result in a beneficial impact under CEQA.

### *Build Alternative 2: Side Lane BRT with Street Parking*

Build Alternative 2 is a build alternative that would provide a dedicated bus lane in the rightmost lane of Van Ness Avenue in both the northbound and southbound directions, from Mission Street to Lombard Street, next to the existing lane of parallel parking. The bus lanes, though distinguished by colored pavement, would be traversable for mixed traffic which would enter the bus lanes to parallel park in the curb lane or make a right turn. BRT stations would be located within the parking strip as extensions to the sidewalk, eliminating the need for buses to pull out of the bus lane to pick up passengers.

As shown in **Table 3-4** previously, Build Alternative 2 automobile VMT would be reduced by 73,555 below baseline conditions. Regional operational emissions, displayed in **Table 3-11** above, would be reduced in the Air Basin. Build Alternative 2 would result in a beneficial impact under CEQA.

### *Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians*

Build Alternative 3 is a build alternative that would convert the existing landscaped median and portions of the two inside traffic lanes, both northbound and southbound, to dedicated bus lanes separated from mixed traffic by dual landscaped medians. The medians would be approximately four to nine feet wide in many locations. Station platforms would be located on the right-side median, allowing right-side boarding.

As shown in **Table 3-4**, Build Alternative 3 automobile VMT would be reduced by 78,256 below baseline conditions. Regional operational emissions, displayed in **Table 3-11**, would be reduced in the Air Basin. Build Alternative 3 would result in a beneficial impact under CEQA.

*Center Lane Alternative Design Option B*

As shown in **Table 3-4**, Center Lane Alternative Design Option B under Alternative 3 would reduce VMT 11,966 below baseline conditions. Regional operational emissions, displayed in **Table 3-11**, would be reduced in the Air Basin. Center Lane Alternative Design Option B under Alternative 3 would result in a beneficial impact under CEQA.

### Build Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median

Build Alternative 4 would convert the existing inside lane of mixed traffic in each direction into a dedicated bus lane operating adjacent to the existing landscaped median. Station platforms would be located on the single center median, requiring left-side passenger loading and unloading. Bus vehicles serving this route would need doors on the left and right sides of the vehicle to allow service to both the left-side BRT platforms and right-side stops.

As shown in **Table 3-4**, Build Alternative 4 automobile VMT would be the same as for Build Alternative 3. Regional operational emissions, displayed in **Table 3-11**, would be reduced in the Air Basin. Build Alternative 4 would result in a beneficial impact under CEQA.

*Center Lane Alternative Design Option B*

As shown in **Table 3-4**, Build Alternative 4 with incorporation of Design Option B automobile VMT would be the same as for Build Alternative 3. Regional operational emissions, displayed in

**Table 3-11**, would be reduced in the Air Basin. Center Lane Alternative Design Option B under Alternative 4 would result in a beneficial impact under CEQA.

### 3.5.3.2 Regional Emissions – Existing Plus Project (2007)

Existing plus Project emissions were estimated using the same methodology employed for 2035 emissions. The EMFAC2011 emission rates, in combination with the VMT provided in **Table 3-4**, provide City-wide emissions associated with the each project alternative. **Table 3-12** shows the total gross operational emissions for each alternative. **Table 3-13** shows the net change in emissions for each of the build alternatives compared to the existing conditions (2007).

**TABLE 3-12: ESTIMATED GROSS OPERATIONAL EMISSIONS – EXISTING PLUS PROJECT (2007)**

| | ROG | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|
| ***Existing Conditions (2007)*** | | | | |
| Pounds Per Day | 5,122 | 15,632 | 1,492 | 757 |
| Tons Per Year | 935 | 2,853 | 272 | 138 |
| | | | | |
| ***Build Alternative 2 (2007)*** | | | | |
| Pounds Per Day | 5,040 | 15,384 | 1,468 | 745 |
| Tons Per Year | 920 | 2,808 | 268 | 136 |
| | | | | |
| **Build Alternatives 3 & 4 without Design Option B *(2007)*** | | | | |
| Pounds Per Day | 5,040 | 15,383 | 1,468 | 745 |
| Tons Per Year | 920 | 2,807 | 268 | 136 |
| | | | | |
| **Build Alternatives 3 & 4 with Design Option B *(2007)*** | | | | |
| Pounds Per Day | 5,053 | 15,424 | 1,472 | 747 |
| Tons Per Year | 922 | 2,815 | 269 | 136 |
| **SOURCE**: TAHA, 2013 (Appendix D). | | | | |

**TABLE 3-13: ESTIMATED NET OPERATIONAL EMISSIONS – EXISTING PLUS PROJECT (2007)**

| | ROG | $NO_X$ | $PM_{10}$ | $PM_{2.5}$ |
|---|---|---|---|---|
| ***Existing vs. Build Alternative 2 (2007)*** | | | | |
| Pounds Per Day | (81) | (248) | (24) | (12) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |
| Tons Per Year | (15) | (45) | (4) | (2) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |
| ***Existing vs.* Build Alternatives 3 & 4 without Design Option B *(2007)*** | | | | |
| Pounds Per Day | (82) | (249) | (24) | (12) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |

| TABLE 3-13: ESTIMATED NET OPERATIONAL EMISSIONS – EXISTING PLUS PROJECT (2007) | | | | |
|---|---|---|---|---|
| Tons Per Year | (15) | (45) | (4) | (2) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |
| ***Existing vs.* Build Alternatives 3 & 4 with Design Option B *(2007)*** | | | | |
| Pounds Per Day | (68) | (208) | (20) | (10) |
| Net Emissions Increase? | No | No | No | No |
| | | | | |
| Tons Per Year | (12) | (38) | (4) | (2) |
| Net Emissions Increase? | No | No | No | No |
| **SOURCE**: TAHA, 2013 (Appendix D). | | | | |

***Build Alternative 2: Side Lane BRT with Street Parking* (2007)**

As shown in **Table 3-4** previously, Build Alternative 2 automobile VMT in 2007 would be reduced by 160,020 below existing conditions. Regional operational emissions, displayed in **Table 3-13** above, would be reduced in the Air Basin. Build Alternative 2 Existing plus Project conditions would result in a beneficial impact under CEQA.

***Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians* (2007)**

As shown in **Table 3-4**, Build Alternative 3 automobile VMT would be reduced by 160,020 below existing conditions. Regional operational emissions, displayed in **Table 3-13**, would be reduced in the Air Basin. Build Alternative 3 Existing Plus Project conditions would result in a beneficial impact under CEQA.

*Center Lane Alternative Design Option B*

As shown in **Table 3-4**, Center Lane Alternative Design Option B under Alternative 3 would reduce VMT 134,471 below existing conditions. Regional operational emissions, displayed in **Table 3-13**, would be reduced in the Air Basin. Center Lane Alternative Design Option B under Alternative 3 Existing Plus Project conditions would result in a beneficial impact under CEQA.

**Build Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median (2007)**

As shown in **Table 3-4**, Build Alternative 4 automobile VMT would be the same as for Build Alternative 3. Regional operational emissions, displayed in **Table 3-13**, would be reduced in the Air Basin. Build Alternative 4 Existing Plus Project conditions would result in a beneficial impact under CEQA.

*Center Lane Alternative Design Option B*

As shown in **Table 3-4**, Build Alternative 4 with incorporation of Design Option B automobile VMT would be the same as for Build Alternative 3. Regional operational emissions, displayed in **Table 3-13**, would be reduced in the Air Basin. Center Lane Alternative Design Option B under Alternative 4 Existing Plus Project conditions would result in a beneficial impact under CEQA.

### 3.5.3.3 Localized Emissions

**Carbon Monoxide Concentrations**

Emissions and ambient concentrations of CO have decreased dramatically in the SFBAAB with the introduction of the catalytic converter in 1975. There have been no exceedances of the State or federal standards for CO since 1991. SFBAAB is currently designated as an attainment area for the CAAQS and NAAQS for CO; however, elevated localized concentrations of CO still warrant consideration in the environmental review process. Occurrences of localized CO concentrations, known as hotspots, are often associated with heavy traffic congestion, which most frequently occur at signalized intersections of high-volume roadways.

Occurrences of localized CO concentrations, known as hotspots, are often associated with heavy traffic congestion, which most frequently occur at signalized intersections of high-volume roadways. The BAAQMD has completed technical analyses that indicate that there is no potential for CO hotspot to occur when:

- The project traffic would not increase traffic volumes at affected intersections to more than 44,000 vehicles per hour; and

- The project traffic would not increase traffic volumes at affected intersections to more than 24,000 vehicles per hour where vertical and/or horizontal mixing is substantially limited (e.g., tunnel, parking garage, bridge underpass, natural or urban street canyon, below-grade roadway). The fact that the Van Ness Avenue BRT study area is a highly developed urban area with multi-story buildings and contains streets with canyon-like air dispersion characteristics, means that this criterion may be applied to certain blocks along Van Ness Avenue and some of its parallel streets.

The proposed project would not increase traffic volumes at any intersection in the traffic study area (including Van Ness Avenue and five parallel streets: Gough, Franklin, Polk, Larkin, and Hyde) to more than 24,000 vehicles per hour, and would therefore be consistent with the criteria above. Further analysis of CO concentrations is not required. Localized CO concentrations would result in less-than-significant impacts.
Under the No-Build Alternative, the same updates in the bus fleet would occur, and no changes to operating schedules would occur. Because of the cleaner running fleet, and no increases in use, this alternative would result in a less-than-significant impact under CEQA.

**Criteria Pollutant Concentrations on Parallel Streets**

Increased congestion on parallel streets has the potential to increase criteria pollutant concentrations. The maximum PM peak hour volumes on Franklin Street with the project would be 3,443 vehicles in 2035. This volume includes project baseline traffic volumes and then considers increased traffic looking ahead to year 2035 in a “with project,” or BRT scenario. Pollutant concentrations were modeled using CALINE4. In response to comments on the Draft Environmental Impact Statement/Environmental Impact Report during public circulation, the wind speed in the model was set at the lowest level allowable to represent potential stagnant wind conditions associated with high-rise apartments and narrow streets. This represents a worst-case scenario for modeling pollutant concentrations. As shown in **Table 3-14**, the concentrations along Franklin Street would be well below the State standards after implementation of the BRT in year 2035 traffic conditions. Therefore, Build Alternatives 2 through 4 would result in a less-than-significant impact related to criteria pollutant concentrations on parallel streets under CEQA.

| TABLE 3-14: CRITERIA POLLUTANT CONCENTRATIONS ON PARALLEL STREETS, 2035 WITH BRT | | | |
|---|---|---|---|
| **Pollutant** | **Concentration at Nearest Sensitive Receptor** | **State Standard** | **Significant Impact?** |
| CO (1-Hour) | 0.5 ppm | 20 ppm | No |
| CO (8-Hour) | 0.35 ppm | 9.0 ppm | No |
| $PM_{2.5}$ (Annual) | 1.2 µg/$m^3$ | 12 µg/$m^3$ | No |
| $PM_{10}$ (24-Hour) | 14 µg/$m^3$ | 50 µg/$m^3$ | No |
| $PM_{10}$ (Annual) | 2.8 µg/$m^3$ | 20 µg/$m^3$ | No |
| $NO_2$ (1-Hour) | 0 ppm | 0.18 ppm | No |
| **SOURCE:** TAHA, 2013. | | | |

## Idle Emissions

The Van Ness Avenue BRT Project would convert two mixed-travel lanes to bus-only lanes (i.e., one lane each in NB and SB directions) and reduce left-turn opportunities along Van Ness Avenue. This would potentially increase vehicle idling and associated air emissions. An idle emissions analysis was completed using the CAL3QHC dispersion model at intersections that would experience the highest vehicle delay. This was identified as the Gough Street/Hayes Street intersection with a PM peak hour volume of 3,954 PM vehicles and an average delay of 195 seconds per vehicle. CAL3QHC incorporates methods for estimating queue lengths and the contribution of emissions from idling vehicles. The model permits the estimation of total air pollution concentrations from both moving and idling vehicles. It is a reliable tool for predicting concentrations of inert air pollutants near signalized intersections. Because idle emissions account for a substantial portion of the total emissions at an intersection, the model is relatively insensitive to traffic speed, a parameter difficult to predict with a high degree of accuracy on congested urban roadways without a substantial data collection effort. The model calculates CO and PM concentrations. One-hour CO concentrations were converted into eight-hour concentrations using conversation factors established by the USEPA. One-hour PM concentrations were converted into 24-hour and annual concentrations using conversion factors established by the USEPA. Consistent with SF-CHAMP, the analysis assumed that heavy-duty vehicles represent two percent of vehicle volumes and the emission rate was adjusted accordingly. As shown in **Table 3-15**, the idle emissions would be well below the State standards after implementation of the BRT in year 2035 traffic conditions.

| TABLE 3-15: IDLE EMISSIONS, 2035 WITH BRT (LPA) | | | |
|---|---|---|---|
| **Pollutant** | **Sidewalk Concentrations** | **State Standard** | **Significant Impact?** |
| CO (1-hour) | 0.1 ppm | 20 ppm | No |
| CO (8-hour) | 0.07 ppm | 9.0 ppm | No |
| PM10 (24-hour) | 4 µg/$m^3$ | 50 µg/$m^3$ | No |
| PM10 (Annual) | 0.8 µg/$m^3$ | 20 µg/$m^3$ | No |
| PM2.5 (Annual) | 0.3 µg/$m^3$ | 12 µg/$m^3$ | No |
| **SOURCE:** TAHA, 2013. | | | |

### 3.5.3.4 Toxic Air Contaminants

The BAAQMD prioritizes TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions and the proximity of the facilities to sensitive receptors. The purpose of the proposed project is to improve transit operations along Van Ness by constructing right-of-way to allow of BRT. Each alternative has been determined to generate minimal air quality impacts for CAAA criteria pollutants and has not been linked with any special TAC concerns. As such, each alternative will not result in any increases in traffic volumes, vehicle mix, basic project location, or any other factor that would cause an increase in TAC impacts of the proposed project from that of the No-Build Alternative. In addition, updating the vehicle fleet from diesel buses to diesel hybrid buses will further reduce diesel particulate matter. Therefore, Build Alternatives 2 through 4 would result in a less-than-significant impact related to TAC emissions under CEQA.

#### Toxic Air Contaminants on Parallel Streets

Increased congestion on parallel streets also has the potential to increase exposure to toxic air contaminants. An assessment was completed both for the segment with greatest incremental increases in annual average daily traffic and the highest total of annual average daily traffic. The greatest incremental change in parallel street traffic between the No Build Alternative and Build Alternatives would be along Franklin Street north of Market Street under either center lane configured alternative (Build Alternatives 3 and 4). The total average daily traffic along this segment would be 29,419 vehicles in 2035 and the incremental increase as a result of the proposed project would be 8,612 vehicles. The BAAQMD has published screening tables for assessing mobile source $PM_{2.5}$ concentrations and cancer risk from surface streets. The screening tables indicate that, at a receptor distance of 50 feet, approximately 30,000 annual average daily vehicles would generate an annual $PM_{2.5}$ concentration of 0.147 µg/m$^3$. As shown in **Table 3-16,** the project-related incremental increase would be responsible for approximately 0.043 µg/m$^3$, or 29 percent, of the annual $PM_{2.5}$ exposure. The lifetime cancer risk associated with 30,000 annual average daily vehicles would be 3.56 persons in one million. The project-related incremental increase would be responsible for approximately 1.0 person in one million, or 29 percent, of the cancer risk. The project $PM_{2.5}$ concentration (0.043 µg/m$^3$) is approximately 0.4 percent of the annual $PM_{2.5}$ State standard and one-tenth (1/10) the project-level threshold (1 person) for cancer risk of 10 persons in one million.

**TABLE 3-16: TOXIC AIR CONTAMINANT CONCENTRATIONS ON PARALLEL STREETS, 2035 WITH BRT**

| Scenario | Concentration at Nearest Sensitive Receptor | Threshold | Significant Impact? |
|---|---|---|---|
| Greatest Incremental Change in Traffic Volume (Franklin Street north of Market Street) | | | |
| Annual $PM_{2.5}$ | 0.043 µg/m$^3$ | 0.3 µg/m$^3$ | No |
| Health Risk | 1.0 Person | 10 Persons | No |
| Highest Daily Traffic Volume (Franklin Street north of Geary Street) | | | |
| Annual $PM_{2.5}$ | 0.025 µg/m$^3$ | 0.3 µg/m$^3$ | No |
| Health Risk | 0.6 Persons | 10 Persons | No |
| **SOURCE:** TAHA, 2013. | | | |

The highest parallel street traffic volume would be 47,823 average daily annual vehicles along Franklin Street north of Geary Street under both center lane configured alternatives (Build Alternatives 3 and 4). The project contribution along this segment would be 4,486 annual average daily vehicles in 2035. The screening tables indicate that, at a receptor distance of 50 feet, approximately 50,000 annual average daily vehicles would generate an annual $PM_{2.5}$ concentration of 0.267 $\mu g/m^3$. The project-related incremental increase would be responsible for approximately 0.025 $\mu g/m^3$, or nine percent, of the annual $PM_{2.5}$ exposure. The lifetime cancer risk associated with 50,000 annual average daily vehicles would be 6.49 persons in one million. The project-related incremental increase would be responsible for approximately 0.60 person in one million, or nine percent, of the cancer risk. The project $PM_{2.5}$ concentration (0.025 $\mu g/m^3$) would be approximately 0.2 percent of the annual $PM_{2.5}$ State standard and one-tenth (1/10) the project-level threshold (1 person) for cancer risk of 10 persons in one million. Therefore, the proposed would result in a less-than-significant impact related to operational TAC exposure.

#### 3.5.3.5 Odor Emissions

Land uses and industrial operations that are associated with odor complaints include wastewater treatment plants, landfills, confined animal facilities, composting stations, food manufacturing plants, refineries, and chemical plants. The proposed project would not include any land use or activity that typically generates adverse odors, and would result in a less-than-significant odor impact for each alternative under CEQA.

### 3.5.4 NEPA Operational Phase Impacts

#### 3.5.4.1 Regional Emissions

***Alternative 1: No-Build (Baseline Alternative)***

Alternative 1, the No-Build Alternative, would not include a BRT service. Alternative 1 considers projected demographic and land use characteristics in addition to proposed Transportation Systems Management (TSM) capabilities improvements. However, the bus improvements associated with each alternative would still be implemented. These improvements include replacing the current electric buses with new electric buses, and replacing the current diesel buses with lower emitting diesel hybrid buses. Alternative 1 would result in a beneficial impact under NEPA.

***Build Alternative 2: Side Lane BRT with Street Parking***

Build Alternative 2 would provide a dedicated bus lane in the rightmost lane of Van Ness Avenue in both the northbound and southbound directions, from Mission Street to Lombard Street, next to the existing lane of parallel parking.

As shown in **Table 3-4**, automobile VMT would be reduced by 73,555 below baseline conditions. **Table 3-11** indicates that this alternative would reduce ROG, $NO_X$, $PM_{10}$, and $PM_{2.5}$ emissions. Because of the reduction in automobile VMT, and updating the bus fleet with cleaner vehicles, Build Alternative 2 would result in a beneficial impact under NEPA.

***Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians***

Build Alternative 3 would convert the existing landscaped median and portions of the two inside traffic lanes, both northbound and southbound, to dedicated bus lanes separated from mixed traffic by dual landscaped medians. The medians would be approximately four to nine feet wide in many locations. Station platforms would be located on the right-side median, allowing right-side boarding.

As shown in **Table 3-4**, automobile VMT would be reduced by 78,256 below baseline conditions. **Table 3-11** indicates that this alternative would reduce ROG, $NO_X$, $PM_{10}$, and $PM_{2.5}$ emissions. Because of the reduction in automobile VMT, and updating the bus fleet with cleaner vehicles, Build Alternative 3 would result in a beneficial impact under NEPA.

*Center Lane Alternative Design Option B*

As shown in **Table 3-4**, Center Lane Alternative Design Option B under Alternative 3 would reduce VMT 11,966 below baseline conditions. Regional operational emissions, displayed in **Table 3-11**, would be reduced in the Air Basin. Center Lane Alternative Design Option B under Alternative 3 would result in a beneficial impact under NEPA.

**Build Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median**

Build Alternative 4 would convert the existing inside lane of mixed traffic in each direction into a dedicated bus lane operating adjacent to the existing landscaped median. Station platforms would be located on the single center median, requiring left-side passenger loading and unloading. Bus vehicles serving this route would need doors on the left and right sides of the vehicle to allow service to both the left-side BRT platforms and right-side stops.

As shown in **Table 3-4**, automobile VMT would be reduced by 11,966 below baseline conditions. **Table 3-11** indicates that this alternative would reduce ROG, $NO_X$, $PM_{10}$, and $PM_{2.5}$ emissions. Because of the reduction in automobile VMT, and updating the bus fleet with cleaner vehicles, Build Alternative 4 would result in a beneficial impact under NEPA.

*Center Lane Alternative Design Option B*

As shown in **Table 3-4**, Build Alternative 4 with incorporation of Design Option B automobile VMT would be the same as for Build Alternative 3. Regional operational emissions, displayed in **Table 3-11**, would be reduced in the Air Basin. Center Lane Alternative Design Option B under Alternative 4 would result in a beneficial impact under NEPA.

### 3.5.4.2 Localized Emissions

Future CO concentrations are expected to be lower than existing conditions due to stringent State and federal mandates for lowering vehicle emissions.[28] Although traffic volumes would be higher in the future both without and with the implementation of the proposed project, CO emissions from mobile sources are expected to be much lower due to technological advances in vehicle emissions systems, as well as from normal turnover in the vehicle fleet. Accordingly, increases in traffic volumes would be offset by increases in cleaner-running cars as a percentage of the entire vehicle fleet on the road.

[28] California Air Resources Board, EMFAC2007 Motor Vehicle Emission Inventory Model, Version 2.3, November 2006.

The proposed project will replace each electric coach currently in the vehicle fleet with newer coaches, and replace each diesel coach with a diesel hybrid coach. These diesel hybrid coaches reduce emissions from their standard diesel counterparts used in existing conditions. In addition, each build alternative for the proposed project would reduce VMT in San Francisco over the No-Build Alternative. Because of cleaner vehicles, and lower overall VMT, the proposed project would not result in any increases in emissions, including carbon monoxide and particulate matter.

None of the build alternatives would result in an adverse impact under NEPA. Under the No-Build Alternative, the same updates in the bus fleet would occur, and no changes to operating schedules would occur. Because of the cleaner running fleet, and no increases in use, this alternative would not result in an adverse impact under NEPA.

### 3.5.4.3 Toxic Air Contaminants

The purpose of the proposed project is to improve transit operations along Van Ness Avenue by constructing right-of-way to allow of BRT. Each alternative has been determined to generate minimal air quality impacts for CAAA criteria pollutants and has not been linked with any special MSAT concerns. As such, each alternative will not result in any increases in traffic volumes on Van Ness Avenue, vehicle mix, basic project location, or any other factor that would cause an increase in MSAT impacts of the proposed project from that of the No-Build Alternative. In addition to this, updating the vehicle fleet from diesel buses to diesel hybrid buses will further reduce diesel particulate matter.

Moreover, EPA regulations for vehicle engines and fuels will cause overall MSAT emissions to decline significantly over the next several decades. Based on regulations now in effect, an analysis of national trends with EPA's MOBILE6.2 model forecasts a combined reduction of 72 percent in the total annual emission rate for the priority MSAT from 1999 to 2050 while vehicle-miles of travel are projected to increase by 145 percent.[29] This will both reduce the background level of MSAT as well as the possibility of even minor MSAT emissions from the proposed project. No alternatives would result in an adverse TAC impact under NEPA.

[29] U.S. Department of Transportation, *Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents*, September, 2009.

**Odor Emissions**

Land uses and industrial operations that are associated with odor complaints include wastewater treatment plants, landfills, confined animal facilities, composting stations, food manufacturing plants, refineries, and chemical plants. The proposed project would not include any land use or activity that typically generates adverse odors, and none of the alternatives would result in an adverse odor impact under NEPA.

### 3.5.4.4 Transportation Conformity Impacts

Transportation conformity is required under CAA section 176(c) (42 U.S.C. 7506(c)) to ensure that federally supported highway and transit project activities are consistent with the purpose of the State Implementation Plan (SIP). Conformity to the purpose of the SIP means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS. USEPA's transportation conformity rule (40 CFR 51.390 and Part 93) establishes the criteria and procedures for determining whether transportation activities conform to the SIP. Under the criteria, transportation projects must demonstrate conformity on regional and local levels.

### 3.5.4.5 Regional Conformity

The proposed project was included in the regional emissions analysis completed by the MTC for the conforming Transportation 2035 Plan.[30] The proposed project's design concept and scope have not changed significantly from what was analyzed in the Transportation 2035 Plan. This analysis found that the plan and, therefore, the individual projects contained in the plan, are conforming projects, and will have air quality impacts consistent with those identified in the SIP for achieving the NAAQS. FHWA determined the Transportation 2035 Plan to conform to the SIP in May, 2009.[31]

The proposed project is also included in the federal 2011 Transportation Improvement Program (TIP). The "open-to-the-public-year" is consistent with (within the same regional emission analysis period as) the construction completion date identified in the federal TIP and Transportation 2035 Plan. The federal TIP gives priority to eligible transportation control measures identified in the SIP and provides sufficient funds to provide for their implementation. FHWA/FTA determined the TIP to conform to the SIP on December 14, 2010. The proposed project is consistent with regional conformity guidelines.

### 3.5.4.6 Local Conformity

**Carbon Monoxide Hotspot Analysis**. The California Project-Level Carbon Monoxide Protocol (CO Protocol) was used to conduct a CO analysis for the proposed project. Part of the CO analysis includes the screening procedure found at Level 2 of the flow chart in Figure 3 in the CO Protocol. First, the proposed project will not significantly contribute to cold start percentages because no additional land uses are proposed that would add vehicle trips to the area. Second, the proposed project does not propose any additional land uses in the area, and as a result, will not generate any additional trips. The project would reduce regional VMT, especially vehicle trips located in and near the project corridor. Third, the proposed project

[30]MTC, *Transportation 2035 Plan for the San Francisco Bay Area*, April 2009.
[31]MTC, Personal Communication, July 21, 2010.

would not impede the flow of traffic in the project area. The traffic study states that in 2015, the average travel speed for most of the streets in the traffic study area under the build alternatives would remain approximately the same (generally ± 0.3 miles per hour) as the No Build Alternative, and no segment would see the speed decrease by more than 0.9 miles per hour). Fourth, the proposed project will not move traffic closer to any sensitive receptors in the region. Although Design Option Center B does not add significantly enough additional traffic volumes on Franklin / Gough to be measurable from an emissions perspective eliminating left turns could increase traffic volumes along certain roadway segments parallel to Van Ness Avenue, such as Franklin Street. As discussed in Section 3.5.3.2 (Localized Emissions), the project would not result in a localized CO hot spot. The proposed project satisfies all the conditions of Level 2 of the CO Protocol in order to be screened out. Therefore, the proposed project will not have the potential for causing or worsening violation of the National Ambient Air Quality Standards for CO.
.

**$PM_{2.5}$/$PM_{10}$ Hotspot Analyses**. Qualitative particulate matter hotspot analysis is required under the USEPA Transportation Conformity rule for Projects of Air Quality Concern (POAQC). Projects that are not POAQC are not required to complete a detailed particulate matter hotspot analysis. According to the USEPA Transportation Conformity Guidance, the following types of projects are considered POAQC:

- New or expanded highway projects that have a significant number of or significant increase in diesel vehicles (defined as greater than 125,000 Annual Average Daily Traffic (AADT) and eight percent or more of such AADT is diesel truck traffic);
- Projects affecting intersections that are at a Level of Service D, E, F, with a significant number of diesel vehicles, or that that will change to Level of Service D, E, or F because of increased traffic volumes from a significant number of diesel vehicles related to the project;
- New bus and rail terminals and transfer points that have a significant number of diesel vehicles congregating at a single location;
- Expanded bus and rail terminals and transfer points that significantly increase the number of diesel vehicles congregating at a single location; or
- Projects in or affecting locations, areas, or categories of sites which are identified in the $PM_{2.5}$ or $PM_{10}$ implementation plan or implementation plan submission, as appropriate, as sites of possible violation.

The proposed project is not considered a POAQC because it does not meet the definition of a POAQC as defined in USEPA's Transportation Conformity Guidance. The proposed project would not increase the percentage of diesel vehicles on the roadway, does not involve a bus or rail terminal that significantly increases diesel vehicles, and is not identified in the SIP as a possible $PM_{2.5}$ or $PM_{10}$ violation site. The proposed project has undergone Interagency Consultation (IAC). IAC participants concurred that the proposed project is not a POAQC (Appendix G). A particulate matter hotspot analysis is not required.

## 3.6 CUMULATIVE IMPACTS

By its very nature, air pollution is largely a cumulative impact. No single project is sufficient in size to, by itself, result in nonattainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulatively significant adverse air quality impacts. If a project's contribution to the cumulative impact is considerable, then the proposed project's impact on air quality would be considered significant. In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. If a project exceeds the identified significance thresholds, its emissions would be cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions. Therefore, additional analysis to assess cumulative impacts is unnecessary.[32]

### 3.6.1 Cumulative Construction

With incorporation of BAAQMD mitigation, none of the alternatives would result in a significant ROG, $PM_{2.5}$, $PM_{10}$, or $NO_X$ impact during construction. According to BAAQMD guidance, each alternative is less than significant on a project basis and would not contribute to a cumulative impact.

### 3.6.2 Cumulative Operations

None of the alternatives would result in a significant ROG, $PM_{2.5}$, $PM_{10}$, or $NO_X$ impact during operations. According to BAAQMD guidance, each project alternative is less than significant on a project basis and would not contribute to a cumulative impact. In addition, each alternative would decrease regional VMT and associated regional emissions. Each alternative would improve regional air quality and would not contribute to a cumulative impact regardless of emissions associated with related projects. .

### 3.6.3 Climate Change

#### Greenhouse Gas Emissions – 2035

The largest source of greenhouse gas emissions are from automobiles. Public transportation projects generally reduce the amount of cars driving on the road, by providing the public with alternative means of transportation. Less cars on the road leads to less sources of pollution. Because of the higher capacity of buses, and the updated fleet associated with the proposed project, buses are able to transport higher quantities of people while producing fewer emissions than the cars they are replacing. This results in a reduction in greenhouse gas emissions. Total gross greenhouse gas emissions are shown for each build alternative in **Table 3-17**. **Table 3-18** below shows the net difference in citywide VMT and $CO_2$e for each alternative.

**TABLE 3-17: ESTIMATED GROSS CITYWIDE GREENHOUSE GAS EMISSIONS - 2035**

| Scenario | VMT | Carbon Dioxide Equivalent (Metric Tons per Year) |
|---|---|---|
| 2035 Baseline | 11,965,507 | 2,341,923 |
| | | |
| Build Alternative 2 | 11,891,952 | 2,327,527 |
| | | |
| Build Alternatives 3 & 4 without Design Option B | 11,887,251 | 2,326,607 |
| | | |
| Build Alternatives 3 & 4 with Design Option B | 11,953,541 | 2,339,581 |

**SOURCE:** TAHA, 2013 (Appendix E).

[32] BAAQMD, *CEQA Air Quality Guidelines*, June 2010.

***Alternative 1: No-Build (Baseline Alternative)***

Alternative 1, the No-Build Alternative, would not include a BRT service. However, the bus improvements associated with each alternative would still be implemented. These improvements include replacing the current electric buses with new electric buses, and replacing the current diesel buses with lower emitting diesel hybrid buses. Because of these improvements, greenhouse gas emissions would be reduced below existing conditions. This would result in a beneficial global warming impact.

**TABLE 3-18: ESTIMATED NET CITYWIDE GREENHOUSE GAS EMISSIONS - 2035**

| Scenario | Net Increase in VMT | Carbon Dioxide Equivalent (Metric Tons per Year) |
|---|---|---|
| Baseline vs. Build Alternative 2 | (73,555) | (14,396) |
| Net Increase in GHG Emissions? | | No |
| | | |
| Baseline vs. Build Alternatives 3 & 4 without Design Option B | (78,256) | (15,316) |
| Net Increase in GHG Emissions? | | No |
| | | |
| Baseline vs. Build Alternatives 3 & 4 with Design Option B | (11,966) | (2,342) |
| Net Increase in GHG Emissions? | | No |
| **SOURCE:** TAHA, 2013. (Appendix E). | | |

***Build Alternative 2: Side Lane BRT with Street Parking***

As shown in **Table 3-18**, Build Alternative 2 would decrease automobile VMT and associated GHG emissions compared to baseline conditions by 14,396 metric tons per year. Build Alternative 2 would result in less GHG emissions than baseline conditions, and would cause a beneficial global warming impact.

***Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians***

As shown in **Table 3-18**, Build Alternative 3 would decrease automobile VMT and associated GHG emissions compared to baseline conditions by 15,316 metric tons per year. Build Alternative 3 would result in less GHG emissions than baseline conditions, and would cause a beneficial global warming impact.

*Center Lane Alternative Design Option B*

As shown in **Table 3-18**, Center Lane Alternative Design Option B under Alternative 3 would decrease automobile VMT and associated GHG emissions compared to baseline conditions by 2,342 metric tons per year. Center Lane Alternative Design Option B under Alternative 3 would result in less GHG emissions than baseline conditions, and would cause a beneficial global warming impact.

**Build Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median**

As shown in **Table 3-18**, Build Alternative 4 would decrease automobile VMT and associated GHG emissions by the same amount as Build Alternative 3, causing a beneficial global warming impact.

*Center Lane Alternative Design Option B*

As shown in **Table 3-4**, Build Alternative 4 with incorporation of Design Option B automobile VMT would be the same as for Build Alternative 3. GHG emissions, displayed in **Table 3-18**, would be reduced in the Air Basin. Center Lane Alternative Design Option B under Alternative 4 would cause a beneficial global warming impact.

**Greenhouse Gas Emissions – Existing Plus Project (2007)**

Total gross greenhouse gas emissions are shown in **Table 3-19** for the Existing plus Project scenarios. **Table 3-20** below shows the net difference in citywide VMT and $CO_2e$ for each alternative.

**TABLE 3-19: ESTIMATED GROSS CITYWIDE GREENHOUSE GAS EMISSIONS – EXISTING PLUS PROJECT (2007)**

| Scenario | VMT | Carbon Dioxide Equivalent (Metric Tons per Year) |
|---|---|---|
| Existing Conditions (2007) | 10,100,425 | 2,076,273 |
| | | |
| Build Alternative 2 (2007) | 9,940,405 | 2,043,378 |
| | | |
| Build Alternatives 3 & 4 without Design Option B (2007) | 9,939,510 | 2,043,194 |
| | | |
| Build Alternatives 3 & 4 with Design Option B (2007) | 9,965,954 | 2,048,630 |

**SOURCE:** TAHA, 2013 (Appendix E).

**TABLE 3-20: ESTIMATED NET CITYWIDE GREENHOUSE GAS EMISSIONS – EXISTING PLUS PROJECT (2007)**

| Scenario | Net Increase in VMT | Carbon Dioxide Equivalent (Metric Tons per Year) |
|---|---|---|
| Existing vs. Build Alternative 2 | (160,020) | (32,894) |
| Net Increase in GHG Emissions? | | No |
| | | |
| Existing vs. Build Alternatives 3 & 4 without Design Option B | (160,915) | (33,078) |
| Net Increase in GHG Emissions? | | No |
| | | |
| Existing vs. Build Alternatives 3 & 4 with Design Option B | (134,471) | (27,642) |
| Net Increase in GHG Emissions? | | No |

**SOURCE:** TAHA, 2013. (Appendix E).

***Build Alternative 2: Side Lane BRT with Street Parking***

As shown in **Table 3-20**, Build Alternative 2 would decrease automobile VMT and associated GHG emissions compared to existing conditions by 32,894 metric tons per year. Build Alternative 2 would result in less GHG emissions than existing conditions, and would cause a beneficial global warming impact.

***Build Alternative 3: Center Lane BRT with Right-Side Boarding and Dual Medians***

As shown in **Table 3-20**, Build Alternative 3 would decrease automobile VMT and associated GHG emissions compared to existing conditions by 33,078 metric tons per year. Build Alternative 3 would result in less GHG emissions than existing conditions, and would cause a beneficial global warming impact.

*Center Lane Alternative Design Option B*

As shown in **Table 3-20**, Center Lane Alternative Design Option B under Alternative 3 would decrease automobile VMT and associated GHG emissions compared to existing conditions by metric 27,642 metric tons per year. Center Lane Alternative Design Option B under Alternative 3 would result in less GHG emissions than existing conditions, and would cause a beneficial global warming impact.

**Build Alternative 4: Center Lane BRT with Left-Side Boarding and Single Median**

As shown in **Table 3-20**, Build Alternative 4 would decrease automobile VMT and associated GHG emissions by the same amount as Build Alternative 3, causing a beneficial global warming impact.

*Center Lane Alternative Design Option B*

As shown in **Table 3-20**, Build Alternative 4 with incorporation of Design Option B automobile VMT would be the same as for Build Alternative 3. GHG emissions, displayed in **Table 3-19**, would be reduced in the Air Basin. Center Lane Alternative Design Option B under Alternative 4 would cause a beneficial global warming impact.