G. Air Quality

This section addresses air quality impacts that could result from implementation of the Transit Center District Plan and Transit Tower project. The analysis estimates potential increases in criteria air pollutants that would be associated with project implementation.

Environmental Setting

The Plan area and the Transit Tower site are within the San Francisco Bay Area Air Basin, which includes all of San Francisco, Alameda, Contra Costa, Marin, San Mateo, Santa Clara, and Napa counties, and the southern and southwestern portions, respectively, of Sonoma and Solano counties. The Bay Area Air Quality Management District (BAAQMD) is the regional agency responsible for air quality planning in the Air Basin.

Ambient Air Quality – Criteria Air Pollutants

As required by the 1970 federal Clean Air Act, the United States Environmental Protection Agency (EPA) has identified six criteria air pollutants that are pervasive in urban environments and for which state and federal health-based ambient air quality standards have been established. EPA calls these pollutants criteria air pollutants because the agency has regulated them by developing specific public health- and welfare-based criteria as the basis for setting permissible levels. Ozone, carbon monoxide (CO), particulate matter (PM), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead are the six criteria air pollutants.

The BAAQMD's air quality monitoring network provides information on ambient concentrations of criteria air pollutants at various locations in the San Francisco Bay Area. **Table 31** is a five-year summary of highest annual criteria air pollutant concentrations (2006 to 2010), collected at the BAAQMD's air quality monitoring station at 10 Arkansas Street in San Francisco, which is located approximately 1.3 miles south of the Plan area.[204] Table 31 compares measured pollutant concentrations with the most stringent applicable ambient air quality standards (state or federal).

Ozone

Ozone is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and nitrogen oxides (NOx). The main sources of ROG and NOx, often referred to as ozone precursors, are combustion processes (including motor vehicle engines) and the evaporation of solvents, paints, and fuels. In the Bay Area, automobiles are the single largest source of ozone precursors. Ozone is referred to as a regional air pollutant because its precursors are transported and diffused by wind concurrently with ozone production through the photochemical reaction process. Ozone causes eye irritation, airway constriction, and shortness of breath

[204] Data from this single location does not describe pollutant levels throughout San Francisco, as these levels may vary depending on distance from key emissions sources and local meteorology. However, the BAAQMD monitoring network does provide a reliable picture of pollutant levels over time.

TABLE 31
SUMMARY OF SAN FRANCISCO AIR QUALITY MONITORING DATA (2006–2010)

Pollutant	Most Stringent Applicable Standard	Number of Days Standards were Exceeded and Maximum Concentrations Measured				
		2006	2007	2008	2009	2010
Ozone						
- Days 1-hour Std. Exceeded	9 pphm [a]	0	0	0	0	0
- Max. 1-hour Conc. (pphm) [b]		5.3	6.0	8.2	7.2	7.9
- Days 8-hour Std. Exceeded	7 pphm [a]	0	0	0	0	0
- Max. 8-hour Conc. (pphm) [b]		4.6	5.3	6.6	5.6	5.1
Carbon Monoxide (CO)						
- Days 8-hour Std. Exceeded	9 ppm [a]	0	0	0	0	0
- Max. 8-hour Conc. (ppm)		2.1	1.6	2.3	2.9	1.4
Suspended Particulates (PM_{10})						
- Days 24-hour Std. Exceeded[c]	50 µg/m^3 [a]	3	2	0	0	0
- Max. 24-hour Conc. (µg/m^3)		**61**	**70**	41	35	39
Suspended Particulates ($PM_{2.5}$)						
- Days 24-hour Std. Exceeded [d]	35 µg/m^3 [b]	3	5	0	1	3.2
- Max. 24-hour Conc. (µg/m^3)		**54.3**	**45.5**	29.4	**35.5**	**45.3**
- Annual Average (µg/m^3)	12 µg/m^3 [a]	9.7	8.9	11.7	ND	10.5 [e]
Nitrogen Dioxide (NO_2)						
- Days 1-hour Std. Exceeded	25 pphm [a]	0	0	0	0	0
- Max. 1-hour Conc. (pphm) [b]		11	7	6	6	9
Sulfur Dioxide (SO_2)						
- Days 24-hour Std. Exceeded	40 ppb [a]	0	0	0	ND	ND
- Max. 24-hour Conc. (ppb) [b]		6	6	4	ND	ND

Notes: Bold values are in excess of applicable standard.
conc. = concentration; ppm = parts per million; pphm = parts per hundred million; ppb=parts per billion;
µg/m3 = micrograms per cubic meter
ND = No data or insufficient data.

[a] State standard, not to be exceeded.

[b] Federal standard, not to be exceeded.

[c] Based on a sampling schedule of one out of every six days, for a total of approximately 60 samples per year.

[d] Federal standard for $PM_{2.5}$ was reduced from 65 µg/m3 to 35 µg/m3 in 2006.

[e] Annual average based on federal method; state average not available.

SOURCE*:* California Air Resources Board

and can aggravate existing respiratory diseases such as asthma, bronchitis, and emphysema. Table 31 shows that, according to published data, the most stringent applicable standards (state 1-hour standard of 9 parts per hundred million (pphm) and the federal 8-hour standard of 8 pphm) were not exceeded in San Francisco between 2004 and 2008.

Carbon Monoxide (CO)

CO is an odorless, colorless gas usually formed as the result of the incomplete combustion of fuels. The single largest source of CO is motor vehicles; the highest emissions occur during low travel speeds, stop-and-go driving, cold starts, and hard acceleration. Exposure to high concentrations of CO reduces the

oxygen-carrying capacity of the blood and can cause headaches, nausea, dizziness, and fatigue, impair central nervous system function, and induce angina (chest pain) in persons with serious heart disease. Very high levels of CO can be fatal. As shown in Table 31, no exceedances of state CO standards were recorded between 2004 and 2008. Measurements of CO indicate hourly maximums average 14 percent of the more stringent state standard, and maximum 8-hour CO levels approximately 20 percent of the allowable 8-hour standard. According to BAAQMD, CO emissions have decreased dramatically since the introduction of the catalytic converter in 1975, and there have been no local exceedances of state or federal standards since 1991.[205]

Particulate Matter (PM_{10} and $PM_{2.5}$)

Particulate matter is a class of air pollutants that consists of heterogeneous solid and liquid airborne particles from manmade and natural sources. Particulate matter is measured in two size ranges: PM_{10} for particles less than 10 microns in diameter, and $PM_{2.5}$ for particles less than 2.5 microns in diameter. In the Bay Area, motor vehicles generate about half of the Air Basin's particulates, through tailpipe emissions as well as brake pad and tire wear. Wood burning in fireplaces and stoves, industrial facilities, and ground-disturbing activities such as construction, as well as demolition and agricultural activities, are other sources of such fine particulates. PM_{10} and $PM_{2.5}$ are small enough to be inhaled into the deepest parts of the human lung and can cause adverse health effects. $PM_{2.5}$ poses an increased health risk because the particles can deposit deep in the lungs and contain substances that are particularly harmful to human health. These fine particulates are strongly associated with premature deaths, respiratory diseases and reduced lung development in children, hospital admissions, and cardiopulmonary disease.[206]

Among the criteria pollutants that are regulated, particulates represent a serious ongoing health hazard. As long ago as 1999, the BAAQMD was reporting, in its CEQA Guidelines published that year, that studies had shown that elevated particulate levels contribute to the death of approximately 200 to 500 people per year in the Bay Area. High levels of particulates have also been known to exacerbate chronic respiratory ailments, such as bronchitis and asthma, and have been associated with increased emergency room visits and hospital admissions. Current evidence suggests that $PM_{2.5}$ "is by far the most harmful air pollutant in [the Bay Area] in terms of the associated impact on public health."[207]

Table 31 shows that exceedances of the state PM_{10} standard have occurred periodically in San Francisco. The state 24-hour PM_{10} standard is estimated to have been exceeded between 1 and 7 days in 2004, 3 and 21 days in 2006, and 2 and 14 days in 2007, but not exceeded in 2005 and 2008. The BAAQMD began

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205 Bay Area Air Quality Management District (BAAQMD), *California Environmental Quality Act (CEQA) Air Quality Guidelines,* Updated May 2011; p. 6-1. http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Updated-CEQA-Guidelines.aspx. Accessed August 18, 2011.

206 Bhatia, Rajiv and Thomas Rivard, San Francisco Department of Public Health, Occupational & Environmental Health Section, Program on Health, Equity, & Sustainability, "Assessment and Mitigation of Air Pollutant Health Effects from Intra-urban Roadways: Guidance for Land Use Planning and Environmental Review," p. 5, May 6, 2008. Available on the internet at: http://www.sfdph.org/dph/files/EHSdocs/AirQuality/MitigateRoadAQLUConlicts.pdf. This document is also available for review at the Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0558E.

207 BAAQMD, *CEQA Air Quality Guidelines,* May 2011 (see footnote 205, above); p. 5-2.

monitoring $PM_{2.5}$ concentrations in San Francisco in 2002.[208] The federal 24-hour $PM_{2.5}$ standard was exceeded on three days in 2006 and five days in 2007, but not exceeded in 2004, 2005, or 2008. The state annual average standard was not exceeded between 2004 and 2008.

Nitrogen Dioxide (NO_2)

NO_2 is a reddish brown gas that is a byproduct of combustion processes. Automobiles and industrial operations are the main sources of NO_2. Aside from its contribution to ozone formation, NO_2 can increase the risk of acute and chronic respiratory disease and reduce visibility. NO_2 may be visible as a coloring component on high pollution days, especially in conjunction with high ozone levels. Table 31 shows that the standard for NO_2 is being met in the Bay Area, and pollutant trends suggest that the Air Basin will continue to meet these standards for the foreseeable future.

Sulfur Dioxide (SO_2)

SO_2 is a colorless acidic gas with a strong odor. It is produced by the combustion of sulfur-containing fuels such as oil, coal, and diesel. SO_2 has the potential to damage materials and can cause health effects at high concentrations. It can irritate lung tissue and increase the risk of acute and chronic respiratory disease.[209] Table 31 shows that the standard for SO_2 is being met in the Bay Area, and pollutant trends suggest that the Air Basin will continue to meet these standards for the foreseeable future.

Lead

Leaded gasoline (phased out in the United States beginning in 1973), paint (on older houses, cars), smelters (metal refineries), and manufacture of lead storage batteries have been the primary sources of lead released into the atmosphere. Lead has a range of adverse neurotoxic health effects; children are at special risk. Some lead-containing chemicals cause cancer in animals. Lead levels in the air have decreased substantially since leaded gasoline was eliminated.

Toxic Air Contaminants

Toxic air contaminants (TACs) are air pollutants that may lead to serious illness or increased mortality, even when present in relatively low concentrations. Potential human health effects of TACs include birth defects, neurological damage, cancer, and death. There are hundreds of different types of TACs with varying degrees of toxicity. Individual TACs vary greatly in the health risk they present; at a given level of exposure, one TAC may pose a hazard that is many times greater than another.

In the Plan area, the primary source of TACs is on-road mobile sources (vehicles traveling on freeways and local roadways). Mobile source air toxics are known or suspected to cause cancer or other serious health or environmental effects. Engine exhaust from diesel, gasoline, and other combustion engines, is a complex mixture of particles and gases, with collective and individual toxicological characteristics.

[208] PM concentrations are not measured daily; hence, the number of annual exceedances is estimated by extrapolating sampling data for approximately 60 days per year.

[209] BAAQMD, *CEQA Guidelines,* op. cit.; p. B-2.

Vehicle tailpipe emissions includes criteria air pollutants such as particulate matter and carbon monoxide, ozone precursor compounds such as nitrogen oxides (NOx) and other hazardous air pollutants (e.g., air toxics) not regulated by EPA as criteria pollutants. Criteria air pollutant levels in the Plan area are described above in Table 31. Motor vehicles also emit air toxics. The EPA has identified seven priority mobile source air toxics, including benzene, 1,3-butadiene, formaldehyde, acetaldehyde, acrolein, naphthalene, and diesel exhaust. Similarly, the California Air Resources Board (CARB) has identified 10 air toxics of concern, five of which are emitted by on-road mobile sources: benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and diesel exhaust particulate matter. Benzene is of particular concern because it is a known carcinogen and most of the nation's benzene emissions come from mobile sources. Diesel particulate matter is a toxic air contaminant and known lung carcinogen resulting from combustion of diesel fuel in heavy duty trucks and heavy equipment.[210]

In addition to monitoring criteria pollutants (Table 31), both the BAAQMD and CARB operate TAC monitoring networks in the San Francisco Bay Area. These stations measure 10 to 15 TACs, depending on the specific station. The TACs selected for monitoring are those that have traditionally been found in the highest concentrations in ambient air, and therefore tend to produce the most significant risk. The BAAQMD operates an ambient TAC monitoring station at its Arkansas Street facility in San Francisco. When TAC measurements at this station are compared to ambient concentrations of various TACs for the Bay Area as a whole, the cancer risks associated with mean TAC concentrations in San Francisco are similar to those for the Bay Area as a whole.[211]

TACs do not have ambient air quality standards, but are regulated by the BAAQMD using a risk-based approach. This approach uses a health risk assessment to determine what sources and pollutants to control as well as the degree of control. A health risk assessment is an analysis in which human health exposure to toxic substances is estimated, and considered together with information regarding the toxic potency of the substances, to provide quantitative estimates of health risks.[212]

Diesel particulate matter (DPM), which is emitted in diesel engine exhaust, was identified as a toxic air contaminant by CARB in 1998. Unlike TACs emitted from industrial and other stationary sources noted above, most diesel particulate matter is emitted from mobile sources—primarily "off-road" sources such as construction and mining equipment, agricultural equipment, and truck-mounted refrigeration units, as well as trucks and buses traveling on freeways and local roadways. Agricultural and mining equipment are not relevant to San Francisco, while construction equipment typically operates for a limited time at changeable locations. As a result, the readily identifiable locations where DPM is emitted in the Plan area include high-traffic roadways and other areas with substantial truck and bus traffic. Therefore, diesel

210 Bhatia, Rajiv, and Thomas Rivard, "Assessment and Mitigation of Air Pollutant Health Effects …"; p. 5 (see note 206, p. 370).

211 BAAQMD, Toxic Air Contaminant Control Program, Annual Report 2003, Volume I and Appendix B-3. August 2007.

212 In general, a health risk assessment is required if the BAAQMD concludes that projected emissions of a specific air toxic compound from a proposed new or modified source suggest a potential public health risk, then the applicant is subject to a health risk assessment for the source in question. Such an assessment generally evaluates chronic, long-term effects, calculating the increased risk of cancer as a result of exposure to one or more TACs.

particulate matter is discussed further under "Roadway-Related Health Effects," p. 376, below. Additionally, temporary emissions of DPM and $PM_{2.5}$ are associated with construction activities, notably building demolition and site excavation and grading, as off-road diesel equipment is prevalent in both of these phases of construction work.

Recently completed air toxics modeling determined that northeastern San Francisco, including the Plan area, has the highest annual DPM concentrations in the Bay Area.[213] Of the estimated annual DPM concentration of 18.3 micrograms per cubic meter, almost 93 percent of the DPM exposure was attributable to transportation sources. Because of the complex interaction between exact source locations and often vigorous localized mixing, this value should be considered more of an indicator of DPM exposure potential in the project vicinity rather than any specific risk.

Sensitive Receptors

Air quality does not affect every individual in the population in the same way, and some groups are more sensitive to adverse health effects than others. Population subgroups sensitive to the health effects of air pollutants include the elderly and the young, population subgroups with higher rates of respiratory disease such as asthma and chronic obstructive pulmonary disease, and populations with other environmental or occupational health exposures (e.g. indoor air quality) that affect cardiovascular or respiratory diseases such as asthma and chronic obstructive pulmonary disease, and populations with other environmental or occupational health exposures (e.g. indoor air quality) that affect cardiovascular or respiratory diseases. The factors responsible for variation in exposure are also often similar to factors associated with greater susceptibility to air quality health effects. For example, poorer residents may be more likely to live in crowded substandard housing and be more likely to live near industrial or roadway sources of air pollution.

Land uses such as schools, children's day care centers, hospitals, and nursing and convalescent homes are considered to be the most sensitive to poor air quality because the population groups associated with these uses have increased susceptibility to respiratory distress. Residential areas are considered more sensitive to air quality conditions compared to commercial and industrial areas because people generally spend longer periods of time at their residences, with associated greater exposure to ambient air quality conditions.

Land uses within the Plan area are described in detail in Section IV.A, Land Use. Residential uses occur in the Plan area, with most located in the eastern portion of the Plan area. Recreational uses would also be considered sensitive compared to commercial and industrial areas due to the greater exposure to ambient air quality conditions. Parks and playgrounds in active recreational use may be considered moderately sensitive to poor air quality because persons engaged in strenuous work or exercise also have increased sensitivity to poor air quality; also, children are frequent users. However, exposure times are generally far shorter in parks and playgrounds than in residential locations and schools, for example, which typically

213 Environ International Corp., *Demonstration Toxics Modeling for the Bay Area Using CAMx*, February 14, 2008. The grid resolution was 2 km x 2 km such that localized variations could not be determined.

reduces overall exposure to pollutants. While there are no existing public parks in the Transit Center District Plan area, there are privately owned, publicly accessible plazas and open space areas, with most located in the central and eastern portions of the Plan area. However, none of these open spaces offer space for active recreational activities. The lack of active uses and the fact that exposure times in Plan area open spaces are typically relatively short means that parks and open spaces are not considered sensitive air quality receptors for purposes of this analysis. (As noted above, day care centers, however, are considered sensitive; this includes the outdoor play areas at such facilities.)

In the vicinity of the proposed Transit Tower, the closest sensitive residential receptors are in the Millennium Tower, a high-residential structure at the southeast corner of Fremont and Mission Streets. This building has commercial and (non-public) community uses on the first two floors and residential uses beginning on the third floor; it is located approximately 82 feet east of the proposed Mission Square park, which would be developed adjacent to the Transit Tower, and approximately 180 feet east of the site of the Transit Tower itself. The licensed child-care facility closest to the Transit Tower site is located at 342 Howard Street (in the office building at 199 Fremont Street), at the northwest corner of Fremont and Howard Streets, some 400 feet southeast of the Transit Tower site. There is another child-care center in the PG&E Building at 77 Beale Street, with an outdoor play area on Mission Street at Main Street. This facility is about 600 feet east-northeast of the Transit Tower site.

Roadway-Related Health Effects

Both criteria pollutants and toxic air contaminants can result in adverse health impacts. Among criteria pollutants, fine particulate ($PM_{2.5}$) is of greatest concern. According to the BAAQMD, "A large body of scientific evidence indicates that both long-term and short-term exposure to $PM_{2.5}$ can cause a wide range of health effects (e.g., aggravating asthma and bronchitis, causing visits to the hospital for respiratory and cardiovascular symptoms, and contributing to heart attacks and deaths). According to the San Francisco Department of Public Health, epidemiological research that indicates that a concentration of 0.2 micrograms per cubic meter of $PM_{2.5}$ can result in an approximately 0.28 percent increase in non-injury mortality, or an increase of approximately 21 "excess deaths" per year (e.g., deaths that would occur sooner than otherwise expected) per one million population in San Francisco.[214,215]

Epidemiologic studies have consistently demonstrated that children and adults living in proximity to freeways or busy roadways have poorer health outcomes, including increased asthma symptoms and respiratory infections and decreased pulmonary function and lung development in children. Air pollution monitoring done in conjunction with epidemiological studies has confirmed that roadway-related health effects vary with modeled exposure to particulate matter and nitrogen dioxide. At this time, it is not possible to attribute roadway-related health effects to a single type of roadway, vehicle, or type of fuel. Vehicle tailpipe emissions contain diverse forms of particulate matter as well as well as

[214] "Excess deaths" (also referred to as premature mortality) refer to deaths that occur sooner than otherwise expected, absent the specific condition under evaluation; in this case, exposure to $PM_{2.5}$.

[215] Bhatia and Rivard, "Assessment and Mitigation of Air Pollutant Health Effects…."; see note 206, p. 370.

ozone precursor compounds such as nitrogen oxides (NOx) and volatile organic compounds (VOC). Vehicles also contribute to particulates by generating road dust and through tire wear.

Air pollution studies have shown an association between respiratory and other non-cancer health effects and proximity to high traffic roadways. CARB community health risk assessments and regulatory programs have produced air quality information about certain types of facilities for consideration by local authorities when siting new residences, schools, day care centers, and medical facilities (i.e., sensitive land uses).[216] Sensitive land uses deserve special attention because children, pregnant women, the elderly, and those with existing health problems are especially vulnerable to the non-cancer effects of air pollution. There is also substantial evidence that children are more sensitive to cancer-causing chemicals.[217]

In traffic-related studies, the additional non-cancer health risk attributable to roadway proximity was seen within 1,000 feet of the roadway and was strongest within 300 feet. California freeway studies show about a 70 percent drop-off in particulate pollution levels at 500 feet from the roadway. Therefore, CARB recommends that new sensitive land uses (e.g., residences, schools, daycare centers, and medical facilities) not be located within 500 feet of a freeway or urban roads carrying 100,000 vehicles per day. This recommendation is put forth to minimize potential non-cancer health effects of exposure to pollutants known to increase incidence of asthma and other respiratory ailments, particularly fine particulates, as well as cancer risk from exposure to diesel particulates from truck and bus exhaust (discussed below) and benzene and 1,3-butadine from automobile exhaust.

CARB notes that these recommendations are advisory and should not be interpreted as defined "buffer zones." CARB acknowledges that land use agencies must balance other considerations, including housing and transportation needs, the benefits of urban infill, community economic development priorities, and other quality of life issues. With careful evaluation of exposure, health risks, and affirmative steps to reduce risk where necessary, CARB's position is that infill development, mixed-use, higher density, transit-oriented development, and other concepts that benefit regional air quality can be compatible with protecting the health of individuals at the neighborhood level.[218]

The closest freeway to the Plan area is located approximately 1,000 feet to the south. However, surface streets in the Plan area also carry high volumes of traffic that can generate substantial levels of pollutants, including $PM_{2.5}$. Modeling conducted by the Department of Public Health in connection with implementation of Article 38 of the *San Francisco Health Code* (discussed below on p. 385 under Air Quality Regulations and Plans) indicates that traffic volumes on some three-fourths of the blocks along major streets (i.e., excluding mid-block alleys) in the Plan area are high enough to potentially result in a roadside concentration of $PM_{2.5}$ that is in excess of the Code's "action level."

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216 As noted previously, parks and playgrounds are not normally considered sensitive receptors because of the lack of long-term exposure and active uses.

217 California Air Resources Board, *Air Quality and Land Use Handbook: A Community Health Perspective,* April 2005. Available on the internet at: http://www.arb.ca.gov/ch/handbook.pdf.

218 *Ibid*.

Diesel Particulate Matter and other Organic Gases

Diesel exhaust is a toxic air contaminant (TAC) that is of concern throughout California. CARB identified diesel particulate matter (DPM) as a TAC in 1998, primarily based on evidence demonstrating cancer effects in humans.[219] The exhaust from diesel engines include hundreds of different gaseous and particulate components, many of which are toxic. Many of these toxic compounds adhere to the diesel particles, which are very small and can penetrate deeply into the lungs. Mobile sources such as trucks, buses, and, to a much lesser extent, automobiles are some of the primary sources of diesel emissions. Studies show that diesel particulate matter concentrations are much higher near heavily traveled highways and intersections. DPM is the TAC most relevant to the draft Plan because of the high levels of bus traffic associated with the Transit Center.

The estimated cancer risk from exposure to diesel exhaust is much higher than the risk associated with any other toxic air pollutant routinely measured in the region. CARB estimated the average Bay Area cancer risk from diesel particulate, based on a population-weighted average ambient diesel particulate concentration, at about 480 in one million, as of 2000. The risk from diesel particulate matter has declined from 750 in one million in 1990 and 570 in one million in 1995. CARB estimated the average statewide cancer risk from DPM at 540 in one million in 2000.[220,221] Other studies have shown that diesel exhaust and other cancer-causing chemicals emitted from cars and trucks are responsible for much of the cumulative cancer risk from airborne toxics in California. Diesel exhaust also contains pulmonary irritants and hazardous compounds that could affect non cancer health effects in sensitive receptors such as young children, senior citizens, or those susceptible to chronic respiratory disease such as asthma, bronchitis, and emphysema.

In 2000, CARB approved a comprehensive Diesel Risk Reduction Plan to reduce diesel emissions from both new and existing diesel-fueled vehicles and engines. The Plan aims to develop and implement specific statewide regulations designed to reduce DPM emissions and the associated health risk 85 percent by 2020. In addition to implementing more stringent engine controls (diesel engines produced today have one-eighth the tailpipe exhausts of a truck or bus built in 1990), diesel fuel is required to have lower sulfur levels. As of June 1, 2006, at least 80 percent of on-road diesel fuel refined in the United States must be ultra-low sulfur diesel, which reduces sulfur emissions by 97 percent. All of the diesel fuel sold in California for use with on-road trucks is now ultra-low sulfur diesel.

Despite these dramatic reductions in emission rates, reducing DPM emissions will take time since older trucks will need to be retrofitted or phased out as part of fleet turnover. While these efforts are reducing

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219 California Air Resources Board, Fact Sheet, "The Toxic Air Contaminant Identification Process: Toxic Air Contaminant Emissions from Diesel-fueled Engines." October 1998. Available on the internet at: http://www.arb.ca.gov/toxics/dieseltac/factsht1.pdf.

220 CARB, *California Almanac of Emissions and Air Quality - 2009 Edition*, Table 5-44 and Figure 5-14. Available on the internet at http://www.arb.ca.gov/Aqd/almanac/almanac.htm. Viewed April 28, 2011.

221 This calculated cancer risk values from ambient air exposure in the Bay Area can be compared against the lifetime probability of being diagnosed with cancer in the United States, from all causes, which is more than 40 percent (based on a sampling of 17 regions nationwide), or greater than 400,000 in one million, according to the National Cancer Institute.

diesel particulate emissions on a statewide basis, they do not yet capture every site where diesel vehicles and engines operate.

Beyond DPM, other TACs emitted by non-diesel vehicles result in similar health risks, and each TAC has specific risk factors that are used when modeling health risk. BAAQMD recommends that when conducting health risk assessments to evaluate risk from traffic-generated pollutants, both DPM and other organic gases be considered.

Regulatory Setting

Air Quality Regulations and Plans

Federal Ambient Air Quality Standards

The 1970 Clean Air Act (last amended in 1990, 42 United States Code [USC] 7401 et seq.) required that regional planning and air pollution control agencies prepare a regional air quality plan to outline the measures by which both stationary and mobile sources of pollutants will be controlled in order to achieve all standards by the deadlines specified in the Clean Air Act. The ambient air quality standards are intended to protect the public health and welfare, and they specify the concentration of pollutants (with an adequate margin of safety) to which the public can be exposed without adverse health effects. They are designed to protect those segments of the public most susceptible to respiratory distress, known as sensitive receptors, including asthmatics, the very young, the elderly, people weak from other illness or disease, persons engaged in strenuous work or exercise, and residential areas, where people spend longer periods of time. Healthy adults can tolerate occasional exposure to air pollution levels that are somewhat above the ambient air quality standards before adverse health effects are observed.

The current attainment status for the San Francisco Bay Area Air Basin with respect to federal standards is summarized in **Table 32**. In general, the Bay Area Air Basin experiences low concentrations of most pollutants when compared to federal standards, except for ozone and particulate matter (both PM_{10} and $PM_{2.5}$), for which standards are exceeded periodically. The Air Basin's attainment status for ozone has changed several times over the past decade, but is now "nonattainment" for the 1-hour federal ozone standard. The Bay Area Air Basin is also "nonattainment" for the federal $PM_{2.5}$ standard and "unclassified" for the federal PM_{10} standard. In 1998, after many years without violations of any CO standards, the attainment status for CO was upgraded to "attainment." The Air Basin is also in attainment for other criteria pollutants.

State Ambient Air Quality Standards

Although the federal Clean Air Act established national ambient air quality standards, individual states retained the option to adopt more stringent standards and to include other pollution sources. California had already established its own air quality standards by the time that federal standards were established, and because of the unique meteorological problems in California, there are some differences between the state and national ambient air quality standards, as shown in Table 32. California ambient standards tend to be at least as protective as national ambient standards and are often more stringent.

TABLE 32
STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS

		(State) SAAQS[a]		(Federal) NAAQS[b]	
Pollutant	**Averaging Time**	**Standard**	**Attainment Status**	**Standard**	**Attainment Status**
Ozone	1 hour	0.09 ppm	**N**	NA	See Note c
	8 hour	0.07 ppm	**N**	0.075 ppm	**N**[d]
Carbon Monoxide (CO)	1 hour	20 ppm	A	35 ppm	A
	8 hour	9 ppm	A	9 ppm	A
Nitrogen Dioxide (NO_2)	1 hour	0.18 ppm	A	NA	NA
	Annual	0.030 ppm	A	0.053 ppm	A
Sulfur Dioxide (SO_2)	1 hour	0.25 ppm	A	NA	NA
	24 hour	0.04 ppm	A	0.14 ppm	A
	Annual	NA	NA	0.03 ppm	A
Particulate Matter (PM_{10})	24 hour	50 µg/m^3	**N**	150 µg/m^3	U
	Annual[e]	20 µg/m^3	**N**	NA	NA
Fine Particulate Matter ($PM_{2.5}$)	24 hour	NA	NA	35 µg/m^3	**N**[f]
	Annual	12 µg/m^3	**N**	15 µg/m^3	A
Sulfates	24 hour	25 µg/m^3	A	NA	NA
Lead	30 day	1.5 µg/m^3	A	NA	NA
	Cal. Quarter	NA	NA	1.5 µg/m^3	A
Hydrogen Sulfide	1 hour	0.03 ppm	U	NA	NA
Visibility-Reducing Particles	8 hour	See Note g	U	NA	NA

NOTES: A = Attainment; **N** = Nonattainment; U = Unclassified; NA = Not Applicable, no applicable standard;= ppm = parts per million; µg/m^3 = micrograms per cubic meter.

a SAAQs = state ambient air quality standards (California). SAAQS for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, particulate matter, and visibility-reducing particles are values that are not to be exceeded. All other state standards shown are values not to be equaled or exceeded.

b NAAQs = national ambient air quality standards. NAAQS, other than ozone and particulates, and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The 8-hour ozone standard is attained when the three-year average of the fourth highest daily concentration is 0.08 ppm or less. The 24-hour PM_{10} standard is attained when the three-year average of the 99th percentile of monitored concentrations is less than the standard. The 24-hour $PM_{2.5}$ standard is attained when the three-year average of the 98th percentile is less than the standard.

c The EPA revoked the national 1-hour ozone standard on June 15, 2005.

d In 2008, the EPA lowered the 8-hour federal standard for ozone to 0.075 ppm. The EPA will issue final designations based on this standard, at which point it is expected that the Bay Area Air Basin will be designated as nonattainment.

e State standard = annual geometric mean.

f The EPA lowered the 24-hour $PM_{2.5}$ standard from 65 µg/m^3 to 35 µg/m^3 in 2006. The EPA issued attainment status designations for the 35 µg/m^3 standard on December 22, 2008. The EPA has designated the Bay Area as nonattainment for the 35 µg/m^3 $PM_{2.5}$ standard.

g Statewide visibility-reducing particle standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

SOURCE: Bay Area Air Quality Management District (BAAQMD), Standards and Attainment Status. Website Accessed on January 15, 2010: http://hank.baaqmd.gov/pln/air_quality/ambient_air_quality.htm

In 1988, California passed the California Clean Air Act (California Health and Safety Code Sections 39600 et seq.), which, like its federal counterpart, called for the designation of areas as attainment or nonattainment, but based on state ambient air quality standards rather than the federal standards. As indicated in Table 32, the Bay Area Air Basin is designated as "nonattainment" for state ozone, PM_{10}, and $PM_{2.5}$ standards. The Air Basin is designated as "attainment" for all other pollutants listed in the table.

California Air Resources Board

CARB is the state agency responsible for regulating air quality. CARB's responsibilities include establishing state ambient air quality standards, emissions standards, and regulations for mobile emissions sources (e.g., autos, trucks, etc.), as well as overseeing the efforts of countywide and multi-county air pollution control districts, such as the BAAQMD, which have primary responsibility over stationary sources.

Bay Area Air Quality Management District

The BAAQMD regulates air quality through its planning and review activities. The district has permit authority over most types of stationary emission sources and can require stationary sources to obtain permits; it can also impose emission limits, set fuel or material specifications, or establish operational limits to reduce air emissions. The BAAQMD regulates new or expanding stationary sources of toxic air contaminants. However, the district has no direct regulatory authority over mobile sources (e.g., cars and trucks), nor does it have permit authority over transportation terminals, such as the new Transit Center, currently under construction to replace the Transbay Terminal.

Air Quality Plans to Achieve Compliance with State Standards

Air quality plans developed to meet federal requirements are referred to as State implementation Plans. The federal Clean Air Act and the California Clean Air Act require plans to be developed for areas designated as non-attainment (with the exception of areas designated as non-attainment for the State particulate matter standards plans for which are not required by California Code of Regulations). In September 2010, BAAQMD adopted the *2010 Bay Area Clean Air Plan*, which updated the *2005 Ozone Strategy*, and also to function as a "multi-pollutant plan to protect public health and the climate."[222] This plan includes ozone control measures and also consider the impacts of these control measures on particulate matter (PM), air toxics, and Greenhouse Gas Emissions (GHGs) in a single, integrated plan.

The *2010 Clean Air Plan* explains how the Basin will achieve compliance with the State one-hour air quality standard for ozone as expeditiously as practicable and how the region will reduce transport of ozone and ozone precursors to neighboring air basins. The Strategy also discusses related air quality issues of interest including the BAAQMD's public involvement process, climate change, fine particulate matter, BAAQMD's Community Air Risk Evaluation program, local benefits of ozone control measures, the environmental review process, national ozone standards, and photochemical modeling.

222 BAAQMD, *2010 Clean Air Plan*, September 2010. Available on the internet at: http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx.

In 1999, BAAQMD adopted its *CEQA Guidelines – Assessing the Air Quality Impacts of Projects and Plans*, as a guidance document to provide lead government agencies, consultants, and project proponents with uniform procedures for assessing air quality impacts and preparing the air quality sections of environmental documents for projects subject to CEQA. These BAAQMD Guidelines were revised and updated in June 2010, as the *BAAQMD CEQA Air Quality Guidelines*.

The 2010 *BAAQMD CEQA Air Quality Guidelines* is an advisory document and local jurisdictions are not required to utilize the methodology outlined therein, but the document is commonly relied upon by local agencies, including the San Francisco Planning Department.[223] The document describes the criteria that BAAQMD uses when reviewing and commenting on the adequacy of environmental documents. It recommends thresholds for use in determining whether projects would have significant adverse environmental impacts, identifies methodologies for predicting project emissions and impacts, and identifies measures that can be used to avoid or reduce air quality impacts. In practice, most local agencies rely on the *BAAQMD CEQA Air Quality Guidelines* when assessing the significance of air quality impacts.

Air Quality Plans to Achieve Compliance with Federal Standards

In response to the EPA re-designation of the basin for the 1-hour federal ozone standard to nonattainment, the BAAQMD, ABAG, and MTC were required to develop an ozone attainment plan to meet this standard. The *1999 Ozone Attainment Plan* was prepared and adopted by these agencies in June 1999. However, in March 2001, the EPA proposed and took final action to approve portions of the 1999 ozone plan and disapprove other portions, while also making the finding that the Bay Area had not attained the national 1-hour ozone standard. As a result, a revised Ozone Attainment Plan was prepared and adopted in October 2001. The 2001 Ozone Attainment Plan amends and supplements the 1999 plan. The 2001 Ozone Attainment Plan contains control strategies for stationary and mobile sources. The adopted mobile-source control program was estimated to substantially reduce volatile organic compound and NOx emissions between 2000 and 2006, reducing emissions from on- and off-road diesel engines (including construction equipment). In addition to emission reduction requirements for engines and fuels, the 2001 Ozone Attainment Plan identified 28 transportation control measures to reduce automobile emissions, including improved transit service and transit coordination, new carpool lanes, signal timing, freeway incident management, and increased state gas tax and bridge tolls.

San Francisco Policies and Ordinances

San Francisco General Plan Air Quality Element

The Air Quality Element of the *San Francisco General Plan* is composed of six sections, each of which focuses on different aspects of air quality improvement efforts. They are: (1) adherence to air quality standards, (2) improvements related to mobile sources, (3) land use planning, (4) public awareness, (5) reduction of dust, and (6) energy conservation. The overarching goal of the Air Quality Element is to "Give high priority to air quality improvement in San Francisco to protect its population from adverse

[223] BAAQMD, *CEQA Guidelines*, May 2011. See footnote 205, p. 370.

health and other impacts of air pollutants." No express conflict with policies of the Air Quality Element were identified in Chapter III, Plans and Policies, with the possible exception of Policy 3.5, which states that the City should "Ensure that growth will not outpace capital improvements to transit or the circulation system." The analysis in Section IV.E, Transportation, indicates that, in combination with other growth downtown, the Plan would result in ridership on BART, Golden Gate Transit buses, and certain Muni screenlines and corridors that would exceed capacity, and would cause most intersections in the Plan area to operate at unacceptable levels of service.

San Francisco Dust Control Ordinance

San Francisco Health Code Article 22B, and *San Francisco Building Code* Section 106.A.3.2.6, collectively the Construction Dust Control Ordinance, requires that all site preparation work, demolition, or other construction activities within San Francisco that have the potential to create dust or to expose or disturb more than 10 cubic yards or 500 square feet of soil comply with specified dust control measures whether or not the activity requires a permit from the Department of Building Inspection (DBI). The Director of DBI may waive this requirement for activities on sites less than one half-acre that are unlikely to result in any visible wind-blown dust.

The project sponsor and the contractor responsible for construction activities at the project site shall use the following practices to control construction dust on the site or other practices that result in equivalent dust control that are acceptable to the Director of DBI. Dust suppression activities may include watering all active construction areas sufficiently to prevent dust from becoming airborne; increased watering frequency may be necessary whenever wind speeds exceed 15 miles per hour. Reclaimed water must be used if required by Article 21, Section 1100 et seq. of the *San Francisco Public Works Code*. If not required, reclaimed water should be used whenever possible. Contractors shall provide as much water as necessary to control dust (without creating run-off in any area of land clearing, and/or earth movement). During excavation and dirt-moving activities, contractors shall wet sweep or vacuum the streets, sidewalks, paths and intersections where work is in progress at the end of the workday. Inactive stockpiles (where no disturbance occurs for more than seven days) greater than 10 cubic yards or 500 square feet of excavated materials, backfill material, import material, gravel, sand, road base, and soil shall be covered with a 10 millimeter (0.01 inch) polyethylene plastic (or equivalent) tarp, braced down, or use other equivalent soil stabilization techniques.

For project sites greater than one half-acre in size, the Ordinance requires that the project sponsor submit a Dust Control Plan for approval by the San Francisco Health Department. DBI will not issue a building permit without written notification from the Director of Public Health that the applicant has a site-specific Dust Control Plan, unless the Director waives the requirement. Interior-only tenant improvements, even if over one-half acre, that will not produce exterior visible dust are exempt from the site-specific Dust Control Plan requirement.

Toxic Air Contaminant (TAC) Regulations

State

In 2005, CARB approved a regulatory measure to reduce emissions of toxic and criteria pollutants by limiting the idling of new heavy-duty diesel vehicles, which altered five sections of Title 13 of the California Code of Regulations. The relevant changes are Sections 2480 and 2485, which limit idling of commercial motor vehicles (including buses and trucks) within 100 feet of a school or residential area for more than five consecutive minutes or periods aggregating more than five minutes in any one hour.[224] Buses or vehicles also must turn off their engines upon stopping at a school and must not turn their engines on more than 30 seconds before beginning to depart from a school. As noted above under Public Health Effects Related to Air Quality, state law prohibits locating public schools within 500 feet of a freeway or busy traffic corridor.

CARB has also adopted rules for new diesel trucks and for off-road diesel equipment. Along with rules adopted by the EPA, these regulations have resulted in substantially more stringent emissions standards for new diesel trucks and new off-road diesel equipment, such as construction vehicles. Effective January 2011, both federal (EPA) and CARB so-called Interim Tier 4 standards take effect in 2011 for new equipment with diesel engines of 175 hp or greater. The interim Tier 4 emissions standards for particulate matter are about 85 percent more restrictive than previous emissions standards (Tier 2 or Tier 3, depending on the size of the engine) for these larger off-road engines. As a result, use of engines that meet the interim Tier 4 standards would reduce diesel exhaust emissions by approximately 85 percent, compared to new engines produced under the previous standards. Tier 2 or Tier 3 engines (for larger equipment, those manufactured since 2006) can achieve generally the same reduction through retrofitting by installation of a diesel particulate filter (a CARB-certified Level 3 Verified Diesel Emissions Control System).

Regarding equipment already in use, CARB adopted rules for in-use off-road diesel vehicles—including construction equipment—in 2007. Those rules also limit idling to five minutes, require a written idling policy for larger vehicle fleets, and require that fleet operators provide information on their engines to CARB and label vehicles with a CARB-issued vehicle identification number. The off-road rules require the retrofit or replacement of diesel engines in existing equipment. This "repowering" was originally to be required beginning in 2010 (for the largest fleets). However, in early 2010, CARB suspended implementation of this aspect of the rule, and in December 2010, CARB formally delayed the start of repowering to 2014 for large fleets, 2017 for medium-sized fleets, and 2019 for small fleets.[225] CARB stated that the delayed implementation was justified because the recession had dramatically reduced emissions, and because the board staff found that the data on which the original rule was based had

[224] There are 12 exceptions to this requirement (e.g., emergency situations, military, adverse weather conditions, etc.), including: when a vehicle's power takeoff is being used to run pumps, blowers, or other equipment; when a vehicle is stuck in traffic, stopped at a light, or under direction of a police officer; when a vehicle is queuing beyond 100 feet from any restricted area; or when an engine is being tested, serviced, or repaired.

[225] Fleet size is based on total horsepower (hp): large fleets are those with more than 5,000 hp; medium fleets have 2,501 to 5,000 hp, and small fleets are those with less than 2,500 hp.

overestimated emissions. According to CARB, under the revised rules, diesel particulate emissions from off-road equipment will decrease by more than 40 percent from 2010 levels by the year 2020, and by 2030, they decrease by more than 75 percent.[226]

Local

The 2010 *BAAQMD CEQA Air Quality Guidelines*, adopted in June 2010, include quantitative CEQA significance thresholds for construction-related and operational emissions of TACs (see discussion under Significance Criteria and Impact Methodology).

In 2008, the City and County of San Francisco adopted an ordinance (*San Francisco Health Code*, Article 38, Air Quality Assessment and Ventilation Requirement for Urban Infill Residential Development). Article 38 requires that public agencies in San Francisco take regulatory action to prevent future air quality health impacts on new residential uses of 10 units or more proposed near busy roadways. The regulation requires a screening analysis of new residential projects for proximity to traffic and a calculation of the concentration of $PM_{2.5}$ from traffic sources where traffic volumes suggest a potential hazard. If modeled levels of traffic-attributable $PM_{2.5}$ at a project site exceed an action level (currently set at 0.2 micrograms per cubic meter), the project sponsor is required to incorporate ventilation systems, with particulate filtration if necessary, to remove 80 percent of $PM_{2.5}$ from outdoor air. The regulation does not place any requirements on proposed residential uses if modeled air pollutant levels fall below the action level. This ordinance only considers impacts from on-road motor vehicles, not impacts related to construction equipment or stationary sources.

As described above under Roadway-Related Health Effects, p. 376, most major streets in the Plan area have traffic volumes that could at least potentially result in a roadside concentration of $PM_{2.5}$ that exceeds the action level contained in Article 38. This means that, under Article 38, nearly any subsequent development project in the Plan area that proposes to introduce new residential units would be required to conduct dispersion modeling, based on traffic volumes on nearby streets, to determine whether the action level of 0.2 micrograms per cubic meter of $PM_{2.5}$ would be exceeded at the project site. If the modeling shows that this level would be exceeded, an enhanced ventilation system, potentially with filtration, would be required to be incorporated into the project design. In some cases, placement of a building's fresh-air intake at a level well above the ground (for example, on a building roof), along with installation of an enhanced ventilation system, can sufficiently reduce the $PM_{2.5}$ for new residential receptors; under Article 38, the Department of Public Health reviews the modeling results and the ventilation system to determine its adequacy.

The City is developing a Community Risk Reduction Plan (CRRP) to help identify locations and neighborhoods at particular risk of adverse health effects due to exposure to toxic air contaminants, including diesel particulate matter, and to fine particulate matter generally (i.e., $PM_{2.5}$). A CRRP is

[226] California Air Resources Board, "Staff Report: Initial Statement of Reasons for Proposed Rulemaking: Proposed Amendments to the Regulation for In-Use Off-Road Diesel-Fueled Fleets and the Off-Road Large Spark-Ignition Fleet Requirements," October 2010; p. 44. Available on the internet at: http://www.arb.ca.gov/regact/2010/offroadlsi10/offroadisor.pdf. Reviewed May 6, 2011.

designed to improve air quality, especially in neighborhoods and "hotspots" affected by poor air quality. The plan would set forth a variety of strategies designed to improve air quality, with emphasis focused upon those locations with poorest air quality. The plan would bring together governmental agency projects and plans and focus them in the direction of gradually improving air quality over the next 10 years. Transportation planning, truck routing, energy conservation, traffic speed control and enforcement, bicycle and pedestrian enhancement, use of alternate fuels and many other tools can be used in a CRRP to improve existing poor air quality. In addition, the plan will identify where new residential development can occur without project-specific air quality mitigation and where such development must provide protection for new residents; for example, by installation of a mechanical ventilation system with particulate filtration in new residential units. A CRRP would also likely require new sources of pollution to include the best available control technology and, potentially, to offset new sources of emissions through reduction in other sources or other controls. In San Francisco, the Planning Department and Department of Public Health are working with BAAQMD on development of a CRRP. The timeline for completion and implementation of the plan is not certain.

Odors

BAAQMD Regulation 7 places general limitations on odorous substances and specific emission limitations on certain odorous compounds. The limitations of this regulation limit the "discharge of any odorous substance which causes the ambient air at or beyond the property line…to be odorous and to remain odorous after dilution with four parts of odor-free air." The BAAQMD must receive odor complaints from ten or more complainants within a 90-day period in order for the limitations of this regulation to go into effect. If this criterion has been met, an odor violation can be issued by the BAAQMD if a test panel of people can detect an odor in samples collected periodically from the source.

Impacts

Significance Criteria

Transit Center District Plan

Criteria Air Pollutants

As noted in the setting, in 2010, BAAQMD published an update to its *CEQA Air Quality Guidelines* and adopted new significance thresholds for CEQA analysis; this document has been updated as of May 2011. Under the 2011 BAAQMD *CEQA Air Quality Guidelines* and thresholds,[227] the significance thresholds for assessment of a planning document, such as the draft Plan, involve an evaluation of the following questions:

(1) Would the plan be consistent with the "control measures" contained in the current regional air quality plan (the *2010 Bay Area Clean Air Plan*); and

[227] BAAQMD, *CEQA Guidelines*, May 2011. See footnote 205, p. 370.

(2) Would the projected rate of increase in vehicle miles traveled or vehicle trips under the plan would be less than or equal to the projected rate of population increase under the plan.

If the two foregoing questions can be answered in the affirmative, the plan would neither:

- Conflict with or obstruct implementation of the applicable air quality plan;
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation; nor
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors).[228]

Community Risk and Hazard Impacts

This analysis also responds to the criterion that asks whether the proposed plan would:

- Expose sensitive receptors to substantial pollutant concentrations.

For plan-related health risks and hazards resulting from emissions of toxic air contaminants, BAAQMD recommends that overlay zones be established around existing and proposed land uses that emit TACs. These overlay zones should be included in proposed plan policies, land use maps, and implementing ordinances. Additionally, the plan must "identify goals, policies, and objectives to minimize potential impacts."[229]

Odors

For odors, a plan must identify the location of existing and planned odor sources in the Plan area. The plan must also include policies to reduce potential odor impacts in the Plan area. Typical odor sources of concern include wastewater treatment plants, sanitary landfills, transfer stations, composting facilities, petroleum refineries, asphalt batch plants, chemical manufacturing facilities, fiberglass manufacturing facilities, auto body shops, rendering plants, and coffee roasting facilities. Given that the draft Plan would not locate sensitive receptors within close proximity to these types of facilities and would not include development of such facilities, it can be reasonably concluded that no odor impact would occur. Therefore, impacts related to odor are not discussed further in this EIR.

Transit Tower

Project level thresholds of significance set by the BAAQMD reflect the level at which a project's individual emissions would result in a cumulatively considerable contribution to an existing air quality problem; therefore, if project impacts identified are significant, impacts would also be cumulatively considerable. As stated in the BAAQMD *CEQA Air Quality Guidelines*:

> Past, present and future development projects contribute to the region's adverse air quality impacts on a cumulative basis. By its very nature, air pollution is largely a cumulative impact.

[228] The bulleted statements are the first three significance criteria in the City's CEQA Initial Study checklist.
[229] BAAQMD *CEQA Air Quality Guidelines* (see footnote 205, p. 370); p. 9-71.

> 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 project's impact on air quality would be considered significant.[230]

According to BAAQMD, no further cumulative analysis should be required beyond the analysis of whether a proposed project's impacts would contribute considerably to ambient levels of pollutants or greenhouse gases,[231] with the exception of the above-noted cumulative risk and hazard analysis for toxic air contaminants.

Criteria Air Pollutants

The BAAQMD-recommended significance thresholds for criteria pollutant emissions from operations of an individual project, such as the proposed Transit Tower, are as follows: for ROG, NOx and $PM_{2.5}$, a net increase of 54 pounds per day or 10 tons per year would be considered significant, while for PM_{10}, a net increase of 82 pounds per day or 15 tons per year would be considered significant. For CO, an increase would be considered significant if it leads to or contributes to CO concentrations exceeding the State Ambient Air Quality Standard, although quantification would not be required if a project is consistent with the local congestion management program and plans and traffic volumes at affected intersections are below 24,000 vehicles per hour. For construction-period impacts, the same thresholds apply for ROG, NOx, $PM_{2.5}$, and PM_{10}, except that the thresholds for $PM_{2.5}$ and PM_{10} apply only to exhaust emissions, and thresholds are specifically based on average daily emissions. There are no quantitative thresholds for construction dust emissions; instead, impacts are considered less than significant if standard best management practices are employed to control dust during construction activities, including demolition and excavation.

Community Risk and Hazard Impacts

With respect to risk and hazard impacts. BAAQMD recommends either that a project be found to be in compliance with a "qualified Community Risk Reduction Plan," or that significance thresholds be used for both construction and operational emissions based on commonly used standards employed in health risk assessment. The thresholds for project-specific impacts are: an increase in lifetime cancer risk of 10 chances in one million, an increase in the non-cancer risk equivalent to a chronic or acute "Hazard Index" greater than 1.0,[232] or an increase in the annual average concentration of $PM_{2.5}$ in excess of 0.3 micrograms per cubic meter. BAAQMD also recommends cumulative thresholds of 100 in one million cancer risk, a chronic Hazard Index greater than 10.0, and a $PM_{2.5}$ concentration greater than 0.8 micrograms per cubic meter. Unlike the volume-based thresholds for criteria pollutants noted above, the toxic air contaminant thresholds are used for specific receptor locations when a risk analysis is required for specific project components, such as permitted stationary sources (boilers, emergency generators, etc.), non-permitted sources such as the new Transit Center, or the use of diesel-powered

230 BAAQMD *CEQA Air Quality Guidelines* (see footnote 205, p. 370); p. 2-1.
231 *Ibid*.
232 Hazard Index represents the ratio of expected exposure levels to an acceptable reference exposure levels.

equipment, including construction equipment. Projects that do not exceed the project-level thresholds would not be considered to contribute considerably to cumulative health risks.

As stated on p. 385, the City is developing a Community Risk Reduction Plan, although the timeline for implementation is not certain.

Odors

- Would the proposed project create objectionable odors affecting a substantial number of people.

As stated above with respect to odor impacts for the draft Plan, the Plan would not locate sensitive receptors within close proximity to odor-generating facilities, nor would it include development of facilities commonly known to generate annoying odors. Because the same is true for the Transit Tower, the tower would not result in significant odor impacts. Therefore, impacts related to odor are not discussed further in this EIR.

Methodology

The above-noted quantitative significance thresholds also apply to long-term operational impacts of the proposed project. Construction exhaust emissions and operational emissions of criteria air pollutants were estimated using the URBan EMISsions (URBEMIS) 2007 model (version 9.2.4) for the expected project buildout and compared to BAAQMD significance thresholds. The model combines information on trip generation with vehicular emissions data specific to different types of trips in the San Francisco area (home-to-work, work-other, etc.) from the ARB's EMFAC 2007 BURDEN model to create an estimated daily emissions burden for travel within the San Francisco Bay Area Air Basin. The resulting quantification is compared against the BAAQMD's recommended thresholds.

For the health risk assessment related to use of diesel-powered construction equipment, the BAAQMD has prepared "screening tables" that allow a project to be found to have a less-than-significant impact if construction activities would occur at least 100 meters (330 feet), in most cases, from sensitive receptors. Because many projects in urban areas, including the Plan area and the site of the proposed Transit Tower, would be closer than this to sensitive receptors, a quantitative risk evaluation is conducted that involves dispersion modeling, using the AERMOD model, accounting for the construction equipment to be used, local meteorology, and nearby sensitive receptors, to determine whether the BAAQMD thresholds would be exceeded at any receptor location. For cancer risk and Hazard Index calculations, further computation is undertaken to convert the model's pollutant concentration outputs to risk numbers. Modeling was also employed to derive quantitative health risks for operational stationary sources, such as the new Transit Center and an emergency generator in the Transit Tower.

Impact Analysis

Transit Center District Plan

Criteria Air Pollutants: Consistency with the 2010 Clean Air Plan

Impact AQ-1: The draft Plan would not conflict with or obstruct implementation of the *2010 Clean Air Plan* or result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard. (Less than Significant)

Consistency with *2010 Clean Air Plan* Control Measures

The BAAQMD *CEQA Air Quality Guidelines* requires that consistency of a plan be evaluated based on the extent to which it implements, or does not hinder implementation of, the Air Quality Plan Control Measures outlined in the *2010 Clean Air Plan*. The *Clean Air Plan* contains 55 control measures aimed at reducing air pollution in the Bay Area. Some (18) of these measures address stationary sources (such as printing facilities and cement kilns, but also including residential and commercial heating systems), and will be implemented by BAAQMD using its permit authority and are therefore not suited to implementation through local planning efforts.[233] The remaining 37 measures are grouped into Transportation, Mobile Source, Land Use and Local Impact, and Energy and Climate measures. the Air Quality Plan Control Measures are discussed in detail below.[234]

The Control Measures most applicable to the draft Plan are the Transportation Control Measures. The Transportation measures concern improvements to transit systems, improving efficiency of the region's transportation system, encouraging residents and employees to exhibit "sustainable transportation behavior," improving bicycle and pedestrian facilities and supporting high-density growth. The draft Plan, through implementation of existing City policies and new programs in the draft Plan, would also further the *Clean Air Plan's* Energy and Climate Measures. The Land Use and Local Impact and Mobile Source measures primarily address the BAAQMD's own programs and regional air quality planning, and are less applicable to local agencies' decisions and projects.

Transportation Control Measures in the *2010 Clean Air Plan* (CAP) are identified in **Table 33**. Inasmuch as the Transportation measures are generally those most applicable to an individual plan or development project, the table identifies each measure or group of measures and correlates the measures to specific elements of the draft Plan or explains why the strategy does not apply to the Plan. As indicated in the table, the draft Plan directly addresses many of the Transportation Control Measures, particularly those that emphasize higher-density development, a mix of uses, and increased transit ridership and pedestrian and bicycle use.

[233] For example, Stationary Source Measures 11 and 12 will ultimately require that new furnaces in the Air Basin emit lower levels of NOx.

[234] Eighteen other measures are included in a list of measures for further study and are not yet identified as feasible for implementation under the *2010 Clean Air Plan*.

TABLE 33
TRANSPORTATION CONTROL MEASURES OF THE *2010 CLEAN AIR PLAN*

2010 CAP Control Measure	Elements of the Proposed Project Consistent with the Measure or Explanation of Non-applicability
Transportation Control Measures (TCMs)	
TCM A-1 and A-2: Improve Local and [Regional Bus and Rail Services	The Plan proposes increased residential density in proximity to an extensive array of bus and rail transit, including the new Transit Center currently under construction, which is planned as the terminus of the state's high-speed rail system draft Plan Objective 4.1 states, "The district's transportation system will prioritize and incentivize the use of transit. Public transportation will be the main, non-pedestrian mode for moving into and between destinations in the Transit Center District." Objective 4.3 states, "The district's transportation system will meet changing transit needs, particularly to support the new Transbay Transit Center and accommodate increased densities. Make changes in the circulation network that ensure delivery of reliable and convenient transit service to the Transbay Transit Center and for district residents, employees, and visitors." Objective 4.9 states, "Prioritize transit movements through and within the district over all other transportation modes." And Objective 4.11 states, "Ensure that changes to the circulation network, including pedestrian and streetscape improvements, are designed to support and enhance the operation of transit." Additional objectives and policies in the draft Plan support regional transit improvements, including the Transit Center. Phase 2 of Measure TCM-A-1 includes partial funding for Muni's Van Ness Avenue Bus Rapid Transit project. Phase 2 of Measure TCM-A-2 includes partial funding for the new Transit Center, the Muni Metro Central Subway now under construction and for the downtown extension and system-wide electrification of Caltrain.
TCM B-1 through B-4: Improve Transportation System (freeways and arterials; transit; express lanes; goods movement) Efficiency	Although these measures addresses infrastructure improvements to increase operational efficiencies such as common fare payment systems and are geared primarily toward regional agencies such as the Metropolitan Transportation Commission and Caltrans, San Francisco (Muni) participates in the 511 transit information system). Freeway and arterial improvements are less relevant to the proposed Plan. Objective 4.6 of the draft Plan states, "The district's transportation system will require management of Bay Bridge queues to reduce and mitigate impacts of regional traffic on transit circulation and the public realm in the district." Objective 4.15 states, "Use demand management strategies to reduce overall levels of auto traffic in the plan area and downtown, particularly in the peak hours, in order to reduce auto impacts on other transportation modes and enable the creation of a high quality public realm."
TCM C-1: Voluntary Employer-Based Trip Reduction Programs	San Francisco employers operate (or contract for) numerous shuttle bus services, most of which serve the Plan area's transit hubs. The City's Commuter Benefits Ordinance (Section 421 of the *Environment Code*) requires that employers with more than 20 employees provide pre-tax purchase of transit passes, employer-paid passes, or employer-provided transit.
TCM C-2: Safe Routes to School and Safe Routes to Transit	This measure funds pedestrian and bicycle improvements. While there are no elementary or secondary schools in the Plan area, the Plan does propose extensive improvements to transit access and pedestrian and bicycle circulation. Moreover, Objective 4.4 of the draft Plan states, "The district's transportation system will prioritize pedestrian amenity and safety. Invest in circulation modifications and urban design measures that support the creation of an attractive and memorable public realm." Objective 4.12 states, "Provide high-quality facilities and experience for transit passengers," and Policy 4.4 states, "Provide sidewalk space and facilities for enhanced transit stops with passenger amenities on Mission Street and other primary transit streets."
TCM C-3: Ridesharing Services and Incentives	Through the 511 commuter information program, preferential vanpool parking, guaranteed ride home in emergencies, and carpool parking permits are provided in San Francisco. The *Planning Code* (Sec. 166) requires that car-share parking be provided in new parking garages. (See also the next measures.)

TABLE 33 (Continued)
TRANSPORTATION CONTROL MEASURES OF THE *2010 CLEAN AIR PLAN*

2010 CAP Control Measure	Elements of the Proposed Project Consistent with the Measure or Explanation of Non-applicability
TCM C-4 and C-5: Public Outreach/Education and Smart Driving	These measures concern efforts to influence commuters' and drivers' behavior and are not directly relevant to the draft Plan. However, subsequent development projects in the Plan area would be required under Section 163 of the *Planning Code* to participate in transportation brokerage services to facilitate the use of transit, ridesharing, and other means of minimizing the use of single-occupant vehicles in commuting. Objectives 4.15 through 4.19 and Policies 4.9 through 4.20 of the draft Plan discuss transportation demand management. Also, the draft Plan proposes to reduce the size of projects to which *Planning Code* Section 163 is applicable from 100,000 square feet to 25,000 square feet.
TCM D-1 and D-2: Improvements to Bicycle and Pedestrian Facilities and Access.	The draft Plan encourages pedestrian activity and bicycle use and would make streetscape and other improvements to encourage both. Objectives 4.20 through 4.28 and Policies 4.21 through 4.35 of the draft Plan discuss enhancements to pedestrian activity, while Objectives 4.29 through 4.33 and Policies 4.36 through 4.43 are concerned with improving bicycle circulation.
TCM D-3: Local Land Use Strategies (to encourage higher density and mixed uses).	The draft Plan would continue and intensify the high-density and mixed-use character of the Plan area.
TCM E-1: Value Pricing Strategies	This measure primarily addresses congestion pricing, which is in effect on Bay Area bridges that charge higher tolls during rush hour. The measure also references a proposal for "congestion pricing" that has been proposed for downtown San Francisco, including the Plan area (this is not proposed in the draft Plan).
TCM E-2: Promote Parking Policies to Reduce Motor Vehicle Travel	The *Planning Code* currently requires that new off-street parking provided for uses other than residential units and hotels in the downtown, including the Plan area, be priced so as to discourage long-term commuter parking, while still providing adequate short-term parking. Section 155(g) of the Code requires that the cost for four hours of parking be no more than four times the rate charged for the first hour, and that the rate charge for eight or more hours of parking be no less than 10 times the rate charged for the first hour. Further, weekly or monthly discounts are prohibited. Code Section 167 requires that residential parking be priced separately from dwelling units themselves. The draft Plan would maintain these requirements. The draft Plan also proposes an absolute cap on off-street parking in the Plan area and, until the appropriate number for such a cap is determined, that the maximum amount of building floor area devoted to non-residential be reduced from the current 7 percent of gross floor area (GFA) to 3.5 percent of GFA. The draft Plan further proposes to prohibit new surface parking in the Plan area and to apply the City's existing parking tax to all non-residential spaces, even those not available to the general public.
TCM E-3: Implement Transportation Pricing Reform	While not directly applicable to the proposed Plan, this measure calls for increasing the cost of driving to reflect "external" costs such as air pollution. Higher gasoline taxes or other taxes or fees would be necessary to implement this measure. The Plan area is well-positioned to benefit from such potential changes due to its high level of transit service and the draft Plan's emphasis on pedestrian and bicycle travel.

SOURCE: *2010 Clean Air Plan*; Environmental Science Associates, 2011.

Based on the analysis in Table 33, Implementation of the draft Plan would promote implementation of, and in some cases, go beyond, these measures, and therefore **the draft Plan would be consistent with the applicable Transportation Control Measures in the *2010 Clean Air Plan*.**

Energy and Climate Measures, newly added in the *2010 Clean Air Plan,* are "designed to reduce ambient concentrations of criteria pollutants, reduce emissions of CO2, and protect our climate" by promoting

building energy conservation and efficiency and renewable energy; reducing "urban heat island" effects by increasing reflectivity of roofs and parking lots; and promoting (low-VOC) tree planting.[235] Many of the City plans and programs that achieve consistency with and promote these measures are discussed in detail in Section IV.H, Greenhouse Gas Emissions. In general, consistency with these measures is directly promoted by the City's energy-efficiency requirements and programs, including the San Francisco Green Building Requirements for Energy Efficiency, Stormwater Management, Water Reduction, Renewable Energy, Solid Waste, and Construction and Demolition Debris Recycling, all of which are contained in Chapter 13C of the *San Francisco Building Code* (the green building regulations), as well as the street tree planting requirement of *Planning Code* Section 138.1(c)(1). Subsequent development projects in the Plan area would be required to comply with these City requirements, and therefore **the draft Plan would be consistent with the Energy and Climate Control Measures in the *2010 Clean Air Plan***. Subsequent development projects in the Plan area would also be subject to Plan policies concerning sustainability, many of which would reduce emissions. For example, the draft Plan proposes that "all major development in the Plan Area to produce a detailed Energy Strategy document outlining how the design of the building minimizes its use of fossil fuel driven heating, cooling and power—through energy efficiency, efficient supply, and no or low carbon generation" (November 2009 Draft Plan, Policy 6.8); that all new buildings in the Plan area be "of leading edge design in terms of sustainability" (Objective 6.4); and that "all major buildings in the Plan Area … achieve the minimum LEED levels established in the SF Green Building Ordinance, not including credits for the given inherent factors of location, density, and existing City parking controls, in order to achieve high-performance buildings" (Policy 6.12) and "should exceed the minimum credits required by the SF Green Building Ordinance under the Energy and Water categories of the LEED schemes" (Policy 6.13).

Land Use and Local Impact Control Measures are also newly added in the *2010 Clean Air Plan*, are "designed to (1) promote mixed-use, compact development to reduce motor vehicle travel and emissions, and (2) ensure that we plan for focused growth in a way that protects people from exposure to air pollution from stationary and mobile sources of emissions."[236] These measures include reducing diesel particulate and greenhouse gas emissions from trucks; development of an "indirect source review rule" primarily aimed at reducing emission from transportation and from construction equipment by imposing limitations on emissions from a particular site; updating the BAAQMD's *CEQA Air Quality Guidelines* and enhancing the district's review of CEQA documents to help new projects reduce emissions; assisting local governments in adopting "smart growth" land use patterns to reduce mobile source emissions, exposure of persons to toxic air contaminants, and emissions related to energy use and waste disposal; reducing and tracking health risk in communities affected disproportionately by pollution exposure; and enhancing the district's air quality monitoring program. Although all of the Land Use and Local Impact Control Measures address BAAQMD programs and are not directly applicable to the draft Plan, by increasing development density in proximity to transit, the draft Plan would strongly further the District's goals of reducing emissions from commuter travel and would not conflict with any of the

235 BAAQMD, *2010 Clean Air Plan*, p. 4-10.
236 BAAQMD, *2010 Clean Air Plan* (see note 222, p. 379), p. 4-9.

foregoing measures. Therefore, **the draft Plan would be consistent with the Land Use and Local Impact Control Measures in the *2010 Clean Air Plan*.**

Mobile Source Control Measures (MSMs) are those intended to reduce emissions by accelerating the replacement of older, dirtier vehicles and equipment through programs such as the BAAQMD's Vehicle Buy-Back and Smoking Vehicle Programs, as well as promoting advanced-technology vehicles. Such region-wide measures are not directly applicable to the draft Plan, although it is noted that the City is cooperating in the implementation of MSM A-2 (Zero-Emission Vehicles and Plug-In Hybrids) by installing electric vehicle charging stations; the implementation of MSM A-3 (Green Fleets) by incorporation into the City vehicle fleet of both hybrid vehicles and vehicles that use biodiesel fuel; and the implementation of MSM C-1 (Construction and Farm Equipment) by requiring, through its Clean Construction Ordinance, that most equipment on city-contracted construction projects use biodiesel fuel (minimum of 20 percent biodiesel, or B20) and employ Tier 2 diesel engines or employ "best available control technology." The draft Plan would not conflict with any of these measures, and therefore **the draft Plan would be consistent with the Mobile Source Control Measures in the *2010 Clean Air Plan*.**

Moreover, the draft Plan would not otherwise disrupt or hinder implementation of any of the Air Quality Plan Control Measures by, for example, precluding extension or expansion of bicycle paths or routes (on the contrary, the draft Plan would foster implementation of the City's Bicycle Plan in the Transit Center District Plan area through proposed streetscape improvements); precluding extension of a transit line (the draft Plan aims to enhance transit use); or provision of excessive parking beyond parking requirements (the draft Plan proposes to decrease the amount of parking that is permitted in office buildings, the Plan area's predominant land use).

Finally, to demonstrate consistency with the *2010 Clean Air Plan*, the *BAAQMD CEQA Air Quality Guidelines* state that the a plan should support the primary goals of the *Clean Air Plan*, which are as follows:

- Attain air quality standards;
- Reduce population exposure and protecting public health in the Bay Area; and
- Reduce greenhouse gas emissions and protect the climate.

As described above, the draft Transit Center District Plan would strongly support a large number of the applicable control measures in the *2010 Clean Air Plan* that are intended to help the Bay Area attain state and federal air quality standards. Implementation of the draft Plan, including implementation of mitigation measures identified in this EIR, would also help reduce population exposure to air pollutants, thereby protecting public health.

Greenhouse gas emissions are discussed in Section IV.H, where it is determined that the draft Plan would be consistent with a Greenhouse Gas Reduction Strategy approved by the BAAQMD, and therefore would result in less than significant impacts with regard to greenhouse gas emissions.

In light of the above, the draft Plan **would be consistent with the Air Quality Plan Control Measures in the *2010 Clean Air Plan* and would support the primary goals of the *2010 Clean Air Plan*.**

Growth in Vehicle Trips Compared to Growth in Population

Consistency of the draft Plan must also be demonstrated by comparing the projected population growth in the Plan area with the forecast growth in vehicle trips. Growth projections prepared by the Planning Department (and discussed in detail in Section IV, Population and Housing, Business Activity and Employment, indicate that the Plan area household population would increase from approximately 1,465 to 10,730 by 2030, the analysis horizon year. This represents an increase of 632 percent. This percentage increase is extremely high because the Plan area currently supports a very small residential population, and therefore the rate of population increase would far outstrip the rate of increase in vehicle trips, since most travel to and from the Plan area is generated by employment uses, primarily office. Moreover, much of the population increase is expected to occur through growth on sites in Zone 1 of the approved Transbay Redevelopment Area, which was established through a separate planning process from the current Transit Center District Plan. Accordingly, for purposes of a more realistic and more conservative assessment, this analysis compares the growth in both population and employment to the growth in traffic. Employment is projected to increase from 77,630 under existing conditions to approximately 106,915 by 2030. The combined population-employment ("service population") increase would therefore be approximately 49 percent ([106,915 + 10,730] ÷ [77,630 + 1,465] = 1.49).

Based on output from the County Transportation Authority travel demand model, the number of person-trips made by vehicle to and from the Plan area would increase by approximately 20.2 percent by 2030. Because the increase in vehicle trips would be less than the increase in "service population," the draft Plan would result in a less-than-significant impact, in accordance with the BAAQMD-recommended criteria.

The draft Plan includes goals and policies that would apply to development within the Plan area. These policies would reduce criteria pollutant emissions, compared to other potential development in the City or in the region by providing for additional high-density mixed-use development in an area with the most extensive array of transit service in the Bay Area, and by improving pedestrian and bicycle access within and to and from the Plan area. The draft Plan seeks to improve transit, pedestrian, and bicycle accessibility and connections, thereby minimizing the need for automobile travel. The transportation analysis for the proposed Plan reveals that vehicle trip generation would be substantially less than would be anticipated for a comparable level of development elsewhere in the Bay Area. In light of the above, implementation of the draft Plan would result in a less-than significant impact with respect to regional emissions of criteria air pollutants.

As noted, the threshold of significance for evaluation of a Plan's emissions of criteria air pollutants is based on consistency with regional air quality planning. On the other hand, the significance of a subsequent individual development project—while ultimately based on the same concept—is determined by a quantitative comparison to the significance thresholds established by BAAQMD. (See the analysis of the Transit Tower, p. 419.) It is possible that individual development projects, if large enough, could result in significant effects related to emissions of criteria air pollutants, even if the overall Plan is determined to have a less-than-significant impact.

Carbon Monoxide

Unlike other criteria pollutants, whose effects are regional, carbon monoxide (CO) impacts are evaluated locally. However, BAAQMD recommends intersection-specific modeling of CO concentrations only for intersections where traffic volumes would exceed 44,000 vehicles per hour, or 24,000 vehicles per hour in areas, like much of the Plan area, where mixing of the air is substantially limited, such as in "urban canyons" created by tall buildings. Based on the traffic analysis completed for the draft Plan, the maximum future (with project) peak-hour traffic volume at any of the study intersections in the Plan area would be less than 5,000 vehicles, and the maximum at any of the study intersections would be fewer than 6,500 vehicles. Therefore, modeling of CO concentrations is not required, and the draft Plan would not be anticipated to exceed the state one-hour or 8-hour CO standards. Therefore, effects related to CO would also be less than significant.

Mitigation: None required.

Community Risk and Hazard Impacts

Impact AQ-2: The draft Plan would expose new sensitive receptors to substantial concentrations of $PM_{2.5}$ and toxic air contaminants. (Significant and Unavoidable with Mitigation)

As described in the Setting, epidemiologic studies have demonstrated that people who live near freeways and high-traffic roadways have poorer health outcomes, including increased asthma symptoms and respiratory infections and decreased pulmonary function and lung development in children. Health effects, both chronic and acute, may result from exposure to both criteria air pollutants and mobile source air toxics. Health effects of air pollutant exposures may also involve synergistic effects among air pollutants, traffic noise and other traffic-related stressors. The evidence relating proximity to roadways and a range of non-cancer and cancer health effects provides the basis of the ARB's guidance on locating sensitive land use in proximity to such roadways.[237]

As noted in the Regulatory Setting discussion of Article 38 of the *San Francisco Health Code*, subsequent residential development projects that include 10 or more dwelling units in most locations in the Plan area would be required to undergo modeling for $PM_{2.5}$ concentrations and, if necessary, incorporate enhanced ventilation systems into building design and construction. Compliance with Article 38 would, in some cases, result in subsequent residential projects being subject to lesser concentrations of $PM_{2.5}$ concentrations and cancer and non-cancer health risks, compared to conditions without implementation of Article 38 requirements. However, the BAAQMD *CEQA Air Quality Guidelines* analysis of $PM_{2.5}$ concentrations and risk- and hazard-related significance determinations, including both cancer risk and chronic and acute hazard index, from both roadway- and stationary-source-generated emissions, not just roadway emissions as is the case with Article 38. These potential risks in the Plan area would arise from both permitted and non-permitted sources. In the case of permitted sources, impacts would be caused

[237] California Air Resources Board, *Air Quality and Land Use Handbook* (see footnote 217, p. 381).

mostly by diesel emissions from standby generators regulated by BAAQMD. Non-permitted-source risks would be generated in large part by operation of the new Transit Center (which will be served by buses primarily fueled by diesel engines), with an additional increment generated by traffic on Plan area streets, including both diesel and non-diesel powered vehicles.

It is noted that much of the future emissions of $PM_{2.5}$, diesel particulate matter, and other toxic air contaminants would come from many sources currently operating in the Plan area: diesel buses currently travel to and from (and through) the Plan area, with the Temporary Transbay Terminal on the block bounded by Howard, Main, Folsom, and Beale Streets serving as a major terminal and, therefore, resulting in a concentration of diesel emissions. (Essentially the same bus operations formerly took place at and around the old Transbay Terminal, on Mission between First and Fremont Streets, prior to that facility's demolition in 2010.) Large volumes of other traffic also travel through the Plan area under existing conditions, particularly commuter traffic heading to and from the Bay Bridge. And, as noted above, many existing high-rise buildings are equipped with backup generators, mostly diesel-fueled.[238] However, inasmuch as the draft Plan would allow for new sensitive receptors (i.e., residential units) to be developed in the Plan area and thus to be exposed to the pollutants generated by these sources, this analysis focuses on the exposure of *new* sensitive receptors to future levels of $PM_{2.5}$ and various toxic air contaminants, even if most of those pollutants are emitted in the Plan area today.

There are dozens of individual permitted sources of toxic air contaminants (TACs) in the Plan area. Most of these are diesel-powered emergency (standby) generators, which are installed in nearly all high-rise buildings to allow for emergency lighting and elevator operations in the event of a power failure. Generators, like most stationary sources of pollutants, require a permit from BAAQMD; under existing regulations, a permit for a new generator is generally not issued unless the generator would result in emissions that would create a lifetime cancer risk from exposure to diesel exhaust of less than 10 in one million (i.e., 10 cases per one million exposed persons, or "receptors"). Older generators, however, may continue to operate even if they have greater emissions. (For purposes of BAAQMD permitting, generator emissions are those emitted during routine testing, which typically involves operating the generator no more than 50 hours per year. Emissions during power failures or other "emergencies" are not subject to permit requirements.) Other common permitted sources of toxic air contaminants in an urban setting include gasoline stations (none are present in the Plan area) and dry cleaners that produce TACs as a byproduct of the cleaning process, and therefore these facilities do not pose health risks locally. Although there are "dry cleaners" in the Plan area, none is permitted to operate a cleaning plant on-site. In the Plan area, some large office buildings operate their own cogeneration (combined heat and electricity) facilities or hot-water boilers; in general, these facilities are fueled by natural gas. Therefore, the permitted stationary sources of TAC emissions in the Plan area are almost exclusively diesel generators and natural gas-fired boilers and cogeneration plants.

238 Section 403.4.7 of the 2010 *San Francisco Building Code* requires provision of a "standby power system" in high-rise buildings (those with occupied floors above 75 feet above grade).

A major unpermitted source is the new Transit Center (replacement for the Transbay Terminal), which will be served by buses from Muni, AC Transit, Golden Gate Transit, SamTrans, and the Western Contra Costa Transit Authority ("Lynx"), along with Greyhound and Amtrak buses.[239] The Transit Center and other individual stationary sources would result in potential health risks (primarily lifetime cancer risk) to "sensitive receptors" in new development projects, which would be expected to consist mostly of persons living in new residential projects developed in the Plan area.[240] Because of the large number of stationary sources within the Plan area, and because of the relatively high traffic volumes on many Plan area streets, there is no location within the Plan area that is not within 1,000 feet—the BAAQMD-recommended distance from a receptor at which sources should be included in dispersion modeling—of at least one such source, and most locations are within 1,000 feet of several sources.

Exposure of new sensitive receptors, such as residents and children in day-care centers, to roadway-generated concentrations of $PM_{2.5}$ and TACs, and exposure of such receptors to TACs generated by stationary sources such as the Transit Center and individual buildings' diesel generators, boilers, and cogeneration plants would potentially result in significant impacts resulting from implementation of the draft Plan. It is also possible that new buildings constructed in the Plan area could include one or more of these emissions sources, although it would be speculative to try to quantify or otherwise analyze in detail those emissions, absent any detailed design proposals.

Likewise, it is not feasible at this time to quantify or provide detailed analysis of any potential district-wide combined heat and power (cogeneration) facility that might at some point be developed to serve multiple buildings in the Plan area. As noted in Chapter II, Project Description, a cogeneration plant generates both electricity and heat from the same equipment, with exhaust heat given off during electricity generation being captured to heat, cool, and/or dehumidify interior air or provide hot water or steam. Such a system in the Plan area, which could entail development of one or more power/heat generating plants, is called for in the draft Plan's Chapter 6, District Sustainability. However, no combined heat and power plant is currently proposed, nor is there any information available as to the size, configuration, or operation of any such facility at some possible time in the future. As stated above, such a facility would be subject to review by the BAAQMD, at a minimum, and could be subject to further CEQA analysis.

In general, a cogeneration plant would likely be fueled by natural gas, and would generate emissions from combustion of that gas. The natural gas engine—whether a traditional reciprocating (piston and cylinder) engine, a combustion turbine (analogous to a jet airplane engine), or a microturbine (a newer,

239 During construction of the new Transit Center, these buses are operating to and from the Temporary Transbay Terminal, at Beale and Howard Streets.

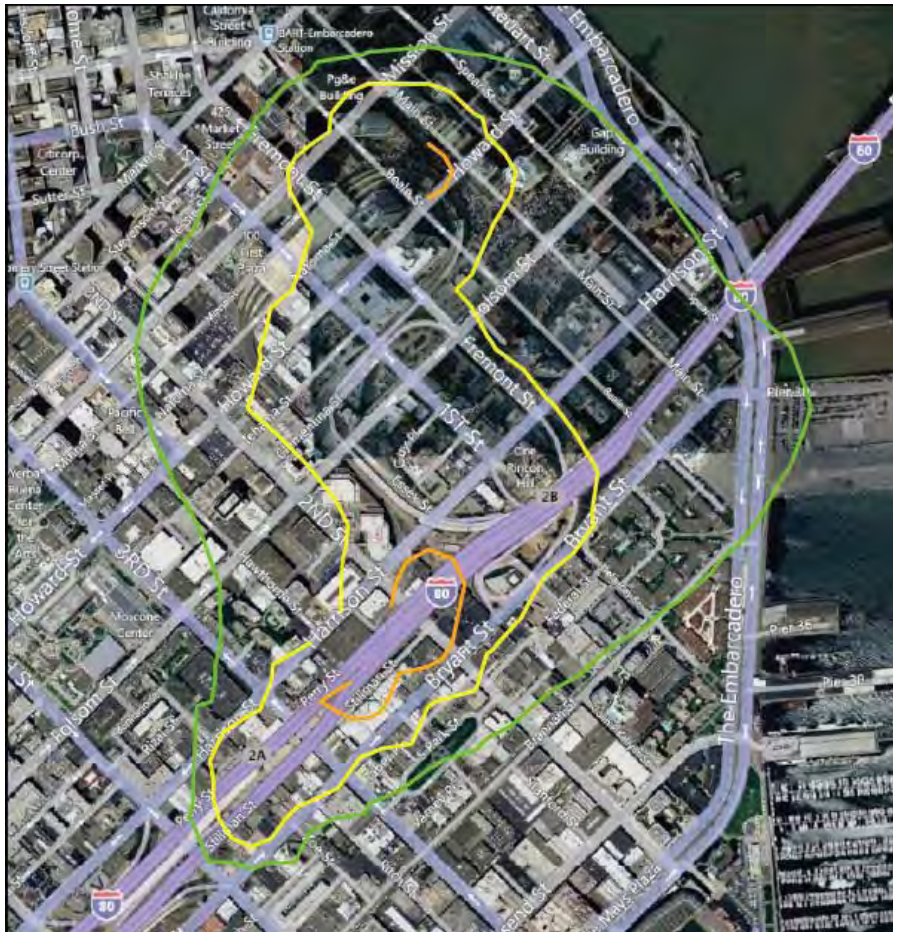
240 Under standard health risk assessment protocols, lifetime cancer risks to residents are calculated based on assumed exposure for 24 hours per day over a 70-year period, with additional risk factors included for infants and children. In contrast, employee risks are normally calculated based on exposure for 8 hours per day over 40 years. Therefore, for the same receptor location, resident risks are always higher than worker risks, and residents are considered "sensitive receptors," while workers are not. Other sensitive receptors likely to be found in the Plan are include children and infants at child-care centers, of which there are several in the Plan area. Hotel occupants are not considered sensitive receptors because they are transient, meaning they are exposed to risks at a particular location for only a few days at a time under most circumstances.

more compact and quieter engine)[241] —would be required to meet current emissions standards established by the EPA and CARB. Because a combined heat and power plant is generally more efficient than separate electricity and heating/cooling facilities, such a facility would be expected to generate lesser emissions, and therefore result in lesser health risks, than separately operating facilities of comparable size. However, to the extent that such a district-wide plant were to be placed in new operation, it could result in an increase in emissions of criteria air pollutants and toxic air contaminants, compared to existing conditions. A project-specific health risk assessment would likely be undertaken for any combined heat and power facility that might be proposed in the Plan area in the future.

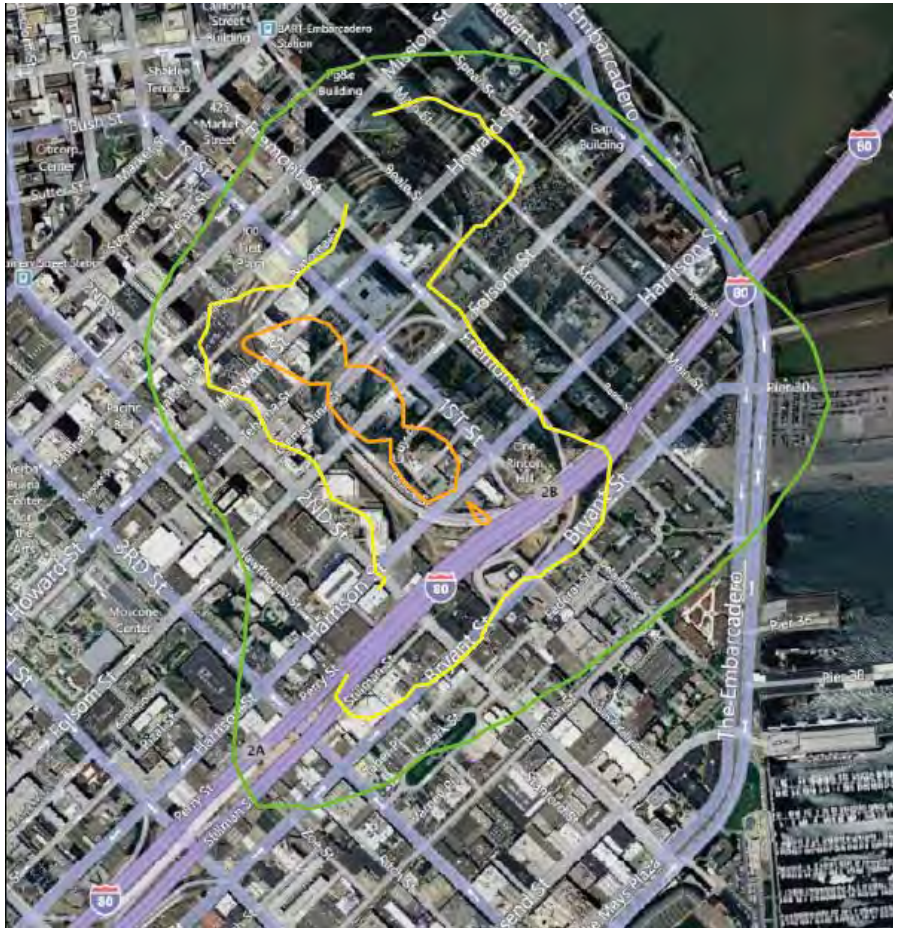
Regarding operation of the Transit Center, because bus operations can be estimated, air quality modeling of diesel buses that will serve the Transit Center was undertaken. The analysis focused on the new Transit Center, because that is where there will be the greatest concentration of diesel-powered buses in the Plan area. The analysis revealed that those bus operations could generate a lifetime cancer risk in excess of 10 in one million at locations proximate to the Transit Center and the ramp linking the terminal to the Bay Bridge, and at elevations from at grade to approximately 100 feet (30 meters) above street level (see **Figure 57**). Subsequent residential development projects (and other projects with sensitive receptors) in these areas, therefore, would be subject to a potential significant impact from diesel bus emissions, exceeding the 10 in one million BAAQMD project-specific guideline for a single source impact on new receptors. Therefore, these projects would likely have to implement mitigation measures, such as installation of a filtration system as described in Mitigation Measure M-AQ-2.

These potential significant air-quality impacts due to exposure to roadway pollutants and stationary source risks, including $PM_{2.5}$ concentrations and cancer and non-cancer health risks, would be reduced with implementation of Mitigation Measure AQ-2, which would require that the final Transit Center District Plan provide that the entire Plan area be encompassed within an overlay zone in which site-specific analysis or refined modeling would be required in advance of the approval of subsequent development projects that would include sensitive receptors, and that the Transit Center District Plan include "goals, policies, and objectives to minimize potential impacts."[242] Mitigation Measure M-AQ-2 would also require that residential development projects in the Plan area be designed to reduce air quality impacts to residents through building design (e.g., ventilation and air filtration systems). This measure would apply to the entire Plan area because of the large number of permitted and unpermitted stationary sources—mostly diesel generators and boilers—and the high percentage of streets with traffic volumes that could generate relatively high concentrations of $PM_{2.5}$ throughout the Plan area and vicinity. Because the pollutant concentrations vary by location, it is not possible to conclude that Mitigation Measure M-AQ-2 would bring concentrations or the resulting health risks below the BAAQMD-specified levels for each subsequent project with sensitive receptors. Therefore, this impact would remain significant at the Plan level after mitigation.

241 A hydrogen fuel cell can power a cogeneration plant, but this equipment is not in common use at present.
242 BAAQMD, *CEQA Air Quality Guidelines* (see footnote 205, p. 370); p. 9-7.



Cancer Risk at Ground Level



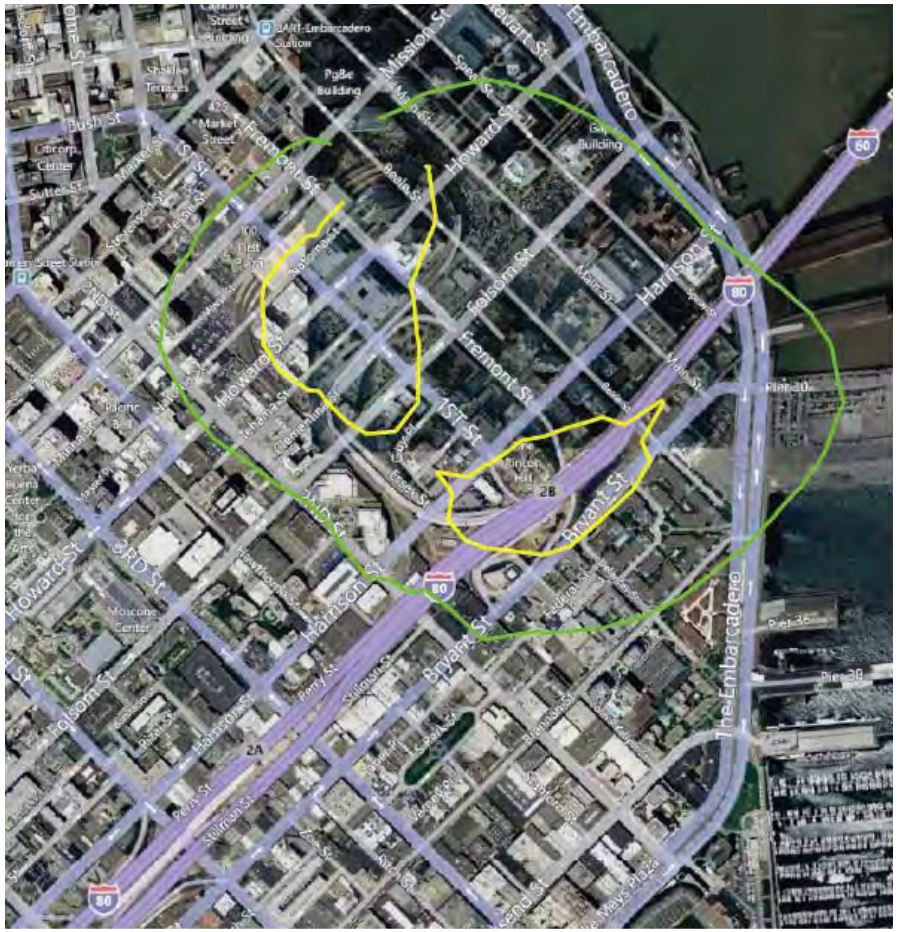
Cancer Risk at 33 feet above grade (10 meters)

5
10
25

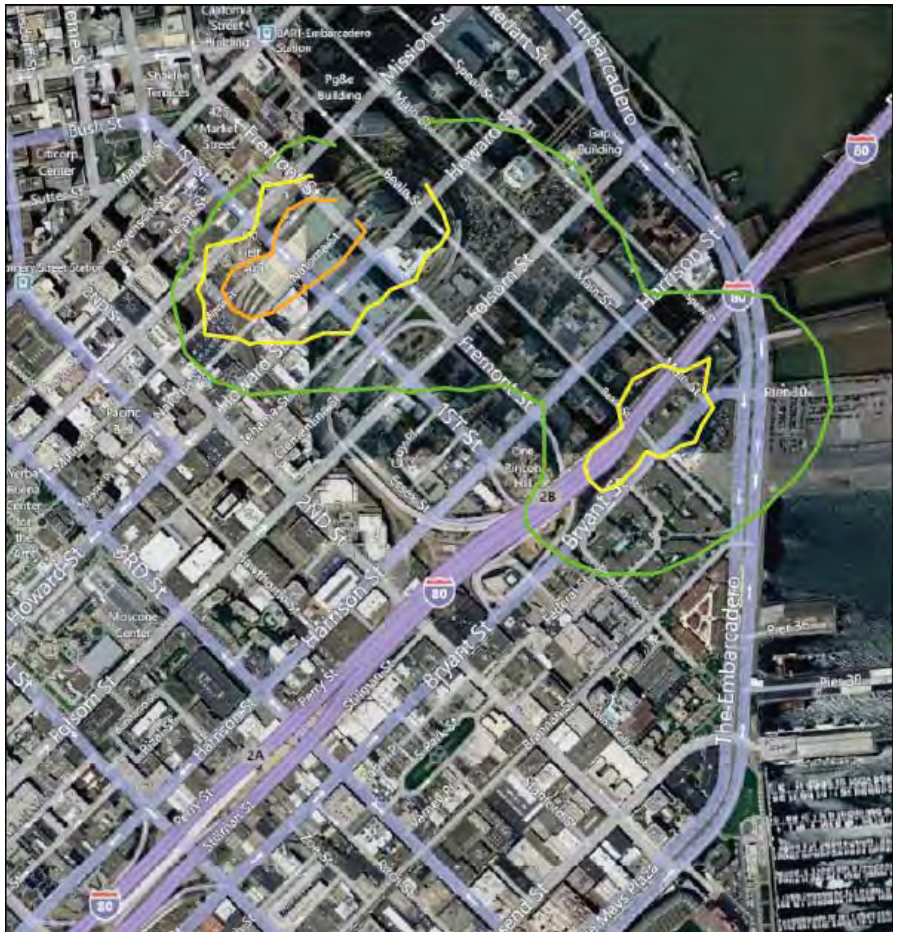
Cancer Risk (chance in one million)

SOURCE: Environ International

Figure 57A
Cancer Risk Due to Transit Center Bus Operations



Cancer Risk at 66 feet above grade (20 meters)



Cancer Risk at 98 feet above grade (30 meters)

5
10
25

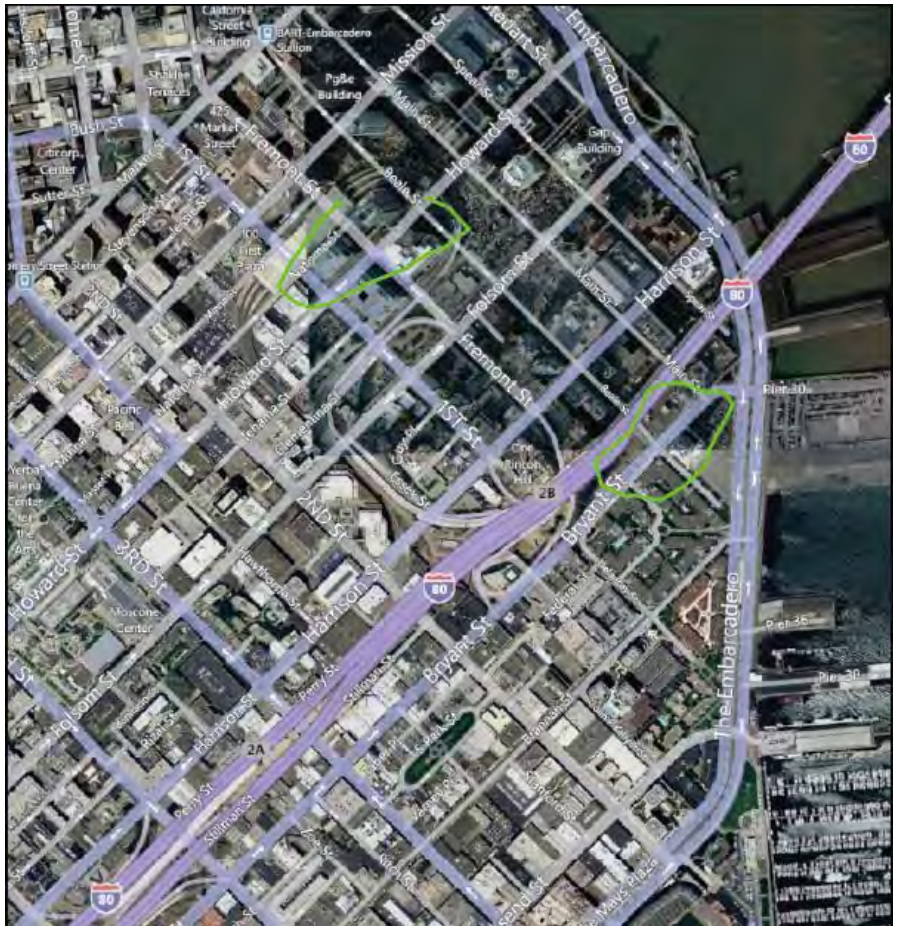
Cancer Risk (chance in one million)

Case Nos. 2007.0558E and 2008.0789E: Transit Center District Plan and Transit Tower. 207439

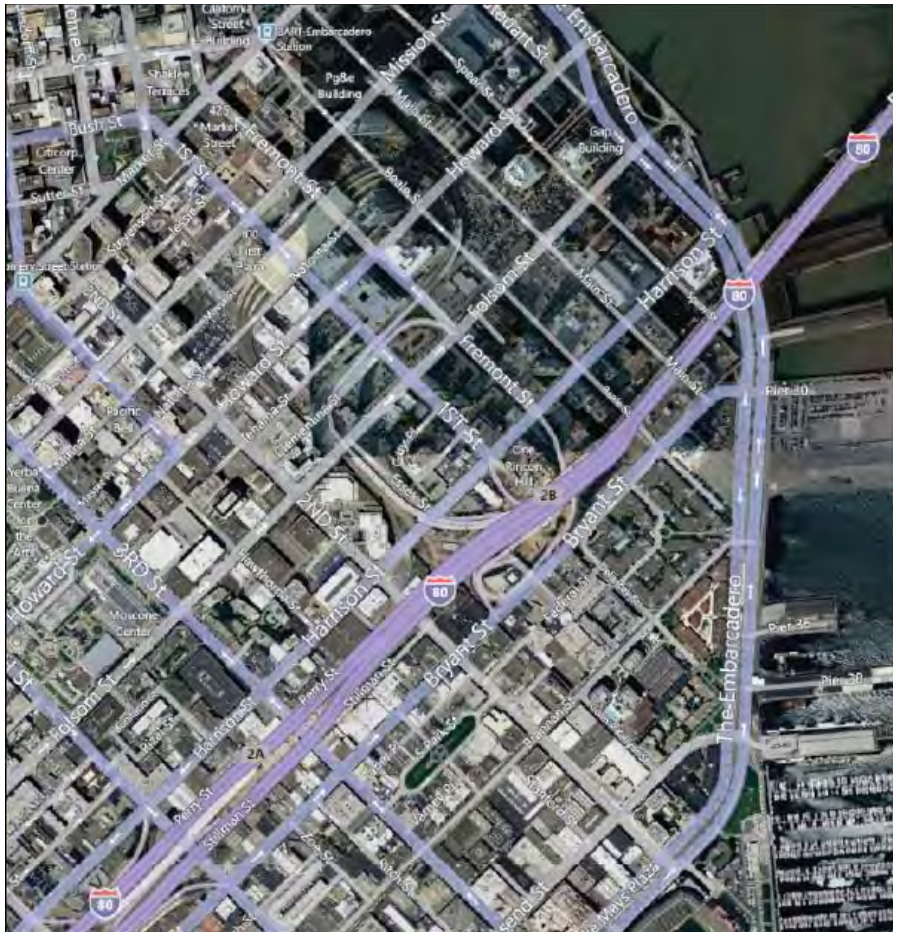
SOURCE: Environ International

Figure 57B

Cancer Risk Due to Transit Center Bus Operations



Cancer Risk at 131 feet above grade (40 meters)



Cancer Risk at 164 feet above grade (40 meters)

Case Nos. 2007.0558E and 2008.0789E: Transit Center District Plan and Transit Tower. 207439

SOURCE: Environ International

Figure 57C
Cancer Risk Due to Transit Center Bus Operations

In addition to the overlay zone, the final Plan should also include "goals, policies, and objectives to minimize potential impacts." The BAAQMD *CEQA Air Quality Guidelines* refer to recommendations included in the CARB *Air Quality and Land Use Handbook* for policy recommendations with respect to locating sensitive receptors near uses, such as high-volume roadways, associated with TACs. (Other such sources, such as gas stations, dry cleaners, and industrial facilities, are not present in the Plan area). Because these recommendations, in general, call for establishing buffer zones between such uses and new residential buildings, and because such buffer zones are not feasible in a high-density neighborhood such as the Plan area, the aforementioned ventilation and filtration requirements are considered the most feasible approach to mitigating potential health risks to new residents and other sensitive receptors.

It is noted that application of Mitigation Measure M-AQ-2 could, in the future, be superseded by a City-prepared Community Risk Reduction Plan (see p. 385).

Mitigation Measure

M-AQ-2 **Implementation of Risk and Hazard Overlay Zone and Identification of Health Risk Reduction Policies:** To reduce the potential health risk resulting from exposure of new sensitive receptors to health risks from roadways, and stationary sources, and other non-permitted sources $PM_{2.5}$ and TACs, the final Transit Center District Plan shall provide that the entire Plan area shall be included in an overlay zone, as recommended by BAAQMD, that would require analysis of potential site-specific health risks (lifetime cancer risk, chronic and acute hazard index, and $PM_{2.5}$ concentration) for all projects that would include sensitive receptors, and implementation of measures to reduce exposure to such risks that are in excess of the BAAQMD significance thresholds (or any future superseding criteria as established by the Planning Department), as they may be amended from time to time. For purposes of this measure, sensitive receptors are considered to include dwelling units; child-care centers; schools (high school age and below); and inpatient health care facilities, including nursing or retirement homes and similar establishments. Parks and similar spaces are not considered sensitive receptors for purposes of this measure unless it is reasonably shown that a substantial number of persons are likely to spend three hours per day, on a daily basis, at such facilities.

Development projects in the Plan area that would include sensitive receptors shall undergo, prior to project approval, a screening-level health risk analysis, consistent with methodology approved by the Planning Department, to determine if cancer risk, hazard index, and/or $PM_{2.5}$ concentration would exceed BAAQMD thresholds or other applicable criteria as determined by the Environmental Review Officer. If one or more thresholds would be exceeded at the site of the subsequent project where sensitive receptors would be located, the project (or portion of the project containing sensitive receptors, in the case of a mixed-use project) shall be equipped with filtration systems with a Minimum Efficiency Reporting Value (MERV) rating of 13 or higher, as necessary to reduce the health risk(s) to the maximum extent feasible. The ventilation system shall be designed by an engineer certified by the American Society of Heating, Refrigeration and Air-

Conditioning Engineers, who shall provide a written report documenting that the system offers the best available technology to minimize outdoor to indoor transmission of air pollution. The project sponsor shall present a plan to ensure ongoing maintenance of ventilation and filtration systems and shall ensure the disclosure to buyers and/or renters regarding the findings of the analysis and inform occupants as to proper use of any installed air filtration.

Level of Significance After Mitigation

The above measure would require development projects in the Plan area to undergo site-specific evaluation and to incorporate the maximum feasible mitigation for impacts resulting from $PM_{2.5}$ or toxic air contaminant levels in excess of adopted thresholds. However, because it cannot be determined with certainty that this mitigation measure would reduce impacts to below BAAQMD's significance thresholds, this impact is considered **significant and unavoidable**. However, it is noted that, in the case of individual development projects in the Plan area, site- and project-specific equipment and other considerations may lead to a conclusion that the project-specific effect can be mitigated to a less-than-significant level.

Impact AQ-3: The draft Plan would expose existing and future sensitive receptors to substantial levels of $PM_{2.5}$ and toxic air contaminants from new vehicles and equipment. (Significant and Unavoidable with Mitigation)

Certain development projects in the Plan area would generate potential health risks for existing sensitive receptors (primarily residents) in or near the Plan area by the inclusion in these projects of sources of toxic air contaminants. Most commonly, these sources would be anticipated to be diesel-powered emergency generators and boilers, which, as noted in the Setting, are installed in most high-rise buildings, and also in mid-rise structures. Operation of these generators and other sources could expose nearby sensitive receptors to elevated concentrations of TACs.

Other potential sources of health risk could include dry cleaning establishments, gasoline stations, distribution centers (warehouses) or other commercial operations that accommodate more than 100 trucks or more than 40 refrigerator trucks per day, and industrial or light industrial uses such as auto body shops, metal plating shops; photo processing, furniture upholstery, appliance repair, printing, hospitals and clinics, biotechnology research, warehousing and distribution centers, and processing of textiles and leather. For the most part, the nature of land use in the Plan area and the area's high land costs mean that the great majority of these uses are unlikely to locate within the Plan area. As noted in the Setting, even dry cleaners in the Plan area do not generally operate on-site facilities that use cleaning chemicals, instead serving as storefronts for pickup and drop-off of items to be cleaned.

In addition to specific types of land uses, all development projects in the Plan area would generate car and truck traffic that would contribute to health risks from traffic-generated pollutants, including $PM_{2.5}$, DPM, and other organic gases.

Implementation of Mitigation Measure AQ-3, Siting of Uses that Emit DPM and Other TACs, would require that such uses, including standby generators, located within 1,000 feet of existing residential units and other sensitive receptors, including schools, day-care centers, hospitals, nursing and convalescent homes, and like uses be the subject of an analysis prior to approval that includes, at a minimum, a site survey to identify such sensitive uses within 1,000 feet of the project site and site-specific dispersion modeling of health risks. Implementation of this measure would reduce impacts of uses generating DPM and other TACs, but not necessarily to a less-than-significant level.

Mitigation Measure

M-AQ-3 **Siting of Uses that Emit DPM and Other TACs:** To minimize potential exposure of sensitive receptors to diesel particulate matter (DPM), for new development including warehousing and distribution centers, and for new development including commercial, industrial or other uses that would be expected to generate toxic air contaminants (TACs) as part of everyday operations, the Planning Department shall require, prior to the first project approval action, the preparation of an analysis that includes, at a minimum, a site survey to identify residential or other sensitive uses within 1,000 feet of the project site, and dispersion modeling of health risk from all potential stationary and mobile sources of TACs generated by the project. The analysis shall include estimated lifetime cancer risk, and chronic and acute hazard index at the nearest sensitive receptor and at other nearby receptor(s) as determined necessary by the Planning Department. If risks to nearby receptors are found to exceed applicable thresholds, then emissions reduction or other comparable measures would be required prior to project approval to ensure that health risks would not be significant. This measure shall be applicable, at a minimum, to the following uses: backup generators (whether diesel- or propane-fueled); dry cleaners; drive-through restaurants; gas dispensing facilities; auto body shops; metal plating shops; photographic processing shops; textiles; apparel and furniture upholstery; leather and leather products; appliance repair shops; mechanical assembly cleaning; printing shops; hospitals and medical clinics; biotechnology research facilities; warehousing and distribution centers; and any use served by at least 100 trucks per day or 40 refrigerated trucks per day, and any project for which a stationary source is proposed (e.g., a generator). Should the results of this analysis conclude that the project would exceed the BAAQMD significance thresholds, the project sponsor shall be required to identify and implement all feasible mitigation measures to reduce health risks impacts below BAAQMD significance thresholds. If it is determined that identified mitigation measures are not feasible, the project sponsor shall document, to the satisfaction of the Environmental Review Officer, that the project sponsor has complied with this mitigation measure to the extent feasible and why full compliance with the mitigation measure is infeasible.

Level of Significance After Mitigation

The above measure would require development projects in the Plan area to undergo site-specific evaluation and to incorporate maximum feasible mitigation for impacts resulting from or toxic air contaminant levels in excess of adopted thresholds. Because it cannot be determined with certainty that mitigation would result in health risks that would be below applicable BAAMQD significance thresholds, this impact is considered **significant and unavoidable**. However, it is noted that, in the case of individual development projects in the Plan area, site- and project-specific equipment and other considerations may lead to a conclusion that the project-specific effect can be mitigated to a less-than-significant level.

Construction Impacts

Implementation of the Transit Center District Plan would allow for development of new office, residential, hotel, and retail space, including a greater amount of development than that currently permitted under existing land use controls. Additionally, the draft Plan proposes streetscape improvements such as bicycle and pedestrian circulation enhancements and reconfiguration of the travel lanes in certain streets. Most development projects in the Plan area would entail demolition and removal of existing structures or parking lots, excavation, and site preparation and construction of new buildings. Emissions generated during construction activities would include exhaust emissions from heavy duty construction equipment, trucks used to haul construction materials to and from sites, worker vehicle emissions, as well as fugitive dust[243] emissions associated with earth disturbing activities.

The BAAQMD *CEQA Air Quality Guidelines* do not include a threshold of significance for evaluating construction-related impacts at the plan level. Instead, subsequent individual development projects in the plan area would be required to meet thresholds of significance for criteria pollutant emissions associated with construction equipment exhaust. The project-specific construction thresholds are 54 lbs per day of reactive organic gases, nitrogen oxides, and $PM_{2.5}$ (exhaust only) and 82 pounds per day for PM_{10} (exhaust only). The BAAQMD Guidelines also contain health-based standards for exposure to toxic air contaminants that are the same as those for project operations, described above on page 388.

Impact AQ-4: Implementation of the draft Plan would result in construction-period emissions of criteria air pollutants, including ozone precursors, that would contribute to an existing or projected air quality violation or result in a cumulatively considerable increase in criteria pollutants, and could expose sensitive receptors to substantial levels of construction dust. (Significant and Unavoidable with Mitigation)

BAAQMD has identified screening thresholds that would allow specified projects to be deemed to have less-than-significant construction-generated emissions without a detailed air quality analysis, with respect to emissions of criteria air pollutants, and assuming that District-recommended "basic" emissions control measures are incorporated into project construction. Examples of projects that would be

243 "Fugitive dust" is dust that is generated during construction and that escapes from a construction site.

considered less than significant under BAAQMD's screening approach include an office building of no more than 277,000 square feet, a high-rise condominium project of no more than 252 dwelling units, and a hotel of no more than 554 rooms.[244] It is noted that the screening thresholds do not consider effects of demolition of existing structures or projects for which construction schedules call for overlapping construction phases (e.g., paving and building construction occurring simultaneously) that could result in greater emissions than assumed by default assumptions used by the so-called URBan EMISsions (URBEMIS) air quality model, nor do they account for mixed-use projects. Additionally, the screening thresholds were determined based on modeling for "typical" construction projects in the Bay Area, which primarily involve low- and mid-rise construction, and assume a larger construction size to accommodate the same square footage or number of residential units than would be the case for projects in downtown San Francisco. Therefore, some development projects in the Plan area, even if they do not exceed the development size screening thresholds set forth by BAAQMD, would require a detailed construction air quality analysis that demonstrates compliance with applicable guidelines at the time of development. On the other hand, such a detailed assessment might reveal that a project that does exceed the BAAQMD screening thresholds would result in less-than-significant construction impacts with respect to criteria air pollutants.

As noted, the BAAQMD has recommended that Basic Construction Mitigation (emissions control) Measures be applied to all construction projects.[245] These measures include the following:

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.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
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.
4. All vehicle speeds on unpaved roads shall be limited to 15 miles per hour.
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.
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.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified visible emissions evaluator.
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.

Measure No. 6 (minimized idling times) is required by regulation, and therefore need not normally be applied as a project-specific mitigation measure. Likewise, Measure No. 2 (covering haul trucks) is

244 BAAQMD, *CEQA Air Quality Guidelines* (footnote 205, p. 370); Table 3-1, pp. 3-2 – 3-3.
245 BAAQMD, *CEQA Air Quality Guidelines* (footnote 205, p. 370); Table 8-1, p. 8-3.

generally required by law.[246] In San Francisco, Measures No. 1 (exposed surfaces shall be watered twice daily) and No. 3 (wet sweeping of streets) are required of all construction projects by the City's Dust Control Ordinance (see p. 383). Measure No. 4 (limit speeds to 15 miles per hour on unpaved roads) is not applicable to most projects in San Francisco because few in-City projects are developed on sites large enough to have unpaved roads. However, this and Measures No. 5 (pave graded areas as soon as possible or use soil binders) and No. 8 (designate a contact person) are included in the suggested measures for a site-specific Dust Control Plan that the Ordinance requires for projects on sites larger than one-half acre.

Mitigation Measure

M-AQ-4a **Construction Vehicle Emissions Minimization:** To reduce construction vehicle emissions, the project sponsor shall incorporate the following into construction specifications:

- 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.

Fugitive Dust

As explained above, any project that is subject to the City's Construction Dust Control Ordinance (discussed on p. 383) would be compliant with the BAAQMD Basic Construction Mitigation Measures with respect to construction dust. Moreover, the Dust Control Plan required for projects larger than one-half acre mandates that the project sponsor: submit a map to the Director of Public Health showing all sensitive receptors within 1,000 feet of the site; wet down areas of soil at least three times per day; provide an analysis of wind direction and install upwind and downwind particulate dust monitors; record particulate monitoring results; hire an independent, third party to conduct inspections and keep a record of those inspections; establish shut-down conditions based on wind, soil migration, etc.; establish a hotline for surrounding community members who may be potentially affected by project-related dust; limit the area subject to construction activities at any one time; install dust curtains and windbreaks on the property lines, as necessary; limit the amount of soil in hauling trucks to the size of the truck bed and secure soils with a tarpaulin; enforce a 15 mph speed limit for vehicles entering and exiting construction areas; sweep affected streets with water sweepers at the end of the day; install and utilize wheel washers to clean truck tires; terminate construction activities when winds exceed 25 miles per hour; apply soil stabilizers to inactive areas; and sweep adjacent streets to reduce particulate emissions. The project sponsor would be required to designate an individual to monitor compliance with dust control requirements.

As noted, the Construction Dust Control Ordinance requires preparation of Dust Control Plan only for projects on sites larger than one-half acre (21,780 square feet). Mitigation Measure M-AQ-4b would

[246] *California Vehicle Code* Sec. 23114(a) states that "…a vehicle shall not be driven or moved on any highway unless the vehicle is so constructed, covered, or loaded as to prevent any of its contents or load … from dropping, sifting, leaking, blowing, spilling, or otherwise escaping from the vehicle."

require that development projects in the Plan area that are not subject to the Construction Dust Control Ordinance requirement to prepare a site-specific Dust Control Plan but that would require more than 5,000 cubic yards of excavation and that would entail ground-disturbing activity lasting four weeks or longer, also prepare and implement a Dust Control Plan, to further minimize fugitive dust emissions from construction. The 5,000-cubic-yard threshold is based on the Dust Control Ordinance threshold of one-half acre, and on approximately 6 feet of excavation (assumed for a slab foundation) over a site of that size (21,780 sq. ft. x 6 feet ÷ 27 cu. ft./cu. yd. = approximately 5,000 cu. yd.). The 5,000-cubic-yard threshold would ensure that projects with excavation greater than the foregoing (e.g., 9 feet of excavation on a 15,000-square-foot site) would be subject to the same requirements and would thus result in lesser emissions of fugitive dust, compared to unmitigated excavation.

Mitigation Measure

M-AQ-4b **Dust Control Plan:** To reduce construction-related dust emissions, the project sponsor of each development project in the Plan area and each public infrastructure project (such as improvements to the public realm) in the Plan area on a site of one-half acre or less but that would require more than 5,000 cubic yards of excavation lasting four weeks or longer shall incorporate into construction specifications the requirement for development and implementation of a site-specific Dust Control Plan as set forth in Article 22B of the *San Francisco Health Code*. The Dust Control Plan shall require the project sponsor to: submit a map to the Director of Public Health showing all sensitive receptors within 1,000 feet of the site; wet down areas of soil at least three times per day; provide an analysis of wind direction and install upwind and downwind particulate dust monitors; record particulate monitoring results; hire an independent, third party to conduct inspections and keep a record of those inspections; establish shut-down conditions based on wind, soil migration, etc.; establish a hotline for surrounding community members who may be potentially affected by project-related dust; limit the area subject to construction activities at any one time; install dust curtains and windbreaks on the property lines, as necessary; limit the amount of soil in hauling trucks to the size of the truck bed and secure soils with a tarpaulin; enforce a 15 mph speed limit for vehicles entering and exiting construction areas; sweep affected streets with water sweepers at the end of the day; install and utilize wheel washers to clean truck tires; terminate construction activities when winds exceed 25 miles per hour; apply soil stabilizers to inactive areas; and sweep adjacent streets to reduce particulate emissions. The project sponsor would be required to designate an individual to monitor compliance with dust control requirements.

Detailed construction information, such as construction techniques and scheduling, that would be utilized for each individual development project is not currently known, and therefore estimation of emissions from individual development projects would be too speculative to warrant evaluation in this EIR. However, implementation of Mitigation Measure M-AQ-4b would require implementation of fugitive dust control measures. Along with compliance with the regulations and procedures set forth by

the *San Francisco Building Code* and *San Francisco Health Code*, this measure would ensure that impacts from fugitive dust would be less than significant.

In addition to reducing fugitive dust, implementation of Mitigation Measure M-AQ-4b would also help reduce construction exhaust emissions from equipment to the maximum extent feasible.

Level of Significance After Mitigation

Notwithstanding implementation of Mitigation Measure M-AQ-4a, it is possible that one or more of the development projects in the Plan area could result in project-specific significant construction exhaust emissions impacts, even with this mitigation measure. Therefore, impacts associated with construction equipment exhaust emissions of criteria pollutants that would result from implementation of the draft Plan are considered **significant and unavoidable**. It should be noted that the identification of this program level potentially significant impact does not preclude the finding of future less-than-significant impacts for subsequent projects that comply with BAAQMD screening criteria or meet applicable thresholds of significance.

Even though implementation of Mitigation Measure M-AQ-4b would reduce construction dust emissions to less-than-significant levels, emissions of criteria pollutants from construction could exceed applicable thresholds for individual projects, despite implementation of Mitigation Measure M-AQ-4a. Therefore, as state above, this impact would be **significant and unavoidable**. As noted, identification of this program level potentially significant impact does not preclude the finding of future less-than-significant impacts for subsequent development projects in the Plan area that comply with BAAQMD screening criteria or meet applicable thresholds of significance.

Impact AQ-5: Implementation of the draft Plan could expose sensitive receptors to substantial levels of toxic air contaminants generated by construction equipment. (Significant and Unavoidable with Mitigation)

Diesel-powered construction equipment generates emissions of diesel particulate matter (DPM), which is identified as a carcinogen by CARB. The BAAQMD has published a guide for a screening-level analysis of construction health risk that has determined that a potentially significant impact related to health risk from DPM would be attributable to construction of virtually any project, other than a residential project of five or fewer units, that is within 100 meters (330 feet) of a sensitive receptor (e.g., residence, child-care center, hospital, and the like).[247] BAAQMD notes that its screening methodology incorporates "many worst-case and conservative assumptions," and states that a project-specific health risk assessment would likely produce more accurate results. Nevertheless, it is clear that the new BAAQMD CEQA guidance leads to a determination of at least a potential significant impact for construction of many potential

247 BAAQMD, "Screening Tables for Air Toxics Evaluation During Construction," May 2010. On the internet at: http://www.baaqmd.gov/Home/Divisions/Planning%20and%20Research/CEQA%20GUIDELINES/Tools%20and%20Methodology.aspx. Reviewed September 1, 2010.

projects in San Francisco and other densely developed Bay Area communities. (It is noted that a typical South-of-Market block west of First Street measures 825 by 550 feet, while a typical North-of-Market block measures 412.5 by 275 feet; thus, a construction project north of Market Street would be within the 330-foot screening distance of most, and in some cases all, other parcels on its block, while a project south of Market Street would be within at least 25 percent of the other parcels on its block.) Project-specific screening-level health risk assessments for construction of individual projects in San Francisco have identified significant impacts resulting from construction in proximity to sensitive receptors, in the form of an incremental increase in lifetime cancer risk in excess of 10 in one million and/or incremental increase in concentration of $PM_{2.5}$ in excess of 0.3 micrograms per cubic meter, both of which are BAAQMD-recommended significance thresholds.

Modeling of construction equipment emissions has revealed that both cancer risk and concentration of $PM_{2.5}$ could be reduced to a less-than-significant level at many, and in some cases, all receptor locations near construction sites (that is, the greatest risk and the greatest concentration would both be less than the BAAQMD thresholds) if all diesel construction equipment were to meet the interim Tier 4 diesel engine standards. As described in the Regulatory Setting, under Toxic Air Contaminant Regulations, p. 384, new diesel engines meeting the interim Tier 4 emissions standards, and Tier 2 or Tier 3 engines retrofitted with a Level 3 Verified Diesel Emissions Control System, can reduce diesel particulate by approximately 85 percent, and would result in a cancer risk that would not exceed 10 chances in one million at many sensitive receptor locations near a particular construction site.

However, depending on the construction schedules for subsequent development projects, retrofitted Tier 2 and Tier 3 equipment/Tier 4 equipment may not readily available. Because the Interim Tier 4 standard only took effect in January 2011 for most diesel equipment, and because retrofits are not yet required by CARB, it will take some time—probably several years—for these new engines to become a large part of construction equipment fleets. And, as also noted in the Regulatory Setting, CARB has delayed implementation of standards for diesel-powered engines already in use by several years. Accordingly, Mitigation Measure M-AQ-5 is required to reduce construction-period emissions to the minimum practicable level.

Mitigation Measure

M-AQ-5 **Construction Vehicle Emissions Evaluation and Minimization:** To reduce the potential health risk resulting from project construction activities, the project sponsor of each development project in the Plan area shall undertake a project-specific health risk analysis, as appropriate and determined by the Environmental Planning Division of the Planning Department, for diesel-powered and other applicable construction equipment, using the methodology recommended by the BAAQMD and/or the Planning Department. If the health risk analysis determines that construction emissions would exceed health risk significance threshold(s) identified by BAAQMD and/or the Planning Department, the project sponsor shall include in contract specifications a requirement for the following BAAQMD-recommended measures:

- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to two minutes;
- 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 NOx reduction and 45 percent PM reduction compared to the most recent project-modeled fleet-wide average. Acceptable options for reducing emissions include, as the primary option, use of Interim Tier 4 equipment where such equipment is available and feasible for use, use of Tier 2/Tier 3 equipment retrofitted with CARB Level 3 Verified Diesel Emissions Control System (VDECS, which includes diesel particulate filters), the use of other 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;
- All construction equipment, diesel trucks, and generators shall be equipped with Best Available Control Technology for emission reductions of NOx and PM, including Tier 3 or alternative fuel engines where such equipment is available and feasible for use;
- All contractors shall use equipment that meets ARB's most recent certification standard for off-road heavy duty diesel engines; and
- The project construction contractor shall not use diesel generators for construction purposes where feasible alternative sources of power are available.

Level of Significance After Mitigation

Implementation of the Mitigation Measure M-AQ-5 would result in the maximum feasible reduction of diesel emissions that would contribute to construction-period health risk, thereby lowering both lifetime cancer risk and the concentration of $PM_{2.5}$ to which sensitive receptors near certain subsequent development projects would be exposed. Although in many cases, the use of interim Tier 4 or Tier 2/ Tier 3 equipment with Level 3 VDECS diesel construction equipment would reduce the health risk to a level that would not exceed any of the significance thresholds identified by the BAAQMD, because it cannot be stated with certainty that either cancer risk or $PM_{2.5}$ concentration would be reduced to below the BAAQMD-recommended significance thresholds, and because of the uncertainty concerning the availability and feasibility of using construction equipment that meets the requirements of Mitigation Measure M-AQ-5, this impact is conservatively judged to be **significant and unavoidable**. However, identification of this program level potentially significant impact does not preclude the finding of future less-than-significant impacts for subsequent development projects in the Plan area that meet applicable thresholds of significance.

Transit Tower

Air quality impacts from the proposed Transit Tower would fall into two categories: short-term impacts due to construction, and long-term impacts due to project operation. These potential impacts are consistent with those described above for development in the Plan area as a whole. First, during project construction, the project would affect local particulate concentrations primarily due to fugitive dust

sources, and would also generate emissions of both criteria air pollutants and toxic air contaminants in construction equipment exhaust. Over the long term, the project would result in an increase in emissions primarily due to increased motor vehicle trips, as well as from operation of on-site stationary sources—in this case, a backup generator. Area sources (such as landscaping and use of consumer products) would result in lesser quantities of pollutant emissions.

Construction Air Quality Impacts

Impact AQ-6: Construction of the Transit Tower would result in emissions of criteria air pollutants, including ozone precursors, that would contribute to an existing or projected air quality violation or result in a cumulatively considerable increase in criteria pollutants, and could expose sensitive receptors to construction dust. (Less than Significant)

Demolition, grading and new construction activities would temporarily affect local air quality during the project's proposed 3-year construction schedule, causing temporary increases in particulate dust and other pollutants. Emissions generated from construction activities include combustion emissions of criteria air pollutants (reactive organic gases [ROG], nitrogen oxides [NOx], carbon monoxide [CO], sulfur oxides [SOx], and PM_{10} and $PM_{2.5}$) primarily from operation of construction equipment and worker vehicles, evaporative criteria pollutant emissions (ROG) from asphalt paving and architectural coating applications, and dust (including PM_{10} and $PM_{2.5}$) primarily from "fugitive" sources; that is, dust generated by construction activities and that escapes from the construction site.

Criteria Air Pollutants

Criteria pollutant emissions of ROG, NOx, PM_{10}, and $PM_{2.5}$ from construction equipment would incrementally add to the regional atmospheric loading of these pollutants during project construction. The BAAQMD *CEQA Air Quality Guidelines* recommend the quantification of project related exhaust emissions and comparison of the emissions to its new significance thresholds. Therefore, daily project construction exhaust emissions that would be associated with the proposed project have been estimated and are presented in **Table 34**.

As indicated in Table 34, emissions from project construction would not exceed the BAAQMD's significance thresholds. Even though construction-related emissions would not exceed the BAAQMD's significance thresholds for criteria pollutants, Implementation of Improvement Measure I-AQ-6 would further reduce the less-than-significant emissions from construction vehicles, and would be consistent with the BAAQMD's basic emissions control measures for all projects.

Improvement Measure

I-AQ-6 **Construction Vehicle Emissions Minimization:** To reduce construction vehicle emissions, the project sponsor shall incorporate the following into construction specifications:

- 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.

TABLE 34
TRANSIT TOWER PROJECT CONSTRUCTION EXHAUST EMISSIONS ESTIMATES

	Estimated Daily Emissions (pounds per day)[a]			
Construction Phase and Year	**ROG**	**NOx**	**PM10[b]**	**PM2.5[b]**
2013	14.4	43.1	1.9	1.7
2014	2.9	12.1	0.6	0.6
2015	40.5	11.0	0.6	0.5
2016	37.18	0.0	0.0	0.0
BAAQMD Threshold	54	54	82	54
Significant?	No	No	No	No

[a] Project construction emissions estimates are based on output from URBEMIS 2007 v.9.2.4 air quality model, using the model's default assumptions. Assumes construction starts in mid-2013 and ends in mid-2016.
[b] Vehicle exhaust only.

SOURCE: Environmental Science Associates, 2011

Fugitive Dust

For fugitive dust, the BAAQMD recommends a "best management practices" approach for dust control. Project-related demolition, excavation, grading and other construction activities may cause wind-blown dust that could contribute particulate matter into the local atmosphere. Although there are federal standards for air pollutants and implementation of state and regional air quality control plans, air pollutants continue to have impacts on human health throughout the country. California has found that particulate matter exposure can cause health effects at lower levels than national standards. The current health burden of particulate matter demands that, where possible, public agencies take feasible available actions to reduce sources of particulate matter exposure. According to the California Air Resources Board, reducing ambient particulate matter from 1998 – 2000 levels to natural background concentrations in San Francisco would prevent over 200 premature deaths.

Dust can be an irritant causing watering eyes or irritation to the lungs, nose and throat. Demolition, excavation, grading and other construction activities can cause wind-blown dust to add to particulate matter in the local atmosphere. Depending on exposure, adverse health effects can occur due to this particulate matter in general and also due to specific contaminants such as lead or asbestos that may be constituents of soil.

In response, as noted under Regulatory Setting (p. 383), the San Francisco Board of Supervisors approved a series of amendments to the *San Francisco Building* and *Health Codes* generally referred hereto as the Construction Dust Control Ordinance (Ordinance 176-08, effective July 30, 2008) with the intent of reducing the quantity of dust generated during site preparation, demolition and construction work in order to protect the health of the general public and of onsite workers, minimize public nuisance complaints, and to avoid orders to stop work by the Department of Building Inspection (DBI).

Implementation of a Dust Control Plan as provided for in the Construction Dust Control Ordinance would be consistent with the BAAQMD *CEQA Air Quality Guidelines'* recommendation that all construction projects employ basic emissions control measures, including watering all exposed surfaces (e.g., staging areas, soil piles, graded areas) twice daily; covering all haul trucks transporting loose material; daily wet street sweeping of visible mud or dirt onto adjacent public streets; minimizing the time that soils are uncovered; and posting contact information for dust complaints.

At approximately 50,000 square feet, the proposed Transit Tower project site is approximately 1.1 acres in size, and therefore is subject to the Dust Control Plan requirement. Accordingly, the Transit Tower projects sponsor would be required to prepare a Dust Control Plan as called for in the Construction Dust Control Ordinance. The Dust Control Plan would require the project sponsor to: submit a map to the Director of Public Health showing all sensitive receptors within 1,000 feet of the site; wet down areas of soil at least three times per day; provide an analysis of wind direction and install upwind and downwind particulate dust monitors; record particulate monitoring results; hire an independent, third party to conduct inspections and keep a record of those inspections; establish shut-down conditions based on wind, soil migration, etc.; establish a hotline for surrounding community members who may be potentially affected by project-related dust; limit the area subject to construction activities at any one time; install dust curtains and windbreaks on the property lines, as necessary; limit the amount of soil in hauling trucks to the size of the truck bed and secure soils with a tarpaulin; enforce a 15 mph speed limit for vehicles entering and exiting construction areas; sweep affected streets with water sweepers at the end of the day; install and utilize wheel washers to clean truck tires; terminate construction activities when winds exceed 25 miles per hour; apply soil stabilizers to inactive areas; and sweep adjacent streets to reduce particulate emissions. The project sponsor would be required to designate an individual to monitor compliance with dust control requirements.

The regulations and procedures set forth by the *San Francisco Building Code* and *San Francisco Health Code*, including preparation of a Dust Control Plan, would ensure that potential dust-related air quality impacts would be less than significant.

Mitigation: None required.

Impact AQ-7: Construction of the Transit Tower would expose sensitive receptors to substantial levels of toxic air contaminants generated by construction equipment. (Significant and Unavoidable with Mitigation)

To determine if construction emissions could result in adverse health effects at nearby receptors, a screening-level health risk assessment and $PM_{2.5}$ analyses were conducted.[248] The analysis considered the nearest residential units to the Transit Tower site, which is the Millennium Tower, across Fremont Street, and the nearest child-care center, which is at 342 Howard Street (in the office building at 199 Fremont

[248] Health risk assessment calculations are included in Appendix B.

Street). The analysis calculated mass emissions of PM_{10}, which was used as a surrogate for diesel particulate matter, and $PM_{2.5}$ exhaust from on-site heavy-duty diesel-powered construction equipment.[249] The estimated mass emissions were entered into the AERMOD dispersion model to estimate ambient concentrations of PM_{10} (diesel particulate matter) and $PM_{2.5}$ associated with the project's construction activities. As recommended by BAAQMD, concentrations of the toxic air contaminant Acrolein were also estimated, because this chemical has the greatest non-cancer health risks for toxic air contaminants contained in diesel exhaust.

The analysis determined that the proposed project's construction-related emissions would generate a cancer risk of 17 in one million for child (infant) receptors at the nearest residential building, the Millennium tower.[250] At the child care center on Howard Street, the analysis identified an incremental lifetime cancer risk of 31 in one million as a result of project construction. Each class of calculated incremental lifetime cancer risk, other than the adult resident, exceeds the BAAQMD significance threshold of 10 in one million, and the impact would therefore be significant.[251]

The maximum concentration of $PM_{2.5}$ at any of the sensitive receptors associated with the project's construction activities would reach an annual average of 0.2 micrograms per cubic meter. This would not exceed the significance threshold of 0.3 micrograms per cubic meter, and would be less than significant.

The Hazard Indices associated with exposure to the toxic air contaminant Acrolein would be less than 1 (0.5 Chronic Hazard Index and 0.1 Acute Hazard Index), and would be less than significant.

It is noted that the foregoing discussion does not represent an impact unique to the proposed Transit Tower project. Rather, as noted, the assessment of construction emission health risk is part of the BAAQMD's 2010 CEQA guidance, and the resulting impacts would be similar for any comparably sized construction project in a densely developed area that contains a mix of land uses.

The project-specific screening-level health risk analysis for the proposed Transit Tower project includes a number of conservative assumptions. For example, for exposure of children at the child care center on Howard Street, the analysis assumes exposure for 10 hours per day, meaning that children are present and exposed to ambient outdoor air for 10 hours per day. In reality, children may spend perhaps half or

249 Diesel-powered construction equipment was assumed to be used primarily during excavation, whereas tower crane(s) and other heavy equipment during building construction was assumed to be electrically powered.

250 For the child receptor, recommended BAAQMD assumptions concerning infants (up to two years of age) were used for purposes of a conservative analysis. These assumptions include a ten-fold "age sensitivity factor" that accounts for infants' greater sensitivity to toxic pollutants. The residential receptor are located on the third story of the adjacent tower as commercial uses occupy the first two stories.

251 According to BAAQMD, the estimated lifetime cancer risk from all toxic air contaminants in the Bay Area is approximately 400 in one million, while the total lifetime cancer risk for all causes is approximately 400,000 in one million (BAAQMD, *Bay Area 2010 Clean Air Plan* [see note 222, p. 379]; p. 1-17). (http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx.) Reviewed September 2, 2010.

more of the day indoors.[252] Depending on the source of the air inside the building—the building in which the child care center is located has fixed windows at all levels, meaning the building has a forced-air ventilation system—indoor air could be substantially cleaner. However, without detailed knowledge of the building or the operation of the child care center, the project health risk assessment defaulted to more conservative exposure assumptions.

The health risk assessment determined that both cancer risk and concentration of $PM_{2.5}$ could be reduced to a less-than-significant level at all receptor locations (that is, the greatest risk and the greatest concentration would both be less than the BAAQMD thresholds) if all diesel construction equipment were to meet the California Air Resources Board (ARB) and U.S. Environmental Protection Agency (EPA) Interim Tier 4 standards for Off-Road Compression-Ignition (Diesel) Engines. As described in the Regulatory Setting, under Toxic Air Contaminant Regulations, p. 384, new diesel engines meeting the interim Tier 4 emissions standards and Tier 2/Tier 3 engines with a CARB-certified Level 3 Verified Diesel Emissions Control System (VDECS) can reduce diesel particulate by approximately 85 percent. Use of these would result in a cancer risk that would not exceed 10 chances in one million at any of the nearby sensitive receptors. For child (infant) receptors at the Millennium tower, the lifetime cancer risk would be 2.6 in one million, compared to 17 in one million in the unmitigated condition. For an infant at the child care center, the risk would decrease to 4.5 in one million, from an unmitigated risk of 30 in one million. Use of Tier 4 diesel equipment or Tier 2/Tier 3 equipment with Level 3 VDECS would also reduce the $PM_{2.5}$ concentration at all receptors to 0.12 micrograms per cubic meter, which is less than the significance threshold of 0.3 micrograms per cubic meter.

However, Tier 4 equipment is not readily available at this time. Both federal (EPA) and CARB Interim Tier 4 standards take effect in 2011 for new equipment. Meanwhile, as also noted above under Toxic Air Contaminant Regulations, ARB has delayed implementation of emissions standards for existing off-road diesel engines, including requirements that construction equipment use so-called Best Available Control Technology or the each operator's fleet of equipment meet a specified average emissions standard, and retrofitting of off-road equipment with Level 3 VDECS is not yet required by CARB. Accordingly, Mitigation Measure M-AQ-7 is identified below to minimize construction emissions.

Mitigation Measure

M-AQ-7 **Construction Vehicle Emissions Minimization:** To reduce the potential health risk resulting from project construction activities, the project sponsor shall include in contract specifications a requirement for the following BAAQMD-recommended measures:

- Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to two minutes;

[252] The State of California requires that child care centers have outdoor play space, and that this space be "open to air and light," which the Child Care Licensing Division of the state Department of Social Services generally interprets as meaning that the outdoor space must be open to the sky (Mardi Lucich, Citywide Childcare Administrator, San Francisco Department of Children, Youth, and Their Families; personal communication, August 24, 2010).

- All off-road construction equipment shall be equipped with Tier 3 (Tier 2 if greater than 750 horsepower) diesel engines or better. The following types of equipment are identified as candidates for retrofitting with CARB-certified Level 3 verified diesel emission controls (Level 3 Verified Diesel Emissions Control Devices, or VDECS, which are capable of reducing DPM emissions by 85 percent or more), due to their expected operating modes (i.e., fairly constant use at high revolution per minute):
  - Excavators
  - Backhoes
  - Rubber-Tired Dozers
  - Concrete Boom Pumps
  - Concrete Trailer Pumps
  - Concrete Placing Booms
  - Soil Mix Drill Rigs
  - Soldier Pile Rigs
  - Shoring Drill Rigs;
- The project construction contractor shall not use diesel generators for construction purposes where feasible alternative sources of power are available. All diesel generators used for project construction shall meet Tier 4 emissions standards.

The equipment listed above may or may not be used for the project. To the extent that the above-listed (or reasonably comparable) equipment is used for project construction, those equipment types shall meet DPM emission standards equivalent to Tier 3 (Tier 2 if greater than 750 horsepower) engines with Level 3 VDECS, if feasible. For the purposes of this mitigation measure, "feasibility" refers to the availability of newer equipment in the contractor's or a subcontractor's fleet that meets these standards, or the availability of older equipment in the contractor's or a subcontractor's fleet that can be feasibly modified to incorporate Level 3 VDECS. It should be noted that for specialty equipment types (e.g. drill rigs, shoring rigs and concrete pumps) it may not be feasible for construction contractors to modify their current, older equipment to accommodate the particulate filters, or for them to provide newer models with these filters pre-installed. Therefore, this mitigation measure may be infeasible.

Should it be determined by the construction contractor or its subcontractor(s) that compliance with the emissions control requirements of this mitigation measure is infeasible for any one of the above listed construction equipment, the construction contractor must demonstrate an alternative method of compliance that achieves an equivalent reduction in the project's fleet-wide DPM and other TAC emissions. If alternative means of compliance with the emissions exhaust requirements are further determined to be infeasible, the construction contractor must document, to the satisfaction of the Environmental Review Officer, that the contractor has complied with this mitigation measure to the extent feasible and why full compliance with the mitigation measure is infeasible.

Level of Significance After Mitigation

Implementation of the above measure would result in the maximum feasible reduction of diesel emissions that would contribute to construction-period health risk, thereby lowering both lifetime cancer risk and the concentration of $PM_{2.5}$ to which receptors would be exposed. Furthermore, the above analysis indicates that use of interim Tier 4 diesel construction equipment or Tier 2/ Tier 3 equipment with Level 3 VDECS would reduce the health risk to a level that would not exceed any of the significance thresholds identified by the BAAQMD. It is also noted that construction emissions could be lower if newer equipment is employed or less powerful or smaller diesel equipment is used than assumed in the analysis. Emissions could also be higher if more or larger diesel equipment is used. Depending on the regulations in place at the time construction begins, and depending on the precise mix of diesel-powered construction equipment employed, it is possible that the impact would be reduced to a less-than-significant level. However, because it cannot be stated with certainty that either cancer risk or $PM_{2.5}$ concentration would be reduced to below the BAAQMD-recommended significance thresholds, and because of the uncertainty concerning the availability and feasibility of using construction equipment that meets the requirements of Mitigation Measure M-AQ-7, this impact is conservatively judged to be **significant and unavoidable**.

Operational Air Quality Impacts

Impact AQ-8: Operation of the proposed Transit Tower would not conflict with *2010 Clean Air Plan,* result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment, either individually or cumulatively. (Less than Significant)

Based on the project transportation analysis,[253] the proposed project would generate approximately 4,000 vehicle trips per day. Operational emissions from project traffic and from operation of the proposed building were calculated using the URBEMIS 2007 (version 9.2.4) model, and are presented in **Table 35**. As shown in Table 6, emission increases attributable to the proposed project would be substantially below the significance thresholds established by the BAAQMD. Therefore, the project's effects of regional criteria pollutant emissions would be less than significant.

The proposed project would be generally consistent with the San Francisco General Plan, as proposed for amendment by the draft Transit Center District Plan. Additionally, the General Plan, Planning Code, and City Charter implement various Transportation Control Measures identified in the 2010 Bay Area Clean Air Plan through the City's Transit First Program, bicycle parking requirements, transit development impact fees applicable to commercial uses, and other actions. The draft Plan would also be consistent with the Transportation Control Measures in the 2010 Clean Air Plan, as described in the analysis under Impact AQ-1, above, and the Transit Tower would be an integral part of the proposed Plan. In light of the above, the project would not make a considerable contribution to cumulative air quality impacts, nor

253 AECOM, *Transit Tower Transportation Impact Study* (see footnote 155, p. 276).

TABLE 35
TRANSIT TOWER ESTIMATED DAILY REGIONAL EMISSIONS (2016)

	Projected Emissions (Pounds per Day)[1,2]			
	ROG	NO_X	PM_{10}	$PM_{2.5}$
Area-Source Emissions	1.1	7.4	0.02	0.02
Mobile-Source (Vehicle) Emissions	23.7	26.5	55.1	10.4
TOTAL	24.7	33.9	55.1	10.4
BAAQMD Threshold	54	54	82	54

NOTES:
1 Emission factors were generated by the URBEMIS 2007 (v. 9.2.4) model for San Francisco County, and assume a default vehicle mix. All daily estimates are the average of summer and winter conditions. Traffic generated emissions based on trip generation from the project transportation study.
2 Columns may not total due to rounding.

SOURCE: Environmental Science Associates, 2011.

would it interfere with implementation of the 2010 Clean Air Plan, which is the applicable regional air quality plan developed to improve air quality and to effectively meet the state and federal ambient air quality standards.

Mitigation: None required.

Local Air Quality Impacts

Impact AQ-9: Operation of the proposed Transit Tower would not result in emissions of carbon monoxide that would exceed state or federal standards, either individually or cumulatively. (Less than Significant)

The San Francisco Bay Area Air Basin is designated as "attainment" for carbon monoxide (CO). As stated in the 2010 update of the BAAQMD *CEQA Air Quality Guidelines*, "Emissions and ambient concentrations of CO have decreased dramatically in the Bay Area Air Basin with the introduction of the catalytic converter in 1975. No exceedances of the CAAQS or NAAQS for CO have been recorded at nearby monitoring stations since 1991."[254] Accordingly, as noted in the Significance Criteria, BAAQMD states that CO impacts may be determined to be less than significant if a project is consistent with the applicable congestion management plan and would not increase traffic volumes at local intersections to more than 24,000 vehicles per hour, for locations, such as the project site, in heavily urban areas, where "urban canyons" formed by buildings tend to reduce air circulation. The project would be consistent with applicable congestion management planning and, as described under Impact AQ-1, above, the greatest

254 BAAQMD *CEQA Air Quality Guidelines* (see footnote 205, p. 370); p. 6-1.

volume at any of the study intersections would be fewer than 6,500 vehicles per hour. Therefore, effects related to CO concentrations would be less than significant.

Mitigation: None required.

Impact AQ-10: Operation of the proposed Transit Tower would not expose sensitive receptors to substantial levels of toxic air contaminants. (Less than Significant)

As noted in the Setting, Article 38 of the *San Francisco Health Code* requires air quality modeling for new residential projects of 10 or more units located in proximity to high-traffic roadways. The proposed project would not include any such sensitive land uses, and because the proposed project would develop office and restaurant/retail uses, which are not considered sensitive receptors, the project would not be subject to Article 38, and the project would not result in adverse effects with regard to exposure of sensitive receptors to DPM or $PM_{2.5}$.

In terms of the effect of project traffic and stationary source (generator) emissions on existing sensitive receptors, as noted in the discussion of Sensitive Receptors, p. 375, the nearest residential building is the Millennium tower, located to the east across Fremont Street from the project site's planned Mission Square park, and the nearest licensed child care center is at 342 Howard Street.

The streets surrounding the Transit Tower site—First, Fremont, and Mission Streets—have all been identified by the San Francisco Department of Public Health as having traffic volumes that place them within "Potential Roadway Exposure Zones"; these zones are areas that, due to proximity to freeways and major roadways, may be subject to relatively high concentrations of $PM_{2.5}$ from local traffic.[255] (These are the locations at which new residential projects are subject to Article 38.) Based on the traffic analysis for the proposed project, project-generated traffic would add up to about 400 peak-hour vehicles on the streets closest to the Transit Tower site, such as First, Fremont, Mission, and Howard Streets. (There would be fewer project vehicles on streets farther away, as traffic is dispersed.) Based on project-generated traffic volumes from the transportation analysis, cancer risk and $PM_{2.5}$ concentrations were calculated for Transit Tower traffic at the Millennium residential tower, the closest sensitive receptor, using the BAAQMD roadway screening tables. The results are shown in **Table 36**.

As stated above, the proposed Transit Tower would include a diesel-powered standby generator to provide emergency electricity to the building in the event of a power outage. Consistent with BAAQMD permit requirements, the standby generator would be limited to 50 hours per year of operations for maintenance and reliability testing. BAAQMD would conduct a screening-level health risk assessment prior to granting a permit for the generator and would not issue the permit if the generator would result

[255] A map of "Potential Roadway Exposure Zones" is included in the recently published EIR for the *San Francisco General Plan* Housing Element, available as FigureV.H-1 in the DEIR Air Quality section, on the internet at: http://www.sf-planning.org/ftp/files/MEA/2007.1275E_SFHE_DEIR_SectionV.H.pdf, at p. V.H-45.

TABLE 36
HEALTH RISKS FROM TRANSIT TOWER OPERATIONAL EMISSIONS[1]

Project Traffic[2]

Street	Direction	Daily Volume	Distance	Cancer Risk[3]	$PM_{2.5}$ Conc.[4]	Exceeds Individual Threshold?
First Street	North-South	2,555	365	0.11	0.004	No
Fremont Street	North-South	522	40	0.11	0.004	No
Beale Street	North-South	0	40	0.00	0.000	No
Main Street	North-South	0	350	0.00	0.000	No
Spear Street	North-South	0	700	0.00	0.000	No
Market Street	East-West	25	685	0.00	0.000	No
Mission Street	East-West	715	40	0.21	0.006	No
Howard Street	East-West	3,575	415	0.13	0.003	No
Folsom Street	East-West	700	1,000	0.02	0.001	No
Sum of Roadway Health Risks				**0.56**	**0.017**	

Project Stationary Source(s)[5]

Source	Cancer Risk[3]	$PM_{2.5}$ Conc.[4]	Non-Cancer Risk		Exceeds Individual Threshold?
			Acute	Chronic	
Emergency Generator (diesel)	0.07	0.001	0.1	0.0003	No
Total of Project Risk	**0.63**	**0.018**	**0.1**	**0.0003**	
					Exceeds T'holds?
Thresholds	**10.0**	**0.3**	**1.0**	**1.0**	**No**

NOTES:
1 Risks calculated for residential (child) receptor at Millennium residential tower.
2 Roadway risk estimated using BAAQMD roadway screening tables.
3 Cancer risk in chances (cases) per one million
4 $PM_{2.5}$ concentration in micrograms per cubic meter
5 Generator risk modeled in AERMOD

SOURCE: Environmental Science Associates, Environ International

in a cancer risk greater than 10 chances in one million. As explained above, this is also the BAAQMD's project-specific significance threshold for toxic air contaminants. Because of this permit requirement, the standby generator would not result in adverse health effects. Nevertheless, a screening-level risk assessment was conducted for the proposed generator, and is included in Appendix D. The results, also provided in Table 36, indicated that the cancer risk due to the generator would be 0.07 in one million, or well below the threshold of 10 in one million. Non-cancer risk, as indicated by an Acute Hazard Index of 0.1 and a chronic Hazard Index of 0.0003, would also be well below the threshold of 1.0, and would be less than significant. The maximum concentration of $PM_{2.5}$, at 0.001 micrograms per cubic meter, would be below the threshold of 0.2 micrograms per cubic meter, and would be less than significant, as well. As shown in the table, total project risks to residential receptors at the Millennium residential tower would be: a lifetime cancer risk of 0.63 in one million; a 24-hour $PM_{2.5}$ concentration of 0.018 micrograms per cubic meter; and acute and chronic hazard indices of 0.1 and 0.0003, respectively. Based on these results, the project's contribution to any potential cumulative impact, on receptors that would also be affected by

project generator emissions, would not be cumulatively considerable. Therefore, project effects related to new sources of toxic air contaminants would be less than significant, both individually and cumulatively.

Similar to the requirements of Article 38, the BAAQMD 2010 *CEQA Air Quality Guidelines* also recommend analysis of "local community risk and hazard impacts"; that is, assessment of effects related to toxic air contaminants (TACs) both from placement of a new sensitive receptor (for example, a residential project) proximate to source(s) of TACs, and from siting of a new source of TACs. As stated above, the proposed Transit Tower would not include any such sensitive land uses, and therefore would not expose new sensitive receptors to substantial concentrations of TACs, nor would the project generate sufficient traffic to newly expose existing sensitive receptors to substantial concentrations of TACs. Therefore, this impact would be less than significant

Mitigation: None required.

Cumulative Impacts

Impact C-AQ: The draft Plan and the proposed Transit Tower would contribute considerably to cumulative air quality impacts. (Significant and Unavoidable with Mitigation)

As stated on p. 386, the BAAQMD recommends evaluation of a plan, such as the draft Transit Center District Plan, with respect to whether the plan would be consistent with the regional air quality plan—as of this writing, the *2010 Bay Area Clean Air Plan*.

With regard to individual development projects, as stated on p. 387, the BAAQMD has established significance thresholds at the levels at which a project's individual emissions would result in a cumulatively considerable contribution to an existing air quality problem; therefore, if project impacts identified are significant, impacts would also be cumulatively considerable.[256] The proposed Transit Tower would result in significant, unavoidable impacts with respect to construction-generated emissions of toxic air contaminants, including diesel particulate matter, and of $PM_{2.5}$. As noted under Impact AQ-7, construction on multiple projects in the Plan area could result in emissions at sensitive receptors proximate to several future project sites would exceed the BAAQMD's significance criteria for cumulative impacts, which are 100 in one million cancer risk, non-cancer hazard index of 10, and a $PM_{2.5}$ concentration of 0.8 micrograms per cubic meter.

Cumulative construction impacts would occur from other projects in the vicinity, most notably the new Transit Center itself, which is currently under construction immediately south of the Transit Tower site. There are several other projects for which the Planning Department has applications on file in proximity to the Transit Center and the proposed Transit Tower site, including a project approved in 2011 at 350 Mission Street, diagonally across the Fremont and Mission Streets intersection from the proposed

256 BAAQMD *CEQA Air Quality Guidelines* (see footnote 205, p. 370); p. 2-1.

Mission Square park. Other development projects with applications on file include a high-rise project with three towers at the northwest corner of First and Mission Streets, a mixed-use tower at 181 Fremont Street, south of the new Transit Center, and a high-rise residential building at 41 Tehama Street, between First and Second Streets. Other potential projects identified on development sites assumed in the analysis of the draft Plan include towers on Mission Street between First and Second Street (Golden Gate University site) and on the north side of Howard Street between First and Second Streets. Each of these projects would result in emissions of diesel particulate matter and other TACs, as well as $PM_{2.5}$. Because concentrations of TACs and $PM_{2.5}$ tend to decrease rapidly with distance from the source, projects more than 100 meters (330 feet) from the sensitive receptors that would be affected by construction of the Transit Center and/or Transit Tower project would contribute substantially less to health risks at these receptors; likewise, the ongoing construction of the Transit Center and proposed construction of the Transit Tower project would make lesser contributions to health risks at receptors more than 330 feet distant. However, particularly given the adjacency of the new Transit Center, where construction will be ongoing until 2017, there is the potential that cumulative construction emissions at sensitive receptors proximate to several future project sites would exceed the BAAQMD's significance criteria for cumulative impacts, which are 100 in one million cancer risk, non-cancer hazard index of 10, and a $PM_{2.5}$ concentration of 0.8 micrograms per cubic meter. For example, the Millennium residential project at Fremont and Mission Street is within 330 feet of the Transit Center, the proposed Transit Tower, the approved building site at 350 Mission Street, and the proposed project at 181 Fremont Street. The Millennium is also within 500 feet of the proposed project at First and Mission Streets, and within 1,000 feet of the proposed project at 41 Tehama Street, an approved building at 535 Mission Street, and potential developments at the Golden Gate University site and on the north side of Howard Street between First and Second Streets. Implementation by the Transbay Joint Powers Authority or a subsequent developer of controls comparable to those identified in Mitigation Measure M-AQ-7 for the proposed Transit Tower project, and implementation of Mitigation Measures M-AQ-4a, M-AQ-4b, and M-AQ-5 for the Transit Center District Plan, would likewise result in the maximum feasible reduction of construction emissions and health risk for these other projects. However, as with the proposed project, because it cannot be stated with certainty that either cancer risk or $PM_{2.5}$ concentration would be reduced to below the BAAQMD-recommended significance thresholds, the cumulative impact is likewise conservatively judged to be **significant and unavoidable**.

Mitigation Measures

Implement Mitigation Measures M-AQ-2, M-AQ-3, M-AQ-4a, M-AQ-4b, M-AQ-5, and M-AQ-7.

Even with implementation of all identified mitigation measures, cumulative impacts with respect to both the draft Plan and the proposed Transit Tower would be **significant and unavoidable**.

H. Greenhouse Gas Emissions

Setting

Greenhouse Gases

Gases that trap heat in the atmosphere are referred to as greenhouse gases (GHGs) because they capture heat radiated from the sun as it is reflected back into the atmosphere, much like a greenhouse does. The accumulation of GHGs has been implicated as a driving force for global climate change. The primary GHGs are carbon dioxide, methane, nitrous oxide, ozone, and water vapor.

While the primary GHGs in the atmosphere are naturally occurring, carbon dioxide (CO_2), methane, and nitrous oxide are largely emitted from human activities, accelerating the rate at which these compounds occur within the earth's atmosphere. Emissions of carbon dioxide are largely by-products of fossil fuel combustion, whereas methane results from off-gassing associated with agricultural practices and landfills. Other GHGs include hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, and are generated in certain industrial processes. Emissions of GHGs are typically reported in "carbon dioxide-equivalent" (CO_2E) measures.[257]

There is international scientific consensus that human-caused increases in GHGs have and will continue to contribute to global warming. Potential global warming impacts in California may include, but are not limited to, loss in snow pack, sea level rise, more extreme heat days per year, more high ozone days, more large forest fires, and more drought years.[258] Secondary effects are likely to include global rise in sea level, impacts to agriculture, changes in disease vectors, and changes in habitat and biodiversity.

The California Air Resources Board (ARB) estimated that in 2008 California produced about 478 million gross metric tons ($MMTCO_2E$; about 525 million U.S. tons) of CO_2E GHG emissions.[259] The ARB found that transportation is the source of 37 percent of the State's GHG emissions, followed by electricity generation (both in-state and out-of-state) at 24 percent and industrial sources at 19 percent. Commercial and residential fuel use (primarily for heating) accounted for 9 percent of GHG emissions.[260] In the Bay Area, fossil fuel consumption in the transportation sector (on-road motor vehicles, off-highway mobile sources, and aircraft) and the industrial/ commercial sector were the two largest sources of GHG emissions, each accounting for about 36 percent of the Bay Area's 95.8 $MMTCO_2E$ (105.4 million U.S. tons) of GHG emissions in 2007. Industrial and commercial sources (including office and retail uses) were

257 Because of the differential heat absorption potential of various GHGs, GHG emissions are frequently measured in "carbon dioxide-equivalents," which present a weighted average based on each gas's heat absorption (or "global warming") potential.

258 California Climate Change Portal. Frequently Asked Questions About Global Climate Change. Available online at: http://www.climatechange.ca.gov/publications/faqs.html. Accessed January 1, 2011.

259 The abbreviation for "million metric tons" is MMT; thus, "million metric tons of CO_2 equivalents is written as $MMTCO_2E$.

260 California Air Resources Board, "California Greenhouse Gas Inventory for 2000-2008—by Category as Defined in the Scoping Plan." http://www.arb.ca.gov/cc/inventory/data/tables/ghg_inventory_scopingplan_00-08_2010-05-12.pdf. January 1, 2011.

the second largest contributors of GHG emissions with about 34 percent of total emissions. Electricity production accounts approximately 16 percent of the Bay Area's GHG emissions, followed by residential fuel usage (e.g., home water heaters, furnaces, etc.) at 7 percent, off-road equipment at 3 percent, and agriculture at 12 percent. Among industrial sources, oil refining currently accounts for more than 40 percent of GHG emissions, or approximately 15 percent of the total Bay Area GHG emissions.[261]

California has taken a leadership role in addressing the trend of increasing GHG emissions, with the passage in 2006 of California Assembly Bill 32 (AB 32), the Global Warming Solutions Act. This legislation is discussed below, under Regulatory Setting.

Regulatory Setting

Federal Actions

Currently, there is no federal legislation requiring reductions in GHG emissions. Rather, the United States Environmental Protection Agency (EPA) administers a variety of voluntary programs and partnerships with GHG emitters in which the EPA partners with industries producing and utilizing synthetic GHGs to reduce emissions of particularly potent GHGs. There are federal actions requiring increasing automobile efficiency, an endangerment finding for CO_2, and a recently finalized regulation requiring large sources of GHG emissions to report their emissions to the EPA. In addition, there are several bills pending in Congress that are attempting to regulate GHG emissions in the United States; most of these bills require a cap and trade program in which GHG emissions would be reduced overall through a market-driven approach.

In December 2009, in response to a U.S. Supreme Court ruling, the EPA made a finding under the Clean Air Act that current and projected atmospheric concentrations of the six generally recognized GHGs—CO_2, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride—"threaten the public health and welfare of current and future generations," and that emissions of these gases from new cars and trucks "contribute to the greenhouse gas pollution which threatens public health and welfare."[262] While not in itself imposing any regulatory requirements, this "endangerment finding" under the Clean Air Act was required before EPA could issue regulations, and allowed the agency to adopt GHG emissions standards that it proposed in September 2009, in conjunction with new fuel economy standards simultaneously proposed by the National Highway Traffic Safety Administration (NHTSA) of U.S. Department of Transportation. The standards, published in the Federal Register in May 2010, and effective in July 2010, apply to passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering model years 2012 through 2016, and require automakers to improve fleet-wide fuel economy and reduce fleet-wide greenhouse gas emissions by approximately five percent each year. They require these vehicles to meet an estimated combined average emissions level of 250 grams of

[261] BAAQMD, *Source Inventory of Bay Area Greenhouse Gas Emissions: Base Year 2007*, December 2008. Available on the internet at: http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Emission%20Inventory/regionalinventory2007_003_000_000_000.ashx.

[262] EPA website: http://www.epa.gov/climatechange/endangerment.html. Reviewed January 2, 2011.

carbon dioxide (CO_2) per mile in model year 2016, equivalent to 35.5 miles per gallon (mpg) if the automotive industry were to meet this CO_2 level entirely through fuel economy improvements.[263]

In May 2010, EPA issued a final rule that establishes thresholds for GHG emissions that define when permits are required for new and existing industrial facilities. Facilities responsible for nearly 70 percent of the national GHG emissions from stationary sources will be subject to permitting requirements under this rule. This includes the nation's largest GHG emitters—power plants, refineries, and cement production facilities. The rule took effect in 2011.

In September 2010, EPH and NHTSA published a Notice of Intent for the development of new GHG and fuel economy standards for model year 2017-2025 vehicles. The agencies published a Supplemental Notice of Intent in December 2010. Draft regulations are anticipated in 2011, with a final rule due to be adopted in 2012.[264]

In a related action, in June 2009, EPA granted California a waiver under the federal Clean Air Act, allowing the state to impose its own, stricter GHG regulations for vehicles beginning in 2009 (see below).

Statewide Actions

As early as 2002, with the passage of Assembly Bill 1493, the California legislature directed ARB to adopt regulations to reduce greenhouse gas (GHG) emissions from cars and light trucks beginning in 2009. Because the so-called Pavley standards (named for the bill's author, current state Senator Fran Pavley) would impose stricter standards than those under the federal Clean Air Act, California applied to the EPA for a waiver under the Clean Air Act; this waiver was denied by the Bush Administration in 2008. As noted above, in 2009, EPA granted the waiver. California has now agreed to cooperate with the federal GHG and Corporate Average Fuel Economy standards under development so that there will be a single national standard.

In 2005, in recognition of California's vulnerability to the effects of climate change, Governor Schwarzenegger established Executive Order S-3-05, which sets forth a series of target dates by which statewide emissions of GHGs would be progressively reduced, as follows: by 2010, reduce GHG emissions to 2000 levels (approximately 458 $MMTCO_2E$); by 2020, reduce GHG emissions to 1990 levels

263 National Highway Traffic Safety Administration, "NHTSA and EPA Establish New National Program to Improve Fuel Economy and Reduce Greenhouse Gas Emissions and for Passenger Cars and Light Trucks," fact sheet, May 2010. Available on the internet at:http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/CAFE-GHG_Fact_Sheet.pdf. Reviewed June 12, 2010.

264 75 Federal Register 76337, December 8, 2010. Available on the internet at: http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/Supplemental_Notice_FR_12082010.pdf; Fact Sheet, "NHTSA and EPA Issue a Supplemental Notice in the Process for Setting Future Greenhouse Gas and Fuel Economy Standards for Passenger Cars and Light Trucks, November 2010. Available on the internet at: http://www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/Supplemental_NOI_CAFE_2017_Fact_Sheet.pdf. Reviewed January 2, 2011.

(an estimated 427 MMTCO$_2$E); and by 2050, reduce GHG emissions to 80 percent below 1990 levels (approximately 85 MMTCO$_2$E).[265]

In 2006, California passed the California Global Warming Solutions Act of 2006 (Assembly Bill No. 32; California Health and Safety Code Division 25.5, Sections 38500, et seq., or AB 32), which requires the California Air Resources Board (ARB) to design and implement emission limits, regulations, and other measures, such that feasible and cost-effective statewide GHG emissions are reduced to 1990 levels by 2020 (representing a 25 percent reduction in emissions).

Pursuant to AB 32, ARB adopted a Scoping Plan in December 2008, outlining measures to meet the 2020 GHG reduction limits. In order to meet these goals, California must reduce its GHG emissions by almost 30 percent below projected 2020 business as usual emissions levels, or about 11 percent from today's levels. The Scoping Plan estimates a reduction of 174 MMT (about 191 million U.S. tons) of CO$_2$E. Approximately one-third of the emissions reductions strategies fall within the transportation sector and include the following: California Light-Duty Vehicle GHG standards, the Low Carbon Fuel Standard, Heavy-Duty Vehicle GHG emission reductions and energy efficiency, and medium and heavy-duty vehicle hybridization, high speed rail, and efficiency improvements in goods movement. These measures are expected to reduce GHG emissions by 57.3 MMT (63 million U.S. tons) of CO$_2$E. Emissions from the electricity sector are expected to reduce another 49.7 MMT (55 million U.S. tons) of CO$_2$E. Reductions from the electricity sector include building and appliance energy efficiency and conservation, increased combined heat and power, solar water heating (AB 1470), the renewable energy portfolio standard (33 percent renewable energy by 2020), and the existing million solar roofs program. Other reductions are expected from industrial sources, agriculture, forestry, recycling and waste, water, and emissions reductions from cap-and-trade programs. Regional GHG targets are also expected to yield a reduction of 5 MMT (5.5 million U.S. tons) of CO$_2$E.[266] Measures that could become effective during implementation of projects in the Transit Center District Plan area, including the proposed Transit Tower, pertain to construction-related equipment and building and appliance energy efficiency. Some proposed measures will require new legislation to implement, some will require subsidies, some have already been developed, and some will require additional effort to evaluate and quantify. Additionally, some emissions reductions strategies may require their own environmental review under CEQA or the National Environmental Policy Act (NEPA). Some applicable measures that are ultimately adopted will become effective during construction and operation of the proposed project and the proposed project would be subject to these requirements.

Most of the Scoping Plan's GHG reduction measures (excepting those for Agriculture, Forestry, and Industry, which would not be applicable to the proposed project) are set forth in **Table 37**. While ARB has identified a GHG reduction target of 15 percent from current levels for actions by local governments

265 California Air Resources Board, Climate Change Scoping Plan: A Framework for Change, December 2008. Available on the internet at: http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm. Accessed January 2, 2011.

266 Ibid.

TABLE 37
GHG REDUCTION MEASURES IN ARB SCOPING PLAN[1]

Measure No.	Measure Description	GHG Reductions (Annual MMT CO_2e)
Transportation		
T-1	Pavley I and II – Light Duty Vehicle Greenhouse Gas Standards	31.7
T-2	Low Carbon Fuel Standard (Discrete Early Action)	15.0
T-3[2]	Regional Transportation-Related Greenhouse Gas Targets	5.0
T-4	Vehicle Efficiency Measures	4.5
T-5	Ship Electrification at Ports (Discrete Early Action)	0.2
T-6	Goods Movement Efficiency Measures. • Ship Electrification at Ports • System-Wide Efficiency Improvements	3.5
T-7, 8	Medium- and Heavy-Duty Vehicle Measures • Aerodynamic Efficiency (Discrete Early Action) • Hybridization	1.4
T-9	High Speed Rail	1.0
		62.3
Electricity and Natural Gas		
E-1	Energy Efficiency (32,000 GWh of Reduced Demand) • Increased Utility Energy Efficiency Programs • More Stringent Building & Appliance Standards Additional Efficiency and Conservation Programs	15.2
E-2	Increase Combined Heat and Power Use by 30,000 GWh (Net reductions include avoided transmission line loss)	6.7
E-3	Renewables Portfolio Standard (33% by 2020)	21.3
E-4	Million Solar Roofs (including California Solar Initiative, New Solar Homes Partnership and solar programs of publicly owned utilities) • Target of 3000 MW Total Installation by 2020	2.1
CR-1	Energy Efficiency (800 Million Therms Reduced Consumptions) • Utility Energy Efficiency Programs • Building and Appliance Standards • Additional Efficiency and Conservation Programs	4.3
CR-2	Solar Water Heating (AB 1470 goal)	0.1
		49.7
Green Buildings		
GB-1	Green Buildings	26
Recycling and Waste		
RW-1	Landfill Methane Control (Discrete Early Action)	1
RW-2	Additional Reductions in Landfill Methane	TBD†
RW-3	High Recycling/Zero Waste	9†
Water		
W-1	Water Use Efficiency	1.4†
W-2	Water Recycling	0.3†
W-3	Water System Energy Efficiency	2.0†
W-4	Reuse Urban Runoff	0.2†
W-5	Increase Renewable Energy Production	0.9†
W-6	Public Goods Charge (Water)	TBD†

1 Table excludes GHG reduction measures for Agriculture, Forestry, and Industry (including high-global warming potential gases).
2 This is not the SB 375 regional target. ARB will establish regional targets for each Metropolitan Planning Organization (MPO) region following the input of the regional targets advisory committee and a consultation process with MPOs and other stakeholders per SB 375.
† GHG emission reduction estimates are not included in calculating the total reductions needed to meet the 2020 target.

SOURCE: ARB, 2008

themselves, it has not yet determined what amount of GHG emissions reductions it recommends from local government land use decisions. However, the Scoping Plan does state that successful implementation of the plan relies on local governments' land use planning and urban growth decisions because local governments have primary authority to plan, zone, approve, and permit land development to accommodate population growth and the changing needs of their jurisdictions. ARB further acknowledges that decisions on how land is used will have large effects on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. As can be seen in Table 37, many of the measures in the Scoping Plan—such as implementation of increased fuel efficiency for vehicles (the "Pavley" standards), increased efficiency in utility operations, and development of more renewable energy sources—require statewide action by government, industry, or both. Some of the measures are at least partially applicable to development projects, such as increasing energy efficiency in new construction, installation of solar panels on individual building roofs, and a "green building" strategy. The City has already implemented several of these measures that require local government action, such as implementing a Green Building Ordinance, a Zero Waste strategy, a Construction and Demolition Debris Recovery Ordinance, and a solar energy generation subsidy program, to realize meaningful reductions in GHG emissions. (See discussion under Local Actions, below.)

In addition to policy directly guided by AB 32, the legislature in 2008 passed Senate Bill (SB) 375, which provides for regional coordination in land use and transportation planning and funding to help meet the AB 32 GHG reduction goals. SB 375 requires regional transportation plans developed by the state's 18 Metropolitan Planning Organizations (in the Bay Area, the Metropolitan Transportation Commission (MTC)), to incorporate a "sustainable communities strategy" in their regional transportation plans that will achieve GHG emission reduction targets set by ARB. SB 375 also includes provisions for streamlined CEQA review for some infill projects such as transit-oriented development. MTC's 2013 RTP will be its first plan subject to SB 375.

SB 375 requires ARB to establish regional GHG reduction targets. ARB appointed a 21-member Regional Targets Advisory Committee to recommend factors to be considered and methodologies used in setting the regional goals; this committee provided its recommendations to ARB in September 2009.

In addition, the state establishes energy standards for new construction. First adopted in June and most recently revised in 2008, these standards are part of the California Building Standards Code (Title 24 of the California Code of Regulations). In general, Title 24 standards require the design of building shells and building components to conserve energy. The standards are updated periodically to allow for consideration and possible incorporation of new energy efficiency technologies and methods. The state Building Code and other standards for appliances and other consumer products apply throughout California, and they limit GHG emissions in California by reducing energy demand.

CEQA Guidelines

Senate Bill 97 (SB 97) required the Office of Planning and Research (OPR) to amend the state CEQA Guidelines to address the feasible mitigation of GHG emissions or the effects of GHGs. In response, OPR

amended the CEQA Guidelines to provide guidance for analyzing GHG emissions. Among other changes to the CEQA Guidelines, the amendments add a new section to the CEQA Checklist (CEQA Guidelines Appendix G) to address questions regarding the project's potential to emit GHGs.

These revisions include a new section (Sec. 15064.4) specifically addressing the significance of GHG emissions. Section 15064.4 calls for a "good-faith effort" to "describe, calculate or estimate" GHG emissions; Section 15064.4 further states that the significance of GHG impacts should include consideration of the extent to which the project would increase or reduce greenhouse gas emissions; exceed a locally applicable threshold of significance; and comply with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions." The revisions also state that a project may be found to have a less-than-significant impact if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (Sec. 15064(h)(3)).

Regional Actions

The Bay Area Air Quality Management District (BAAQMD) is the regional air district with jurisdiction over the nine-county region located in the Bay Area Air Basin. BAAQMD is responsible for attaining and/or maintaining air quality in the Air Basin within federal and State air quality standards. BAAQMD has established a Climate Protection Program with the goal of integrating climate protection activities into the district's existing programs. The BAAQMD provides recommendations for lead agencies to follow in protecting air quality, including reducing GHG emissions, through implementation of CEQA review. Notably, in June 2010, the District adopted revised *CEQA Air Quality Guidelines* that include quantitative thresholds for determining significance of GHG emissions and provides an extensive list of mitigation measures that can be applied to reduce operational emissions, including of GHGs. The District recommends that local agencies adopt a Greenhouse Reduction Strategy consistent with AB32 goals.

Specifically, the BAAQMD 2010 *CEQA Air Quality Guidelines* set forth the requirements for a GHG Reduction Strategy to be considered consistent with the State's GHG reduction goals as codified through AB 32. Projects that are consistent with such qualified GHG Reduction Strategies can be found to have a less-than-significant impact in terms of GHG emissions and climate change. BAAQMD standards for a qualified GHG Reduction Strategy include:

a) Quantification of GHGs for existing (baseline) and future years (2020 or other forecast year) that includes future emissions under a "business-as-usual" scenario;
b) An adopted GHG reduction goal of (i) 1990 GHG emission levels, (ii) 15 percent below baseline (2008 or earlier) emission levels, or (iii) a per-service-population emissions rate of 6.6 $MMTCO_2E$, the specified general plan significance criterion in the BAAQMD *CEQA Air Quality Guidelines*;
c) Analysis of anticipated GHG emissions resulting from local and state policies and regulations that may be planned or adopted but not implemented;
d) Identification of specific feasible reduction measures to meet the identified target on a project-by-project basis, including quantification of each measure's effectiveness in GHG reduction;

e) Establishment of a monitoring program, including identification of which measures apply to different types of new development projects, a mechanism for reviewing and determining if all applicable mandatory measures are being applied, implementation steps and parties responsible for ensuring implementation of each action and a schedule for implementation, procedures for monitoring and updating the GHG inventory and reduction measures at three- to five-year intervals, and annual review and reporting on the progress of implementation; and

f) Adoption through a public process following environmental review.

Because few local agencies have completed all of these steps, BAAQMD recognizes that a local agency can demonstrate equivalency with a qualified GHG Reduction Strategy if its climate change ordinances, policies, and programs are consistent with AB 32 and include requirements or feasible measures to reduce GHG emissions to 1990 levels, 15 percent below 2008 levels, or 6.6 MMTCO_2E.

Local Actions

In August 2010, the San Francisco Planning Department submitted to the BAAQMD a draft of the City and County of San Francisco's *Strategies to Address Greenhouse Gas Emissions*. This document presents a comprehensive assessment of policies, programs and ordinances that collectively represent San Francisco's Qualified Greenhouse Gas Reduction Strategy. The BAAQMD reviewed San Francisco's GHG reduction strategy and concluded that the strategy meets the criteria for a Qualified GHG Reduction Strategy as outlined in BAAQMD's CEQA Guidelines (2010).[267] Therefore, projects that are consistent with San Francisco's GHG reduction strategy would result in less than significant GHG emissions.

The City's *Strategies to Address Greenhouse Gas Emissions* ("GHG Reduction Strategy") includes, following an introduction, chapters that address each of the requirements, a through f, noted above. Chapter II of the GHG Reduction Strategy sets forth the City's GHG inventory as contained in the City's *Climate Action Plan: Local Strategies to Reduce Greenhouse Gas Emissions* (*Climate Action Plan*), published in 2004 by the City's Department of the Environment and Public Utilities Commission.[268] The *Climate Action Plan* was called for in the City's 2002 Greenhouse Gas Emissions Reduction Resolution. The Plan provides the context of climate change in San Francisco and examines strategies to meet the 20 percent GHG reduction target.

The *Climate Action Plan* estimated that in 1990 San Francisco's GHG emissions were approximately 8.26 MMT of CO_2 equivalent (about 9.1 million U.S. tons). Just over half of these emissions in 1990 were from motor vehicles, with the remainder generated by building energy use. The Plan estimated year 2000 GHG emissions at 8.8 MMT of CO_2E (about 9.7 million U.S. tons) and projected 2012 GHG emissions at 9.8 MMT of CO_2E (about 10.8 million U.S. tons) based on a business-as-usual scenario (without citywide actions to reduce GHG emissions). The *Climate Action Plan* estimated that GHG emissions are projected to rise approximately 9 percent from 2000 levels in the transportation sector, and 14 percent from 2000 levels

[267] San Francisco's *Strategies to Address Greenhouse Gas Emissions* and BAAQMD's letter are available online at: http://www.sfplanning.org/index.aspx?page=1570.

[268] San Francisco Department of the Environment and San Francisco Public Utilities Commission, Climate Action Plan for San Francisco, Local Actions to Reduce Greenhouse Emissions, September 2004.

in the building energy sector. In 2008, San Francisco commissioned an independent third party to conduct a review the City's baseline community-wide GHG emissions for years 1990, 2000 and 2005. The independent report generally confirmed the Plan's 1990 and 2000 emissions estimates and found that 2005 GHG emissions were approximately 7.8 MMT of CO_2e (about 8.6 million U.S. tons), a decrease of about 5 percent from 1990.[269]

Chapter II of the GHG Reduction Strategy also sets forth the City's GHG reduction targets, established by the 2008 Greenhouse Gas Reduction Ordinance:

- Reduce greenhouse gas emissions by 25 percent below 1990 levels by 2017;
- Reduce greenhouse gas emissions by 40 percent below 1990 levels by 2025; and
- Reduce greenhouse gas emissions by 80 percent below 1990 levels by 2050.

Chapter III of the GHG Reduction Strategy lists objectives and policies within the *San Francisco General Plan* that address climate change, categorizing the policy language into one or more of five GHG emission sectors: Transportation, Energy Efficiency, Renewable Energy, Waste, and Environment/Conservation. Policies from both plan elements and area plans are included.

Chapter IV of the Strategy describes "actions or categories of actions that, when implemented, will achieve a specified GHG emissions level." This includes the four categories of actions set forth in the *Climate Action Plan*, which are the same as the first four sectors identified in the preceding paragraph, and the added category of Environment/Conservation, which includes "other climate change-related policies, such as street planting and landscaping, policies that increase carbon sequestration, and those that encourage conservation of the natural environment."

Chapter IV identifies six main Transportation-related actions to reduce GHG emissions by more than 874,000 metric tons of CO_2e (963,000 U.S. tons) per year, including increasing the use of public transit; increasing ridesharing; increasing bicycling and walking; support of employer-based trip-reductions programs; "discourage driving"; and increasing the use of clean air vehicles and improving fleet efficiency. In Chapter VI, Progress Towards Emissions Reductions, the Strategy recognizes declines in per-capita vehicle ownership and vehicles per household, as well as decreases in driving and small increases in transit use and bicycling and a greater increase in persons working at home.

Energy Efficiency Actions include increasing incentives, direct installation, and technical assistance for improvements to residential, commercial, and municipal buildings; expanding education and outreach; and strengthening legislation, codes, and standards (estimated reduction of 727,000 metric tons (800,000 U.S. tons) CO_2e per year). The Strategy notes that the Department of the Environment's Energy Watch Program, in 2009, saved 27,000,000 gross kWh and 53,000 therms of gas.

Renewable Energy Actions include development of renewable solar, wind, and biomass projects; conducting pilot projects for emerging technologies; and supporting and developing green power

[269] Contained in Appendix C to the GHG Reduction Strategy; http://www.sfplanning.org/index.aspx?page=1570.

projects (estimated reduction of 500,000 metric tons (550,000 U.S. tons) of CO_2e per year). Accomplishments noted in Chapter VI include progress in the development of solar power and biodiesel; closure of the Hunters Point Power Plant in 2006 (the Potrero Power Plan closed in 2011); installation of more than 1,600 photovoltaic systems (capacity of 8.5 megawatts); installation of solar panels at the Sunset Reservoir to generate 5 megawatts of electricity; the use and development of biofuels, including the SFGreasecycle program in which the City picks up used cooking oil and grease from local establishments and converts the oil into biodiesel; and biodiesel use by City fleets.

Solid Waste Actions include increasing residential recycling and composting; increasing commercial recycling and composting; and expansion of construction and demolition debris recycling (estimated reduction of 270,000 metric tons (300,000 U.S. tons) of CO_2e per year). Chapter VI notes that the City has recently mandated recycling and composting program for all residents and businesses.

In the area of Environment/Conservation, Chapter VI states, "The City's efforts to design a more sustainable streetscape have culminated in the Better Streets Plan [that] provides design guidelines for streetscape improvement projects, including guidelines for the number and placement of street trees and guidelines for increasing the City's permeable surfaces."

Additional GHG reduction strategies are set forth in Chapter V. These include the 2008 GHG ordinance noted above, which calls upon the San Francisco Department of the Environment to coordinate GHG reduction efforts; implementation of various City departments' climate action plans; specific actions by the Planning Department, Department of Building Inspection, and Department of Public Works with respect to project review; City Administrator and San Francisco Public Utilities Commission efforts to reduce municipal GHG emissions; and consideration of future legislation to develop or utilize available market-based compliance mechanism. In 2008, the Department of the Environment released *SForward*, an environmental plan for the City that identifies eight policy areas to be developed: climate action, renewable and efficient energy, clean transportation, green buildings, urban forest, zero waste, environmental justice, and toxics reduction. The San Francisco Carbon Fund, created in response to Executive Directive 07-13 and codified in Chapter 52 of the City *Administrative Code*, will fund carbon-offset activities exclusively within San Francisco. Programs funded have included a waste grease biodiesel facility in the Dogpatch neighborhood, the planting of fruit trees in, among other places, one of San Francisco's larger public housing developments, and kiosks at San Francisco International Airport that the calculation of a flight's carbon footprint and the purchase carbon offsets to support local projects.

Other key GHG reduction strategies described in Chapter V include San Francisco's Transit First Policy (Section 16.102 of the City Charter), instituted in 1973 with the goal of reducing the City's reliance on freeways and meeting transportation needs by emphasizing mass transportation (the Transit First Policy gives priority to public transit investments; adopts street capacity and parking policies to discourage increased automobile traffic; and encourages the use of transit, bicycling and walking rather than use of single-occupant vehicles); the Green Taxi Fleet (the Taxi Commission passed a resolution in 2007 calling for the San Francisco taxi industry to reduce GHG emissions by 20 percent from 1990 levels and 50 percent from current levels by 2012, as well as to work to offset remaining emissions with investments

in renewable energy or energy efficiency by 2015, and to move to a Zero Emissions taxi fleet by 2020); the Municipal Transportation Agency (MTA) Zero Emissions 2020 (hybrid diesel-electric buses have replaced older diesel buses, newer diesel vehicles have been retrofitted, and certain vehicles are using a blend of 20 percent biodiesel with regular diesel) and draft MTA Climate Action Plan.

Chapter V of the GHG Reduction Strategy also discusses the contribution of the City's denser-than-typical land use pattern to reducing vehicle travel and vehicular GHG emissions; other environmental policies and programs such as tree planting and protection, and business programs such as the City's Green Business Program that helps San Francisco businesses adopt environmental practices that are sustainable and profitable.

Chapter VI of the GHG Reduction Strategy discusses progress made to date, including the 5 percent reduction in community-wide GHG emissions from 1990 to 2005 discussed above. Also discussed are increases in bicycling, walking, and transit ridership, energy savings, and reductions in waste disposed of at landfills.

Chapter VII sets forth a future GHG emissions monitoring strategy.

Chapter VIII of the Strategy identifies other ongoing GHG reduction efforts, including the Department of the Environment 2010-2012 Strategic Plan and the Climate Action Plans of San Francisco International Airport and the Public Utilities Commission, while Chapter IX describes a large number of regulations that are applicable to new development and renovations that are expected to yield greenhouse gas (GHG) reductions. These include, among others, the Transit Impact Development Fee, Commuter Benefits Ordinance, Transportation Management Program requirement for larger projects, bicycle parking and car-sharing requirements, limitations on vehicle parking, the City's Green Building Ordinance, newly enacted stormwater controls, and mandatory recycling and composting.

As stated previously, the BAAQMD has determined that the GHG Reduction Strategy is a Qualified GHG Reduction Strategy as set forth in the BAAQMD 2010 *CEQA Air Quality Guidelines*. The District found that, in some areas, "the City has surpassed the minimum standard elements of a Qualified GHG Reduction Strategy," and concluded that "Aggressive GHG reduction targets and comprehensive strategies like San Francisco's help the Bay Area move toward reaching the State's AB 32 goals, and also serve as a model from which other communities can learn."[270]

To evaluate whether a project is consistent with the City's GHG Reduction Strategy, the Planning Department has prepared a Greenhouse Gas Analysis Compliance Checklist that is used to compare a project's attributes with various components of the Strategy. This compliance checklist is discussed further in the Impacts Analysis, below.

[270] BAAQMD letter contained in Appendix A of the GHG Reduction Strategy. Available on the internet at: http://www.sf-planning.org/index.aspx?page=1570.

Impacts

Significance Criteria

The proposed project would have a significant air quality impact if it were to:

- Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment; or
- Conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases.

Methodology

Quantification of greenhouse gas (GHG) emissions was conducted using a combination of the URBEMIS 2007 model (version 9.2.4), the BAAQMD Greenhouse Gas Model, and other emissions factors.

Impact Analysis

Transit Center District Plan

Impact GG-1: Implementation of the proposed Plan would not generate greenhouse gas emissions, either directly or indirectly, that would have a significant impact on the environment, nor would the project conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases. (Less than Significant)

Adoption and implementation of the draft Plan would not directly result in GHG emissions; however, implementation of development projects in the Plan area, including the proposed Transit Tower, would result in GHG emissions (see separate analysis of Transit Tower under Impact GG-2, below). The draft Plan includes goals and policies that would apply to development within the Plan area, including any potential future combined heat and power facility (although no such facility is currently proposed). These policies are generally consistent with the City's *Strategies to Address Greenhouse Gas Emissions*. The draft Plan would support reductions in GHG emissions by providing for additional high-density mixed-use development in an area with the most extensive array of transit service in the Bay Area, and by improving pedestrian and bicycle access within and to and from the Plan area. Of the GHG reduction sectors listed in the City's *Strategies to Address Greenhouse Gas Emissions* (i.e., Transportation, Energy Efficiency, Renewable Energy, Waste, and Environment/Conservation), many of the draft Plan policies relate to improving transportation through improved transit, pedestrian, and bicycle accessibility and connections. In particular, the following objectives and policies from the draft Plan would serve to reduce potential GHG emissions by concentrating growth near transit, discouraging use of single-occupancy vehicles for commuter travel and encouraging alternative forms of travel.

> **Objective 1.1:** Maintain downtown San Francisco as the region's premier location for transit-oriented job growth within the Bay Area.
>
> **Objective 1.2:** Reinforce the role of downtown within the city as its major job center by protecting and enhancing the central district's remaining capacity, principally for employment growth.

Policy 1.4: Prevent long-term under-building in the area by requiring minimum building intensities for new development on major sites.

Policy 2.6: Establish a minimum height requirement for the Transit Tower site, as well as other adjacent sites zoned for a height limit of 750 feet or greater.

Policy 2.7: Do not limit the floor plate or dimensions of the lower tower for buildings taller than 550 feet.

Policy 2.23: Eliminate the Floor Area Ratio penalty for tall floors. Section 102.11 of the *Planning Code* currently requires creating and counting "phantom floors" in square footage calculations when average floor-to-floor height exceeds 15 feet. This discourages tall ground floor spaces that add variety and grandeur to a streetscape.

Policy 2.26: Maximize daylight on streets and open spaces and reduce heat-island effect, by using materials with high light reflectance, without producing glare.

Policy 2.27: Encourage the use of green, or "living," walls as part of a building design in order to reduce solar heat gain as well as to add interest and lushness to the pedestrian realm.

Objective 3.1: Make walking a safe, pleasant, and convenient means of moving about throughout the district.

Objective 3.2: Create a high-quality pedestrian environment in the district consistent with the vision for the central district of a world-class city.

Objective 3.4: Emphasize the importance of streets and sidewalks as the largest component of public open space in the Transit Center District.

Policy 3.1: Create and implement a district streetscape plan to ensure consistent corridor-length streetscape treatments.

Policy 3.2: Widen sidewalks to improve the pedestrian environment by providing space for necessary infrastructure, amenities and streetscape improvements.

Policy 3.3: Facilitate pedestrian circulation by providing sidewalk widths that meet the needs of projected pedestrian volumes and provide a comfortable and safe walking environment.

Policy 3.5: Create additional pedestrian capacity and shorten pedestrian crossing distances by narrowing roadways and creating corner curb bulb-outs.

Policy 3.6: Enhance pedestrian crossings with special treatments (e.g. paving, lighting, raised crossings) to enhance pedestrian safety and comfort, especially where bulb-outs cannot be installed.

Objective 3.6: Enhance the pedestrian network with new linkages to provide direct and varied pathways, to shorten walking distances, and to relieve congestion at major street corners,

Objective 3.8: Ensure that new development enhances the pedestrian network and reduces the scale of long blocks by maintaining and improving public access along existing alleys and creating new through block pedestrian connections where non e exist.

Objective 3.9: Ensure that mid-block crosswalks and through-block passageways are convenient, safe, and inviting.

Policy 3.9: Create convenient pedestrian access by providing signalized mid-block crosswalks, especially on blocks longer than 300 feet.

Policy 3.10: Prohibit the elimination of existing alleys within the District. Consider the benefits of shifting or re-configuring alley alignments if the proposal provides an equivalent or greater degree of public circulation.

Policy 3.11: Design new and improved through-block pedestrian passages to make them attractive and functional parts of the public pedestrian network.

Objective 4.1: The district's transportation system will prioritize and incentivize the use of transit. public transportation will be the main, non-pedestrian mode for moving into and between destinations in the Transit Center District.

Objective 4.2: The district's transportation system will implement and require transportation demand management strategies to minimize growth in auto trips and reduce volumes as necessary. actively manage the transportation system to optimize person-carrying capacity.

Objective 4.3: The district's transportation system will meet changing transit needs, particularly to support the new Transbay Transit Center and accommodate increased densities. make changes in the circulation network that ensure delivery of reliable and convenient transit service to the Transbay Transit Center and for district residents, employees, and visitors.

Objective 4.4: The district's transportation system will prioritize pedestrian amenity and safety. Invest in circulation modifications and urban design measures that support the creation of an attractive and memorable public realm.

Objective 4.7: The district's transportation system will further sustainability goals. Advance the goals of the city's climate action plan, by reducing greenhouse gas emissions generated by vehicular transportation.

Objective 4.9: Prioritize transit movements through and within the district over all other transportation modes.

Objective 4.10: Design transit facilities to improve the reliability and function of transit movements and to enhance the rider experience.

Objective 4.11: Ensure that changes to the circulation network, including pedestrian and streetscape improvements, are designed to support and enhance the operation of transit.

Objective 4.13: Support enhanced funding and capacity for regional transit service to support increases in population and employment growth as well as shifts from auto to public transit travel.

Policy 4.5: Support funding and construction of the Transbay Transit Center project to further goals of the District Plan, including completion of the Downtown Extension for Caltrain and High Speed Rail.

Policy 4.6: Ensure that regional transit carriers operating on city streets are prioritized along with local transit by implementing the surface transit priority improvements proposed in this plan.

Policy 4.7: Work with BART to identify and fund measures to increase capacity as necessary to serve the District, particularly at the Montgomery and Embarcadero stations.

Objective 4.14: Support enhanced funding and capacity for local transit service to support increases in population and employment growth as well as shifts from auto to public transit travel.

Policy 4.8: Support revenue measures and investments essential to enhancing Muni's capacity, reliability and operational efficiency in providing service to and within the District.

Objective 4.15: Use demand management strategies to reduce overall levels of auto traffic in the plan area and downtown, particularly in the peak hours, in order to reduce auto impacts on other transportation modes and enable the creation of a high quality public realm.

Objective 4.17: Create and ensure compliance with mechanisms that provide workers and residents with incentives to take transit and use modes of transportation other than single-occupant autos.

Objective 4.18: Encourage the use of non-auto modes of transportation by requiring participation in a transportation demand management program in new buildings throughout the district.

Policy 4.15: Expand the TMA [Transportation Management Association] requirement to include non-office uses, including hotels, large retail, cultural, and institutional uses.

Policy 4.18: Expand the purview and funding of the existing downtown Transportation Management Association (TMA) or create a district-specific TMA.

Objective 4.29: Make cycling a safe, pleasant, and convenient means of transportation throughout the district.

Objective 4.30: Ensure high-quality on-street bicycle connections to the Transbay Transit Center.

Objective 4.31: Enhance facilities for intra-district bicycle travel.

Objective 4.32: Ensure local connections to regional bicycle facilities.

Objective 4.33: Ensure the provision of adequate secure, on- and off-street bicycle parking facilities to accommodate and encourage employees to cycle for commuting and daily needs.

Policy 4.44: Do not compromise pedestrian, bicycle, or transit amenity or service within the District to accommodate or maintain levels of service for regional auto trips.

Policy 4.50: Establish an absolute maximum cap on number of parking spaces in the district and adjacent areas based on the established targets for traffic reduction and goals for transit usage.[271]

Policy 4.51: Scrutinize and restrict new accessory and non-accessory parking in the Plan area until a comprehensive cap on new parking is adopted.

Policy 4.58: Make all non-residential parking, including accessory parking, subject to the City's Parking Tax, regardless of whether such parking is made available to the public for a fee.

Policy 4.60: Develop a local parking cash-out ordinance to apply to all parking accessory to commercial development.

Objective 4.47: Ensure that adequate space is provided for car sharing services throughout the district accessible to residents, employees, and visitors.

Objective 6.1: Increase energy efficiency, reduce carbon intensiveness of energy production, and enhance energy reliability in the district.

Policy 6.1: Create efficient, shared district energy, heating and cooling systems in the district.

Policy 6.2: Pursue a Combined Heat and Power (CHP) system or series of systems for the Transit Center District and the Transbay Redevelopment Area (Zone 1).[272]

Policy 6.3: Require all new buildings to be designed to plug into such a system in the future.

Policy 6.6: Require all major development to demonstrate that proposed heating and cooling systems have been designed in accordance with the following order of diminishing preference:

- Connection to sources of waste heat or underutilized boiler or CHP plant within the Transit Center District or adjacent areas
- Connection to existing district heating, cooling, and/or power plant or distribution networks with excess capacity
- Site-wide CHP powered by renewable energy

271 No numerical parking limit is proposed for adoption as part of the draft Plan, but could be evaluated and subject to CEQA review at such time as a specific proposal is developed and presented for review.

272 No physical improvements have been defined to implement a district-wide heat and power system in the Plan area, and any district-wide energy system proposed in the future would be subject to subsequent CEQA review at such time as a specific proposal is developed and presented for review.

- Site-wide CHP powered by natural gas
- Building level communal heating and cooling powered by renewable energy
- Building level communal heating and cooling powered by natural gas

Objective 6.4: All new buildings developed in the plan area will be of leading edge design in terms of sustainability, both high performance for their inhabitants and low impact for the environment.

Policy 6.9: Take maximum advantage of San Francisco's moderate year-round climate by integrating passive solar features into building design.

Policy 6.10: Reduce the need for mechanical air conditioning through the use of natural ventilation.

Policy 6.11: Use on-site renewable energy systems to reduce the use of fossil fuel generated energy.

Policy 6.12: Require all major buildings in the Plan Area to achieve the minimum LEED levels established in the SF Green Building Ordinance, not including credits for the given inherent factors of location, density, and existing City parking controls, in order to achieve high-performance buildings.

Policy 6.13: All major buildings in the Plan Area should exceed the minimum credits required by the SF Green Building Ordinance under the Energy and Water categories of the LEED schemes.

Objective 6.6: Reduce stormwater runoff from the district into the sewer system to improve bay water quality and reduce strain on treatment plants during wet weather events.

Objective 6.7: Take advantage of significant concentrated development and infrastructure reconstruction in the district and adjacent areas to create district-scale water efficiency and reuse measures.

Policy 6.14: Create a reliable supply of non-potable water that can be used throughout the plan area to reduce potable water demand.

Policy 6.15: Pursue a variety of potential sources of non-potable water, including municipally-supplied recycled water and district-based grey water, stormwater, and building de-watering.

Policy 6.16: Create infrastructure in the Transit Center District and immediately adjacent areas for non-potable water use, including treatment and distribution.[273]

Policy 6.17: Include distribution pipes and other necessary infrastructure for non-potable water when undertaking any major streetscape or other infrastructure work in the right-of-ways in the Transit Center District and immediately vicinity.

Policy 6.18: Identify and protect suitable sites within the Plan Area or immediate vicinity for locating a treatment facility for creating a local non-potable supply.

Policy 6.19: All new and large redevelopment projects in the city should adhere to the following hierarchical approach to maximize resources and minimize use of potable water:

- Reduce demands by installing efficient water fixtures and behaviors;
- Design sites to reduce the total amounts of stormwater generated on site; through the use of alternative surfaces and collection and treatment devices;
- Identify all on-site sources (rainwater, cooling tower blow down, fog, greywater, stormwater, and diverted sump water);
- Install appropriate on-site collection, treatment, storage and conveyance systems for non-potable needs;

273 No defined recycled water system is proposed for development as part of the draft Plan. Such a system would be evaluated and subject to CEQA review at such time as a specific proposal is developed and presented for review.

- Meet all other unmet non-potable demands using district non-potable water or municipal recycled water; and
- Meet all other unmet demands using potable water.

Policy 6.20: Ensure projects use Low Impact Design (L.I.D.) techniques in all streetscape, public space, and development projects to reduce the quantity of stormwater runoff and slow its flow into the sewer system, and to harvest this water for on-site uses.

The foregoing policies in the draft Plan would, if implemented, ensure that development projects in the Plan area would not generate greenhouse gas emissions, either directly or indirectly, that would have a significant impact on the environment, nor would these projects conflict with the City's GHG Reduction Strategy. Therefore, the draft Plan would be consistent with the GHG Reduction Strategy, and effects of Plan implementation related to GHG emissions would be less than significant.

Mitigation: None required.

Transit Tower

The proposed project would be required to comply with the local ordinances and regulations discussed above, including the Green Building Ordinance and Mandatory Recycling and Composting Ordinance and employer provision of transit benefits to employees, as well as the *Planning Code* limitation on the amount of on-site parking and *Planning Code* requirements for the provision of bicycle parking and showers and lockers; transportation management and transportation brokerage services; and planting of street trees; as well as transit development impact fees under Article 38 of the *Administrative Code*. In addition, as noted in the Project Description, the Transit Tower is proposed for LEED Gold (Version 2.2) certification, which would reduce energy consumption and water use (and thereby reduce emissions from electricity production and consumption of natural gas for heating) to levels below what would otherwise be used with traditional construction.

Impact GG-2: The proposed Transit Tower would not generate greenhouse gas emissions, either directly or indirectly, that would have a significant impact on the environment, nor would the project conflict with any applicable plan, policy, or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases. (Less than Significant)

In its *CEQA Air Quality Guidelines*, the BAAQMD recommends that the determination of the significance of a project's contribution to climate change be evaluated by comparing the project to the applicable jurisdiction's Climate Action Plan or equivalent policy framework; where the project is found consistent, the project would have a less-than-significant impact. In the absence of such a conclusion, the BAAQMD recommends a quantitative threshold of 1,100 metric tons per year or a "service population" (residents plus employees) threshold of 4.6 metric tons per year per person.[274]

274 BAAQMD, CEQA Guidelines, May 2011 (see footnote 205, p. 370).

This evaluation relies on the proposed BAAQMD approach to determining significance, and also follows the State CEQA Guidelines, as revised in 2010, which provide general direction with regard to analysis of GHG emissions. These revisions include a new section (Sec. 15064.4) specifically addressing the significance of GHG emissions. Section 15064.4 calls for a "good-faith effort" to "describe, calculate or estimate" GHG emissions; Section 15064.4 further states that the significance of GHG impacts should include consideration of the extent to which the project would increase or reduce greenhouse gas emissions; exceed a locally applicable threshold of significance; and comply with "regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions." The revisions also state that a project may be found to have a less-than-significant impact if it complies with an adopted plan that includes specific measures to sufficiently reduce GHG emissions (Sec. 15064(h)(3)).

The following analysis evaluates the proposed Transit Tower for consistency with the City's GHG Reduction Strategy and also presents a quantification of estimated project GHG emissions.

As noted above under Regulatory Setting, p. 435, the Planning Department has developed a Greenhouse Gas Analysis Compliance Checklist for use in evaluating a project's consistency with the City's GHG Reduction Strategy, which the BAAQMD has determined is a "Qualified GHG Reduction Strategy" for purposes of assessing the significance of GHG emissions in the context of the BAAQMD's *CEQA Air Quality Guidelines*.

Table 38 presents City regulations and programs that are referenced in the GHG Reduction Strategy and that are applicable to the proposed Transit Tower project. Because the proposed Transit Tower would be consistent with these requirements and programs, the project would be consistent with the City's GHG Reduction Strategy, and thus GHG emissions from the proposed project would be less than significant.

Moreover, as infill development, the proposed project would be constructed in an urban area with good transit access, reducing regional vehicle trips and vehicle miles traveled, and therefore the project's transportation-related GHG emissions would tend to be less relative to the same amount of population and employment growth elsewhere in the Bay Area, where transit service is generally less available than in the central city of San Francisco.[275] Additionally, through the process of LEED® Certification under the Gold category and the project's "green" building components and compliance with the City's regulations discussed above, GHG emissions produced by the proposed project would be reduced compared to what would otherwise be the case for conventional construction. Moreover, the project would generate 3.7 metric tons of CO_2E/year per service population (employee). Given that San Francisco has implemented binding and enforceable programs to reduce GHG emissions applicable to the proposed project and that San Francisco's sustainable policies have resulted in the measured success of reduced GHG emissions levels, the proposed project's GHG emissions would result in a less than significant impact.

[275] The California Air Pollution Control Officers' CEQA and Climate Change (January 2008) white paper identifies infill development as yielding a "high" emissions reduction score (between 3-30%). This paper is available online at: http://www.capcoa.org/ceqa/CAPCOA%20White%20Paper%20-%20CEQA%20and%20Climate%20Change.pdf. Accessed April 15, 2008.

TABLE 38
CITY GHG REGULATIONS APPLICABLE TO THE PROPOSED TRANSIT TOWER PROJECT

Regulation or Program	Requirement	Project Consistency
Commuter Benefits Ordinance (*Environment Code*, Section 421)	Employers in the proposed new building with more than 20 employees in San Francisco would be required to provide at least one of the following programs: 1. A Pre-Tax Election consistent with 26 U.S.C. § 132(f), allowing employees to elect to exclude from taxable wages and compensation, employee commuting costs incurred for transit passes or vanpool charges, or (2) Employer Paid Benefit whereby the employer supplies a transit pass for the public transit system requested by each Covered Employee or reimbursement for equivalent vanpool charges at least equal in value to the purchase price of the appropriate benefit, or (3) Employer Provided Transit furnished by the employer at no cost to the employee in a vanpool or bus, or similar multi-passenger vehicle operated by or for the employer.	Applies to individual employers, not a project (building) as a whole. All employers in the Transit Tower with more than 20 employees would be required by law to participate. Therefore, the project would be consistent with this requirement.
Emergency Ride Home Program	Administered by the San Francisco Department of the Environment, this program allows participating employers to be reimbursed by the Department for the cost to reimburse employees who travel to work by transit, carpool, bicycle, or other method other than single-occupancy auto and who are unable to return home by their normal travel means due to unexpected circumstances.	Applies to individual employers, not a project (building) as a whole. Employers located in the Transit Tower could participate voluntarily. Therefore, the project would be consistent with this program.
Transportation Management Programs (*Planning Code*, Section 163)	Requires new buildings or additions of greater than 100,000 square feet in the C-3 Use District, including the proposed project, to implement a Transportation Management Program and provide on-site transportation management brokerage services for the life of the building. The program must be designed to promote transit and ridesharing, reduce parking demand, and allow for flexible work schedules.	The Transit Tower would be required by law to implement a Transportation Management Program. Therefore, the project would be consistent with this requirement. [COA-CO]
Transit Impact Development Fee (*Administrative Code*, Chapter 38)	Establishes a fee of $5.00 per square foot for downtown office space and $10.00 per square foot for retail space, paid to the Municipal Transportation Agency to improve local transit services.	The Transit Tower would be required by law to pay this fee. Therefore, the project would be consistent with this requirement.
Jobs-Housing Linkage Program (*Planning Code* Section 413)	The Jobs-Housing Linkage Program is designed to provide housing for those new uses within San Francisco, thereby allowing employees to live close to their place of employment. The program requires a developer to pay a fee or contribute land suitable for housing to a housing developer or pay an in-lieu fee.	The Transit Tower would be required by law to comply with this section of the *Planning Code*. Therefore, the project would be consistent with this requirement. [COA-BP]
Bicycle Parking (*Planning Code*, Section 155.4)	For office uses of 10,000 – 20,000 square feet, 3 bicycle spaces are required; for 20,000– 50,000 square feet, 6 bicycle spaces are required. For floor area in excess of 50,000 square feet, 12 bicycle spaces are required. For retail uses of 25,000– 50,000 feet, 3 bicycle spaces are required. For 50,000 – 100,000 feet, 6 bicycle spaces are required. For floor area in excess 100,000 square feet, 12 bicycle spaces are required. The draft Transit Center District Plan would increase required bicycle parking for office buildings larger than 50,000 square feet to one space for every 6,000 square feet.	The Transit Tower would provide approximately 225 bicycle spaces, which would exceed the requirement of Planning Code Section 155.4(d), and would meet the proposed requirement of the draft Transit Center District Plan. [COA-CO]
Bicycle parking in parking garages (*Planning Code*, Section 155.2)	Every garage must provide at least 6 bicycle spaces. Garages with 120 – 500 automobile spaces must provide 1 bicycle space for every 20 auto spaces. Garages with more than 500 auto spaces must provide 25 bicycle spaces plus 1 space for every 40 auto spaces in excess of 500, up to a maximum of 50 bicycle spaces.	No parking garages are proposed within the Plan area, with the possible exception of some portion of the Transit Tower parking garage, which may be classified as a Major Parking Garage. Any parking garages proposed must comply with this requirement. (Parking proposed in new buildings would typically be accessory parking.)

TABLE 38 (continued)
CITY GHG REGULATIONS APPLICABLE TO THE PROPOSED TRANSIT TOWER PROJECT

Regulation or Program	Requirement	Project Consistency
Bicycle parking in Residential Buildings (*Planning Code*, Section 155.5)	For projects up to 50 dwelling units, one Class 1 space for every 2 dwelling units. For projects over 50 dwelling units, 25 Class 1 spaces plus one Class 1 space for every 4 dwelling units over 50.	Not applicable to the proposed Transit Tower, which would contain no residential units.
Car Sharing Requirements (*Planning Code*, Section 166)	New residential projects or renovation of buildings being converted to residential uses and new non-residential buildings are required to provide car share parking spaces if parking is provided.	The proposed Transit Tower would be required to provide a minimum of 6 car-share spaces for its 300 parking spaces, to comply with this section of the *Code*.
San Francisco Green Building Requirements for Energy Efficiency (*Building Code*, Chapter 13C)	Projects such as the proposed Transit Tower that are registered under LEED v2.2 must use the published LEED v2.2 rules to demonstrate the proposed building has an annual energy cost at least 14.0% less than a LEED baseline building.	The Transit Tower would be required by law to comply with the *Building Code*. Therefore, the project would be consistent with this requirement. As a LEED Gold building, the proposed Transit Tower would comply with this requirement.
San Francisco Green Building Requirements for Stormwater Management (*Building Code*, Chapter 13C)	All projects in San Francisco are required to comply with the SFPUC's stormwater design guidelines, which emphasize low impact development using a variety of Best Management Practices for managing stormwater runoff and reducing impervious surfaces, thereby reducing the volume of combined stormwater and sanitary sewage requiring treatment. The proposed project would comply with this requirement.	The Transit Tower would be required by law to comply with the *Building Code*. Therefore, the project would be consistent with this requirement. As a LEED Gold building, the proposed Transit Tower would comply with this requirement.
San Francisco Green Building Requirements for water reduction (*Building Code*, Chapter 13C)	New large commercial buildings (over 25,000 square feet), such as the proposed project, are required to reduce the amount of potable water used for landscaping by 50% and reduce the amount of potable water used for the building by 20% (increasing to 30% in 2011), compared to conventional construction (baseline fixture performance requirements of the federal Energy Policy Act of 1992).	The Transit Tower would be required by law to comply with the *Building Code*. Therefore, the project would be consistent with this requirement. As a LEED Gold building, the proposed Transit Tower would comply with these requirements.
San Francisco Green Building Requirements for renewable energy (*Building Code*, Chapter 13C)	These provisions require that a LEED version 2.2 certified building be documented to use 14% less energy than a convention building.	The Transit Tower would be required by law to comply with the *Building Code*. Therefore, the project would be consistent with this requirement. As a LEED Gold building, the proposed Transit Tower would comply with this requirement.
Commercial and Residential Water Conservation Ordinances (*Building Code*, Chapters 13A and Housing Code, Chapter 12A)	Requires projects to meet minimum standards for water conservation, including use of low-flow (2.5 gallons per minute [gpm]) showerheads, use of no more than one showerhead per valve, use of low-flow (2.2 gpm) faucets, use of low-flow toilets (1.6 gal./flush) and urinals (1 gal./flush), and repair of all water leaks.	The Transit Tower would be required by law to comply with the *Building Code*. Therefore, the project would be consistent with this requirement. As a LEED Gold building, the proposed Transit Tower would comply with these requirements.
San Francisco Green Building Requirements for solid waste (*Building Code*, Chapter 13C)	Pursuant to Section 1304C.0.4 of the Green Building Ordinance, all new construction, renovation and alterations subject to the ordinance are required to provide recycling, composting and trash storage, collection, and loading that is convenient for all users of the building.	The Transit Tower would be required by law to comply with the *Building Code*. Therefore, the project would be consistent with this requirement. As a LEED Gold building, the proposed Transit Tower would comply with this requirement.
Mandatory Recycling and Composting Ordinance (*Environment Code*, Chapter 19)	All persons in San Francisco must separate their refuse into recyclables, compostables, and trash, and place each type of refuse in a separate container designated for that type of refuse.	The Transit Tower would be required by law to comply with the *Environment Code*. Therefore, the project would be consistent with this requirement.

TABLE 38 (continued)
CITY GHG REGULATIONS APPLICABLE TO THE PROPOSED TRANSIT TOWER PROJECT

Regulation or Program	Requirement	Project Consistency
San Francisco Green Building Requirements for construction and demolition debris recycling (*Building Code*, Chapter 13C)	Large buildings (over 25,000 square feet), such as the proposed project, must divert at least 75% of construction debris from landfills.	The Transit Tower would be required by law to comply with the *Building Code*. Therefore, the project would be consistent with this requirement.
Construction Demolition and Debris Recovery Ordinance (*Environment Code*, Chapter 14)	This ordinance requires that at least 65 percent of all construction and demolition material to be diverted from landfills.	The Transit Tower would be required by law to comply with the *Environment Code*. As noted above, the proposed Transit Tower would be subject to the more stringent Green Building requirements of the *Building Code*, and so would also comply with this requirement.
Street Tree Planting Requirements for New Construction (*Planning Code* Section 138.1(c)(1))	New construction, significant alterations or relocation of buildings within many of San Francisco's zoning districts requires planting one 24-inch box tree for every 20 feet along the property street frontage.	The Transit Tower would be required by law to comply with the *Planning Code*. The proposed project would include planting of new street trees on the First and Mission Street project frontages, consistent with *Planning Code* requirements, and would also include street trees on the Fremont Street frontage of the proposed Mission Square open space. Therefore, the project would be consistent with this requirement.
Regulation of Diesel Backup Generators (*Health Code*, Article 30)	Requires (among other things) that all diesel generators to be registered with the Department of Public Health and be equipped with the best available air emissions control technology.	The Transit Tower would be required by law to comply with the *Health Code*. Therefore, the project would be consistent with this requirement.

NOTES:
COA-BP – This requirement would be made a Condition of Approval by the Planning Commission if the project is approved, and the condition would have to be met prior to issuance of a Building or Site Permit, or Final Addendum thereto.
COA-CO – This requirement would be made a Condition of Approval by the Planning Commission if the project is approved, and the condition would have to be met prior to issuance of a Certificate of Occupancy.

As noted above, this analysis also quantifies estimated GHG emissions. The calculation presented below includes CO_2E GHG emissions from the construction period, as well as annual CO_2E GHG emissions from increased vehicular traffic and energy consumption, including both natural gas and electricity, from electricity used to transport water and treat wastewater, and from solid waste generation.

The proposed project would increase the activity onsite by developing a new 61-story building containing approximately 1.35 million square feet of office space and about 16,500 square feet of retail space. Therefore, the proposed project would contribute to annual long-term increases in GHGs as a result of traffic increases (mobile sources) and commercial operations associated with heating, energy use, water usage and wastewater treatment, and solid waste disposal (area sources). Construction of the proposed project would emit approximately 3,634 metric tons (4,005 U.S. tons) of CO_2E.[276] Annualized over a 40-

[276] Construction emissions and annual emissions are not intended to be additive as they occur at different points in the project's lifecycle. Construction emissions are one-time emissions that occur prior to building occupancy. Annual emissions are incurred only after construction of the proposed project and are expected to occur annually for the life of the project.

year lifespan of the proposed building (a conservative assumption, as many buildings last far longer), construction emissions would total approximately 91 metric tons per year.

Direct project CO_2E emissions (including CO_2, methane, and nitrous oxide emissions) would include approximately 4,522 metric tons (4,983 U.S. tons) of CO_2E/year from transportation and about 1,339 metric tons (1,476 U.S. tons) of CO_2E/year from heating, for a total of about 5,861 metric tons (6,459 U.S. tons) of CO_2E/year of project-emitted GHGs. The project would also indirectly result in GHG emissions from off-site electricity generation at power plants (approximately 6,140 metric tons, or 6,776 U.S. tons, of CO_2E/year, including electricity associated with water transport and treatment) and about 4,713 metric tons (5,194 U.S. tons) of CO_2E from anaerobic decomposition at landfills, for a GHG operational emissions total of approximately 16,714 metric tons (about 18,419 U.S. tons of CO_2E/year. Annual emissions would represent two-tenths of one percent (0.02 percent) of total Bay Area GHGs emitted in 2007.[277] GHG emissions are shown in **Table 39**.

TABLE 39
TRANSIT TOWER TOTAL CO_2-EQUIVALENT EMISSIONS (METRIC TONS/YEAR)[1]

Transportation	4,522
Heating	1,339
Water and Wastewater	58
Electricity Generation	6,082
Solid Waste[2]	4,713
Total Operation Emissions (CO_2E) (annual)	**16,714**
Annual Operational Emissions per Service Population[3]	**3.4**
Total Construction Emissions (CO_2E) (one-time)	**3,634**
Annualized Construction Emissions[4]	**90.9**

[1] Emissions are unmitigated.
[2] Solid waste emissions conservatively assume 50 percent diversion from landfill.
[3] Service population emissions based on total project employment of approximately 4,938.
[4] Based on assumed 40-year lifetime of proposed building.

SOURCE: Environmental Science Associates, 2011

As noted in Table 39, project emissions of GHGs would exceed the 1,100 metric tons per year threshold, but would fall below 4.6 metric tons per year per service population. Therefore, the proposed project would not exceed the BAAQMD's proposed significance threshold. This is indicative of the fact that development in San Francisco, with its extensive transit network, limited parking, mix of uses, and proximity of services is, in general, inherently more likely to generate a reduced volume of GHG emissions than development of a comparable project elsewhere in the Bay Area, where the foregoing factors are less prevalent or lacking.

To the extent feasible, the emissions presented above incorporate assumptions regarding emission reductions due to compliance with the City's regulations that would reduce project GHG emissions.

277 The Bay Area Air Quality Management District reported regional Bay Area GHGs emissions in 2007 at approximately 95.8 MMT (105.3 million U.S. tons) CO2E.

Specifically, the proposed project would include the features described in Table 38, which would result in a reduction in GHG emissions.

As noted above in the discussion of the Regulatory Setting, the AB 32 Scoping Plan states that successful implementation of the plan relies on local governments' land use planning and urban growth decisions because local governments have primary authority to plan, zone, approve, and permit land development to accommodate population growth and the changing needs of their jurisdictions. The Air Resources Board acknowledges that decisions on how land is used will have large effects on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. While some of the GHG reduction measures contained in the Scoping Plan, such as increasing energy efficiency in new construction, installation of solar panels on individual building roofs, and a "green building" strategy, are at least partially applicable to development projects, many measures in the Scoping Plan (increased fuel efficiency, increased efficiency by utilities, increased use of renewable energy) require statewide action by government, industry, or both, that is outside the purview of the City and individual developers.

As described above, the City has developed its own strategy to address greenhouse gas emissions on a local level. The vision of the strategy is expressed in the City's Climate Action Plan, however implementation of the strategy is appropriately articulated within other citywide plans (*General Plan,*

Sustainability Plan, etc.), policies (Transit-First Policy, Precautionary Principle Policy), and regulations (Green Building Ordinance, *Building Code*, *Planning Code*), and other provisions as well.

The proposed project would be required to comply with all San Francisco ordinances and regulations that are aimed at reducing GHG emissions (see Table 38). The project would also be required to comply with other GHG reduction regulations, such as applicable AB 32 Scoping Plan measures that are ultimately adopted and become effective during implementation of proposed project. Given that the City has adopted an extensive array of GHG reduction strategies recommended in the AB 32 Scoping Plan, that the City's GHG reduction strategy includes binding, enforceable measures to be applied to development projects, such as the proposed project, and that the City's GHG reduction strategy has produced measurable reductions in GHG emissions, the proposed project would not conflict with either the state or local GHG reduction strategies. In addition, the proposed project would not conflict with any plans, policies, or regulations adopted for the purpose of reducing GHG emissions. Therefore, the proposed project would have a less than significant impact with respect to plans for reduction of GHG emissions.

Mitigation: None required.

I. Wind

This section describes potential wind effects of the proposed project, based upon wind-tunnel testing and computational analysis of the potential changes in building massing in the Plan area.[278]

Setting

Tall buildings and structures can strongly affect the wind environment for pedestrians. Groups of structures tend to slow the winds near ground level, due to the friction and drag of the structures themselves on winds. Buildings that are much taller than their surrounding buildings intercept and redirect winds that might otherwise flow overhead, and bring them down the vertical face of the building to ground level, where they create ground-level wind and turbulence. These redirected winds can be relatively strong and also relatively turbulent, and can be incompatible with the intended uses of nearby ground-level spaces. In addition, building designs that present tall flat surfaces square to strong winds can create ground-level winds that can prove to be hazardous to pedestrians in the vicinity.

The comfort of pedestrians varies under different conditions of sun exposure, temperature, clothing, and wind speed. Winds up to 4 miles per hour (mph) have no noticeable effect on pedestrian comfort. With velocity from 4 to 8 mph, wind is felt on the face. Winds from 8 to 13 mph will disturb hair, cause clothing to flap, and extend a light flag mounted on a pole, while winds from 13 to 19 mph will raise loose paper, dust and dry soil, and will disarrange hair. For wind velocities from 19 to 26 mph, the force of the wind will be felt on the body. At 26 to 34 mph, umbrellas are used with difficulty; hair is blown straight; there is difficulty in walking steadily; and wind noise is unpleasant. Winds over 34 mph increase difficulty with balance and gusts can blow people over.

Regulatory Framework

In order to provide a comfortable wind environment for people in San Francisco, the City has established comfort criteria to be used in the evaluation of proposed buildings. Section 148 of the *Planning Code* specifically outlines these criteria for the Downtown Commercial (C-3) Districts, including the project site.[279] The comfort criteria are based on pedestrian-level wind speeds that include the effects of turbulence; these are referred to as "equivalent wind speeds" (defined in the *Planning Code* as "an hourly mean wind speed adjusted to incorporate the effects of gustiness or turbulence on pedestrians").

Planning Code Section 148 establishes equivalent wind speeds of 7 mph as the comfort criterion for seating areas and 11 mph as the comfort criterion for areas of substantial pedestrian use, and states that new buildings and additions to buildings may not cause ground-level winds to exceed these levels more

278 Rowan Williams Davies & Irwin, Inc., *Pedestrian Wind Study: Transit Tower,* June 24, 2011. This report is presented in Appendix E.

279 Additional *Planning Code* sections apply the same criteria to the Rincon Hill, Van Ness Avenue, and South of Market areas.

than 10 percent of the time year round between 7:00 a.m. and 6:00 p.m.[280] If existing wind speeds exceed the comfort level, or when a project would result in exceedances of the comfort criteria, an exception may be granted, pursuant to Section 309, if the building or addition cannot be designed to meet the criteria "without creating an unattractive and ungainly building form and without unduly restricting the development potential" of the site, and it is concluded that the exceedance(s) of the criteria would be insubstantial "because of the limited amount by which the comfort level is exceeded, the limited location in which the comfort level is exceeded, or the limited time during which the comfort level is exceeded." Section 148 also establishes a hazard criterion, which is a 26 mph equivalent wind speed for a single full hour, or approximately 0.0114% of the time. Under Section 148, new buildings and additions may not cause wind speeds that meet or exceed this hazard criterion.[281] Under Section 148, no exception may be granted for buildings that result in winds that exceed the hazard criterion.[282]

Section 148 applies to approval of individual development projects, but not to areawide plans such as the draft Plan. Because wind conditions in the Plan area will be affected by the combination of building forms resulting from existing and future buildings, a planning-level study, using computational fluid dynamics, supplemented by knowledge gleaned from wind-tunnel analysis of certain projects in the Plan area (including the proposed Transit Tower), is considered an appropriate methodology for evaluation of areawide wind impacts.

Project-specific wind-tunnel test results are provided for the Transit Tower, which this EIR evaluates at a project level of detail. This wind-tunnel test included a cumulative scenario that is used to evaluate effects of the draft Plan in the portion of the Plan area within about one block of the Transit Tower site, consistent with accepted wind-tunnel testing methodology.

It is also noted that individual building projects that are subsequently considered for approval will be required to comply with Section 148, and that subsequent high-rise buildings will undergo project-specific wind-tunnel testing.

280 The *Planning Code* specifies the hours of 7:00 a.m. to 6:00 p.m. In contrast, the available weather data, as aggregated, cover the hours of 6:00 a.m. to 8:00 p.m. Thus, observations from two additional evening hours and one additional morning hour are included in the wind speed distribution data.

281 Because the hazard criterion is stated in terms of 1 hour of exceedance, it is most appropriate to report exceedances of this criterion in terms of the number of hours per year that the excess occurs, rather than the accompanying wind speeds. Thus, for each wind analysis, the number of locations and the total sum of the durations of exceedances of the hazard criterion are important measures of effect. This differs from reporting of both comfort criteria, for which wind speeds exceeded 10% of the time are examined and presented, but statistics other than the number of locations are not detailed.

282 The comfort criteria are based on wind speeds that are measured for one minute and averaged. In contrast, the hazard criterion is based on winds that are measured for one hour and averaged; when stated on the same basis as the comfort criteria winds, the hazard criterion speed is a one-minute average of 36 mph, to distinguish between the wind comfort conditions and hazardous winds. Therefore, the hazard criterion is reported here as 36 mph, because the results are therefore consistent across test scenarios.

Existing Wind Conditions

For purposes this analysis, the new Transit Center, which is currently under construction, is considered part of the "existing setting" in order that the wind analysis most accurately represent the changes that would occur as a result of implementation of the proposed Plan and the Transit Tower.

Transit Center District Plan Area

In general, based on the wind-tunnel testing for the Transit Tower and previous tests for other projects in the vicinity, the northern portion of the Plan area is windier than the southern portion: areas along Market Street and on the blocks of streets perpendicular to and just south of Market Street have higher winds than areas south of the new Transit Center site. This is a common phenomenon along Market Street, where the street grids north and south of Market Street join together. The offsetting street grids result in downwind buildings south of Market Street facing directly into northerly and westerly winds that are channeled along north-of-Market streets; when these winds reach the facades of tall south-of-Market buildings, the winds tend to accelerate as they move down the building walls, resulting in relatively higher winds at pedestrian level in this part of the Plan area. Moreover, winds tend to be accelerated along Market Street by the tall towers that line both sides of the street. Winds are somewhat less strong in the center portion of the block of Market Street between First and Second Streets, where closely spaced buildings block some of the oncoming wind flow. This blockage, however, results in relatively high turbulence between the buildings within this area, and relatively stronger winds around the perimeter.

In contrast to the northern part of the Plan area, the southern part of the Plan area has relatively fewer tall buildings to intercept the winds and bring them down to ground level. Accordingly, pedestrian wind speeds are lower south of the new Transit Center site. Some areas of the western edge of the Plan area also experience relatively stronger winds because southwesterly winds, in particular, are first intercepted by tall buildings just west of the Plan area, along Third Street (buildings southwest of Third Street are considerably shorter, for the most part), resulting in turbulence and sometimes strong winds, particularly around the base of the most western tall buildings, such as the two residential/hotel towers at Third and Mission Streets, the W Hotel at Third and Howard Street, and the former Pacific Telephone Building on New Montgomery Street.

Additional information about existing wind conditions is provided in the following discussion of the area around the Transit Tower project site.

Transit Tower Project Site

Wind-tunnel testing was conducted for the proposed Transit Tower. Under the existing setting, the vicinity of the Transit Tower project site is moderately windy; the average wind speed for the 172 points tested for existing conditions is 9.3 mph.[283] Wind speeds in pedestrian areas range from 5 to 24 mph, and

283 "Wind speed" refers to equivalent wind speed (including the effects of turbulence) that is exceeded 10 percent of the time.

in seating areas, from 6 to 20 mph.[284] Wind speeds in excess of the 11-mph pedestrian comfort criterion currently occur at 18 of the 102 locations tested (17 percent of sidewalk locations tested) and exceedances of the 7-mph seating comfort criterion currently occur at 90 percent (62 of 69) of the seating locations tested (winds at five of these locations also exceed the 11-mph pedestrian criterion), for a total of 80 exceedances of the Section 148 wind speed criteria (47 percent of all points tested under existing conditions). Of 50 test points in the City Park, wind speeds exceed the 7-mph seating criterion at 45, or 90 percent of the test points. The highest wind speed in the vicinity (24 mph) occurs on the south sidewalk of Mission Street east of Second Street, between the existing high-rise buildings at 101 Second Street and 555 Mission Street, and across the street from 560 Mission Street [test point #149]. Test points are shown on Figure 58, p. 455, in the impacts section.

The Code's wind hazard criterion of 26 mph (reported as 36 mph in the test results)[285] is exceeded at a single test location under existing conditions—the location on Mission Street east of Second Street.

Impacts

Significance Criteria

Wind impacts of the draft Plan would be considered significant if development pursuant to the Plan would cause large increases in pedestrian wind speeds or wind speeds in publicly accessible open spaces over a substantial portion of the Plan area.

The Transit Tower project would have a significant wind impact if it would cause the 26-miles-per-hour wind hazard criterion to be exceeded for more than one hour per year. A project that would cause exceedances of the comfort criteria, but not the wind hazard criterion, would not be considered to have a significant impact.

Methodology

As noted in the Setting, two separate analyses were conducted to evaluate wind conditions in the Plan area and potential wind effects of implementation of the draft Plan and development of the proposed Transit Tower. For the Transit Tower, the analysis used the same approach as is used in analyses routinely conducted for tall structures in San Francisco. This methodology involves testing of the proposed project in a wind tunnel. To undertake the test, a scale model of the proposed building is created, in this instance at a scale of 1 inch equals approximately 33 feet. (The resulting Transit Tower model is therefore approximately 32 inches tall.) A scale model is also created for each surrounding building and, where applicable, topography, for a circular area within a radius of approximately

284 For purposes of this analysis, all privately owned, publicly accessible open spaces are considered seating areas, even if they are effectively passageways between buildings, with no provision for formal seating. Pedestrian areas include all sidewalks. Thus, the analysis is conservative. Because the existing condition includes the new Transit Center, there are 50 test points in the City Park open space atop the Transit Center, covering the entire park except the western edge, which was deemed too close to the edge of the test model to attain accurate results.

285 See footnote 282, p. 448.

1,500 feet of the project site. The model is fitted with sensors that measure wind speeds and placed inside a device known as a wind tunnel, where fan-generated air flow is used to simulate actual winds. As noted above, the sensors are placed at distances representing locations no further than about one block (about 800 feet) from the center of the model. This is because locations closer to the edges of the model, and particularly locations near the upwind edges, can report wind speeds with less accuracy, since they are not adequately "protected" by upwind building masses that exist beyond the edge of the model. Because actual winds blow from variable directions and the wind tunnel can test only one direction at a time, a series of tests is run to simulate winds blowing from different directions, and the sensor readings are then run through a computer program to generate the ultimate results.

To satisfy the criteria of *San Francisco Planning Code* Section 148, two sets of results are produced: one that indicates, for each test location, the wind speed that is exceeded 10 percent of the time, year-round, and the second, that indicates whether a wind speed of 26 miles per hour is exceeded for one full hour of the year. The former results determine whether the project would meet the *Planning Code's* "comfort criteria," while the latter results determine whether the project would cause an exceedance of the *Code's* "hazard criterion." As stated above, a significant impact would occur if the hazard criterion is exceeded.

The wind-tunnel test built upon testing that was conducted of the new Transit Center in 2010 for the Transbay Joint Powers Authority, which is building the new terminal. As noted above in the Setting, the new Transit Center is considered part of the "existing setting" in the wind analysis in this EIR. This is consistent with the approach to wind-tunnel testing in San Francisco, which includes buildings that are under construction as part of the existing condition, because those buildings can normally be assumed to have been completed by the time that a project under analysis will be built. Therefore, and in order that the wind analysis most accurately represent the effect of the Transit Tower and other growth pursuant to the draft Plan, the Transit Center is included in the existing conditions scenario.

Under the existing conditions scenario, 171 individual locations were tested on sidewalks and in publicly accessible, primarily privately owned, open spaces in the vicinity of the Transit Tower site, including 50 locations in the City Park that will be developed atop the Transit Center. For the project (Transit Tower) and cumulative (Transit Center District Plan) scenarios, an additional 35 test locations were included. Ten of these locations were around the base of the Transit Tower and, when added to the 14 points also tested in the existing condition, allow for a detailed characterization of anticipated winds around the base of the tower. Most of the other added test points are at locations north of Mission Street that are generally upwind or "crosswind" of the Transit Tower site but within the Plan area. Additionally, a few additional points were added in publicly accessible open spaces to evaluate winds in those locations.

For the Plan area as a whole, the wind-tunnel analysis also provided information with respect to wind conditions in the central portion of the area, in the vicinity of the Transit Tower site, relying on the cumulative scenario from the wind-tunnel test. This cumulative scenario includes generalized massing models of all buildings currently proposed within the Plan area; generalized massing models on other Plan area sites assumed to be developed; and massing models of projects near the Plan area that are

either proposed or anticipated to be developed (i.e., are considered "reasonably foreseeable"). The wind-tunnel analysis was supplemented, for the outlying portions of the Plan area, by a planning-level, computational (i.e., computer-based, as opposed to measurement-based) wind study. This analysis results in qualitative, rather than quantitative, results (i.e., winds are described in relative terms, with areas characterized as having "low," "moderate," or "high" winds, but without actual wind speeds calculated). This analysis considers factors including regional meteorological data, previous wind tunnel studies undertaken in the vicinity, and the analysts' engineering judgment and knowledge of wind flows around buildings, and makes use of specialized computer software developed for estimating the potential wind conditions around generalized building forms and a Computational Fluid Dynamics software for visualizing wind flow patterns.[286] For this analysis, generalized building massing models were studied.

It is noted that the results of this planning-level study do not, and are not intended to, satisfy the criteria of *Planning Code* Section 148. Pedestrian-level wind speeds are dependent on specific building designs and surrounding conditions at the time of development, so the programmatic analysis does not lend itself to wind speed computation. This EIR is not intended to analyze the impacts of specific development proposals (other than the Transit Tower), including building form, but rather to assess the effects of adoption and implementation of the draft Plan. Each individual building proposed for development in the Plan area that is tall enough to result in potential adverse wind impacts will be required to undergo project-specific (and design-specific) wind-tunnel testing, just as was undertaken for the proposed Transit Tower. Nevertheless, it is anticipated that cumulative conditions in the vicinity of a particular project will be able to be derived from this analysis.

Because the wind-tunnel test is the basis for this analysis, in this section, unlike the remainder of this EIR, the project-specific analysis of the proposed Transit Tower is presented first.

Wind-Tunnel Analysis

Transit Tower Project Analysis

Impact WI-1: The proposed Transit Tower would not result in a new exceedance of the wind hazard criterion. (Less than Significant)

Wind tunnel testing was performed for the proposed project, the results of which are summarized in the following discussion.[287] **Table 40** presents a summary of the test results. **Figure 58**, p. 455, depicts the wind test point locations. The complete report describing the wind-tunnel test results is included in Appendix E.

286 Rowan Williams Davies & Irwin, Inc., *Transit Center District Plan Final Report: Pedestrian Wind Assessment,* April 29, 2011. This report is available for review at the Planning Department, 1650 Mission Street, Suite 400, in Case File No. 2007.0558E.

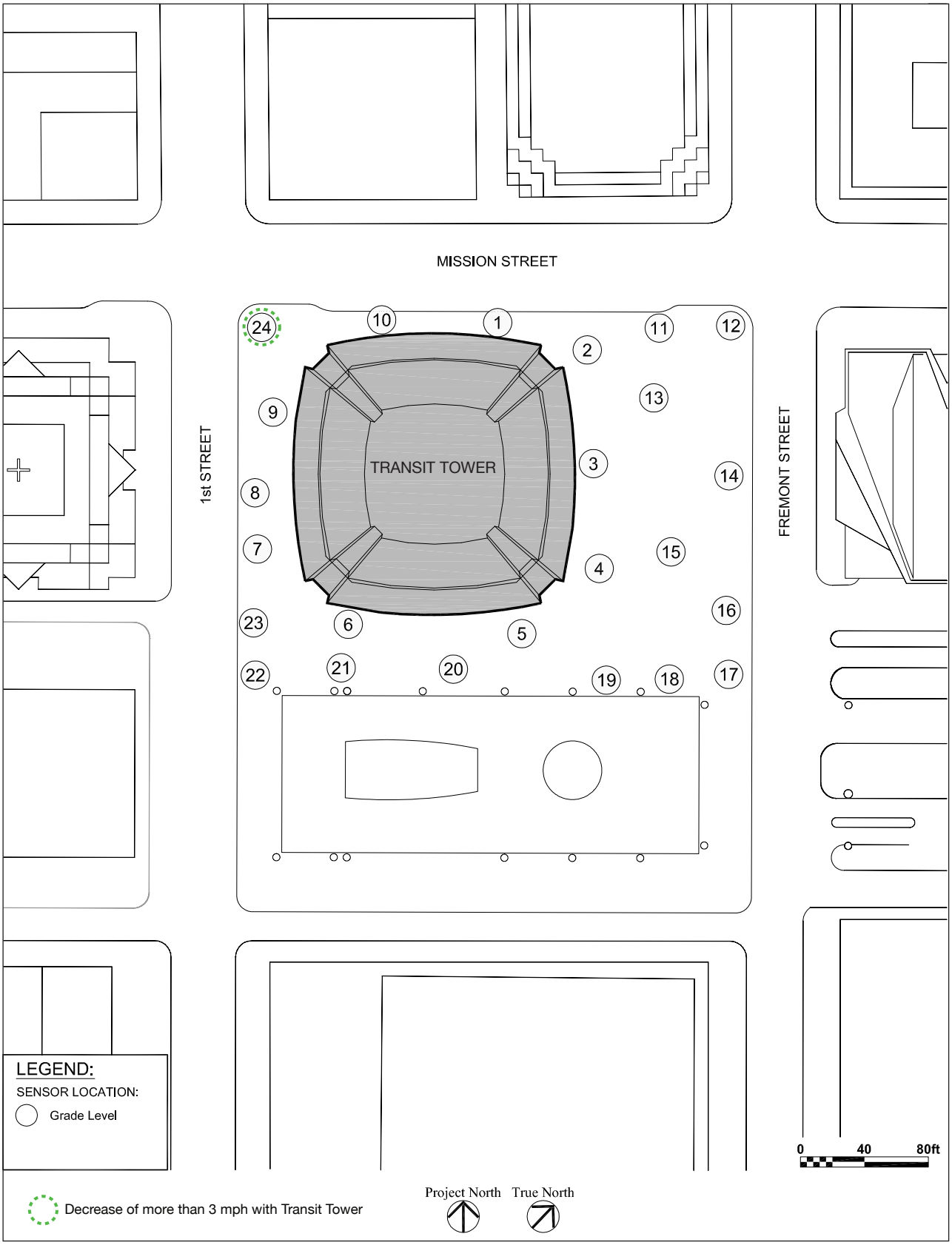
287 Rowan Williams Davies & Irwin, Inc., *Pedestrian Wind Study: Transit Tower,* June 24, 2011. This report is presented in Appendix E.

TABLE 40
SUMMARY OF WIND-TUNNEL TEST RESULTS

	Existing		Existing plus Transit Tower							Existing plus Transit Tower plus Cumulative (Draft Plan)										
					Change from Existing[3]							Change from Existing[3]					Change from Tower Only[3]				
	Speed[1]	Exceed-ances[2]	Speed[1]	Exceed-ances[2]	Speed[1]	+	-	0	>3	Speed[1]	Exceed-ances[2]	Speed[1]	+	-	0	>3	Speed[1]	+	-	0	>3
All Test Points																					89
	9.3	80	9.8	101	0.5	84	56	32	7	10.9	117	1.5	95	59	18	42	1.0	89	76	42	39
No. of pts.	172	47%	207	49%						207	57%										
Max. Spd.	24		19							20											
Min. Spd.	5		4							4											
City Park Test Points																					
	8.7	45	9.9	37	1.1	34	13	3	5	12.5	45	3.8	40	5	5	22	2.6	26	14	10	20
No. of pts.	50	90%	50	74%						50	90%										
Max. Spd.	12		14							20											
Min. Spd.	6		4							5											
Other Open Space Test Points																					
	11.8	17	11.7	34	-0.1	10	7	3	0	11.3	32	-0.6	7	11	2	1	-0.5	7	17	12	0
	20	85%	36	94%						36	89%										
Max. Spd.	24		19							18											
Min. Spd.	7		7							6											
Sidewalk Points																					
	9.3	18	9.4	30	<0.1	59	37	26	21	10.2	40	0.8	67	44	11	38	0.8	56	46	20	19
No. of pts.	103	17%	122	25%						122	33%										
Max. Spd.	24		19							19											
Min. Spd.	5		4							4											

[1] Speed refers to wind speed exceeded 10 percent of the time; in miles per hour
[2] Exceedances indicates number of exceedances of applicable Planning Code Section 148 comfort criteria, and percentage of test points that exceed the criteria.
[3] + / - / 0 indicate number of points where speed increases / decreases / does not change from previous scenario. >3 indicates number of points where speed increase by more than 3 mph.

SOURCE: RWDI, Environmental Science Associates

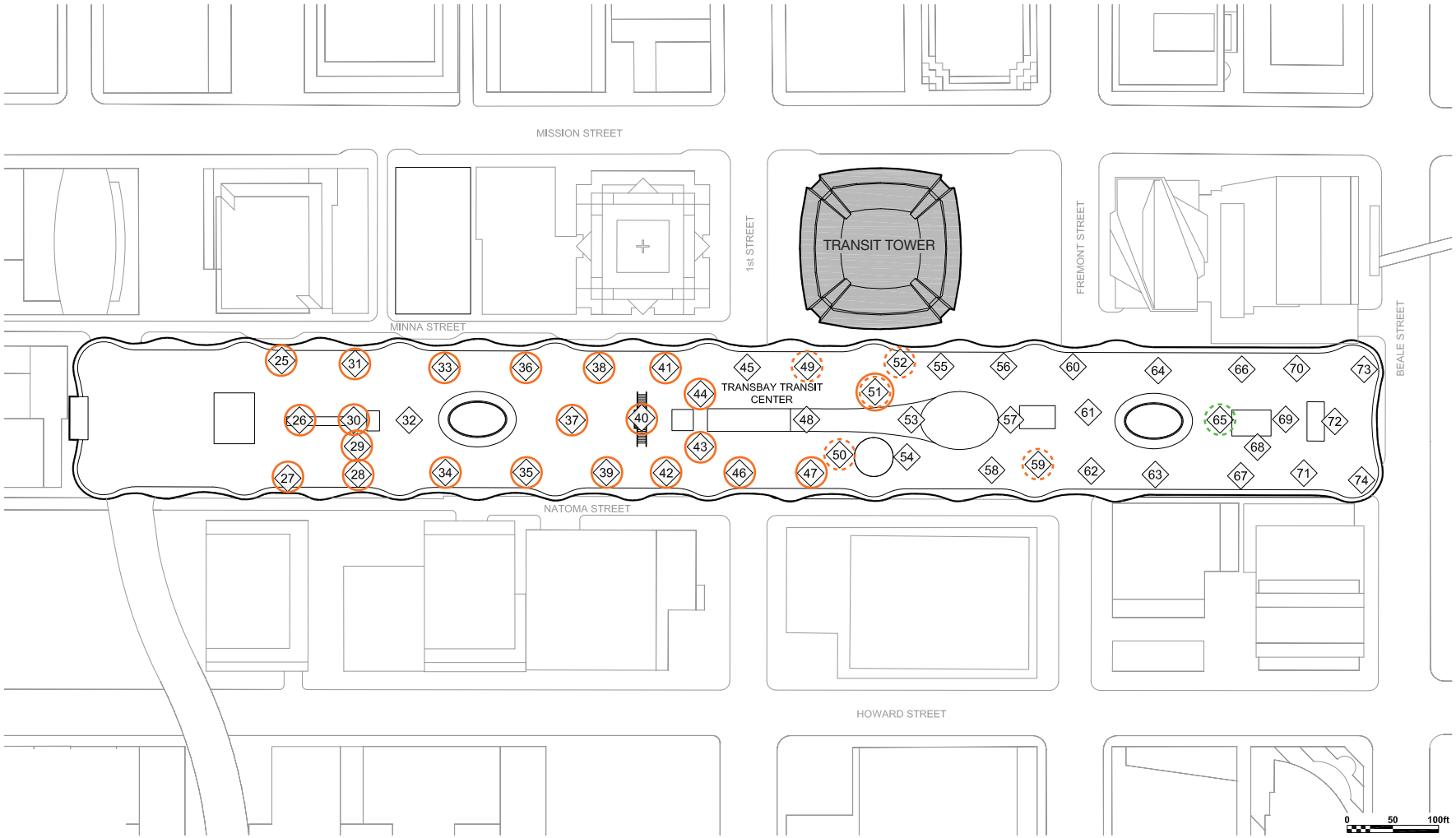


SOURCE: RWDI

Case Nos. 2007.0558E and 2008.0789E: Transit Center District Plan and Transit Tower . 207439

Figure 58A

Wind Tunnel Test Points - Mission Square



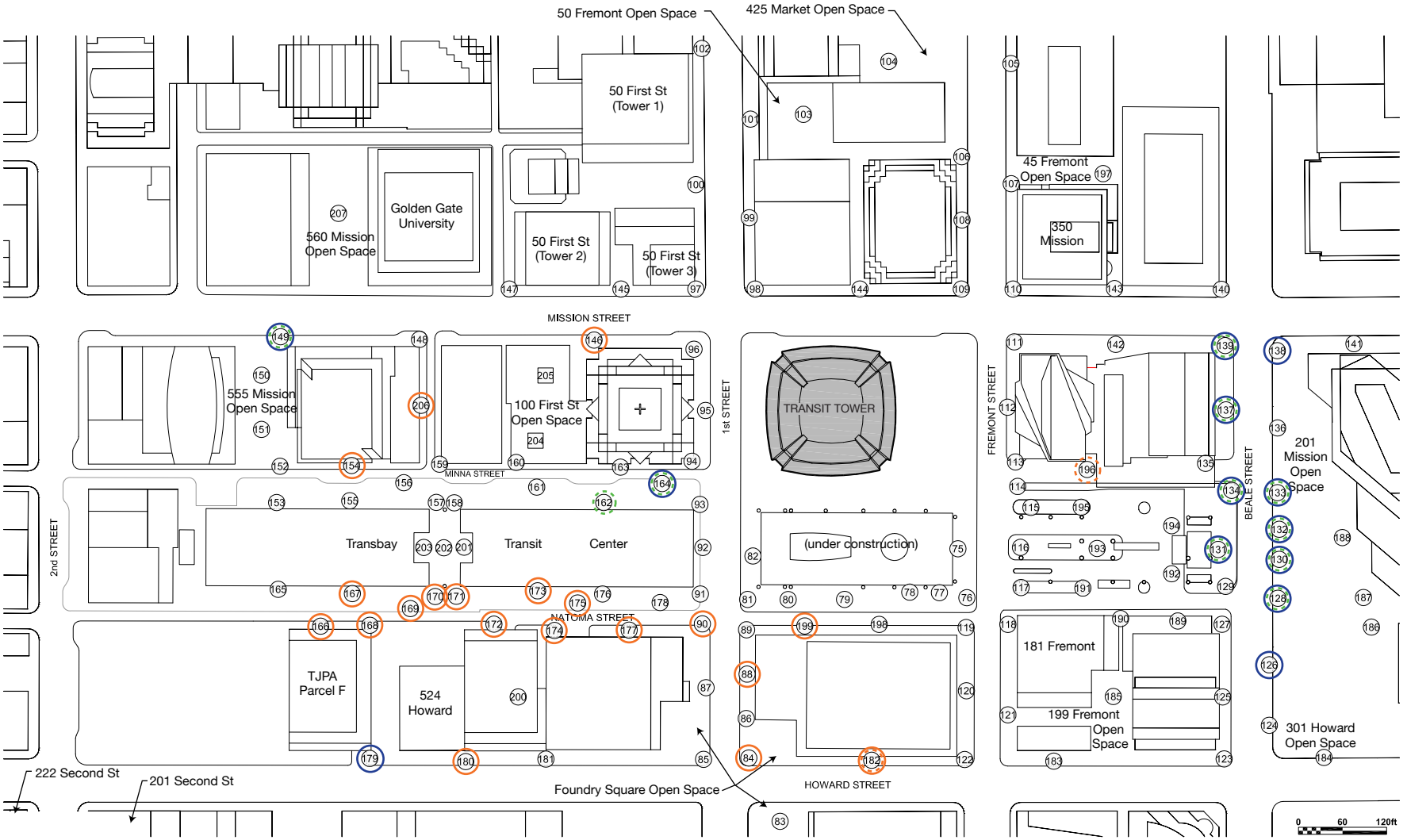
Roof Level | Increase of more than 3 mph with Transit Tower | Decrease of more than 3 mph with Transit Tower | Increase of more than 3 mph from existing with Plan development

SOURCE: RWDI

Case Nos. 2007.0558E and 2008.0789E: Transit Center District Plan and Transit Tower . 207439

Figure 58B

Wind Tunnel Test Points - Transit Center Roof (City Park)



Grade Level

Podium Level

Increase of more than 3 mph with Transit Tower

Decrease of more than 3 mph with Transit Tower

Increase of more than 3 mph from existing with Plan development

Decrease of more than 3 mph from existing with Plan development

Note:
Labeled sites denote Plan-Area development sites in Transit Tower vicinity

SOURCE: RWDI

Case Nos. 2007.0558E and 2008.0789E: Transit Center District Plan and Transit Tower . 207439

Figure 58C

Wind Tunnel Test Points - Transit Tower Vicinity

The wind-tunnel testing demonstrated that the project would result in relatively modest changes in ground-level winds. Wind conditions would continue to be moderately windy; the average wind speed would increase from 9.3 mph to 9.8 mph; this degree of change generally would not be noticeable at any given location, although the change would be greater at certain spots, and would be apparent. Wind speeds at the 207 test points would range from 4 to 19 mph, with the highest speed continuing to be the location on Mission Street east of Second Street. A wind speed of 19 mph would also be exceeded 10 percent of the time at two locations in the privately owned, publicly accessible open space at 555 Mission Street.

Wind speeds with the Transit Tower in place would increase at 84 locations where winds were also tested in the existing condition, and would decrease at 56 locations. At 32 locations, there would be no change in the average wind speed. The increase in wind speeds would be small—1 to 3 mph—at a large majority of points. At seven of 172 locations, the increase in average wind speed would be greater than 3 mph: five of these locations are in the City Park atop the Transbay Terminal, proximate to the Transit Tower, where the average wind speed would increase by 4 mph at each location. At two pedestrian locations east and south of the Transit Tower (points 182 and 196), wind speeds would also increase by 4 mph. Around the base of the Transit Tower itself, wind speeds would change little, with increases or decreases of 2 mph to 3 mph at most locations except at the southeast corner of First and Mission Streets, where the wind speed exceeded 10 percent of the time would decrease by 5 mph, from 16 mph to 11 mph. Locations east of the Tower, in the planned Mission Square park, would increase or decrease by 2 mph or 3 mph. Wind speeds at all test points in Mission Square would exceed the seating comfort criterion of 7 mph, as is the case for all points tested there under existing conditions.

City Park

The Transit Tower would incrementally increase winds in the City Park atop the Transit Center, although not to a substantial degree that is considered significant. As noted above, five locations in City Park would experience increases of 4 mph with the addition of the Transit Tower. At these locations, winds accelerating down the façade of the tower would be most noticeable. Wind speeds exceeded 10 percent of the time in these locations would be 12 to 14 mph, up from 8 to 10 mph without the Tower. The higher speeds would be comparable to recent wind-tunnel test results for locations on New Montgomery Street between Market and Mission Streets, and would exceed not only the seating criterion but also the 11-mph pedestrian comfort criterion. The average wind speed in City Park would increase from 8.7 mph to 9.9 mph, and winds would increase at 34 of 50 test locations. Wind speeds would decrease at 13 locations (mostly in the western half of the park, upwind from the Transit Tower) and would remain unchanged at three locations. However, the number of locations in City Park at which the 7-mph *Planning Code* comfort criterion for seating areas would be exceeded would decline from 45 of the 50 test points (90 percent) under existing conditions, to 37 of 50 points (74 percent) with the Transit Tower in place. With the Transit Tower, wind speeds in City Park would range from 4 to 14 mph, compared to 6 to 12 mph under existing conditions.

Other Open Spaces

In other seating locations (open spaces) tested and depicted on Figure 58C, wind speeds would increase incrementally. Of 19 locations tested under both existing and Transit Tower (project) conditions, wind speeds would increase at 10 locations (by up to 3 mph), and would decrease at six locations (also by up to 3 mph); there would be no change at three locations. Wind speeds at these locations would range from 7 to 19 mph, compared to 7 to 20 mph under existing conditions. The 7-mph Section 148 seating criterion would be exceeded at 34 of 35 test locations (97 percent), compared to 17 of 19 locations (89 percent) tested under existing conditions.[288] The average wind speed at open space locations (other than City Park) would increase slightly under conditions with the Transit Tower, to 11.5 mph, from 11.2 mph for open space points tested under existing conditions.

All Test Points, Including Sidewalk Locations

With implementation of the Transit Tower project, there would be 101 exceedances of the Section 148 wind-speed criteria at 207 test locations (49 percent); this compares to exceedances at 80 of 172 locations (47 percent) under existing conditions. Of the 101 total exceedances, 37 would exceed the 7-mph seating criterion in City Park and 34 would exceed the 7-mph seating criterion in other publicly accessible open spaces. Of 122 sidewalk locations, 30 (25 percent) would exceed the 11-mph pedestrian criterion, compared to 18 of 103 sidewalk locations (17 percent) under existing conditions.

Wind speeds would generally decrease along Beale Street between Mission and Howard Streets.

The Transit Tower project would result in no exceedances of the *Planning Code* wind hazard criterion, and therefore would have no significant effect related to wind. The one hazard exceedance found under existing conditions—on Mission Street east of Second Street—would experience a decrease in average wind speed, from 24 mph to 19 mph, which would be sufficient to eliminate the existing hazard criterion exceedance.

Although the Transit Tower would not result in a significant effect with respect to wind, the project sponsor would seek, and would be required to obtain, an exception to the requirements of *Planning Code* Section 148 because the project would result in a net increase in the number of increase of the pedestrian and seating comfort criteria and would not eliminate all existing wind speed exceedances of the comfort criteria.

Mitigation: None required.

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[288] As noted in the discussion of Methodology, additional points in publicly accessible open spaces were tested in the project (Transit Tower) and cumulative (Transit Center District Plan) scenarios.

Transit Tower Cumulative Analysis and Transit Center District Plan

Impact WI-2: Implementation of the draft Plan would not cause large increases in pedestrian wind speeds or wind speeds in publicly accessible open spaces over a substantial portion of the Plan area. (Less than Significant with Mitigation)

The cumulative scenario tested in the wind tunnel represents a cumulative condition for the Transit Tower and also represents assumed buildout under the draft Plan, in that this test scenario included massing models of all projects in the Plan area within the Transit Tower test area (within about one block) for which plans are currently on file with the Planning Department, as well as massing models on sites in the Plan area assumed for ultimate development, and massing models of projects in Zone 1 of the approved Transbay Redevelopment Plan, primarily along the southern edge of the Plan area. This cumulative test scenario included the following potential future developments in the vicinity of the Transit Tower project site: an approved 360-foot-tall building at 350 Mission Street, diagonally across the Mission/Fremont Streets intersection from the Transit Tower site;[289] two towers on a site a the northwest corner of First and Mission Streets (915 feet [including sculptural elements] and 605 feet); a 700-foot tower on the Golden Gate University site; a 700-foot tower at 181 Fremont Street; a 400-foot building at 41 Tehama Street, an approved 350-foot building at 222 Second Street, a 350-foot building at 201 Second Street, two towers on the north side of Howard Street between First and Second Streets (750 feet and 400 feet), a 600-foot tower addition to the southwest corner of the Palace Hotel on New Montgomery Street, and six towers in Zone 1 of the Redevelopment Plan. As stated previously, the actual building designs proposed were not included in this analysis; instead, models used simulated the anticipated generalized massing. (Because of physical limitations on the size of the wind-tunnel test equipment, other potential development in the far western portion of the Plan area, west of New Montgomery Street, and cumulative projects farther west, were not included because their locations are too far from the center of the test area.)

Under this cumulative scenario, the average wind speed would increase by about 1 mph, compared to with-Tower conditions, and by 1.5 mph, compared to existing conditions, to 10.9 mph. Compared to the Tower-only scenario, wind speeds would increase at 89 of 207 test locations and decrease at 76 locations, while remaining unchanged at 42 locations. Compared to existing conditions, wind speeds would increase under cumulative conditions at 95 locations, decrease at 59 locations, and remain unchanged at 18 locations. Under the cumulative scenario, wind speeds would exceed the comfort criteria at 117 of the 207 test points (57 percent), an increase of 16 exceedance locations compared to existing-plus-Tower conditions. The wind speeds exceeded 10 percent of the time at the 207 test points would range from 4 to 20 mph, similar to the range of 4 to 19 mph under Tower-only conditions, and a lesser maximum wind speed than the range of 5 to 24 mph under existing conditions. The highest winds speed would be at a location along the southern edge of City Park atop the Transit Terminal (point #28), proximate to two development sites immediately south of the Transit Center: a site known as Parcel F, a site owned by the

[289] It is noted that the Transit Center District Plan calls for a 700-foot-tall building on the 350 Mission Street project site. However, because a shorter building was approved by the Planning Commission in February 2011, that approved project was included in the cumulative wind-tunnel analysis.

Transbay Joint Powers Authority that is proposed under the draft Plan for a height limit of 750 feet, and a site referred to as 524 Howard Street. At these locations, winds would exceed 20 mph 10 percent of the time. Winds at these locations would increase by the greatest amount—up to a 12 mph increase—and would range between 12 mph and 20 mph, compared to 8 mph to 11 mph under existing conditions. Winds at three of these locations would approach the hazard criterion. However, there would be no exceedances of the hazard criterion at any location in City Park, under any of the three test scenarios.

The models of these buildings were regular, rectilinear shapes and did not incorporate façade articulation of setbacks called for in the draft Plan, and therefore the wind-tunnel test results likely present a conservative picture of potential future wind conditions. It is likely that actual building designs, when proposed, could be sculpted to reduce wind speeds, compared to those reported here.

City Park

In City Park, wind speeds would range from 5 to 20 mph, compared to 4 to 14 mph with the Transit Tower alone and 6 to 12 mph under existing conditions. Wind speeds would increase, compare to Tower-only conditions, at 40 of 50 points, and at 26 of 40 points, compared to existing conditions. The 7-mph seating comfort criterion would be exceeded at 90 percent (45 of 50) of the test locations in City Park. The wind speed exceeded 10 percent of the time would increase by more than 3 mph, compared to existing conditions, at almost all of the points from the Transit Center to the west. In particular, wind speeds would increase by more than 5 mph at 16 locations in City Park, compared both to conditions with the Transit Tower, and to existing conditions. All of these increases would be at locations upwind of the Transit Tower and near TJPA Parcel F and 524 Howard Street. As noted above, the cumulative scenario was analyzed using massing models (i.e., rectilinear shapes to represent the height and bulk of potential future building) that do not reflect specific design or sculpting that may be proposed for specific projects. In the case of Parcel F and 524 Howard Street, there is neither a project sponsor nor an actual design on file with the Planning Department. Therefore, the analysis is considered conservative, and it is possible that specific building designs, especially if they were to include a podium, setbacks, and/or substantial articulation of the facades, could perform substantially better, in terms of effects on wind speeds in City Park, than the results here indicate. This analysis does indicate, however, that the design of buildings on these two sites should carefully consider potential wind effects in City Park and incorporate wind-tunnel testing as part of design development.

Other Open Spaces

Concerning wind speeds at other seating (open space) locations, the cumulative scenario found that the average wind speed at these locations would decrease slightly (by less than 1 mph), compared to both the Tower-only condition (with the Transit Tower only) and existing conditions. Wind speeds would decrease at more locations than where speeds would increase, and the number of exceedances of the comfort criterion would drop, compared to the Tower-only scenario, from 34 to 32. (Compared to existing conditions, the number of exceedances would increase from 17 to 32 because of the increased number test points, but the percentage would be similar—91 percent, compared to 89 percent under the existing scenario.)

Sidewalk Locations

At sidewalk locations, compared to conditions with the Transit Tower, wind speeds would increase by more than 3 mph at 19 locations, and by more than 5 mph, at five locations. Compared to existing conditions, wind speeds would increase by more than 3 mph at 19 sidewalk locations, and by more than 5 mph, at nine locations. All but one of the nine largest increases, like the greatest increases in City Park, were identified adjacent to the Parcel F and 524 Howard Street sites. At these eight locations, average wind speeds would increase by as much as 10 mph, compared to the Tower-only scenario, and by up to 12 mph, compared to existing conditions. As stated above, these results can be considered conservative, given the massing of the models tested in the wind tunnel, but are indicative of the potential for strong winds near these sites. The ninth location with an increase of more than 5 mph was on Howard Street between First and Fremont Streets, where the increase was 3 mph, compared to Tower-only conditions, and 7 mph, compared to existing conditions. No hazard criterion exceedances were identified at any of these nine locations.

As with the Transit Tower scenario, under the cumulative (Plan) scenario, wind speeds would generally decrease along Beale Street between Mission and Howard Streets.

Under the cumulative scenario, one exceedances of the wind hazard criterion was identified. This location is on the east side of First Street between Mission and Market Streets (point #101), where the *Planning Code* 26-mph hazard criterion would be exceeded for three hours per year. However, wind-tunnel testing undertaken for the 50 First Street project (Case No. 2006.1523E) shortly after the Transit Tower wind-tunnel test was conducted—and using a scale model of the actual project proposed at 50 First Street, which features a sculpted form and not the rectilinear design included in the cumulative scenario test for this analysis—identified no hazard exceedance at either of two test points within approximately 50 feet of the location where a hazard exceedance was identified in this cumulative analysis. Additionally, the 50 First Street test consistently identified average wind speeds some 3 mph or more lower along both sides of First Street than were identified in this cumulative scenario. Such a finding is consistent with the design of the 50 First Street project as proposed, which does not comprise rectilinear shapes but instead has irregular, curved facades, and would thus be expected to perform better, in terms of its effects on ground-level winds, than the massing model included in the cumulative scenario tested for this analysis. Accordingly, although the cumulative test indicates that the Plan could result in a new exceedance of the *Planning Code* hazard criterion, this effect is judged to be avoidable through design of subsequent projects, in compliance with Section 148 of the *Planning Code* and with implementation of Mitigation Measure M-WI-2.

Mitigation Measure

M-WI-2: **Tower Design to Minimize Pedestrian Wind Speeds:** As part of the design development for buildings on Parcel F and at the 524 Howard Street, 50 First Street, 181 Fremont Street and Golden Gate University sites, the project sponsor(s) shall consider the potential effect of these buildings on pedestrian-level winds and on winds in the City Park atop the Transit Center. If wind-tunnel testing identifies adverse impacts, the project sponsor(s)

shall conduct additional mitigation testing to resolve impacts to the maximum degree possible and to the satisfaction of Planning Department staff. Design features could include, but not be limited to, setting a tower atop a podium, which can interfere with "downwash" of winds from higher elevations toward the ground; the use of setbacks on tower facades, particularly those facades facing into prevailing winds, which can have similar results; using chamfered and/or rounded corners to minimize the acceleration of upper-level winds as they round corners; façade articulation; and avoiding the placement of large, unbroken facades into prevailing winds.

Level of Significance After Mitigation

Implementation of the above measure, along with compliance, as required, with Section 148 of the *Planning Code*, would reduce potential wind impacts of the draft Plan to a less-than-significant level.

Cumulative Plan Area Analysis

Impact C-WI: Implementation of the draft Plan and the proposed Transit Tower, along with cumulative development, would neither cause large increases in ground-level wind speeds over a substantial portion of the Plan area, nor result in a new exceedance of the wind hazard criterion. (Less than Significant with Mitigation)

Concerning portions of the Plan area outside the area covered by the wind-tunnel test, the qualitative analysis found that wind conditions would not be expected to change substantially in the northwest portion of the Plan area, except in the immediate vicinity of a project that would add a residential tower to the southwest corner of the existing Palace Hotel; however, while pedestrian wind speeds would increase on Jessie and Annie Streets at the base of the proposed tower, no new exceedances of the *Planning Code* hazard criterion are anticipated, based on preliminary wind-tunnel analysis for a proposed project at 706 Mission Street at Third Street, just west of the Plan area (Case No. 2008.1084).

The qualitative analysis found that wind speeds could increase, compared to existing conditions, in the southwestern part of the Plan area, in the area between Howard and Folsom Streets and west of New Montgomery Street. These increases would largely result from potential cumulative development outside the Plan area, including a potential project at Third and Folsom Streets that might include three mixed-use towers in conjunction with expansion of Moscone Convention Center. However, wind-tunnel testing undertaken in connection with the proposed expansion of the Museum of Modern Art (Case Nos. 2009.0291E and 2010.0275E), to a site on Howard Street east of Third Street, indicates that no significant effects would ensue on Howard Street or elsewhere from cumulative development. Testing did not extend as far south as Folsom Street; however, the mixed-use project proposed in connection with Moscone Center expansion would be subject to project-specific wind-tunnel testing and compliance with Section 148 to ensure that no significant impacts would occur.

The qualitative analysis found that northeast portion of the Plan area, east of Beale Street, could experience increased wind speeds, compared to existing conditions, as a result of development north of the new Transit Center, between Fremont and Second Streets. However, the more detailed results of the wind-tunnel test undertaken for this analysis, as well as detailed project-specific wind-tunnel testing for the approved 350 Mission Street project, reveal a less-than-significant overall anticipated increase in wind speeds proximate to the anticipated new development, including the Transit Tower. Farther east, along Main and Spear Streets, the Plan area is largely built out, and no new towers exceeding prevailing building heights are anticipated. Therefore, no significant wind impacts are expected.

The southeast portion of the Plan area could also experience increased wind speeds, compared to existing conditions, particularly from development approved in Zone 1 of the Transbay Redevelopment Area. However, wind-tunnel testing conducted for the EIR for the redevelopment plan (Case No. 2000.0048E) found that wind speeds in Zone 1 were anticipated to increase by 3 to 4 mph at most, and would not result in any exceedances of the *Planning Code* hazard criterion. Accordingly, no significant impacts were identified in that EIR.

It is noted that fog plays a major role in San Francisco's weather, and in the comfort that pedestrians experience on the sidewalk and in seating areas. Wind-tunnel testing is performed based on actual wind-speed data collected over a five-year period at the Old Federal Building in the Civic Center. The correlation between fog and wind speed is implicit in the actual wind speed – frequency distributions used in the analysis methodology; that is, fog is more likely to be present during the summer, when westerly winds prevail, whereas there is less chance of fog during strong winter storm winds. However, because the wind test results represent conditions over a full year, it is not possible to confirm the presence or absence of fog at a given time during the year.

Mitigation Measure

M-C-WI: Implement Mitigation Measure M-WI-2.

Level of Significance After Mitigation

Implementation of the above measure, along with compliance, as required, with Section 148 of the *Planning Code*, would reduce potential wind impacts of the draft Plan to a less-than-significant level.

Summary

In summary, neither the proposed Transit Tower project nor the Transit Center District Plan would significantly affect ground–level winds such that mitigation would not be feasible. Although both average wind speeds and the number of exceedances of the pedestrian comfort criteria would increase from existing conditions to and existing-plus-project and cumulative conditions, the increases would not be large and would not be expected to affect the use of sidewalks or publicly accessible open spaces, with the possible exception of areas proximate to Parcel F and the 524 Howard Street site. As stated above, implementation of

the Mitigation Measure M-WI-2, along with compliance, as required, with Section 148 of the *Planning Code*, would reduce potential wind impacts of the draft Plan to a less-than-significant level.

Under existing, project (Transit Tower), and cumulative (draft Plan) conditions, the Plan area would be moderately windy. Under existing and project conditions, just over one-half of the test points meet the applicable *Planning Code* comfort criterion; this figure would decrease to 44 percent under cumulative (Plan) conditions. Under existing conditions, 90 percent of the test points in City Park on the roof of the Transit Center exceed the 7-mph seating criterion. The Transit Tower (project) scenario would increase the average wind speed in City Park by about 1.2 mph but, because wind speeds would decrease at about several locations where the existing speed is just above 7 mph, the Transit Tower (project) scenario would have fewer exceedances of the seating comfort criterion—37 of 50 locations, compared to 45 of 50 under existing conditions. In the cumulative (Plan) scenario, 45 of 50 points in City Park would exceed the 7-mph seating criterion, the same number as under existing conditions, but the average wind speed would be nearly 4 mph greater than under existing conditions and 2.6 mph greater than with the Transit Tower. There would be no exceedances of the hazard criterion at any location in City Park, under any of the three test scenarios.

Other publicly accessible open spaces would be windier under the project (Transit Tower) scenario than under the cumulative scenario; in both cases, more than 90 percent of points tested would exceed the 7-mph seating criterion, compared to 89 percent under existing conditions. The average wind speed at these points would increase from 11.2 mph under existing conditions to 11.5 mph with the proposed Transit Tower, and would decrease to 11.1 mph with Plan area development. Concerning pedestrian locations where the applicable comfort criterion is 11 mph, the percentage of test points where the 11-mph criterion is exceeded would increase from 17 percent under existing conditions to 25 percent with the Transit Tower and 33 percent with Plan area development. The average wind speed at the sidewalk test points would increase from 9.3 mph under existing conditions to 9.4 mph with the proposed Transit Tower, and to 10.1 mph with Plan area development.

The Transit Tower project would not result in any new exceedances of the wind hazard criterion. Under cumulative conditions, one hazard exceedance was identified, which appears to be avoidable through design of subsequent towers, notably a proposed project at 50 First Street.

As explained in the discussion of Methodology, above, the cumulative (Plan) scenario tested in the wind tunnel was based on simplified massing models of potential development on specified sites in the Plan area. These models were regular, rectilinear shapes and did not incorporate façade articulation of setbacks called for in the draft Plan, and therefore the wind-tunnel test results likely present a conservative picture of potential future wind conditions. It is likely that actual building designs, when proposed, could be sculpted to reduce wind speeds, compared to those reported here.

Based on the foregoing, effects related to wind would be less than significant with incorporation of mitigation identified in this EIR.

J. Shadow

This section describes shadow effects on publicly accessible areas, including public parks, publicly-accessible private open spaces, and sidewalks.

Setting

Open space in the Plan area is limited. Generally, the open space that exists nearby is in the form of publicly accessible, privately owned open space developed, in accordance with the Downtown Plan and *Planning Code*, in conjunction with newer office buildings. **Figure 59** depicts open spaces in the Plan area. There are no public parks or other public open spaces in the immediate project vicinity. The nearest public open space is Yerba Buena Gardens, a San Francisco Redevelopment Agency property, at Third and Howard Streets, one block west of the project site. Across Mission Street to the north of Yerba Buena Gardens is Jessie Square, an open space south of the Contemporary Jewish Museum. The new Transit Center will include a public park ("City Park") located on the roof of the terminal, approximately 70 feet above grade level. Rincon Park, a Redevelopment Agency property, is located along the Embarcadero between Mission and Harrison Streets.[290] Ferry Plaza is a Port-owned public open space on the Bay side of the Ferry Building. Smaller public open spaces include Hallidie Plaza at Powell and Market Streets and the Mechanics Plaza at Battery, Bush, and Market Streets. The Plan area and vicinity also contains numerous privately owned publicly accessible open spaces (sometimes known as POPOS) that have been developed in conjunction with office towers built over approximately the last 40 years. These open spaces are shown on Figure 59.

Regulatory Framework

Sunlight Ordinance

Section 295 of the *Planning Code*, the Sunlight Ordinance, was adopted through voter approval of Proposition K in November 1994 to protect certain public open spaces from shadowing by new structures. Section 295 generally prohibits the issuance of building permits for structures or additions to structures greater than 40 feet in height that would shade property under the jurisdiction of or designated to be acquired by the Recreation and Park Commission, during the period from one hour after sunrise to one hour before sunset. Section 295(b) states that the Planning Commission, following a public hearing, "shall disapprove" any project governed by this section that would have an "adverse effect" due to shading of a park subject to Section 295, "unless it is determined that the impact would be insignificant." The Planning Commission's decision under Section 295 cannot be made "until the general manager of the Recreation and Park Department in consultation with the Recreation and Park Commission has had an opportunity to review and comment to the City Planning Commission upon the proposed project." None of the open spaces in the Plan area identified above is subject to Section 295.

[290] This park contains two buildings housing restaurants that occupy much of the park south of Folsom Street.

NOTE: Open Spaces Not to Scale and Locations May not be Exact

1 595 Market Street
2 555 – 575 Market Street (former Chevron buildings)
3 525 Market Street
4 55 Second Street
5 71 Stevenson Street
6 49 Stevenson Street
7 560 Mission Street
8 Golden Gate University
9 25 Ecker Street
10 425 Market Street
11 50 Fremont Street (Fremont Center Plaza)
12 333 Market Street
13 45 Fremont Street
14 50 Beale Street (Bechtel Plaza)
15 PG&E (77 Beale Street)
16 One Market Plaza
17 101 Second Street
18 555 Mission Street
19 100 First Street Plaza
20 Foundry Square
21 199 Fremont Street
22 201 Mission Street
23 301 Howard Street
24 135 Main Street
25 123 Mission Street
26 Spear Street
27 180 Howard Street
28 Rincon Center
29 235 Second Street (CNet/CBS Interactive)
30 211 Main Street
31 221 Main Street
32 201 Spear Street (Gap Building)

SOURCE: San Francisco Planning Department; ESA

Case Nos. 2007.0558E and 2008.0789E: Transit Center District Plan and Transit Tower . 207439

Figure 59
Open Space in Plan Area

In 1989, the two Commissions adopted shadow criteria for 14 downtown parks, including an Absolute Cumulative Limit for new shadow for each open space and qualitative criteria for assessing new shadow. The sunlight on a park is measured in terms of "square-foot-hours" of sunlight, while the shadow load is measured in terms of "shadow-foot-hours." A square-foot-hour of sunlight is one hour of sunlight on one square foot of ground, while a shadow-foot-hour represents one hour of shade on one square foot of ground. For projects that would affect parks for which a quantitative limit was established, shadow impacts have typically been judged less than significant if the project would not exceed the Absolute Cumulative Limit. In establishing the Absolute Cumulative Limits for the downtown parks, the commissions generally relied upon the following guidelines: for smaller parks (of less than two acres) on which more than 20 percent of the potential "Prop. K" sunlight was in shadow under then-existing conditions, no additional shadow was to be permitted. (This standard was applied to nine downtown parks.) For larger parks (of two acres or more) with between 20 percent and 40 percent existing shadow, the Absolute Cumulative Limit was to be set at 0.1 percent; that is, an additional 0.1 percent new shadow, measured in shadow-foot-hours, would be permitted beyond existing conditions.[291] The increment permitted as the Absolute Cumulative Limit—0.1 percent, in this case—is measured as a percentage of the theoretical annual available sunlight.[292] For larger parks shadowed less than 20 percent of the time,[293] an additional 1.0 percent new shadow was to be permitted.[294] No guideline was provided for parks of less than two acres that have less than 20 percent existing shadow.[295]

There are no parks subject to Section 295 within the Plan area. Yerba Buena Gardens, just west of the Plan area, is under the jurisdiction of the San Francisco Redevelopment Agency and is not subject to Section 295. The nearest parks subject to Section 295 are Union Square; Justin Herman Plaza, at the foot of Market Street; St. Mary's Square, on Pine Street near Kearny Street; Portsmouth Square, at Clay and Kearny Streets; Willie "Woo Woo" Wong Playground (formerly Chinese Playground), between Sacramento and Clay Streets and Stockton Street and Grant Avenue; Chinese Recreation Center, a partially indoor facility at Washington and Mason Streets (under renovation and scheduled to reopen in 2012); Woh Hei Yuen Recreation Center and Park, on Powell Street between Jackson Street and Pacific Avenue; Maritime Plaza, an elevated park between Battery and Davis Streets and Clay and Washington Streets; Sue Bierman Park, between the Embarcadero and Drumm Streets at Clay Street; Boeddeker Park, on the block bounded by Ellis, Eddy, Jones, and Taylor Streets; Huntington Park, between California and

291 This criterion applied to Union Square and Embarcadero Plaza II (Justin Herman Plaza). Two other parks, Washington Square and North Beach Playground, were not permitted new shadow because height limits precluded the possibility of new shadow on those parks.

292 The theoretical annual available sunlight is the amount of sunlight, measured in square-foot-hours, that would fall on a given park during the hours covered by Section 295. It is computed by multiplying the area of the park by 3,721.4, which is the number of hours in the year subject to Section 295. Thus, this quantity is not affected by shadow cast by existing buildings, but instead represents the amount of sunlight that would be available with no buildings in place. Theoretical annual available sunlight calculations for each downtown park were used by the Planning and Recreation and Park Commissions in establishing the allowable Absolute Cumulative Limit for downtown parks in 1989.

293 Civic Center Plaza was the only park in this category.

294 The guidelines for new shadow were presented in a memorandum to the Planning and Recreation and Parks Commissions, from their staffs, dated February 3, 1989, and referred to in Joint Resolution 11595 of the two commissions, adopted February 7, 1989.

295 None of the 14 downtown parks for which Absolute Cumulative Limits were established met these criteria.

Sacramento Streets and Taylor and Mason Streets; Gene Friend Recreation Center, at Sixth and Folsom Street; and South Park, in the center of the block bounded by Second, Third, Bryant, and Brannan Streets. The latter two parks, because they are well south of the Plan area, would not be affected by shadows from development in the Plan area.

Other Planning Code Regulations

Planning Code Section 146(a), applicable to certain streets in the C-3 zoning districts, requires that buildings and additions fit within an envelope defined by a plane sloping away from the street at a prescribed angle above a prescribed height "in order to maintain direct sunlight on public sidewalks in certain downtown areas during critical periods of use." In the Plan area, Section 146(a) applies to the west side of New Montgomery Street and the west side of Second Street (to a point 300 feet south of Folsom Street), specifying that buildings be within an envelope that slopes away from the street at an angle of 62 degrees from horizontal beginning at 132 feet above grade. Section 146(a) also applies to portions of Bush, Sutter, Post, Geary, O'Farrell, Ellis, Powell, Stockton, and Kearny Streets and Grant Avenue. Under Section 146(b), an exception to the foregoing may be granted, pursuant to the procedures of Section 309, Permit Review in C-3 Districts, if no new shadow is created, or if "the shadow created by the penetration of the plane is deemed insignificant because of the limited extent or duration of the shadow or because of the limited public use of the shadowed space." Section 146(c) states that, on other streets in the C-3 districts, "New buildings and additions to existing buildings shall be shaped, if it can be done without creating an unattractive design and without unduly restricting the development potential of the site in question, so as to reduce substantial shadow impacts on public sidewalks." A determination of compliance with Section 146(c) is made as part of the Section 309 project consideration process.

Planning Code Section 147, applicable to the C-3, RSD, SLR, SLI, or SSO zoning districts, where height limits are greater than 40 feet, requires that all new development and additions to existing structures where the height exceeds 50 feet must be shaped to minimize shadow on public plazas or other publicly accessible open spaces other than those protected by Section 295, "in accordance with the guidelines of good design and without unduly restricting the development potential of the property." The following factors must be taken into account in determining compliance with this criterion: the amount of area shadowed, the duration of the shadow, and the importance of sunlight to the type of open space being shadowed. A determination of compliance with Section 147 is made as part of the Section 309 project consideration process.

Impacts

Significance Criteria

The proposed project would have a significant shadow impact if it were to create new shadow in a manner that would:

- Affect, in an adverse manner, the use of any park or open space under the jurisdiction of the Recreation and Park Department; or

- Substantially affect the usability of other existing publicly accessible open space or outdoor recreation facilities or other public areas.

Plan Analysis

Impact SH-1: The draft Plan would adversely affect the use of various parks under the jurisdiction of the Recreation and Park Department and, potentially, other open spaces. (Significant and Unavoidable)

Shadow effects of the draft Plan were analyzed by computer generation of shadows that would be cast by the proposed Transit Tower as well as shadows that would be cast by other buildings that could be built with implementation of the draft Plan, as described in the discussion of Analysis Assumptions at the start of Chapter IV (p. 72). For potential future buildings other than the Transit Tower, shadows analyzed are based on massing models representative of potential future development in the Plan area. Each individual development project that is proposed in the Plan area would be subject to *Planning Code* Sections 295, 146, and 147, and therefore project-specific shadow impacts would be analyzed at such a time as a subsequent project is being reviewed by the Planning Department.

As described below and depicted in **Figures 60 – 62**, shadow from several potential future Plan area buildings at 500 feet in height or greater would reach a number of parks subject to Section 295 controls, including Union Square, Justin Herman Plaza, Portsmouth Square, St. Mary's Square, Maritime Plaza, and Boeddeker Park. Figures 60 through 62 depict shadow from the proposed project for representative times of day during the four seasons: in December, on the winter solstice, the midday sun is at its lowest and shadows are at their longest, while on the summer solstice in June, the midday sun is at its highest and shadows are at their shortest. Shadows are also shown at the spring equinox, when shadows are midway through a period of shortening, and at the fall equinox, when shadows are midway through a period of lengthening. Shadows on any other day of the year would be within the range of shadows presented in Figures 60 through 62. In some cases, new shadow would fall on parks during times not portrayed in the figures. **Table 41**, p. 523, summarizes shadow impacts on the affected parks.

With one exception, shadow from any given potential building would cover part of any affected Section 295 park for less than 45 minutes per day over a period of time ranging from 4 to 12 weeks (one to three months) per year; the exception would be that Union Square would be newly shaded by up to about one hour per day, over a period of six months, by a 600-foot tower addition to the southwest corner of the Palace Hotel on New Montgomery Street.[296] Most new shadow on Section 295 parks would be in the early morning hours, except that Justin Herman Plaza would be newly shaded in the early afternoon in late fall and early winter.

[296] A project on file at this location (Case No. 2005.1101E) proposes a 710-foot-tall residential tower at this location. This project is discussed under Alternative C, Developer-Proposed Scenario, in Chapter VI, p. 665.

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-A

June 21 - Sunrise + 1 Hour

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-B
June 21 - 7AM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-C
June 21 - 8AM

SOURCE: CADP

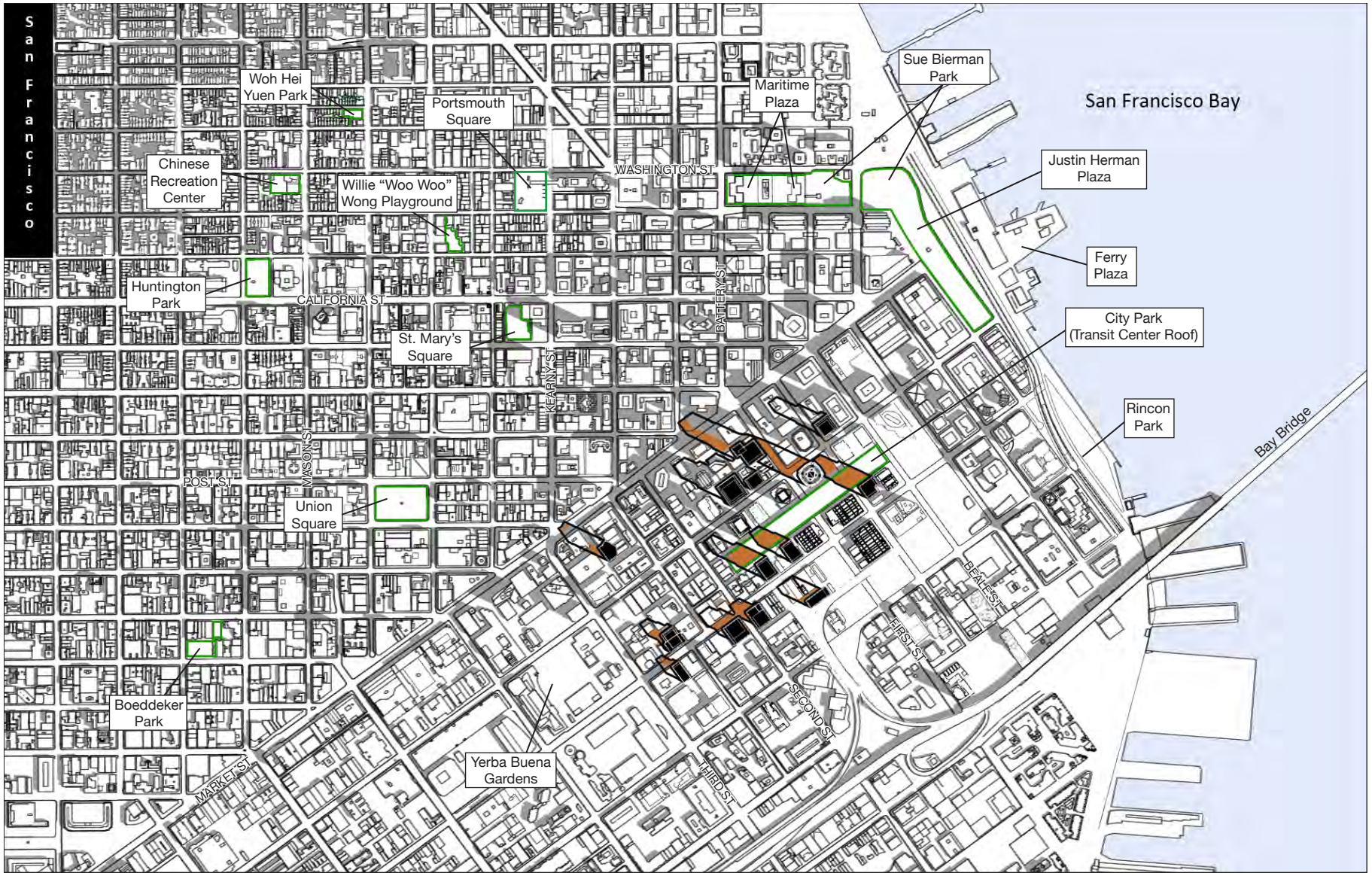
Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-D
June 21 - 9AM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

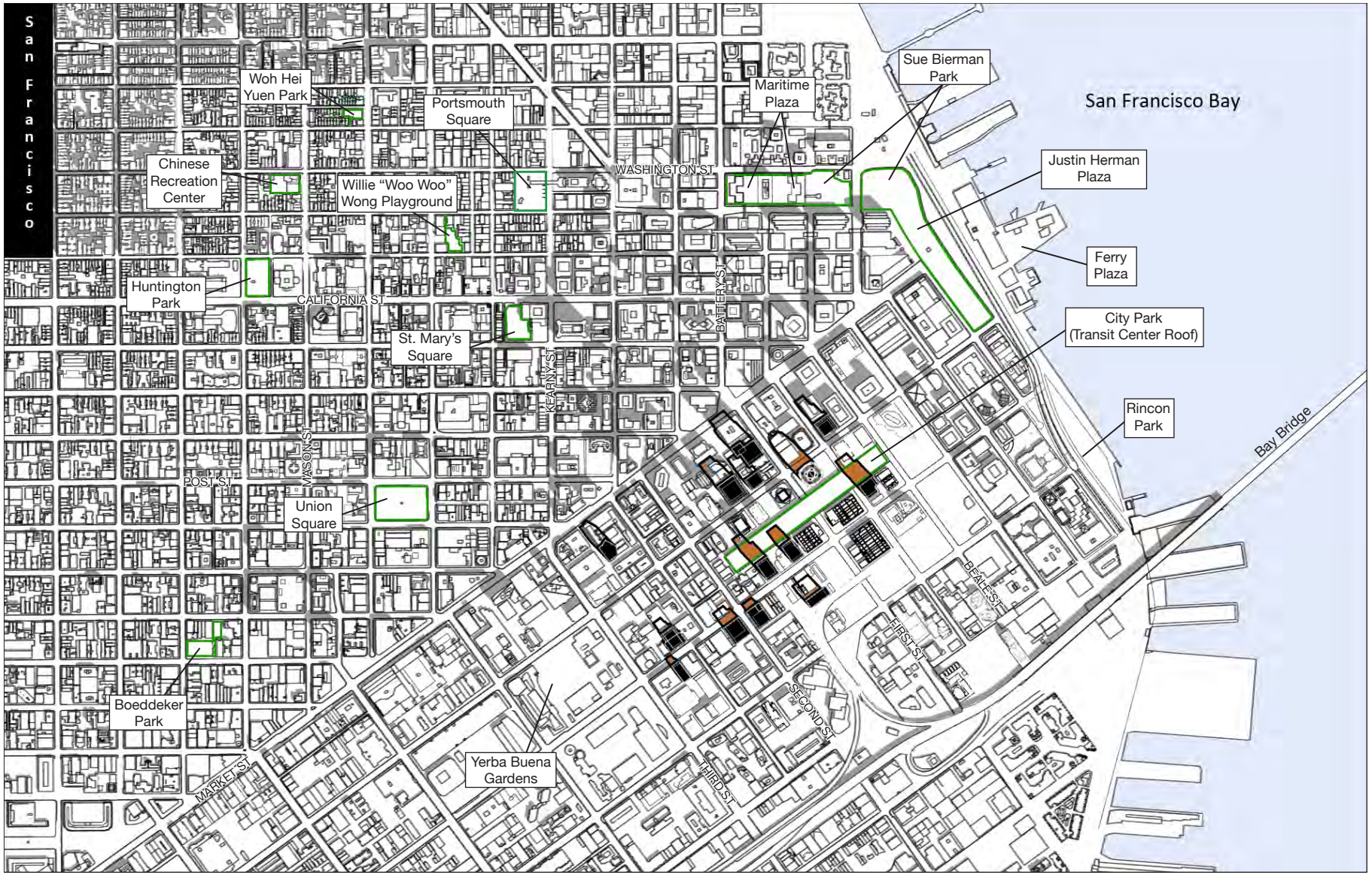
Figure 60-E
June 21 - 10AM



SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-F
June 21 - 11AM



SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-G

June 21 - 12 Noon

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-H
June 21 - 1PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-I
June 21 - 2PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-J
June 21 - 3PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-K
June 21 - 4PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-L
June 21 - 5PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-M
June 21 - 6PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-N
June 21 - 7PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 60-O

June 21 - Sunset -1 Hour

SOURCE: CADP

Figure 61-A
September 21 - Sunrise +1 Hour
(March 21 Similar)

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-B
September 21 - 8AM
(March 21 Similar)

SOURCE: CADP

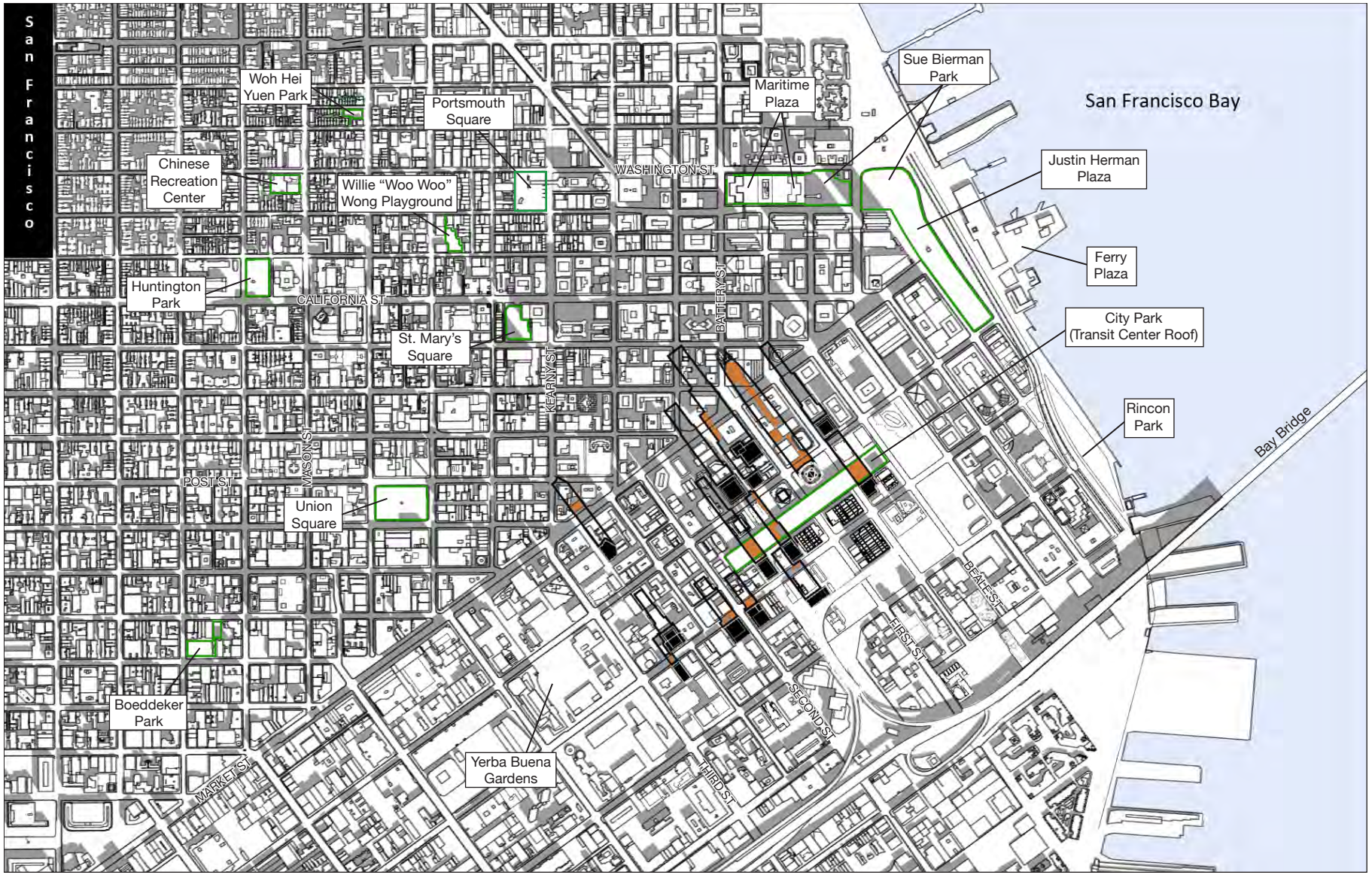
Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-C
September 21 - 9AM
(March 21 Similar)

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-D
September 21 - 10AM
(March 21 Similar)



SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-E
September 21 - 11AM
(March 21 Similar)

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-F
September 21 - 12 Noon
(March 21 Similar)

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-G
September 21 - 1 PM
(March 21 Similar)

SOURCE: CADP

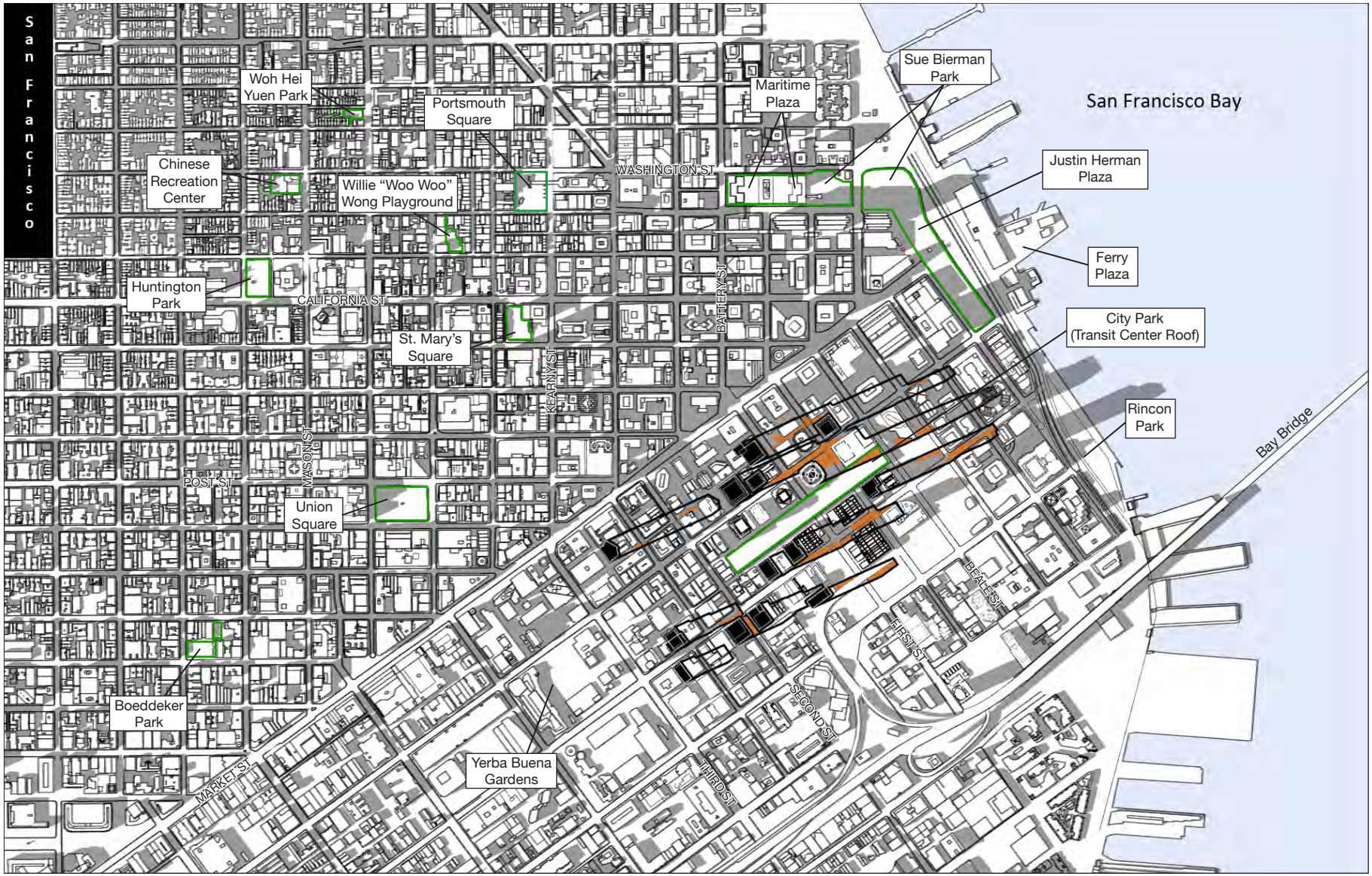
Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-H
September 21 - 2 PM
(March 21 Similar)

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

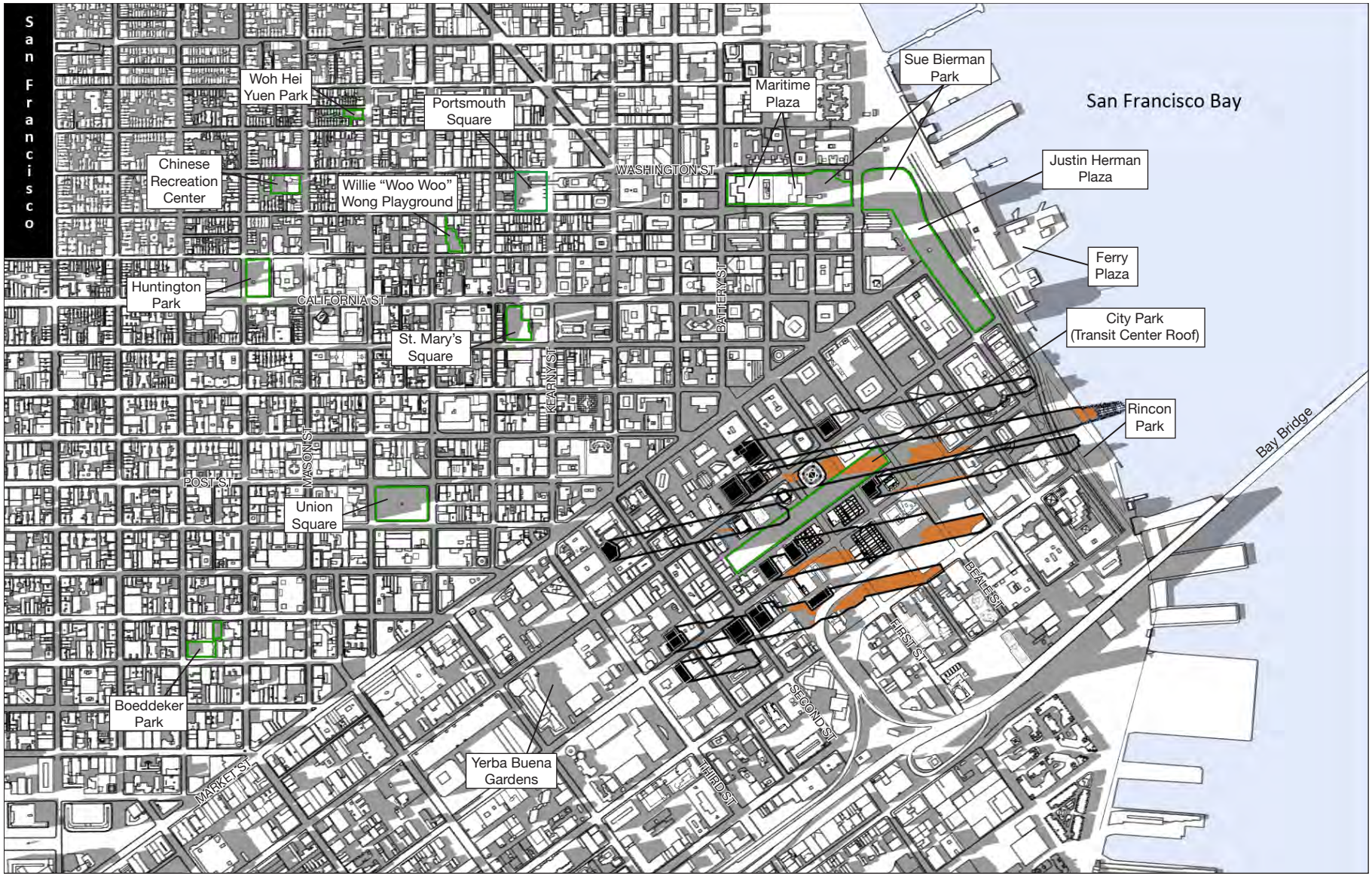
Figure 61-I
September 21 - 3PM
(March 21 Similar)



SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-J
September 21 - 4PM
(March 21 Similar)



SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-K
September 21 - 5PM
(March 21 Similar)

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

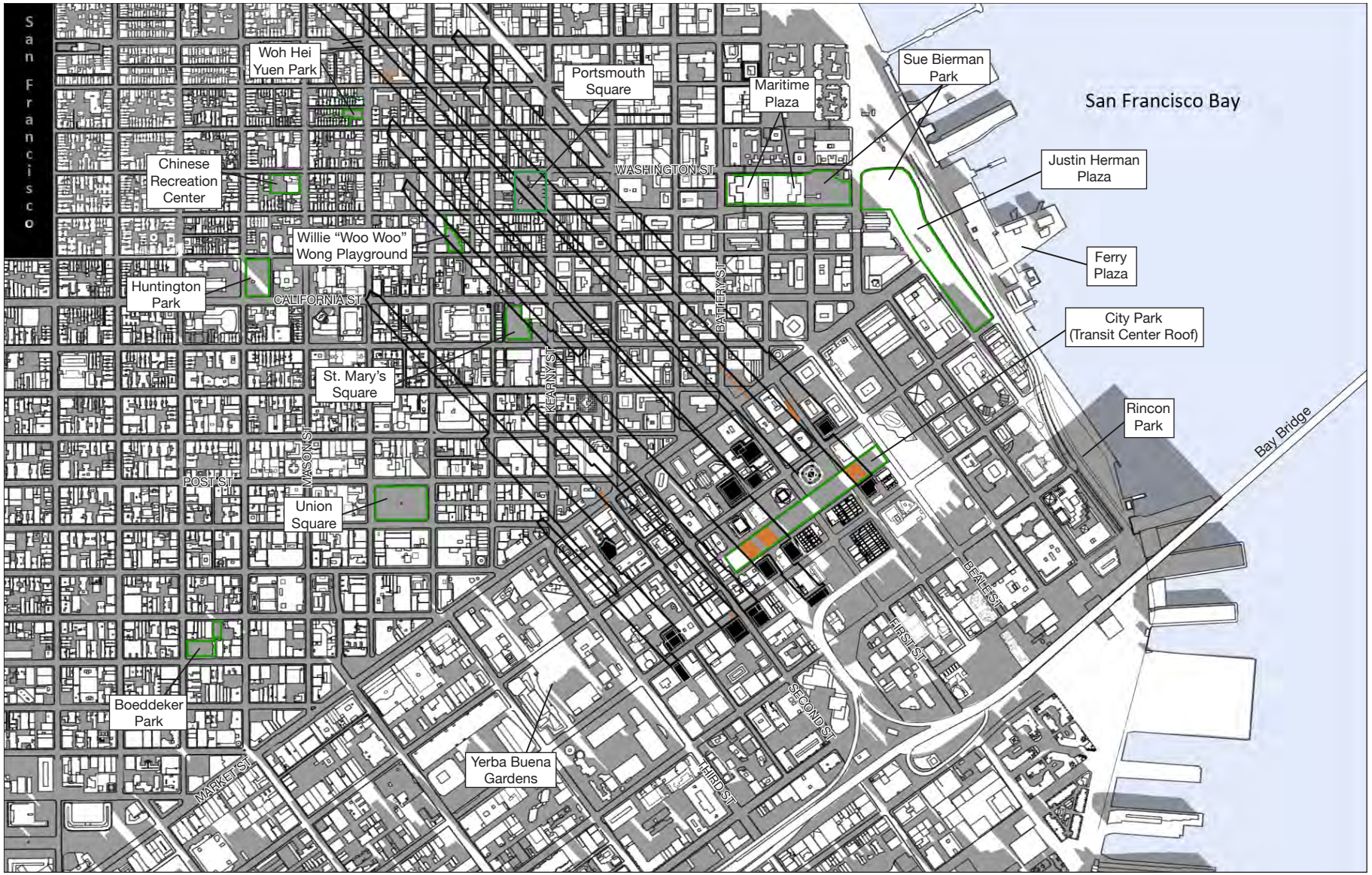
Figure 61-K
September 21 - 6PM
(March 21 Similar)

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 61-M

September 21 - Sunset -1 Hour
(March 21 Similar)

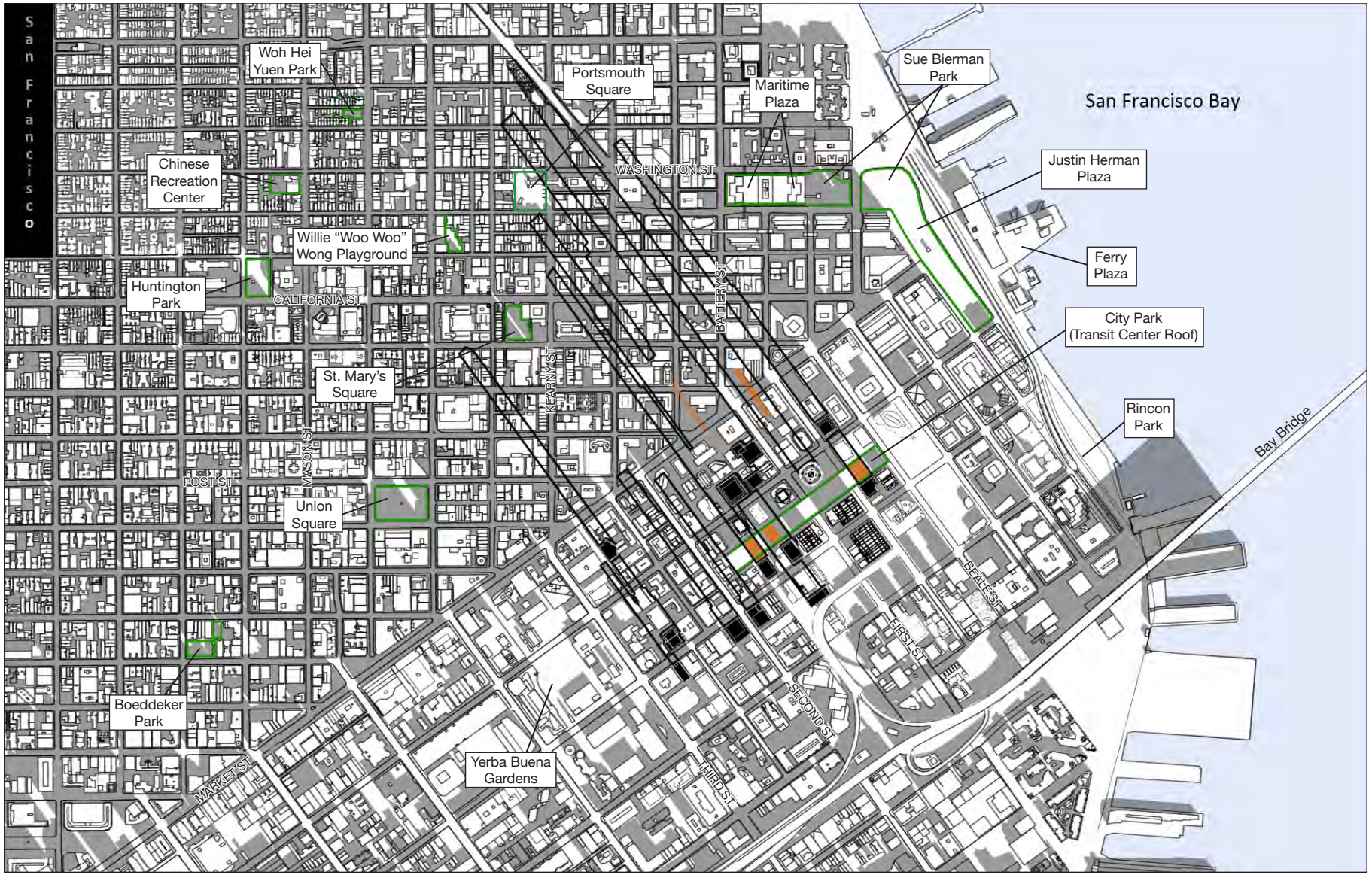


SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 62-A

December 21 - Sunrise +1 Hour



SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 62-B

December 21 - 9AM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 62-C

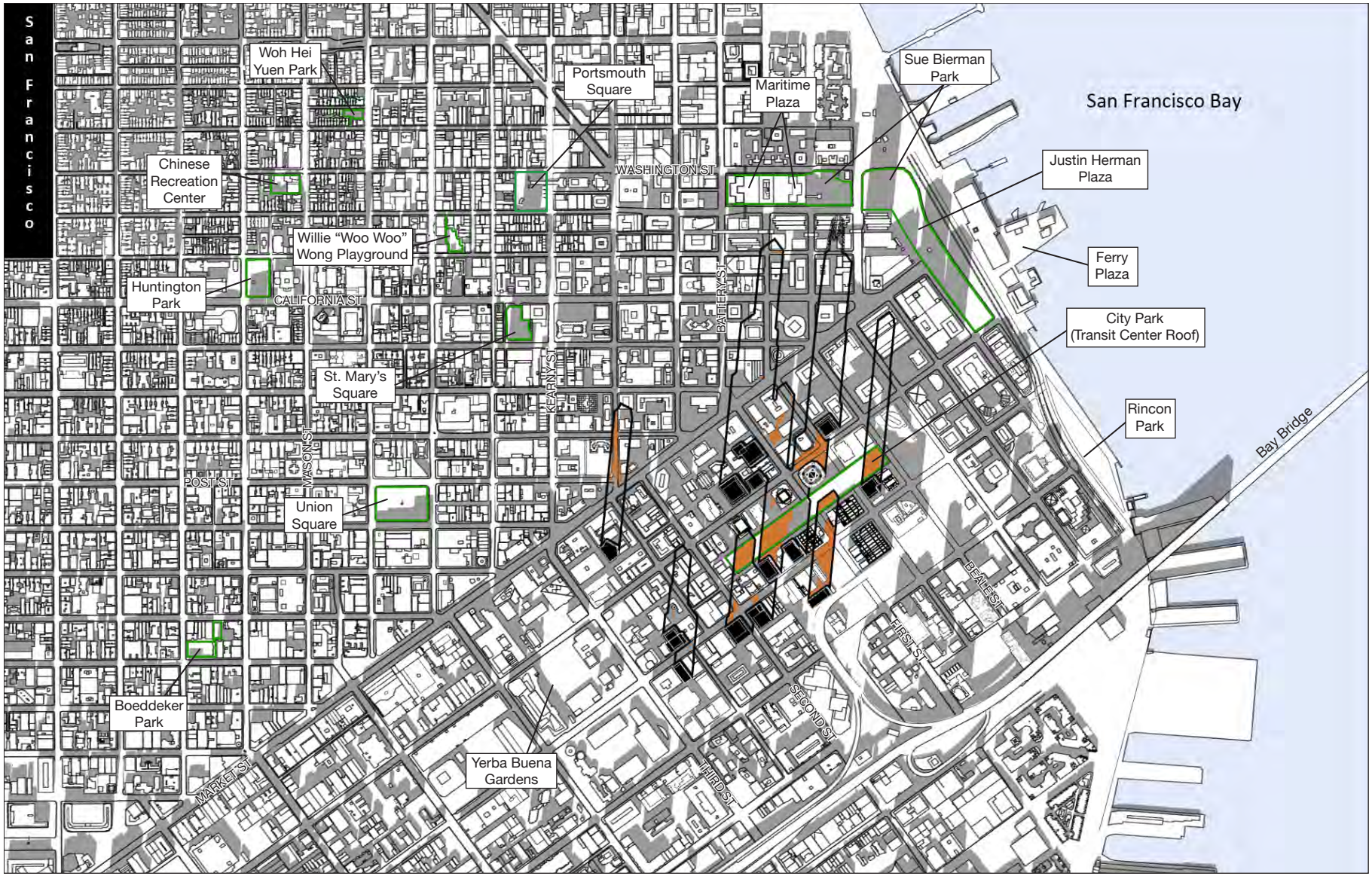
December 21 - 10AM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 62-D

December 21 - 11AM



SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 62-E

December 21 - 12 Noon

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 62-F

December 21 - 1 PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 62-G

December 21 - 2 PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 62-H
December 21 - 3 PM

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 62-I

December 21 - Sunset -1 Hour

TABLE 41
SHADOW ON SECTION 295 PARKS FROM DEVELOPMENT IN THE PLAN AREA

Open Space	Existing Shadow[1]	Permitted Shadow[2]	Shaded By:[3]	Plan Shadow[4]	Shadow w/Plan[5]	Time/Date of Net New Shadow	Maximum Shadow[6]
Union Square[7]	38.30%	0.1% (0.098%)	Pal., 50 F, TT, GGU, 181 Frmt.	0.24%	38.5%	mid-July – late September; mid-March – late May – 7:20 - 8:50 a.m."	24.5% (8:00 am, early Apr. & early Sept.il)
St. Mary's Square[8]	51.90%	0.0%	TT, 50 F, GGU	0.09%	52.0%	mid- Sep – mid-October; late February – late March – 8:40 - 9:10 a.m.	26.3% (8:45 am, mid-Mar. & late Sept.)
Portsmouth Square	39.00%	0.0%	TT, 50 First	0.24%	39.2%	mid-October – early December; early January – late February – 8:00 - 9:10 a.m."	42.5% (8:30 am, mid-Jan. & late Nov.)
Justin Herman Plaza[9]	37.60%	0.1% (0.007%)	TT, 50 F, 350 Msh.	0.09%	37.7%	early November - early February – 1:00 - 2:40 p.m."	10.1% (1:15 pm, early Jan. & early Dec.)
Willie "Woo Woo" Wong Plgrd.	52.80%	0.0%	P-F; GGU	0.03%	52.83%	early November. - early December; January – 8:00 - 8:20 a.m.	15.1% (8:15 am, mid-Jan. & late Nov.)
Maritime Plaza	68.40%	0.0%	Transit Tower	<0.01%	68.4%	early to mid-December; late December- early January – 10:40 to 11:05 a.m."	1.9% (10:45 am, late December)
Woh Hei Yuen Park[10]	n/a	n/a	Transit Tower	0.07%	n/a	Early November and early February, approximately 7:45 a.m.	87.7% (7:44 am,* late Jan. & early Nov.)
Chinese Recreation Ctr.	n/a	0.0%	Transit Tower	<0.01%	n/a	Mid-October and mid-February, approximately 8:25 a.m.	36.5%(8:23 am,* late Feb. & mid-Oct.)
Boeddeker Park[11]	37.70%	0.244% (0.000%)	Transit Tower	<0.01%	37.70%	early June – early July, from 6:50 to 7:00 a.m.	2.9% (6:47 am,* late June)

1 Existing Shadow is the existing amount of shadow cast by existing buildings, measured by the percentage of theoretical annual available sunlight (TAAS) that would be available if no existing buildings were present (based on 1989 Planning Department analysis). TAAS is computed by multiplying the area of each park by 3,721.4 (number of hours covered by Sec. 295). n/a – Not Available

2 Permitted Shadow is the additional amount of **net new** shadow allowed (the Absolute Cumulative Limit) under Sec. 295 for each park. This includes any changes that have occurred since 1989. Bottom figure (in parentheses) indicates remaining budget available, if applicable.

3 Shaded By indicates Plan area buildings that would shade each park: TT – Transit Tower; Pal. – Palace Hotel tower addition; 50 F – 50 First Street; 181 Frmt. – 177 – 187 Fremont; GGU – Golden Gate University site tower; P-F – TJPA Parcel F; 350 Msh. – 350 Mission Street tower (at 700 feet, in accordance with the draft Plan height; this is taller than the 375-foot-tall approved project at this site).

4 Plan Shadow is the amount of net new shadow, given as an approximate percentage of the theoretical annual available sunlight, that would be cast on each park on an annual basis.

5 Shadow w/Plan is the percentage of theoretical annual available sunlight that would be shaded by existing building ***plus*** the proposed project, on an annual basis. Top number is entire Transit Tower; bottom number excludes rooftop element.

6 Maximum Shadow is the greatest amount of each park that would be newly shaded by Plan area buildings at any one moment. Percent of park area that would be shaded is given first column; dates and time in parentheses). Asterisk (*) indicates time is first minute subject to Section 295.

7 The shadow budget remaining within the Absolute Cumulative Limit (ACL) for Union Square has been partially reduced since 1989. In 2004, 69,540 square foot hours was allocated to a project at 690 Market Street, which rehabilitated and expanded the historic De Young (Chronicle) Building, now the Four Seasons Residences, reducing the 0.1 percent budget by 0.02 percent.

8 Existing sunlight and existing shadow coverage for St. Mary's Square, as calculated by the Planning Department, assumed future expansion of this park.

9 The shadow budget remaining within the Absolute Cumulative Limit (ACL) for Justin Herman Plaza has been reduced since 1989, when an ACL for this park was established at 0.1 percent, by the allocation of most of the shadow budget. In 2000, the Planning Commission allocated more than nine-tenths of the available shadow under the 0.1 percent ACL to the Hotel Vitale at Spear and Mission Streets, reducing the remaining available shadow to 0.008 percent of theoretical annual available sunlight. In 2008, the Commission allocated an additional 0.001 percent of the available shadow to a proposed vertical expansion of an office building at 100 California Street (Case No. 2006.0660K), reducing the remaining available shadow to 0.007 percent of theoretical annual available sunlight. This latter project has not been constructed.

10 No Absolute Cumulative Limit has been established for Woh Hei Yuen Park.

11 The Absolute Cumulative Limit (ACL) for Boeddeker Park has been adjusted three times since 1989, to accommodate the Emporium/Bloomingdales project (amendment to the Yerba Buena Center Redevelopment Project, for which the ACL was increased from 0.0%to 0.007%); the Tenderloin Neighborhood Development Center (TNDC) Curran House residential project at 145 Taylor Street (0.087%); and, most recently, in 2009, the TNDC Eddy & Jones Family Housing Project (0.244%). This latter project has not yet been constructed.

SOURCE: San Francisco Planning Department; CADP; Environmental Science Associates

Among Recreation and Park Department parks, development pursuant to the draft Plan would most substantially affect Union Square, Portsmouth Square, and St. Mary's Square, both in terms duration (time of day and year) and amount of shadow (increased shadow coverage).

Union Square

Union Square would be newly shaded by up to five potential projects—the Transit Tower and private developments including the Palace Hotel residential tower, a mixed-use project consisting of two towers at 50 First Street, and a residential-office tower at 181 Fremont Street (also known as 177 – 187 Fremont Street)—applications are on file for all of these sites—as well as potential development of a 700-foot-tall building at the existing location of Golden Gate University, on Mission Street between First and Second Streets, as called for in the draft Plan.[297] Because of the location of Union Square relative to the Plan area and to the position of the sun in the sky, shadow from development in the Plan area would fall on Union Square from late March through late September, about 6 months in all, between about 7:10 a.m. and 8:40 a.m.; on any given day during that period, new shadow would fall on Union Square for between a few minutes and about one hour, with the duration being less than 30 minutes on most days except between late August and mid-September and between late March and mid-April, when shadows would last up to about one hour. Most of the new shadow on Union Square would be cast by the Palace Hotel tower, which is proposed for a site that is considerably closer to Union Square than other development in the Plan area.

New shadow from potential Plan area buildings would eliminate less than 0.2 percent of the theoretical annual available sunlight from Union Square, increasing the annual shadow load from approximately 38.3 percent to about 38.5 percent. Under the criteria adopted by the Planning and Recreation and Park Commissions in 1989, Union Square has an Absolute Cumulative Limit of 0.1 percent, meaning that one-tenth of one percent of additional shadow may be permitted, relative to theoretical annual available sunlight. Union Square has had the most development activity relative to the creation of net new shadow of any of the parks that would be affected by tall buildings in the Plan area. Changes have included the addition to the Macy's store facing Union Square at 235-281 Geary Street (Case No. 1996.228K; approved November 21, 1996), which involved the demolition of two six-story buildings and construction of a new eight-story structure of the south side of Geary Street between Powell and Stockton Streets; because of setbacks at the upper story, this project resulted in a net decrease in shadow on Union Square during the hours covered by *Planning Code* Section 295 of approximately 194,293 shadow-foot-hours; however, this amount was not formally "added back" to Union Square's shadow budget. New shadow was added to Union Square by the vertical expansion of the historic DeYoung (Chronicle) Building at 690 Market Street for development of the Ritz-Carlton Residences project (Case No. 2004.0584K; approved March 18, 2004). That project added approximately 69,540 shadow-foot-hour hours of new shade on Union Square, approximately 17.7 percent of the annual shadow hours available for use under the absolute cumulative limit. Therefore, in order for Plan area buildings that would add new shadow to Union Square to be

[297] No application is on file for the Golden Gate University site, although it is assumed in this analysis to be redeveloped in the future.

approved, the Absolute Cumulative Limit would have to be increased—as part of individual building approvals—to approximately 0.2 percent, if all Plan area buildings were to be approved.[298]

The greatest area of net new shadow at any one time would be approximately 27,500 square feet (about 24.5 percent of the total area of Union Square), at 8:00 a.m. in early September and early April, from the Palace Hotel tower (see **Figure 63**). At these times, shadow on Union Square would increase from about 67 percent shadow coverage to over 90 percent shading. Because most of the Plan area buildings (with the exception of the Palace Hotel tower) that would shade Union Square would do so in the very early morning, additional shadow would generally be cast on Union Square when the park is already three-fourths or more shaded, and often when existing shadow covers more than 90 percent of the park; in some instances, new shadow would complete the shading of Union Square, although for only a few minutes per day. The Palace Hotel tower, being farther west than the other building sites, would add shadow to Union Square when the park is as little as one-third in shadow under existing conditions, and would never result in full shading of the park.

Portsmouth Square

Two potential buildings (the Transit Tower and the project at 50 First Street) would newly shade Portsmouth Square. The park's location to the northwest of these project sites means that new shadow would fall on Portsmouth Square in the late fall and early winter, when shadows are longer. New shadow would reach Portsmouth Square between mid-October and early December, and between early January and late February (almost 4 months in all), from about 8:00 a.m. until just after 9:00 a.m. Because of the locations of the Transit Tower and the 50 First Street tower relative to Portsmouth Square, shadow from these two projects would fall on the park in sequence during November and early December and again during January and early February. For these approximately 10 weeks, shadow from the First Street project would begin to fall on Portsmouth Square just as shadow from the Transit Tower is leaving the park, meaning that new shadow would be cast for about one hour each morning between about 8:00 and 9:00 a.m. On any given day during the rest of the time when Portsmouth Square would be newly shaded, new shadow would last less than 30 minutes. The greatest area of net new shadow at any one time would be approximately 27,600 square feet (about 43 percent of the total area of Portsmouth Square), at 8:30 a.m. in late November and mid-January, from the project at 50 First Street; at these times, shadow on Portsmouth Square would increase from about 50 percent to more than 90 percent shadow coverage (see **Figure 64**).

New shadow from potential Plan area buildings would eliminate about 0.24 percent of the theoretical annual available sunlight from Portsmouth Square, increasing the annual shadow load from approximately 39 percent to about 39.2 percent. Under the criteria adopted by the Planning and Recreation and Park Commissions in 1989, Portsmouth Square has an Absolute Cumulative Limit of

[298] A pending case, 706 Mission Street (Case No. 2008.1084), proposes to exhaust the remaining shadow budget for Union Square, and to increase the budget by 0.004 percent. Should this project be approved, additional adjustments in the Absolute Cumulative Limit would be necessary to accommodate Plan area buildings.

Maximum Extent of New Shadow on Union Square (Draft Plan) - April 5 / September 6, 8:00 a.m.

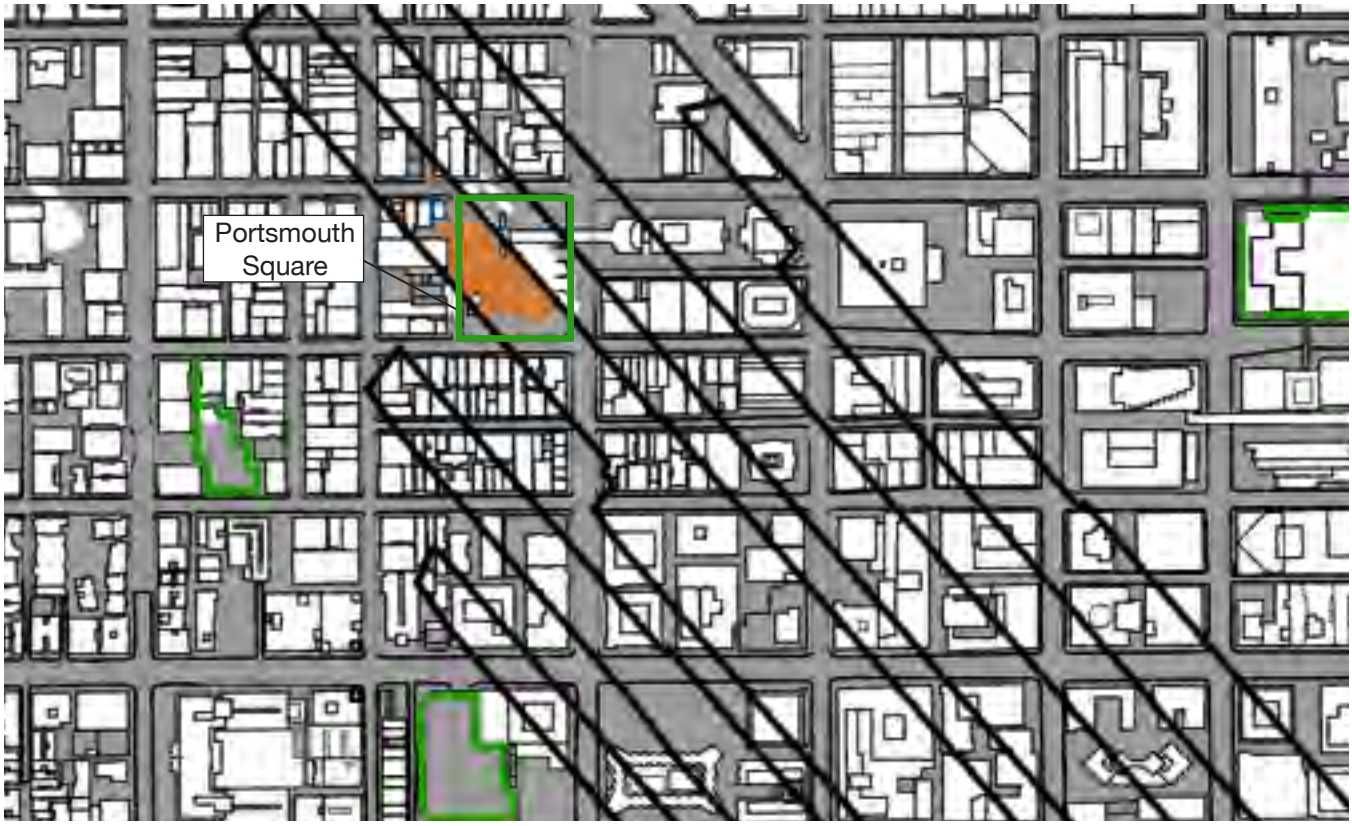
Maximum Extent of New Shadow on Union Square (Transit Tower) - Mayt 10 / August 2, 7:45 a.m.

Net New Shadow Shadow Outline from New Buildings Existing Shadow

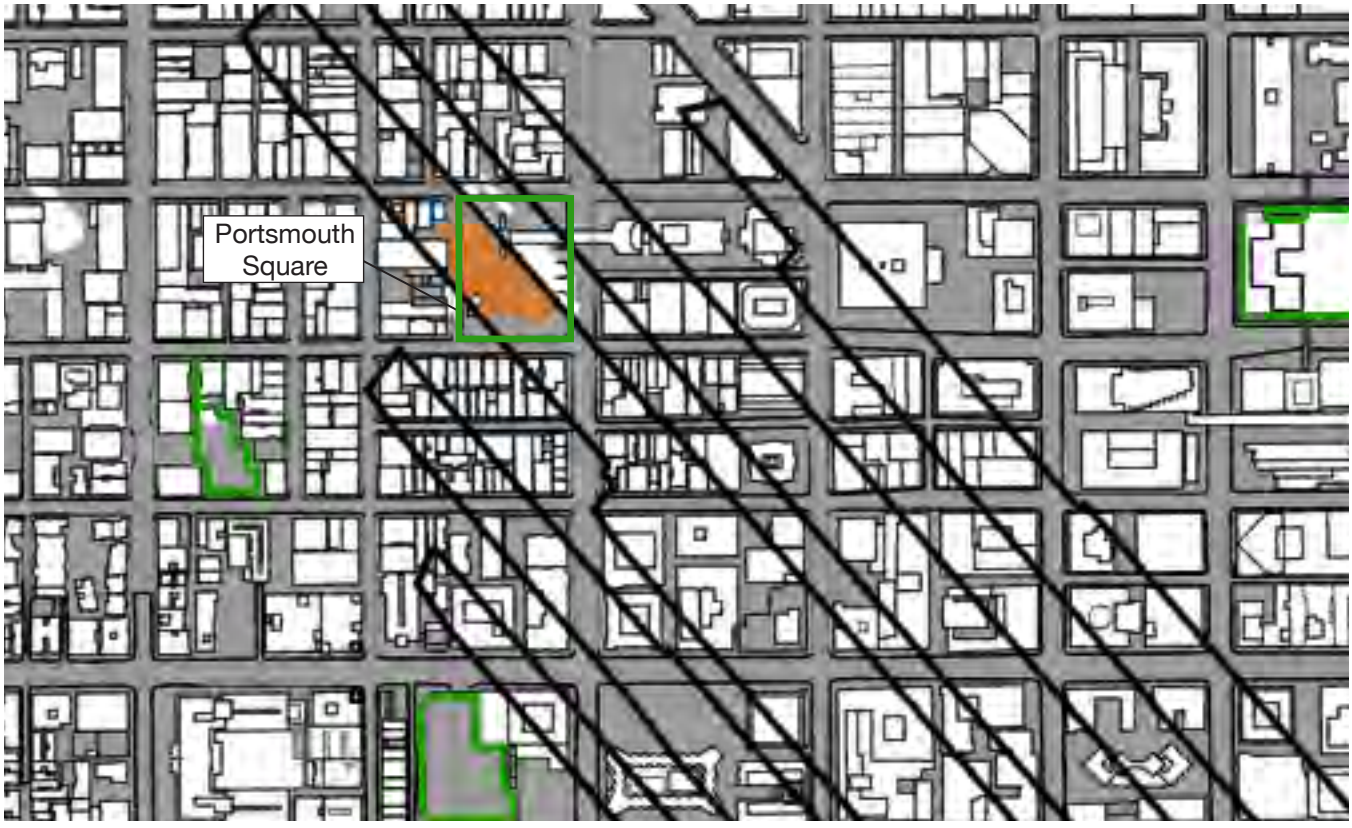
SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 63
Maximum Extent of New Shadow on Union Square



Maximum Extent of New Shadow on Portsmouth Square - January 10 / November 29, 8:30 a.m.



Maximum Extent of New Shadow on Portsmouth Square - January 31 / November 8, 8:15 a.m.

Net New Shadow | Shadow Outline from New Buildings | Existing Shadow

SOURCE: CADP

Case No. 2007.0558E: Transit Center District Plan and Transit Tower . 207439

Figure 64
Maximum Extent of New Shadow on Portsmouth Square

0.0 percent, meaning that no additional shadow may be permitted. Therefore, in order for Plan area buildings that would add new shadow to Portsmouth Square to be approved, the Absolute Cumulative Limit would have to be increased—as part of individual building approvals—to approximately 0.24 percent, if all Plan area buildings were to be approved.

St. Mary's Square

St. Mary's Square has the greatest existing shadow load of the parks that would be most substantially affected, with nearly 52 percent of theoretical annual available sunlight already lost to building shadows. St. Mary's Square would be newly shaded by the Transit Tower, the 50 First Street project, and a potential 700-foot building at 350 Mission Street, as called for in the draft Plan.[299] New shadow would fall on St. Mary's Square from mid-September to mid-October, and during March (about 1.5 months in all), between about 8:10 a.m. and 9:10 a.m. As with Portsmouth Square, St. Mary's Square would be consecutively shaded by the Transit Tower and the 50 First Street project. This would occur in late September and early October, and in mid- to late March. During these times of the year, new shadow would last more than 30 minutes. At other times when new shadow would fall on St. Mary's Square, the duration on any particular day would be 20 minutes or less. The greatest area of net new shadow at any one time would be approximately 10,500 square feet (about 26 percent of the total area of St. Mary's Square), at 8:45 a.m. in late September and mid-March, from the project at 50 First Street; at these times, shadow on St. Mary's Square would increase from about 75 percent to 100 percent shadow coverage (see **Figure 65**).

New shadow from potential Plan area buildings would eliminate less than 0.1 percent of the theoretical annual available sunlight from St. Mary's Square, increasing the annual shadow load from approximately 51.9 percent to about 52.0 percent. Under the criteria adopted by the Planning and Recreation and Park Commissions in 1989, St. Mary's Square has an Absolute Cumulative Limit of 0.0 percent, meaning that no additional shadow may be permitted. Therefore, in order for Plan area buildings that would add new shadow to St. Mary's Square to be approved, the Absolute Cumulative Limit would have to be increased—as part of individual building approvals—to approximately 0.09 percent, if all Plan area buildings were to be approved.

Justin Herman Plaza

The only other Proposition K park that would be affected by more than one building in the Plan area would be Justin Herman Plaza. Justin Herman Plaza is also the only Proposition K open space that would be affected at a time of day other than early morning. This park would be shaded by the Transit Tower, the 50 First Street project, and a building at 350 Mission Street developed at the draft Plan's proposed height limit of 700 feet. Justin Herman Plaza would be newly shaded between early November and early February (about 2.5 months in all), from about 1:00 p.m. to 2:40 p.m. New shadow would fall on Justin

[299] As stated in the Project Description, a 375-foot-tall building was approved at this site in 2011. However, the Plan proposes that the height limit on this site be increased to 700 feet.

Maximum Extent of New Shadow on St. Mary's Square - March 15 / September 27, 8:45 a.m.

Maximum Extent of New Shadow on St. Mary's Square - March 15 / September 27, 8:45 a.m.

Net New Shadow | Shadow Outline from New Buildings | Existing Shadow

SOURCE: CADP

Figure 65
Maximum Extent of New Shadow on St. Mary's Square

Herman Plaza for between 15 minutes and 50 minutes per day. The greatest area of new shadow at any one time would be approximately 16,400 square feet (about 10 percent of the total area of Justin Herman Plaza), at 1:15 p.m. in early December and early January, from the Transit Tower; at these times, shadow on Justin Herman Plaza would increase from about 86 percent to about 96 percent shadow coverage (see **Figure 66**).[300]

New shadow from potential Plan area buildings would eliminate about 0.1 percent of the theoretical annual available sunlight from Justin Herman Plaza, increasing the annual shadow load from 37.6 percent to about 37.7 percent. Under the criteria adopted by the Planning and Recreation and Park Commissions in 1989, Justin Herman Plaza has an Absolute Cumulative Limit of 0.1 percent, meaning that one-tenth of one percent of additional shadow may be permitted. However, most of the 0.1 percent increment of new shadow was consumed by the Hotel Vitale, which was approved and constructed at Mission Street and the Embarcadero subsequent to adoption of the shadow criteria in 1989. According to the Final EIR for the Hotel Vitale, that project added approximately 510,544.8 square-foot-hours of shadow to Justin Herman Plaza, representing approximately 92 percent of the allowable new shadow (0.092 percent of potential sunlight), as established in 1989.Therefore, in order for Plan area buildings that would add new shadow to Justin Herman Plaza to be approved, the Absolute Cumulative Limit would have to be increased to approximately 0.2 percent.

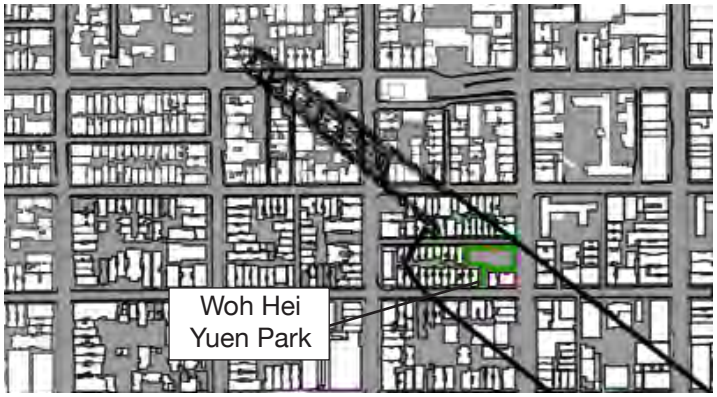
Willie "Woo Woo" Wong Playground

Plan area development would add new shadow to Willie "Woo Woo" Wong Playground (formerly Chinese Playground); this shadow would be cast by a potential 700-foot building on the Golden Gate University site and by a potential 700-foot building on the TJPA's "Parcel F" (on the south side of the Transit Center east of Second Street), and would occur from early November to early December and during January (about 2 months in all), from about 8:00 to 8:20 a.m. New shadow would fall on Willie Wong Playground for about 20 minutes per day. The greatest area of new shadow at any one time would be approximately 4,000 square feet (about 15 percent of the total area of Willie Wong Playground), at 8:15 a.m. in late November and mid-January; at these times, shadow on the playground would increase from about 80 percent to about 97 percent shadow coverage (see **Figure 67**).

New shadow from potential Plan area buildings would eliminate about 0.06 percent of the existing sunlight on an annual basis from Willie Wong Playground (about 0.03 percent of the theoretical annual available sunlight), increasing the annual shadow load only incrementally (from 52.80 percent to about 52.83 percent. Under the criteria adopted by the Planning and Recreation and Park Commissions in 1989, Willie Wong Playground has an Absolute Cumulative Limit of 0.0 percent, meaning that no additional shadow may be permitted. Therefore, in order for Plan area buildings that would add new shadow to

300 As described below under Impact SH-2, the shadow analysis includes shadow potentially cast by the rooftop sculptural element atop the proposed Transit Tower. This element was modeled as a series of discrete vertical columns and horizontal beams, and the shadow from each discrete column and beam was included in the analysis, even though this shadow would, in most cases, not be readily perceptible on the ground.

Maximum Extent of New Shadow on Justin Herman Plaza - January 3 / December 6, 1:15 a.m.



Maximum Extent of New Shadow on Woh Hei Yuen Park - January 31 / November 8, 7:44 a.m. (First Prop. K minute)

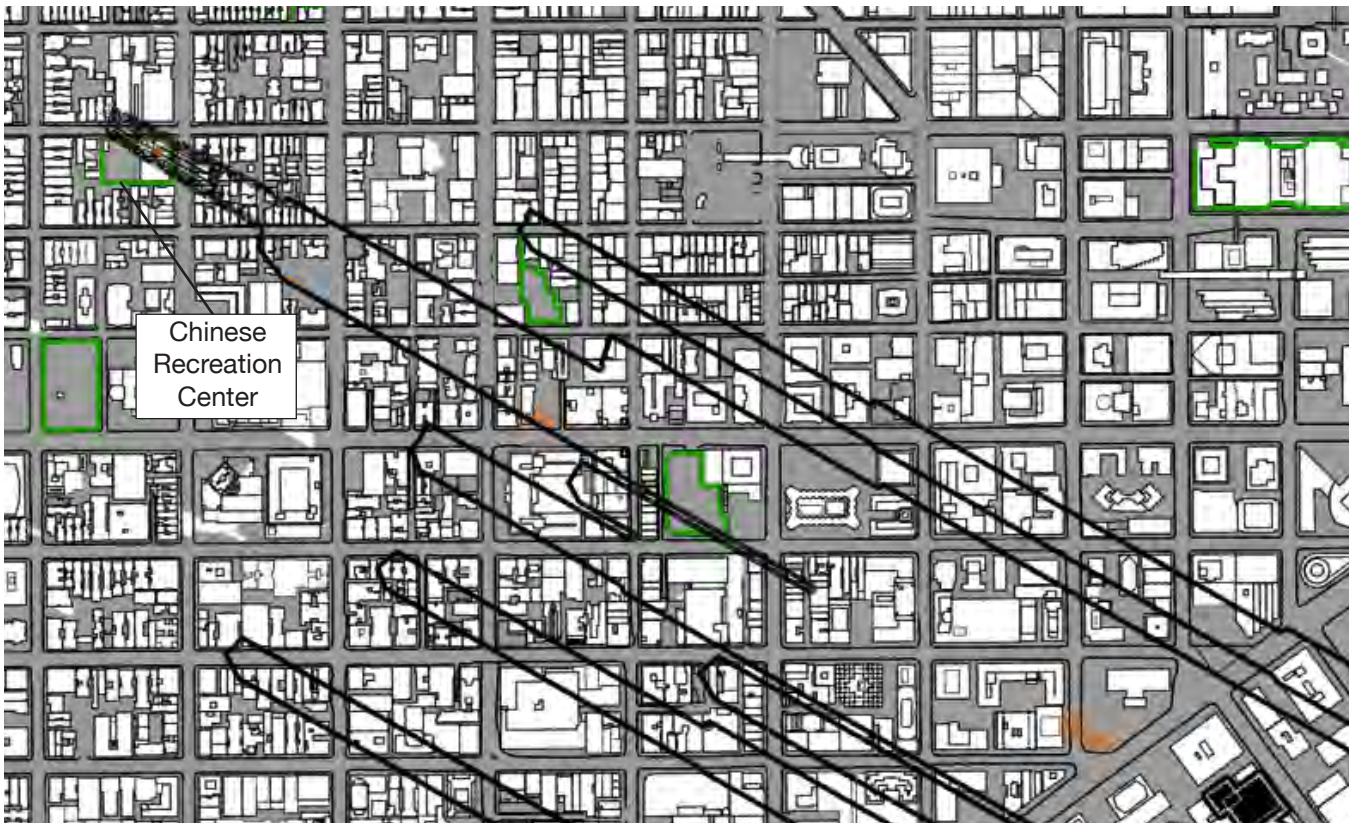
Net New Shadow Shadow Outline from New Buildings Existing Shadow

SOURCE: CADP

Figure 66

Maximum Extent of New Shadow on Justin Herman Plaza and Woh Hei Yuen Park

Maximum Extent of New Shadow on Willie "Woo Woo" Wong Playground - January 10 / November 29, 8:15 a.m.



Maximum Extent of New Shadow on Chinese Recreation Center - February 21 / October 18, 8:23 a.m. (First Prop. K minute)

Net New Shadow Shadow Outline from New Buildings Existing Shadow

SOURCE: CADP

Figure 67
Maximum Extent of New Shadow on Willie "Woo Woo" Wong Playground and Chinese Recreation Center

Willie Wong Playground to be approved, the Absolute Cumulative Limit would have to be increased to approximately 0.03 percent.

Other Section 295 Parks

Development pursuant to the draft Plan would also result in net new shadow falling on Maritime Plaza (about 0.004 percent of theoretical annual available sunlight), Chinese Recreation Center (about 0.008 percent of theoretical annual available sunlight; see Figure 67), Boeddeker Park (about 0.003 percent of theoretical annual available sunlight), and Woh Hei Yuen Recreation Center and Park (about 0.07 percent of theoretical annual available sunlight). The first three of these parks have an Absolute Cumulative Limit of 0.0 percent, meaning that no additional shadow may be permitted; no Absolute Cumulative Limit has been established for Woh Hei Yuen Park, as this facility was developed subsequent to the 1989 action that set these limits for 14 downtown parks. Therefore, in order for Plan area buildings that would add new shadow to Maritime Plaza, Boeddeker Park, Chinese Recreation Center, or Woh Hei Yuen Park to be approved, the Absolute Cumulative Limit would have to be increased to between.003 percent and 0.07 percent, depending on the park. Because only the proposed Transit Tower would shade these parks, those shadows are discussed in detail under impact SH-2, below.

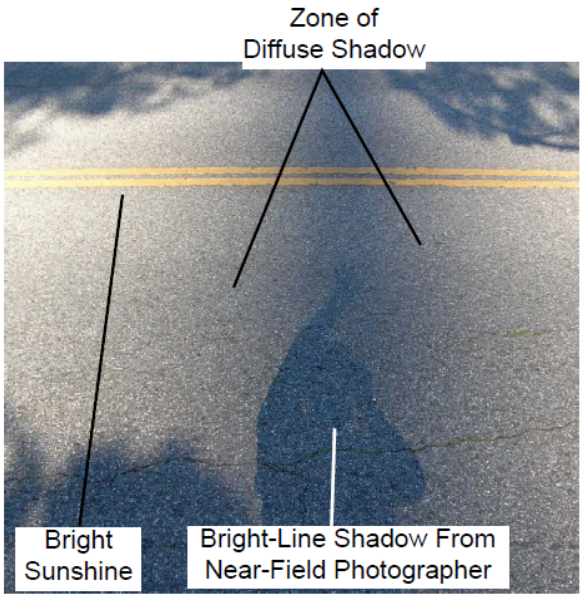
It is important to note that, because of the distance between many of the parks and the buildings whose shadow would fall on the parks, the great majority of new shadow from Plan area buildings on Section 295 parks would not have an edge defined by a clear divide between sunlight and shadow. Instead, the observer would see on the ground an area that would gradually change from fully sunlit to fully shaded, with no evident "edge" do the shadow. The reason for this is that the sun, when observed from earth at any given moment, is seen as a disk that occupies approximately one-half of one degree (0.53 degrees) of a 360-degree circle that represents the sun's orbit around the earth. Because light emanates from the entire surface of the disk, sunlight can "pass around" objects that are occupy less than 0.53 degrees of the sky. For example, a finger held at arm's length is not wide enough to obscure the sun. Accordingly, in the case of a building more than a few hundred feet from a particular park, the edge of the building intercepts only a portion of the sunlight at any given moment, and therefore the shadow from that building is cast as a diffuse "line" on the distant park. **Figure 68** illustrates this phenomenon, depicting shadow cast by Sutro Tower on Marview Way (about 900 feet distant) and by the residential tower at One Rincon Hill onto the corner of Howard and Fremont Streets, approximately 1,500 feet (one-quarter mile) distant. Because the parks that are subject to Section 295 and that would be shaded by Plan area buildings are all at least one-quarter mile from the building that would cast shadow—many are one-third to one-half a mile away, or even more—the actual area than an observer on the ground would see as being shaded would generally be less than is reported above. For this reason, actual effects of shadow as perceived by park users could be less substantial than indicated by the calculations.

For the same reason, individual elements of a building, such as a spire or a small mechanical penthouse, cast no solid shadow on a distant park if they obscure less than the 0.533-degree angle. Thus, at a distance of one-third of a mile (1,750 feet), a 16-foot wide object will cast no discernible shadow at all because, like the finger at arm's length, this object will not obscure the entirety of the sun's disk, and the sun's rays

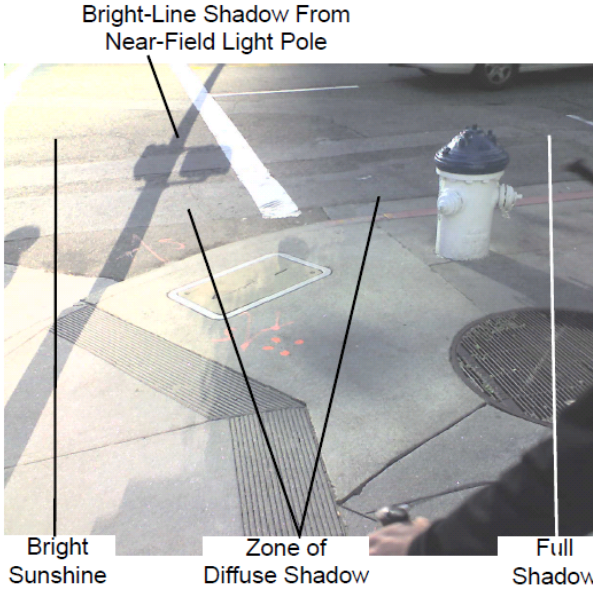
therefore can pass around the object to light the location one-third of a mile distant from the object. This phenomenon is the reasoning behind the decorative sculptural element at the top of the proposed Transit Tower.

Impacts on Use of the Affected Parks

Union Square, because it is in a retail and tourist hotel neighborhood, is generally not heavily used during the early morning hours (before 8:00 a.m.) when much of the new shadow from Plan area buildings would fall on the park. Between 8:00 a.m. and 9:00 a.m., when shadow from the Palace Hotel tower would fall on Union Square, activity is increased, although there is substantially more pedestrian activity on the sidewalks surrounding Union Square at this time than in the park itself, as many people pass Union Square when walking to work and other destinations.



Sutro Tower Shadow on Marview Way (900 feet distant)



One Rincon Hill Shadow at Fremont and Howard Streets (1,500 feet distant)

Figure 68
Diffuse Shadow

Portsmouth Square, at the eastern edge of Chinatown, a very dense residential neighborhood, is relatively heavily used even between 8:00 a.m. and 9:00 a.m., when new shadow from Plan area buildings would fall on the park. Much of the activity in Portsmouth Square at this time of day consists of individuals, many elderly, exercising.

St. Mary's Square, although near the southern edge of Chinatown, is not as heavily used as Portsmouth Square. However, it is used by people exercising in the early morning, when new shadow from Plan area buildings would fall on the park.

Justin Herman Plaza, which would be newly shaded in the early afternoon in late fall and early winter, is heavily used during the midday period by persons traveling to and from the Ferry Building, tourists, street vendors, and lunchtime office workers and strollers.

In general, due to the relatively small area that would be newly shaded and the limited times of the day that would be affected at most parks, shadow from the buildings that could be developed in the Plan area pursuant to the draft Plan would not be likely to result in major changes in usage of the affected parks, such that the use of any of the parks would be dramatically affected. In some cases, such as Portsmouth Square and Justin Herman Plaza, new shadow would be expected to be readily noticeable to park users. However, given that approval of the Plan area buildings would require that the Absolute Cumulative Limit be increased on eight downtown parks, the impact is considered adverse, and this impact would therefore be **significant and unavoidable**, with the Plan-proposed building heights. No mitigation is available for shadow impacts on existing parks, because it not possible to lessen the intensity or otherwise reduce the shadow cast by a building at a given height and bulk. Additionally, it is not normally possible to relocate an existing park or to add park space to existing parks. It is noted, however, that the draft Plan proposes to create or fund the creation of up to 11 acres of new open space (including the City Park atop the Transit Center) and to set aside funds from fees generated by new development in the Plan area to make improvements to parks that would be shaded by Plan area buildings, notably Portsmouth Square and St. Mary's Square. Chapter VI, Alternatives, discusses shadow impacts of alternatives that would reduce building heights from those proposed in the draft Plan.

In terms of shadow effects on sidewalks and open spaces not subject to *Planning Code* Section 295, development pursuant to the draft Plan would result in relatively greater impacts on sidewalks in the Plan area and on nearby non-Section 295 open spaces, compared to impacts on the Section 295 open spaces described above. This is because shadow effects are typically greater for closer-in locations than locations very far away because—assuming existing shadow loads are comparable—closer-in spaces will tend to be shaded for more days and more hours of the year than distant locations.

The non-Section 295 public open space that would be most greatly affected by Plan area development is Rincon Park along the Embarcadero. This open space would be newly shaded in the late afternoon throughout much of the year, except from mid-fall through mid-winter, by the Transit Tower, 181 Fremont, the 50 First Street project, and potential 700-foot buildings at the Golden Gate University site and at 350 Mission Street. Rincon Park is currently in substantial late afternoon shadow, cast primarily by office towers at 201 Spear Street, 2 Harrison Street (the GAP building), and 211 and 221 Main Street, as well as by the parking garage at Howard and Steuart Street and by Hills Plaza. New buildings in the Plan area would add additional shadow between the shadow cast by existing buildings, obscuring some of the existing sunlight. Several Plan area buildings, including the Transit Tower, 50 First Street project, and potential buildings at the Golden Gate University site and 350 Mission Street, would add new shadow to Ferry Plaza in the late afternoon in late fall and early winter. Much of the plaza is already shaded by the Ferry Building at this time; net new shadow would be limited to the southern portion of Ferry Plaza. Portions of Herb Caen Way (the pedestrian promenade along the Embarcadero) would also be shaded by Plan area buildings in the afternoon, year-round, with the precise location, extent, and

duration varying by season. The 50 First Street project and the Transit Tower would each add new shadow to Mechanics Plaza, on the north side of Market Street at Battery Street, in the late morning in spring and fall. None of the Plan area buildings discussed above, including the Transit Tower, would add new shadow to Yerba Buena Gardens during the hours covered by Section 295 (from one hour after sunrise to one hour before sunset), because this open space is too far south of the Plan area building sites. Yerba Buena Gardens would be newly shaded in the early morning by buildings proposed and approved near the southwestern corner of the Plan area, such as the approved building at 222 Second Street and potential buildings at the southeast corner of Second and Howard Streets and on either side of Howard Street near Hawthorne Street.

Development pursuant to the draft Plan would also add new shadow to privately owned, publicly accessible open spaces (POPOS), such as the open spaces at 555 – 575 Market Street, 525 Market Street, 560 Mission Street, 50 Fremont Street (Fremont Center Plaza), 45 Fremont Street, and 50 Beale Street (Bechtel Plaza), as well as Crown Zellerbach Plaza (at One Bush Street) and McKesson Plaza (at one Post Street); this last open space would be shaded during the noon hour in spring and fall by the proposed Palace Hotel Tower. Plan area buildings, including the Transit Tower, would also add new shadow to the planned City Park atop the new Transit Center and to Mission Square, adjacent to the proposed Transit Tower (see Figures 60 through 62).

The only assumed development sites in the Plan area subject to *Planning Code* Section 146(a), which requires that buildings and additions fit within an envelope defined by a plane sloping away from the street at a prescribed angle above a prescribed height, are sites at the southwest corner of Second and Howard Streets, the proposed Palace Hotel tower at New Montgomery and Jessie Streets, and as site on the west side of Second Street between Natoma and Howard Streets. Regarding the first site, an office tower was approved in 2010 at 222 Second Street and, as part of that approval, the Planning Commission granted an exception to the shadow angle requirement of Section 146(a), pursuant to Section 309. The Palace Hotel tower and the other Second Street site would require the granting of similar exceptions if the Planning Commission finds that "the shadow created by the penetration of the plane is deemed insignificant because of the limited extent or duration of the shadow or because of the limited public use of the shadowed space." For all subsequent projects in the Plan area, a determination would have to be made, under Section 146(c), that each building is shaped "so as to reduce substantial shadow impacts on public sidewalks in the C-3 Districts" if this can be done "without creating an unattractive design and without unduly restricting the development potential of the site in question."

Planning Code Section 147 requires that all new development and additions to existing structures where the height exceeds 50 feet must be shaped to minimize shadow on public plazas or other publicly accessible open spaces other than those protected by Section 295, "in accordance with the guidelines of good design and without unduly restricting the development potential of the property." As indicated above and in Figures 60 through 62, Plan area buildings would add new shadow to various POPOS. A separate determination concerning Section 147 compliance would be required to be made for each subsequent project in the Plan area.

Impact SH-2: The proposed Transit Tower would adversely affect the use of various parks under the jurisdiction of the Recreation and Park Department and, potentially, other open spaces. (Significant and Unavoidable)

As stated under Impact SH-1, the proposed 1,070-foot-tall Transit Tower would cast new shadow on eight parks that are governed by Section 295 of the *Planning Code*: Union Square, Portsmouth Square, St. Mary's Square, Justin Herman Plaza, Maritime Plaza, Woh Hei Yuen Recreation Center and Park, Chinese Recreation Center, and Boeddeker Park. **Table 42** summarizes the impacts of the Transit Tower on each of these parks.

To evaluate the year-round Proposition K impact from the Transit Tower, a quantitative analysis of sunlight and shade was conducted for net new shadow. The analysis consisted of calculating the amount of shadow coverage resulting from existing buildings at 15-minute intervals on one day per week, for six months of the year. The shadow coverage at the 15-minute intervals was averaged to calculate hourly shadow coverage (in shadow-foot-hours), and the hourly figures for each day were added and resulting numbers extrapolated to weekly figures through averaging with the preceding week's total. Because the sun's path from January through June essentially mirrors its path from July through December, the six months' shadow-foot-hour totals were doubled to return a yearly figure.[301]

It is noted that the proposed Transit Tower would consist of a 920-foot-tall building with 150-foot-tall sculptural element atop the roof (and a 20-foot-tall mechanical penthouse within the sculptural element, set back from the perimeter of the roof). Because the sculptural element is proposed as a lattice-like structure, the sculptural element would not cast a solid shadow on the ground at distant locations, such as the Section 295 parks included in this analysis. This analysis considers shadow cast by the sculptural element as part of the total building shadow; the sculptural element was included in the shadow model as a series of discrete vertical columns and horizontal beams, as is proposed. As discussed above in Impact SH-1, building components that are narrower than the apparent width of the sun in the sky do not cast actual shadow that can be seen on the ground at distant locations, because the sun's rays pass around the object. Because the sculptural element would consists of a steel lattice with individual columns and beams no more than 2 feet wide, none of the individual steel members would cast discernible shadow on any of the Section 295 parks, and the only actual shadow that would be cast by the 150-foot-tall sculptural element would occur if the sun were to be at an angle relative to the building such that several of the steel members were lined up next to one another, like a closely spaced picket fence. This condition would not be expected to generally arise, except at discrete locations in a park that would be much smaller than the theoretical shadow from the sculptural element, were it to be a solid object. **Figures 63 and 66** illustrate this potential for representative times at Union Square and Justin Herman Plaza. Although these figures depict shadow from the entire sculptural element, the single "strands" of shadow illustrated in the figures are artifacts of the computer modeling program, and would not, under actual conditions, be visible on the ground. Moreover, the drawing program uses lines that appear thicker in the shadow images than the theoretical shadow on the ground. Nevertheless, for purposes of a conservative analysis,

[301] This is the same methodology used by the Planning Department to calculate shadow and establish the Proposition K baseline shadow coverage for other San Francisco parks.

TABLE 42
TRANSIT TOWER SHADOW ON SECTION 295 PARKS

Open Space	Existing Shadow[1]	Permitted Shadow[2]	Project Shadow[3]	Pct. new Shadow[4]	Shadow w/Project[5]	Time/Date of Net New Shadow includes Rooftop Element)	Maximum Shadow Sq. Ft.[6]	Maximum Shadow Percent[7]	Maximum Shadow Date/ Time[8]
Union Square[9]	38.30%	0.1% (0.098%)	47,165 22,935	0.011% 0.005%	38.31% 38.31%	Mid-July – mid-August; May, from approx. 7:30 to 8:00 a.m.	7,565 3,882	6.7% 3.4%	7:45 am, mid-May & early Aug.
St. Mary's Square[10]	51.90%	0.0%	70,928 52,120	0.048% 0.035%	51.95% 51.94%	Mid- September – early October; March – 8:40 - 9:10 a.m.	7,442 6,579	18.8% 16.6%	8:45 am, mid-Mar. & late Sept.
Portsmouth Square	39.00%	0.0%	321,553 277,780	0.133% 0.115%	39.13% 39.12%	Mid-October - early Dec.; early Jan. - mid-Feb. – 8:00 - 8:40 a.m.	22,523 22,523	34.7% 34.7%	8:15 am, late Jan. & early Nov.
Justin Herman Plaza[11]	37.60%	0.1% (0.007%)	277,935 119,665	0.046% 0.020%	37.65% 37.62%	Mid-November - late January – 1:00 - 1:40 p.m.	16,381 8,263	10.1% 5.1%	1:15 pm, early Jan. & early Dec.
Maritime Plaza	68.40%	0.0%	19,110 0	0.004% 0.000%	68.40% 68.40%	Early December – early January, from 10:40 to 11:10 a.m.	2,659 0	1.9% 0.0%	10:45 am, late December
Woh Hei Yuen Park[12]	n/a	n/a	510 510	0.001% 0.001%	n/a n/a	Early November and late January, approximately 7:45 a.m.	275 275	1/9% 1.9%	7:44 am,* late Jan. & early Nov.
Chinese Recreation Ctr.	n/a	0.0%	8,415 0	0.008% 0.000%	n/a n/a	Mid-October and mid-February, approximately 8:25 a.m.	10,386 0	36.5% 0.0%	8:23 am,* late Feb. & mid-Oct.
Boeddeker Park[13]	37.70%	0.244% (0.000%)	3,900 3,900	0.003% 0.003%	37.70% 37.70%	early June – early July, from 6:50 to 7:00 a.m.	1,188 1,188	2.9% 2.9%	6:47 am,* late June

1 Existing Shadow is the existing amount of shadow cast by existing buildings, measured by the percentage of theoretical annual available sunlight (TAAS) that would be available if no existing buildings were present (based on 1989 Planning Department analysis). TAAS is computed by multiplying the area of each park by 3,721.4 (number of hours covered by Sec. 295). n/a – Not Available

2 Permitted Shadow is the additional amount of **net new** shadow allowed (the Absolute Cumulative Limit) under Sec. 295 for each park. This includes any changes that have occurred since 1989. Bottom figure (in parentheses) indicates remaining budget available, if applicable.

3 Project Shadow is the amount of net new shadow, measured in shadow-foot-hours, that would be cast on each park on an annual basis. Top number is entire Transit Tower; bottom number excludes rooftop element.

4 Pct. new Shadow is the percentage of theoretical annual available sunlight (TAAS) that would be lost due to project shadow, on an annual basis. Top number is entire Transit Tower; bottom number excludes rooftop element.

5 Shadow w/Project is the percentage of theoretical annual available sunlight that would be shaded by existing building ***plus*** the proposed project, on an annual basis. Top number is entire Transit Tower; bottom number excludes rooftop element.

6 Sq. Ft. is the greatest amount of each park that would be newly shaded by the proposed project at any one moment. Top number is entire Transit Tower; bottom number excludes rooftop element.

7 Percent Coverage is the percent of each park that would be newly shaded by the proposed project at any one moment. Top number is entire Transit Tower; bottom number excludes rooftop element.

8 Date/Time indicates the date(s) during the year and the time of day when the maximum shadow would fall on each park. Asterisk (*) indicates time is first minute subject to Section 295.

9 The shadow budget remaining within the Absolute Cumulative Limit (ACL) for Union Square has been partially reduced since 1989. In 2004, 69,540 square foot hours was allocated to a project at 690 Market Street, which rehabilitated and expanded the historic De Young (Chronicle) Building, now the Four Seasons Residences, reducing the 0.1 percent budget by 0.02 percent.

10 Existing sunlight and existing shadow coverage for St. Mary's Square, as calculated by the Planning Department, assumed future expansion of this park.

11 The shadow budget remaining within the Absolute Cumulative Limit (ACL) for Justin Herman Plaza has been reduced since 1989, when an ACL for this park was established at 0.1 percent, by the allocation of most of the shadow budget. In 2000, the Planning Commission allocated more than nine-tenths of the available shadow under the 0.1 percent ACL to the Hotel Vitale at Spear and Mission Streets, reducing the remaining available shadow to 0.008 percent of theoretical annual available sunlight. In 2008, the Commission allocated an additional 0.001 percent of the available shadow to a proposed vertical expansion of an office building at 100 California Street (Case No. 2006.0660K), reducing the remaining available shadow to 0.007 percent of theoretical annual available sunlight. This latter project has not been constructed.

12 No Absolute Cumulative Limit has been established for Woh Hei Yuen Park.

13 The Absolute Cumulative Limit (ACL) for Boeddeker Park has been adjusted three times since 1989, to accommodate the Emporium/Bloomingdales project (amendment to the Yerba Buena Center Redevelopment Project, for which the ACL was increased from 0.0%to 0.007%); the Tenderloin Neighborhood Development Center (TNDC) Curran House residential project at 145 Taylor Street (0.087%); and, most recently, in 2009, the TNDC Eddy & Jones Family Housing Project (0.244%). This latter project has not yet been constructed.

SOURCE: San Francisco Planning Department; CADP; Environmental Science Associates

these narrow shadows are considered in the quantitative analysis below. For information, Table 42 also indicates the amount of new shadow that would be cast by the solid portion of the Transit Tower, excluding shadow from the rooftop sculptural element.

As can be seen in Table 42, the quantitative analysis found that the proposed Transit Tower would result in an increase in shadow on the eight affected open spaces of between 0.003 percent and 0.133 percent of the Theoretical Annual Available Sunlight (TAAS). The greatest impact would occur on Portsmouth Square (0.133 percent of TAAS), followed by Woh Hei Yuen Recreation Center and Park (0.073 percent), St. Mary's Square (0.048 percent of TAAS), Justin Herman Plaza (0.046 percent), Union Square (0.011 percent), Chinese Recreation Center (0.008 percent), Maritime Plaza (0.004 percent), and Boeddeker Park (0.003 percent). Approval of the proposed Transit Tower would require that the Absolute Cumulative Limit for seven of these eight parks be increased to accommodate project shadow, in general by the amount of new shadow that would be cast by the Transit Tower.[302] Union Square has sufficient available shadow remaining within its Absolute Cumulative Limit to allow for the shadow from the Transit Tower, although approval would require a finding by the Planning Commission, upon the advice of the Recreation and Park Commission or General Manager, that project shadow would not adversely affect the use of Union Square.

As with the impacts of buildings that could be developed pursuant to the draft Plan, most net new shadow from the Transit Tower would occur in the early morning hours—before 8:45 a.m. at three of the eight parks and before 9:15 a.m. at three others. As with Plan impacts, Justin Herman Plaza would be the only park shaded in the midday period: new shadow from the Transit Tower would fall on Justin Herman Plaza between mid-November and late January, from about 1:00 - 1:40 p.m.[303] The Transit Tower would add new shadow to Maritime Plaza in the late morning—between early December and early January, from about 10:40 to 11:10 a.m.

The greatest one-time effect would be on Portsmouth Square. The Transit Tower would add about 22,500 square feet of shadow, covering about 35 percent of the park, at 8:15 a.m. in early November and late January (see **Figure 64**). The largest impact on Justin Herman Plaza would be about 16,400 square feet (10 percent of the park) in early December and early January (see **Figure 66**), while the largest single area shaded at Union Square and St. Mary's Square would be about 7,500 square feet on each park (see **Figures 63** and **65**). At Union Square, this would represent about 7 percent of the park area, and would occur in early August and mid-May, while at St. Mary's Square, this would amount to about 19 percent of the park, and would occur in late September and mid-March. The Transit Tower would add a small amount of new shadow to Woh Hei Yuen Recreation Center and Park, for about two weeks of the year, in early November and late January, for less than 15 minutes after the "first Proposition K minute"; that is, approximately 7:45 a.m. At these times, the Tower would delay for a few minutes the sunlight beginning

302 Justin Herman Plaza has approximately 0.007 percent of theoretical available annual sunlight remaining to be allocated; thus, the Absolute Cumulative Limit for this par, would have to be increased to 0.167 percent in order for the Transit Tower to be approved.

303 Shadow from the solid portion of the building, excluding the rooftop sculptural element, would occur at generally the same times, but only in December and early January, and for a few minutes less each day.

to fall on this park, casting shadow on the 2 percent of the park that is not then shaded—but only for about 10 minutes (see Figure 66). The maximum one-time shadow on Maritime Plaza and Boeddeker Park would each be less than 3 percent of the parks' areas, and each would be shaded by the Transit Tower for less than one month of the year (see **Figure 69**).

As with the effects of Plan area buildings discussed above in Impact SH-1, shadow from the proposed Transit Tower would not be likely to result in major changes in usage of the affected parks, such that the use of any of the parks would be dramatically affected, because the areas that would be newly shaded would be relatively small at most times of the day and year. However, in many instances, the new shadow would be noticeable to park users. Therefore, given that approval of the Transit Tower would require that the Absolute Cumulative Limit be increased on five downtown parks, the impact of the Transit Tower with respect to shading of Section 295 parks is considered adverse. This impact would be **significant and unavoidable**, with the Transit Tower as proposed, because design solutions would not entirely reduce this impact to a less-than-significant level. Chapter VI, Alternatives, discusses shadow impacts of alternatives that would develop the Transit Tower at a lesser height, which would reduce shadow impacts.

As described above in Impact SH-1, the proposed Transit Tower would add new shadow to Mission Square, which would be adjacent to and east of the Tower. Accordingly, the Transit Tower (and the 181 Fremont Street and 50 First Street projects building to the southeast and northwest, respectively) would shade Mission Square to varying degrees in the late morning and the afternoon throughout the year (see Figures 50-F, 60-H through 60-M, 61-D, 61-G through 61-K, 62-D and 62-E, and 66). (Mission Square is not proposed to be under the jurisdiction of the Recreation and Park Commission, and therefore would not be subject to *Planning Code* Section 295.) The Transit Tower would also add shadow to the planned City Park, atop the Transit Center. However, because the Transit Tower would be northwest of this park, the Tower would shade only the eastern end of City Park (east of the Tower), and only in the late afternoon (see Figures 60-J through 60-M, 61-J, and 61-K). (No shadow from the Transit Tower shadow would fall on City Park in late fall and early winter, when the sun does not move far enough to the north, relative to the earth.)

The Transit Tower would cast new shadow on nearby sidewalks and POPOS, as well. For example, new Tower shadow would fall on the open space at 333 Market Street in the morning in winter (see Figure 62-B); on the open spaces at 525 Market Street and 50 Fremont Street at mid-morning in spring, summer, and fall (see Figures 60-E, 60-F, 61-C, 61-E, 61-F); on the 50 Fremont Street at noon in summer (see Figure 60-G); and on the open spaces at 199 Fremont Street and 301 Howard Street during summer afternoons (see Figure 60-K).

Maximum Extent of New Shadow on Maritime Plaza - December 20, 10:45 a.m.

Maximum Extent of New Shadow on Boeddeker Park- June 21 / September 21, 6:47 a.m. (First Prop. K minute)

Net New Shadow | Shadow Outline from New Buildings | Existing Shadow

SOURCE: CADP

Figure 69
Maximum Extent of New Shadow on Maritime Plaza and Boeddeker Park

Impact C-SH: The draft Plan, including the proposed Transit Tower, would contribute to cumulative new shadow that would adversely affect the use of various parks under the jurisdiction of the Recreation and Park Department and, potentially, other open spaces. (Significant and Unavoidable)

In addition to shadow from development in the Plan area, a 550-foot-tall residential tower is proposed at 706 Mission Street (Case No. 2008.1084E), just west of the Plan area. This tower, which is part of a project that would also rehabilitate the historic Aronson Building at Third and Mission Streets and provide a permanent location for the Mexican Museum, would add new shadow to Union Square. This project would add new shadow to Union Square from mid-October to mid-November, and during the month of February, between about 7:20 a.m. and 9:20 a.m. This shadow would fall on Union Square at different times of the year than shadow from Plan area buildings, due to the fact that the 706 Mission Street project is east of the Plan area. As noted previously in Impact SH-1, the 706 Mission Street project proposes to exhaust the reminder of the 0.1 percent shadow budget for Union Square, and to increase the budget by 0.004 percent. Therefore, in order for the 706 Mission Street project and all Plan area buildings that would add new shadow to Union Square to be approved, the Absolute Cumulative Limit would have to be increased—as part of individual building approvals—to approximately 0.2 percent (subject to variation in individual building designs), if all Plan area buildings and the 706 Mission Street project were to be approved. The draft Plan, in combination with the 706 Mission Street project, would contribute considerably to a significant cumulative shadow impact on Union Square; this impact, as with the draft Plan and Transit Tower, would be **significant and unavoidable**. It is noted that design changes to the building might reduce impacts, but not necessarily to a less-than-significant level.

Mitigation Measures

None available.

Chapter VI, Alternatives, discusses shadow impacts of alternatives that would allow for development of the Transit Tower and other Plan area buildings at lesser heights, which would reduce shadow impacts.