2.2 Air Quality

This section evaluates the regional air quality impacts of implementing the proposed Plan. The analysis focuses on the following criteria pollutants: (1) ground-level ozone precursor emissions, for which the Bay Area is currently designated as a non-attainment area under the national and state standards, (2) particulate matter (PM) emissions, for which the Bay Area is currently designated as non-attainment under the national and state standards; and (3) carbon monoxide emissions, for which the Bay Area is designated as attainment under the national standard. It also evaluates criteria pollutants and Toxic Air Contaminants (TACs) from construction activity and local and regional emissions of TACs and fine particulate matter ($PM_{2.5}$).

This EIR examines these at a regional level. However, for TACs and $PM_{2.5}$ a localized analysis is provided to identify potential public health impacts from locating new sensitive receptors within Transit Priority Project (TPPs) areas. The EIR does not examine the effects on local or regional air quality from specific land use and transportation improvements in the proposed Plan.

The related issues of greenhouse gas emissions and potential climate change effects are addressed separately in *Chapter 2.5: Climate Change and Greenhouse Gases* of this EIR.

Environmental Setting

PHYSICAL SETTING

Air quality is affected by the rate, amount, and location of pollutant emissions, and the associated meteorological conditions that influence pollutant movement and dispersal. Atmospheric conditions, including wind speed, wind direction, and air temperature, in combination with local surface topography (i.e., geographic features such as mountains and valleys), determine the effect of air pollutant emissions on local and regional air quality.

Climate, Meteorology, and Topography

The Bay Area region has a Mediterranean climate characterized by wet winters and dry summers. Rainfall totals can vary widely over a short distance, with windward coastal mountain areas receiving over 40 inches of rain, while leeward areas receive about 15 inches. During rainy periods, horizontal and vertical air movement ensures rapid pollutant dispersal. Rain also washes out particulate and other pollutants.

Normally, air temperatures decrease with increasing elevations. Sometimes this normal pattern is inverted, with warmer air aloft, and cool air trapped near the earth's surface. This phenomenon occurs in all seasons. In summer, especially when wind speeds are very low, a strong inversion will trap air

emissions and high levels of ozone smog can occur. In winter, a strong inversion can trap emissions of particulate and carbon monoxide near the surface, resulting in unhealthful air quality.

The Bay Area topography is complex, consisting of coastal mountain ranges, inland valleys, and bays, which distort normal wind flow patterns. The Pacific Ocean bounds the area to the west with warmer inland valleys to the south and east. The only major break in California's Coast Range occurs at San Francisco Bay. The gap on the western side is called the Golden Gate, and on the eastern side, it is called the Carquinez Strait. These gaps allow air to pass between the Central Valley and the Pacific Ocean. The general region lies in the semi-permanent high-pressure zone of the eastern Pacific, resulting in a mild climate tempered by cool sea breezes with light average wind speeds. The usually mild climatological pattern is interrupted occasionally by periods of extremely hot weather, winter storms, and offshore winds.

Regional wind patterns vary from season to season. During the summer, winds flowing from the northwest are drawn inland through the Golden Gate and over the lower portions of the San Francisco Peninsula. Wind speeds may be strong locally in areas where air is channeled through a narrow opening, such as the Carquinez Strait, Golden Gate or the San Bruno Gap. In the winter, the region frequently experiences stormy conditions with moderate to strong winds, as well as periods of stagnation with very light winds. Winter stagnation episodes are characterized by nighttime drainage flows in coastal valleys. Drainage refers to the reversal of the usual daytime air-flow patterns; air moves from the Central Valley toward the coast.

Wind tends to move from areas of high-pressure to areas of low-pressure. In warmer months, this means that air currents move on-shore from the Pacific Ocean to inland areas. Pacific Ocean air receives emissions from numerous sources (anthropogenic and biogenic) as it comes onshore, and will then carry these pollutants to areas many miles away. Mountains and valleys often affect on-shore winds. This means that a wind pattern that started as northwesterly will often swing 90 degrees or more when it encounters topographic features.

The climatological pollution potential of an area is largely dependent on winds, atmospheric stability, solar radiation, and terrain. The combination of low wind speeds and a strong inversion produces the greatest concentration of air pollutants. On days without inversions, or on days of winds averaging over 15 miles per hour (mph), smog potential is greatly reduced. Because of wind patterns, and, to a lesser degree, the geographic location of emission sources, high ozone levels usually occur in inland valleys, such as the Livermore area. High particulate matter levels can occur in areas of intense motor vehicle use, such as freeways, ports, etc., and in most valley areas where residential wood smoke and other pollutants are trapped by inversions and stagnant air.

Existing Air Quality and Attainment Status Summary

The federal Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 5) for six pollutants considered harmful to public health and the environment. These six pollutants are ground-level ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead (Pb). EPA calls these pollutants "criteria" air pollutants because it regulates them by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels.

Under amendments to the federal Clean Air Act, EPA has classified air basins or portions thereof, as either "attainment" or "nonattainment" for each criteria pollutant, based on whether or not the national standards have been achieved. The California Clean Air Act, patterned after the federal Clean Air Act, also designates areas as "attainment" or "nonattainment" for State standards. Thus, California has two sets of attainment/nonattainment designations: one with respect to national standards and one with respect to State standards.

Table 2.2-1 identifies the ambient air quality standards and attainment status for all criteria pollutants. The Bay Area is currently designated as a nonattainment area for State and federal ozone standards, the federal 24 hour $PM_{2.5}$ standard, and State PM_{10} standards. Based on the nonattainment status of these pollutants, this analysis is focused on ground-level ozone, particulate matter, and carbon monoxide.[1] **Table 2.2-2** presents a ten-year Bay Area air quality summary for days over the national and California standards for ozone, carbon monoxide, and particulate matter. Each of these criteria pollutants is discussed in more detail in the following pages.

[1] In April 1998, the Bay Area was re-designated to attainment for the national 8-hour carbon monoxide standard. However, the Bay Area must continue to demonstrate attainment of that standard. Because of this, the EIR evaluates the carbon monoxide impacts of the proposed Plan.

TABLE 2.2-1: BAY AREA AMBIENT AIR QUALITY STANDARDS AND ATTAINMENT STATUS AS OF 2012

Pollutant	*Averaging Time*	*California Standard[1,2]*	*Attainment Status for California Standard*	*Federal Primary Standard[1,3]*	*Attainment Status for Federal Standard*	*Major Pollutant Sources*
Ozone	8 hour	0.070 ppm	Non-Attainment	0.075 ppm	Non-Attainment	Motor vehicles, other mobile sources, combustion, industrial and commercial processes
	1 hour	0.09 ppm	Non-Attainment			
Carbon Monoxide (CO)	8 hour	9.0 ppm	Attainment	9 ppm	Attainment	Internal combustion engines, primarily gasoline-powered motor vehicles
	1 hour	20 ppm	Attainment	35 ppm	Attainment	
Nitrogen Dioxide (NO_2)	1 hour	0.18 ppm	Attainment	0.100 ppm	Unclassified	Emissions from cars, trucks, and buses
	Annual Arithmetic Mean	0.030 ppm	---	0.053 ppm	Attainment	
Sulfur Dioxide (SO_2)	24 Hour	0.04 ppm	Attainment	0.14 ppm	Attainment	Fossil fuel combustion at power plants and other industrial facilities, and burning of high sulfur containing fuels by locomotives, large ships, and non-road equipment
	1 Hour	0.25 ppm	Attainment	0.075 ppm	Attainment	
	Annual Arithmetic Mean	---	---	0.030 ppm	Attainment	
Particulate Matter (PM_{10})	24 Hour	50 µg/m^3	Non-Attainment	150 µg/m^3	Unclassified	Dust- and fume-producing industrial and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays)
	Annual Arithmetic Mean	20 µg/m^3	Non-Attainment	---	---	
Particulate Matter – Fine ($PM_{2.5}$)	24 Hour	---	---	35 µg/m^3	Non-Attainment	Same as above
	Annual Arithmetic Mean	12 µg/m^3	Non-Attainment	15 µg/m^3	Attainment	

TABLE 2.2-1: BAY AREA AMBIENT AIR QUALITY STANDARDS AND ATTAINMENT STATUS AS OF 2012

Pollutant	*Averaging Time*	*California Standard[1,2]*	*Attainment Status for California Standard*	*Federal Primary Standard[1,3]*	*Attainment Status for Federal Standard*	*Major Pollutant Sources*
Lead[4]	30 day Average	1.5 μg/m^3	---	---	Attainment	Fuels in on-road motor vehicles and industrial sources
	Calendar Quarter	---	---	1.5 μg/m^3	Attainment	
	Rolling 3 Month Average[5]	---	---	0.15 μg/m^3		

Notes:

1. PPM=parts per million; mg/m^3=milligrams per cubic meter; and μg/m^3=micrograms per cubic meter
2. California standards for ozone, CO (except Lake Tahoe), NO_2, SO_2, PM_{10}, $PM_{2.5}$, and visibility reducing particles are values not to be exceeded. All other are not to be equaled or exceeded.
3. National standards (other than ozone, PM, and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 μg/m^3 is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.
4. The California Air Resources Board has identified lead and vinyl chloride as "toxic air contaminants" with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.
5. National lead standard, rolling 3-month average: final rule signed October 15, 2008.

Source: Bay Area Air Quality Management District, 2012; The California Air Resources Board 2011a.

TABLE 2.2-2: TEN-YEAR BAY AREA AIR QUALITY SUMMARY (2002-2011)

Days Over Standard for Ozone, Carbon Monoxide and Particulate Matter (PM)

	Ozone			*Carbon Monoxide*			*PM_{10}*		*$PM_{2.5}$*
	1-Hr	*8-Hr*		*1-Hr*	*8-Hr*		*24-Hr*		*24-Hr*[2]
Year	*Cal*	*Nat*[1]	*Cal*	*Nat*	*Cal*	*Nat/Cal*	*Nat*	*Cal*	*Nat*
2002	16	7	-	0	0	0	0	6	7
2003	19	7	-	0	0	0	0	6	0
2004	7	0	-	0	0	0	0	7	1
2005	9	1	9	0	0	0	0	6	0
2006	18	12	22	0	0	0	0	15	10
2007	4	1	9	0	0	0	0	4	14
2008	9	12	20	0	0	0	0	5	12
2009	11	8	13	0	0	0	0	1	11
2010	8	9	11	0	0	0	0	2	6
2011	-	4	10	0	0	0	0	4	8

Notes:

1. On May 17, 2008, the U.S. EPA implemented a more stringent national 8-hour ozone standard, revising it from 0.08 ppm to 0.075 ppm. Ozone exceedance days for 2008 reflect the new standard.
2. On December 17, 2006, the U.S. EPA implemented a more stringent national 24-hour $PM_{2.5}$ standard—revising it from 65 µg/m^3 to 35 µg/m^3. Starting in 2006, $PM_{2.5}$ exceedance days reflect the new standard.

Nat = National, Cal =California

Source: Bay Area Air Quality Management District, 2010.

Ozone

Ozone is a reactive pollutant, which is not emitted directly into the atmosphere, but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving reactive organic gases (ROG) and oxides of nitrogen (NO_x). ROG and NO_x are known as precursor compounds of ozone. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of ROG and NO_x that help to form ozone. Ozone is a regional air pollutant because it is formed downwind of sources of ROG and NO_x under the influence of wind and sunlight. During summertime (particularly on hot, sunny days with little or no wind), ozone levels are at their highest.

Short-term exposure to elevated concentrations of ozone is linked to such health effects as eye irritation and breathing difficulties. Repeated exposure to ozone can make people more susceptible to respiratory infections and aggravate pre-existing respiratory diseases. Long-term exposures to ozone can cause more serious respiratory illnesses. Ozone also damages trees and other natural vegetation, reduces agricultural productivity, and causes deterioration of building materials, surface coatings, rubber, plastic products and textiles.

Tables 2.2-3 and **2.2-4** show exceedances of the State one-hour ozone standard and national eight-hour ozone standard, respectively. The number of days the region experiences unhealthy ozone levels has fallen overall. This improvement is due to the California Air Resources Board (ARB) regulations affecting motor vehicle emissions and Bay Area Air Quality Management District (BAAQMD) regulations to reduce emissions from industrial and commercial sources.

TABLE 2.2-3: DAYS EXCEEDING THE CALIFORNIA 1-HOUR OZONE STANDARD (1998-2010)

Stations by Sub-Region	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Northern													
Benicia	--	--	--	--	--	--	--	--	--	0	2	--	--
Napa	3	4	0	1	1	2	0	0	1	0	1	1	1
San Rafael	0	2	0	0	0	0	0	0	0	0	0	0	0
Santa Rosa	0	1	0	0	0	1	0	0	0	0	0	0	0
Vallejo	3	4	0	0	1	2	1	0	0	0	1	2	0
Central													
Hayward	4	4	1	2	0	3	0	0	2	0	1	4	--
Oakland	0	0	0	0	0	0	0	0	--	--	0	0	1
Redwood City	0	0	0	1	0	1	1	0	0	0	0	0	2
San Francisco	0	0	0	0	0	0	0	0	0	0	0	0	0
San Leandro	2	3	1	0	1	2	1	1	0	0	0	--	--
Richmond/San Pablo	0	1	0	0	0	0	1	0	0	0	0	0	1
Eastern													
Bethel Island	10	5	1	3	5	0	1	0	9	0	4	2	3
Concord	13	8	2	6	5	5	1	1	8	1	3	2	2
Fairfield	9	9	1	3	4	0	1	0	3	0	2	2	1
Livermore	21	14	7	9	10	10	5	6	13	2	5	8	3
Pittsburg	4	2	1	2	4	0	0	0	3	1	1	--	--
Southern													
Fremont	7	3	2	3	3	4	0	1	4	0	1	4	1
Los Gatos	5	4	0	2	4	7	0	3	7	0	2	3	2
Mountain View/ Sunnyvale	2	7	--	0	0	4	1	1	3	0	0	--	--
San José Central	4	3	0	2	--	4	0	1	5	0	1	0	5
San José East	5	2	1	0	0	2	0	1	--	--	--	--	--
Gilroy	10	3	--	3	6	6	0	0	4	0	1	1	0
San Martin	15	7	4	7	8	9	0	2	7	1	2	4	2

Source: Bay Area Air Quality Management District, 2010.

TABLE 2.2-4: DAYS EXCEEDING THE NATIONAL 8-HOUR OZONE STANDARD (1998-2010)

Stations by Sub-Region	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*	*2007*	*2008*	*2009*	*2010*
Northern													
Benicia	--	--	--	--	--	--	--	--	--	0	--	--	--
Napa	1	1	0	0	0	0	0	0	0	0	2	1	2
San Rafael	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Rosa	0	0	0	0	0	0	0	0	0	0	0	0	0
Vallejo	0	1	0	0	0	0	0	0	0	0	0	0	1
Central													
Hayward	0	1	0	1	0	1	0	--	0	0	1	3	--
Oakland	0	0	0	0	0	0	0	0	--	--	0	0	0
Redwood City	0	0	0	0	0	0	0	0	0	0	0	0	1
San Francisco	0	0	0	0	0	0	0	0	0	0	0	0	0
San Leandro	0	0	0	0	0	0	0	0	0	0	--	--	--
Richmond/San Pablo	0	0	0	0	0	0	0	0	0	0	0	--	1
Eastern													
Bethel Island	5	5	1	2	3	0	0	0	1	0	4	3	4
Concord	6	6	1	1	3	1	0	0	4	0	6	2	1
Fairfield	3	4	0	0	0	0	0	0	1	0	1	2	2
Livermore	10	5	2	2	6	3	0	1	5	1	6	6	3
Pittsburg	1	1	0	1	2	0	0	0	1	0	1	--	--
Southern													
Fremont	0	1	0	0	0	1	0	0	0	0	1	0	1
Los Gatos	2	1	0	1	2	2	0	1	4	0	2	4	2
Mountain View/Sunnyvale	0	1	--	0	0	2	0	0	0	0	1	--	--
San José Central	1	0	0	0	--	0	0	0	1	0	2	0	3
San José East	0	0	0	0	0	0	0	0	--	--	--	--	--
Gilroy	4	0	--	2	2	2	0	0	2	0	1	2	5
San Martin	6	3	1	2	5	4	0	0	5	0	2	5	5

Source: Bay Area Air Quality Management District, 2010.

Carbon Monoxide

Carbon monoxide (CO) is an odorless and invisible gas. It is a non-reactive pollutant that is a product of incomplete combustion of gasoline in automobile engines. Carbon monoxide is a localized pollutant, and the highest concentrations are found near the source. Ambient carbon monoxide concentrations generally follow the spatial and temporal distributions of vehicular traffic and are influenced by wind speed and atmospheric mixing. Carbon monoxide concentrations are highest in flat areas on still winter nights, when temperature inversions trap the carbon monoxide near the ground. When inhaled at high

concentrations, carbon monoxide reduces the oxygen-carrying capacity of the blood, which, in turn, results in reduced oxygen reaching parts of the body. Most of the Bay Area's carbon monoxide comes from on-road motor vehicles, although a substantial amount also comes from burning wood in fireplaces. Over the past 10 years, the Bay Area has not experienced any exceedances of either the national or state carbon monoxide standard.

Particulate Matter

Particulate matter includes dirt, dust, soot, smoke and liquid droplets found in the air. Coarse particulate matter, or PM_{10}, refers to particles less than or equal to 10 microns in diameter (about one-seventh the diameter of a human hair). PM_{10} is primarily composed of large particles from sources such as road dust, residential wood burning, construction/demolition activities, and emissions from on- and off-road engines. Some sources of particulate matter, such as demolition and construction activities, are more local in nature, while others, such as vehicular traffic, have a more regional effect. Fine particulate matter, or $PM_{2.5}$, refers to particles less than or equal to 2.5 microns in diameter, and contains particles formed in the air from primary gaseous emissions. Examples include sulfates formed from SO_2 emissions from power plants and industrial facilities, nitrates formed from NO_x emissions from power plants, automobiles, and other combustion sources, and carbon formed from organic gas emissions from automobiles and industrial facilities.

The Bay Area experiences its highest particulate matter concentrations in the winter, especially during evening and night hours, due to the cool temperatures, low-wind speeds, low inversion layers, and high humidity. Specifically, $PM_{2.5}$ is viewed as a significant component of the region's total particulate matter problem because the $PM_{2.5}$ fraction of total particulate matter accounts for approximately 60 percent of the PM_{10} during the winter and approximately 45 percent during the rest of the year. On days when the PM standards are exceeded, $PM_{2.5}$ can account for as much as 90 percent of PM_{10}.

Coarse and fine particulate matters are small enough to get into the lungs and can cause numerous health problems, including respiratory conditions such as asthma and bronchitis, and heart and lung disease. People with heart or lung disease, the elderly, and children are at highest risk from exposure to particulate matter.

Toxic Air Contaminants

The California Health and Safety Code defines toxic air contaminants (TACs) as air pollutants that may cause or contribute to an increase in mortality or in serious illness, or that may pose a present or potential hazard to human health. TACs are less pervasive in the urban atmosphere than criteria air pollutants, but are linked to short-term (acute) or long-term (chronic and/or carcinogenic) adverse human health effects. For evaluation purposes, TACs are separated into carcinogens and non-carcinogens based on the nature of the physiological effects associated with exposure to TACs. Carcinogens are assumed to have no safe threshold below which health impacts would not occur. Cancer risk from carcinogens is expressed as excess cancer cases per one million exposed individuals, typically over a lifetime of exposure. Non-carcinogens differ in that there is a safe level in which it is generally assumed that no negative health impacts would occur. These levels are determined on a pollutant-by-pollutant basis.

There are many different types of TACs with varying degrees of toxicity. TACs may also exist as particulate matter or as vapors or gases. Sources of TACs include industrial processes, commercial operations (e.g., gasoline stations and dry cleaners), and motor vehicle exhaust—particularly diesel-

powered vehicles. Compared to other air toxics that ARB has identified and controlled, diesel particulate matter (diesel PM) emissions are estimated to be responsible for about 70 percent of the total ambient air toxics risk statewide.

The three most potent carcinogens come primarily from motor vehicles—diesel PM overall, and 1,3-butadiene and benzene as specific components of diesel PM. Cleaner motor vehicles and fuels are reducing the risks from these three priority toxic air pollutants. The remaining toxic air pollutants, such as hexavalent chromium and perchloroethylene, while not appearing to contribute as much to the overall risks, can present high risks to people living close to a source due to the highly localized concentration of TACs. ARB has control measures for motor vehicles, consumer products, and industrial source programs either already on the books, in development, or under evaluation for most TACs.

Health risks from diesel PM are highest in areas of concentrated emissions, such as near ports, rail yards, freeways, or warehouse distribution centers. According to the ARB, diesel engine emissions are responsible for the majority of California's known cancer risk from outdoor air pollutants. Those most vulnerable are children whose lungs are still developing and the elderly who may have other serious health problems. Based on numerous studies, ARB has also stated that diesel PM is a contributing factor for premature death from heart and/or lung diseases. In addition, diesel PM reduces visibility and is a strong absorber of solar radiation that contributes to global warming.[2]

According to the ARB, levels of toxic air pollutants have decreased significantly with the adoption of airborne toxic control measures, stringent vehicle standards, requirements for low emission vehicles, and cleaner fuels. Since 1980, there has been a statewide reduction of 98 percent in lead, and since 1990, there has been a statewide reduction of 85 percent in benzene 80 percent in 1,3-butadiene, 75 percent in hexavalent chromium, and 50 percent in diesel PM. The estimated cancer risk from TACs, measured statewide, has been reduced by 60 percent since 1990.[3]

To address community risk from air toxics, BAAQMD initiated the Community Air Risk Evaluation (CARE) program in 2004 to evaluate and reduce health risks associated with exposure to outdoor TACs. The program examines TAC emissions from point sources, area sources and on-road and off-road mobile sources co-located with sensitive populations to help focus mitigation strategies. In fiscal year 2012 alone, the BAAQMD allocated over $60 million to fund diesel emission reduction projects in CARE communities. Some of the projects funded included replacing or retrofitting on and off road heavy duty trucks; installation of shore side electric power at 11 berths at the Port of Oakland to reduce ship emissions; and to replace a locomotive operating at the rail yard in Richmond.

Based on annual emissions inventory of TACs prepared through the CARE program, TAC emissions from all sources in the Bay Area region were estimated to be 115 tons per day for 2005. The largest single source of daily average TAC emissions was on-road mobile sources, accounting for 38 percent. Diesel PM emissions constitute about 86 percent of cancer toxicity-weighted pollutants emitted in the region.

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[2] See ARB's fact sheet entitled "Health Effects of Diesel Exhaust Particulate Matter found at http://www.arb.ca.gov/research/diesel/dpm_draft_3-01-06.pdf.

[3] ARB, The California Almanac of Emissions and Air Quality, 2009 Edition.

The largest single sources of diesel PM in the Bay Area region include the Port of Oakland, refineries, and rail yards.

REGULATORY SETTING

Air quality is regulated at the federal, state, and regional levels. The following subsection summarizes the applicable air quality regulations and regulatory agencies.

Federal Regulations

Federal Clean Air Act

The federal Clean Air Act (CAA) of 1970, amended in 1977 and 1990 (42 USC 7506(c)), was enacted for the purposes of protecting and enhancing the nation's air resources to benefit public health. In 1971, the CAA required the EPA to set NAAQS to achieve the purposes of Section 109 of the act. The NAAQS require that certain pollutants should not exceed specified levels; areas that exceed the standard for specified pollutants are designated as "nonattainment" areas. In promulgating the NAAQs, the EPA allowed some states the option to develop stricter state standards. As such, California has adopted its own set of stricter standards under the California Clean Air Act (CCAA) of 1988 (described under State Regulations).

The federal CAA requires states to develop State Implementation Plans (SIPs) that outline how each state will control air pollution under the CAA. A SIP includes the regulations, programs and policies that a state will use to clean up polluted areas. States must hold public hearings and provide opportunities for the public and industries to be involved and comment on the development of each state plan. The Bay Area's latest SIP is the *2001 Ozone Attainment Plan*, which demonstrates how the region is addressing the national 1-hour ozone standard.

1990 Amendments to Clean Air Act

The 1990 Amendments to the CAA included a provision to address air toxics. Under Title III of the CAA, EPA establishes and enforces National Emission Standards for Hazardous Air Pollutants (NESHAPs), which are nationally uniform standards oriented towards controlling particular hazardous air pollutants (HAPs). Section 112(b) of the CAA identifies 189 "Air Toxics" (hazardous air pollutants), directs EPA to identify sources of the 189 pollutants, and establishes a 10-year time period for EPA to issue technology-based emissions standards for each source category. Title III of the CAA provides for a second phase under which EPA is to assess residual risk after the implementation of the first phase of standards and impose new standards, when appropriate, to protect public health.

Federal Transportation Conformity Requirements

Transportation conformity is required under the CAA section 176(c) to ensure that federally supported highway and transportation project activities are consistent with ("conform to") the purpose and requirements of the SIP. Conformity currently applies to areas that are designated nonattainment, and those re-designated to attainment after 1990 ("maintenance areas") for the following transportation-related criteria pollutants: ozone, $PM_{2.5}$ and PM_{10}, CO, and NO_x. Conformity, to the purpose of the SIP, means that transportation activities will not cause new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS. Conformity is demonstrated by showing that the total

air pollutant emissions projected for a RTP/SCS are within the emissions limits ("budgets") established by the SIP.

Conformity requires demonstration that transportation control measures (TCMs) in ozone nonattainment areas are implemented in a timely fashion. TCMs are expected to be given funding priority and to be implemented on schedule and, in the case of any delays, any obstacles to implementation have been or are being overcome. A total of 33 TCMs have been fully implemented since the 1982 Bay Area Air Quality Plan; 12 TCMs were originally listed in the 1982 Bay Area Air Quality Plan, 16 additional TCMs were adopted by MTC in February 1990 in response to a 1990 lawsuit in the federal District Court to bring the region back on the "Reasonable Further Progress" track, and five TCMs were adopted as part of the 2001 1-Hour Ozone Attainment Plan. These TCMs include strategies such as improved transit service and transit coordination, ridesharing services and new carpool lanes, signal timing, freeway incident management, and increased gas taxes and bridge tolls to encourage use of alternatives modes.

MTC must make a determination that the proposed Plan conforms to the SIP and is consistent with the applicable air quality attainment plans. The transportation conformity analysis and findings prepared by MTC for the proposed Plan are addressed in a separate process from the Plan Bay Area environmental review process, and are included as a Supplemental Report to Plan Bay Area that is available for review at www.onebayarea.org.

State Regulations

California Clean Air Act

The California Clean Air Act (CCAA) of 1988 requires nonattainment areas to achieve and maintain the state ambient air quality standards by the earliest practicable date and local air districts to develop plans for attaining the state ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide standards. The ARB sets the state ambient air quality standards.

Under the CCAA, areas not in compliance with the standard must prepare plans to reduce ozone. Non-compliance with the state ozone standard does not impact the ability to proceed with any transportation plan, program, or project. The first Bay Area Clean Air Plan (CAP) was adopted in 1991, and updates to the CAP have occurred since then, with the most recent being the *Bay Area 2010 Clean Air Plan*. The Bay Area 2010 CAP provides "all feasible measures" to reduce ozone in the Bay Area.

Senate Bill 656 (Chapter 738, Statues of 2003)

In 2003, the Legislature enacted Senate Bill (SB) 656 (Chapter 738, Statutes of 2003), codified as Health and Safety Code Section 39614, to reduce public exposure to PM_{10} and $PM_{2.5}$. SB 656 requires ARB, in consultation with local air pollution control and air quality management districts (air districts), to develop and adopt, by January 1, 2005, a list of the most readily available, feasible, and cost-effective control measures that could be employed by ARB and the air districts to reduce PM_{10} and $PM_{2.5}$ (collectively referred to as PM). The legislation establishes a process for achieving near-term reductions in PM throughout California ahead of federally required deadlines for $PM_{2.5}$, and provides new direction on PM reductions in those areas not subject to federal requirements for PM. Measures adopted as part of SB 656 will complement and support those required for federal $PM_{2.5}$ attainment plans, as well as for State ozone plans. This will ensure continuing focus on PM reduction and progress towards attaining California's more health protective standards. This list of air district control measures was adopted by the ARB on

November 18, 2004. ARB also developed a list of State PM control measures for mobile and stationary sources, including measures planned for adoption as part of ARB's Diesel Risk Reduction Plan. The lists are at the following web site: http://www.arb.ca.gov/pm/pmmeasures/pmmeasures.htm.

To comply with SB 656, BAAQMD reviewed the list of 103 potential PM control measures prepared by ARB and developed a Particulate Matter Implementation Schedule which was adopted by BAAQMD in November 2005.[4] As a result, the BAAQMD adopted or amended existing rules to reduce particulate matter from internal combustion engines, chain driven commercial broiling, and residential woodburning and expanded its public awareness program.

Toxic Air Contaminant Identification and Control Act of 1983

Under the Toxic Air Contaminant Identification and Control Act of 1983 (Assembly Bill (AB) 1807, Chapter 1047, Statues of 1983), the California Legislature created a two-step identification and risk management program to reduce the risk of health effects from air toxic substances. During the first step (identification), the ARB and the Office of Environmental Health Hazard Assessment (OEHHA) determines if a substance should be formally identified as a toxic air contaminant (TAC) in California. During the second step (risk management), the ARB reviews the emission sources of an identified TAC to determine if any regulatory action is necessary to reduce the risk. The analysis includes a review of controls already in place, the available technologies and associated costs for reducing emissions, and the associated risk. Conducting public outreach is essential during the development of a control plan and any control measure to ensure that the ARB efforts are cost-effective and appropriately balance public health protection and economic growth.

In 1993, AB 1807 was amended to include the identification and control of additional TACs. Specifically, AB 2728 required the ARB to identify the 189 federal hazardous air pollutants as TACs. For substances that have not previously been identified under AB 1807, but were subsequently identified under AB 2728, health effects values will need to be developed.

Assembly Bill 2588 Air Toxics "Hot Spots" Information and Assessment Act of 1987

In September 1987, the California Legislature established the Air Toxics "Hot Spots" Information and Assessment Act of 1987, Assembly Bill (AB) 2588 (Health and Safety Code Sections 44300-44394). It requires facilities to report their air toxics emissions, ascertain health risks, and to notify nearby residents of significant risks. The emissions inventory and risk assessment information from this program has been incorporated into this report. In September 1992, the "Hot Spots" Act was amended by Senate Bill 1731 which required facilities that pose a significant health risk to the community to reduce their risk through a risk management plan.

Diesel Risk Reduction Plan

In August 1998, the ARB identified particulate emissions from diesel-fueled engines (diesel PM) as toxic air contaminants, based on data linking diesel PM emissions to increased risks of lung cancer and respiratory disease. Following the identification process, the ARB was required by law to determine if

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[4] http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/Particulate%20Matter/sb656_staff_report.ashx.

there is a need for further control, which led to creation of the Diesel Advisory Committee to assist in the development of a risk management guidance document and risk reduction plan. In September 2000, the ARB adopted the Diesel Risk Reduction Plan, which recommends control measures to reduce the risks associated with diesel PM and achieve a goal of 75 percent diesel PM reduction by 2010 and 85 percent by 2020.

Specific statewide regulations designed to further reduce diesel PM emissions from diesel-fueled engines and vehicles will be evaluated and developed. The goal of these regulations is to make diesel engines as clean as possible by establishing state-of-the-art technology requirements or emission standards to reduce diesel PM emissions.

California Health and Safety

Under the California Health and Safety Code, Division 26 (Air Resources), the ARB is authorized to adopt regulations to protect public health and the environment through the reduction of TACs and other air pollutants with adverse health effects. As such, the ARB has promulgated several mobile and stationary source airborne toxic control measures (ATCMs). For instance, effective as of July 2003, ARB approved an ATCM that limits school bus idling and idling at or near schools to only when necessary for safety or operational concerns (13 CCR Chapter 10 Section 2480). This ATCM is intended to reduce diesel PM and other TACs and air pollutants from heavy-duty motor vehicle exhaust. It applies to school buses, transit buses, school activity buses, youth buses, general public paratransit vehicles, and other commercial motor vehicles. This ATCM focuses on reducing public exposure to diesel PM and other TACs, particularly for children riding in and playing near school buses and other commercial motor vehicles, who are disproportionately exposed to pollutants from these sources. In addition, effective February 2005, the ARB approved an ATCM to limit the idling of diesel-fueled commercial motor vehicles with gross vehicular weight ratings of greater than 10,000 pounds, regardless of the state or country in which the vehicle is registered (13 CCR Chapter 10 Section 2485).

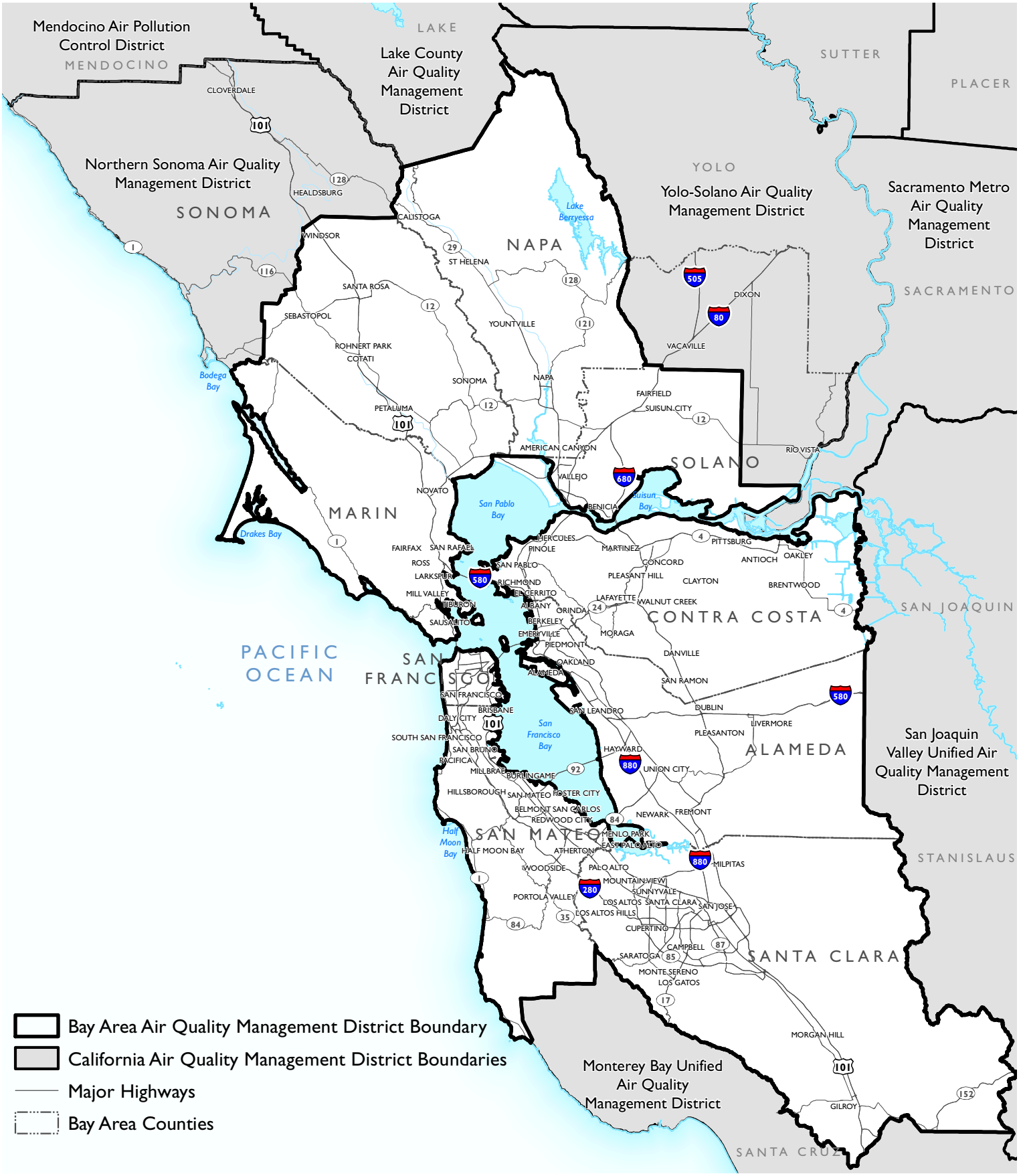
Regional Regulations

Air District Boundaries

The nine-county MTC region encompasses three air basins: the San Francisco Bay Air Basin in its entirety, portions of the North Coast Air Basin, and portions of the Sacramento Valley Air Basin. Northern Sonoma County is located within the North Coast Air Basin, and eastern Solano County is located within the Sacramento Valley Air Basin (the remaining areas not located within those air basins are located within the San Francisco Bay Air Basin). BAAQMD governs the San Francisco Bay Air District, the Northern Sonoma County Air Pollution Control District (NSCAPCD) governs the North Coast Air Basin, and the Yolo-Solano Air Pollution Control District (YSAPCD) governs the Sacramento Valley Air Basin. The geographic boundaries of these three air basins and air districts are shown in **Figure 2.2-1**. Each air pollution control district is responsible for attaining and maintaining air quality standards and undertakes a variety of activities, including: adopting and enforcing rules and regulations, issuing permits for stationary sources of air pollution, inspecting stationary sources of air pollution, responding to citizen inquiries and complaints, monitoring ambient air quality and meteorological conditions, administering incentives-based programs to reduce motor vehicle emissions, and conducting public education campaigns. In California, air pollution control districts generally follow county boundaries; in the more urban areas, county agencies were merged by State legislation into unified air quality management districts.

Figure 2.2-1

Air Basin Boundaries



Data Source: Air Resource Board, California Environmental Protection Agency, 2012; Metropolitan Transportation Commission, 2012; Cal-Atlas Geospatial Clearinghouse, 2012; Tom Tom North America, 2011; Dyett & Bhatia, 2012.

0 5 10 20 Miles

1 in = 16 miles

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Impact Analysis

IMPACT SIGNIFICANCE CRITERIA

Implementation of the proposed Plan would have a potentially significant adverse impact if it would:

Criterion 1: Conflict with or obstruct implementation of an applicable air quality plan, including: (a) the primary goals; (b) applicable control measures; or (c) implementation of any control measures.

Criterion 2: Cause a substantial net increase in construction-related emissions.

Criterion 3: Cause a net increase of emissions of criteria pollutants from on-road mobile sources compared to existing conditions, including: (a) ROG, NO_x, CO, and $PM_{2.5}$; or (b) PM_{10}.

Criterion 4: Cause a cumulative net increase in emissions of diesel PM, 1,3-butadiene, and benzene (TACs) from on-road mobile sources compared to existing conditions.

Criterion 5: Cause a localized net increase in sensitive receptors located in Transit Priority Project (TPP) corridors where: (a) TACs or fine particulate matter ($PM_{2.5}$) concentrations result in a cancer risk greater than 100/million or a concentration of $PM_{2.5}$ greater than 0.8 $\mu g/m^3$ of $PM_{2.5}$; or (b) sensitive receptors are located within set distances (**Table 2.2-10**) to mobile or stationary sources of TAC or $PM_{2.5}$ emissions; or (c) TACs or fine particulate matter ($PM_{2.5}$) concentrations result in noncompliance with an adopted Community Risk Reduction Plan.

Criterion 6: Cause a localized larger increase or smaller decrease of TACs and or $PM_{2.5}$ emissions in disproportionally impacted communities compared to the remainder of the Bay Area communities.

METHOD OF ANALYSIS

Consistency with Air Quality Plans

The EIR includes a qualitative assessment to evaluate whether the proposed Plan's transportation investments and land development pattern will result in any inconsistencies with BAAQMD's 2010 Clean Air Plan (2010 CAP) or the 2001 State Implementation Plan (SIP) for ozone.

A more detailed analysis related to consistency with the 2001 SIP is addressed in the required federal transportation conformity analysis and findings prepared by MTC, which is being prepared separately from the environmental review process for Plan Bay Area, and will be included as a Supplemental Report to Plan Bay Area and can be found at www.onebayarea.org.

Construction-Related Emissions

Construction emissions can vary depending on the level of activity, the specific operations taking place, the equipment being operated, local soil conditions, weather conditions, and other factors. A qualitative

analysis of potential local and regional air quality impacts from construction activity associated with proposed Plan investments was conducted. The qualitative analysis is based on dispersion modeling that has been completed for representative construction projects. At the program level of analysis, it is not possible to quantify the amount of emissions expected from implementation of the transportation projects or land use development that would be consistent with the proposed Plan. However, the overall impact on local and regional air quality from any one project or all of the projects combined will be primarily dependent on the number of pieces and age of diesel powered equipment operating daily and the duration of their operation at the construction site or in the region. Should implementing agencies adopt feasible mitigation measures for each construction project resulting from the proposed Plan, impacts associated with construction activity on local and regional air quality will be less than significant. Therefore, this analysis identifies the measures, or best management practices (BMPs), that must be implemented for an individual construction project to have less than significant impacts.

Motor Vehicle Emissions

MTC's travel demand forecasting models produce forecasts of travel behavior and vehicle activity. These models have been extensively reviewed by federal and State agencies and refined in connection with their application to air quality analyses of various kinds. Key model outputs for use in air quality analyses include: total daily vehicle trips, vehicle miles of travel (VMT), and distribution of vehicle miles of travel by speed. This information was then used to determine total emissions from transportation activity in the Bay Area using motor vehicle emissions models developed and maintained by the ARB.

Table 2.2-5 provides the core 2040 travel activity data used to calculate regional motor vehicle emissions. Between 2010 and 2040, the Bay Area is projected to add about 2.1 million people (30 percent increase) and 1.1 million jobs (33 percent increase). Based on expected future growth, MTC and ABAG estimate that the total vehicles miles traveled will increase by 20 percent, which means that VMT is growing at a slower rate compared to population growth and job growth in the region. This can be attributed to the focused land use pattern and investment in transit and roadway projects in the proposed Plan.

TABLE 2.2-5: TRAVEL DATA

	2010	*2040 Plan*	*Change 2010 to 2040 Plan*	
			Numerical	*Percent*
Vehicles in Use	4,608,722	5,463,760	855,038	19%
Daily Vehicle Miles Traveled (VMT)	163,903,095	196,927,122	33,024,027	20%
Engine Starts	30,834,375	36,362,648	5,528,273	18%
Total Population	**7,091,000**	**9,196,000**	**2,105,000**	**30%**
Total Employment	**3,385,000**	**4,505,000**	**1,120,000**	**33%**

Source: Metropolitan Transportation Commission, 2012.

ARB's latest emissions inventory model that calculates emissions for motor vehicles operating on roads in California is EMFAC2011. Emission estimates of on-road vehicle emissions include consideration of the fleet mix (vehicle type, model year, and accumulated mileage); miles traveled; ambient temperatures; vehicle speeds; and vehicle emission factors, as developed from Smog Check data, Caltrans vehicle counts, and ARB testing programs. The model also incorporates the effects of recent diesel regulations including ARB's truck and bus rules; and greenhouse gas regulations including the Pavley Clean Car

Standard and the Low Carbon Fuel standard; however the newest national fuel standards for model year (MY) 2017 through 2025 light-duty motor vehicles are not included in EMFAC2011. EMFAC2011 has CO_2 controls for MYs 2009 through 2016 (Pavley Phase I) only. Because of this, and the ARB Advanced Clean Car Standards approved in 2012, it is anticipated that emissions in the future will be lower than those calculated by this current version of the EMFAC model (EMFAC2011).[5]

EMFAC2011 generates emission factors for all types of on-road vehicles under different ambient and driving conditions. ARB developed these factors based on thousands of emissions tests on both new and used vehicles recruited randomly from the California fleet. In the EMFAC2011 model, the emission rates were combined with vehicle activity data provided by regional transportation agencies (such as MTC) to calculate the regional emissions inventories.

Emission estimates for ROG, NO_X, CO and particulate matter (associated with engine exhaust and tire wear) are direct outputs from EMFAC2011. To obtain rough estimates of the amount of particulate matter generated by autos from roads (called "entrained dust"), regional VMT[6] was multiplied by the following (annual) factors: (1) 0.132 grams/mile entrained dust for $PM_{10,}$ and (2) 0.020 grams/mile entrained dust for $PM_{2.5}$.[7]

Toxic Air Contaminants (TACs)

TACs were evaluated on both a regional and local level. The regional analysis studies the impacts of the cumulative TAC emissions for the entire Bay Area; the local analysis studies the impacts of TAC emissions on corridors within TPPs and disproportionally impacted communities to provide a better understanding of localized health impacts. The methodologies for both the regional TACs and localized TACs analysis are described below.

Regional TACs

To calculate TACs from all on-road motor vehicles, MTC uses the CT-EMFAC model, a complementary model to EMFAC2011, which estimates diesel PM, benzene and 1,3-butadiene emissions in units of kilograms per day. The EMFAC2011 and CT-EMFAC emissions factors reflect travel speeds and vehicle types specific to each roadway link.

Local Pollutant Impact Analysis

The purpose of the local pollutant impact analysis is to assess potential localized health impacts to new sensitive receptors that could be located within TPP corridors based on the proposed Plan transportation investments and proposed Plan land use scenario. One of the primary objectives of SB 375 and the SCS is to locate more residential and commercial/retail development along existing transit corridors to reduce vehicle trips, vehicle miles traveled and mobile source air pollution. While this strategy can be beneficial

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[5] http://www.arb.ca.gov/msprog/consumer_info/advanced_clean_cars/consumer_acc.htm.

[6] Note that MTC upwardly adjusts the regional VMT forecasts from the MTC travel demand models to account for differences in VMT estimates produced by ARB and MTC using a protocol prescribed by ARB.

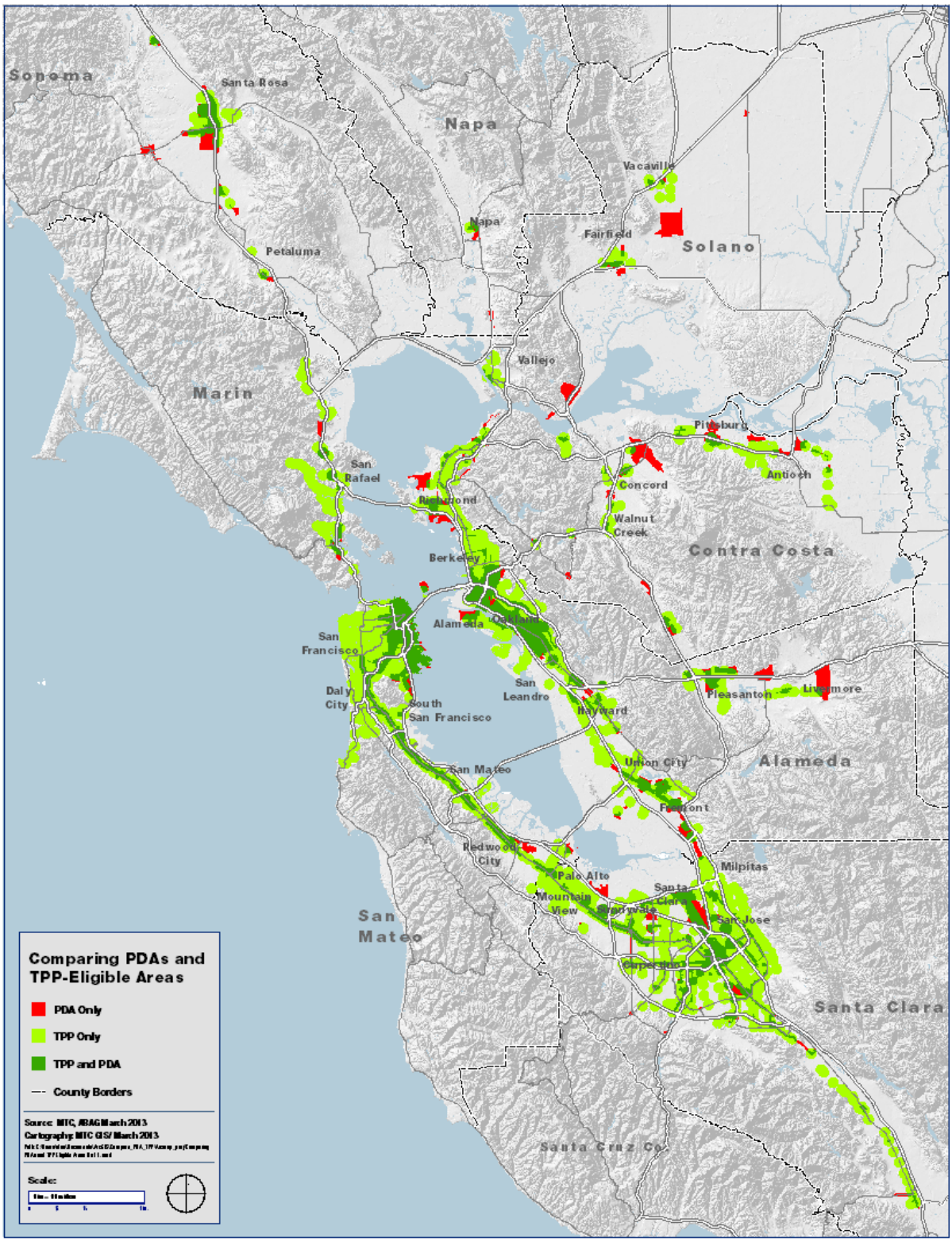
[7] California Air Resources Board, Miscellaneous Process Methodology 7.9 - Entrained Paved Road Travel, Paved Road Dust. Revised and Updated, July 2012

to air quality in general by reducing the amount of air pollution emitted into the atmosphere every day, serious adverse health impacts can result by locating sensitive receptors within close proximity to sources of TACs and $PM_{2.5}$. The urbanized areas along these transit corridors typically contain a wide range of air pollution sources including stationary and area sources (e.g., gas stations, manufacturing facilities, etc.) and mobile sources (e.g., cars, trucks, trains etc.) which generate TACs and $PM_{2.5}$ that can create localized health risks to residents and other sensitive receptors from prolonged exposure to elevated concentrations.

An analysis of TAC concentrations from stationary and mobile emission sources was conducted within TPP areas, which can include Priority Development Areas (PDAs). As shown in **Figure 2.2-2**, many PDAs (74 percent of PDA acreage) overlap with TPP areas. While PDAs were locally defined and used by MTC and ABAG to identify future growth areas in the proposed Plan, TPP areas are defined by SB 375 as areas within half a mile of a major transit stop or high quality transit corridor, amongst other criteria[8]. TPP corridors generally include existing neighborhoods served by transit, and contain a wide range of housing options along with jobs, schools, and amenities. Under SB 375, certain residential or mixed use residential projects and projects located within TPP corridors that meet defined criteria may be eligible for CEQA streamlining. The local pollutant impact analysis focuses on impacts within TPP areas, rather than in PDAs, to more closely mirror SB 375 and to more closely reflect data and modeling prepared by BAAQMD and used in the local pollutant impact analysis. Implementing agencies can utilize the analysis for certain CEQA streamlining purposes, as appropriate.

[8] More information on TPP areas can be found here: http://opr.ca.gov/docs/SB375-Intro-Charts.pdf.

Figure 2.2-2: Priority Development Areas and Transit Priority Projects Corridors



Under the proposed Plan land use scenario, it is anticipated that TPP corridors will absorb a majority of the approximately 700,000 new households and 1.1 million new jobs expected in the Bay Area by 2040. The majority of the housing growth and job growth is expected to occur around the Bay Area's core transit network (e.g., BART, Caltrain, etc.) in San Francisco, Alameda, San Mateo, and Santa Clara counties. With more limited transit access, the North Bay counties of Marin, Napa, Sonoma, and Solano are expected to take on a much smaller share of regional growth.

Using emissions data from BAAQMD, stationary and mobile emission sources were estimated through dispersion modeling for highways and rail lines. For the cities of San Francisco and San José, BAAQMD is assisting with the preparation of Community Risk Reduction Plans (CRRPs) to address TACs and $PM_{2.5}$. To identify the potential for adverse health effects to occur if sensitive receptors were located within TPPs, BAAQMD evaluated TPP corridors to identify areas that may be exposed to existing sources of TACs and $PM_{2.5}$ that would exceed impact significance Criterion 5. BAAQMD used its extensive stationary source database to estimate cancer risk and particulate matter concentrations around these stationary sources. The cancer risk and $PM_{2.5}$ concentrations for stationary sources were calculated using health effect values adopted by the Office of Environmental health Hazard Assessment (OEHHA); health protective assumptions relating to the extent of an individual's exposure (a 70-year exposure duration was used) including age sensitivity factors; and a conservative modeling procedure (using the EPA SCREEN 3 model) that established how TACs are dispersed in the atmosphere.[9] For a few of the stationary sources, BAAQMD staff had conducted a site-specific health risk assessment as part of a separate permit process. The cancer risk and $PM_{2.5}$ concentrations from these health risk assessments are also included in the database.

BAAQMD estimated cancer risk and $PM_{2.5}$ concentration data for mobile sources located in and within 1,000 feet of TPP areas. Mobile sources include freeways, roadways with over 30,000 annual average daily trips (AADT), and railroads. Mobile source TAC and $PM_{2.5}$ emissions from Bay Area highways were calculated through modeling using CALINE3, developed by the California Department of Transportation. The dispersion modeling applied EMFAC2011 emission factors from ARB and daily vehicle activity profiles by highway link provided by Caltrans and MTC. BAAQMD meteorological data were used for each County within the Bay Area. A similar analysis was conducted to estimate TAC and $PM_{2.5}$ emissions from the Bay Area's railroad network (further described below).

A geospatial analysis was conducted using GIS software to evaluate potential increased cancer risks and/or $PM_{2.5}$ concentrations due to TAC and/or $PM_{2.5}$ emissions from mobile and stationary sources in TPP areas. The geospatial analysis was executed using BAAQMD's estimated health risk data on stationary and mobile sources of TAC's and $PM_{2.5}$. The geospatial analysis identifies areas where the cumulative cancer risks and/or $PM_{2.5}$ concentrations exceed MTC's air quality significance thresholds using a spatial additive process. The spatial additive process involves three data sets: a regularized raster dataset[10] representing the spatial extent of the TPP areas, to which all pollution values associated with the

[9] Except for gas stations, where EPA's AERMOD atmospheric dispersion model was used instead.

[10] Raster data consists of a matrix of cells (or pixels) organized into rows and columns (a grid) where each cell contains a value representing information, such as temperature (or, in this case, health risk data). Source: Esri.com.

stationary and mobile sources are added; raster datasets representing the TAC and/or $PM_{2.5}$ plumes associated with each stationary sources that were decayed to a specified distance (discussed in greater detail in Appendix E); and raster datasets representing TAC emissions and/or $PM_{2.5}$ concentrations generated by mobile sources. Appendix E contains a more detailed description of the GIS model methodology.

The following subsections describe the emission sources included in the local pollutant analysis and how health risks from each source were estimated.

Highways

Highways include all freeways, highways, and state routes that run through a TPP corridor. Cancer risk and $PM_{2.5}$ concentrations were derived for highways using BAAQMD's Highway Screening Analysis Tool. The data in the tool is based on dispersion modeling conducted by BAAQMD for every highway in the Bay Area.

High Traffic Roadways

This source includes all roadways with over 30,000 vehicles per day that run through a TPP corridor. Cancer risk and $PM_{2.5}$ concentrations were estimated using BAAQMD's Roadway Screening Analysis Tool. BAAQMD developed county-specific roadway screening tables based on annual average daily vehicle trips on roadways.

Railroads

Railroad sources include all rail lines and rail stations in TPP corridors. BAAQMD prepared screening tables for Amtrak, Caltrain, SMART rail, ACE, and freight rail. The screening tables are based on dispersion modeling.

Ferry Terminals

Ferry Terminals include commuter ferry stations located in TPP corridors. BAAQMD prepared general screening data for ferry terminals by county.

Large Mobile Sources

This source includes ports, railyards, distribution centers, refineries, and chrome platters located within or in close proximity to TPP corridors. Appropriate distances from large sources identified in the impact assessment (**Table 2.2-11**) are based on BAAQMD emission data, health studies, and ARB recommendations.

Stationary Sources

Stationary sources include sources permitted by BAAQMD such as refineries, gas stations, back-up generators, auto body shops, etc. Cancer risk and $PM_{2.5}$ concentrations are estimated using BAAQMD's Stationary Source Screening Analysis Tool.

The TAC analysis also analyzed exposure to impacted communities within the entire region. Using MTC roadway modeling information, all freeway links within impacted communities were evaluated to determine if there will be a localized increase or decrease in TACs associated with the implementation of the proposed Plan. These levels were compared to a "no net increase" threshold.

Regional Pollutant Analysis of Toxic Air Contaminants and $PM_{2.5}$ in Disproportionally Impacted Communities

There are numerous locations within the Bay Area where concentrations of TACs and fine particulate matter ($PM_{2.5}$) are substantially higher than other areas. These areas tend to be along major transportation and goods movement corridors. These areas also often include communities that are more vulnerable to the effects of air pollution, due to age of residents (youth and seniors), higher rates of adverse health outcomes, or low household income. The effects of the proposed transportation projects and land use scenario are evaluated to determine if TAC and $PM_{2.5}$ emissions will increase or decrease in these disproportionally impacted communities compared to other communities. For the purpose of this analysis, disproportionally impacted communities were identified through BAAQMD's Community Air Risk Evaluation Program.

CARE Communities

BAAQMD's Community Air Risk Evaluation Program (CARE) was initiated in 2004 to identify areas with elevated concentrations of, and public exposure to, TACs. The CARE program is examining population exposure to elevated concentrations of $PM_{2.5}$ and other pollutants as additional criteria for identifying areas that are disproportionally impacted. The intent of the CARE program is to estimate the potential increased health risks associated with exposure to TACs and $PM_{2.5}$ from stationary and mobile sources, to identify the primary sources causing this disproportionate impact, and to develop risk reduction strategies to reduce public exposure and therefore public health risks.[11]

CARE communities are defined as areas that (1) are close to or within areas of high TAC and $PM_{2.5}$ emissions; (2) contain sensitive populations, defined as youth and seniors; and (3) where over 40 percent of the population has income levels below the federal poverty level. Six CARE communities have been identified to date: Concord, eastern San Francisco, western Alameda County, Redwood City/East Palo Alto, Richmond/San Pablo, and San José. In general, these communities are adjacent to major arterials, roadways, freeways and ports. The counties of Marin, Napa, Solano, and Sonoma are not evaluated in this impact discussion since they do not contain any CARE communities.

The six CARE communities overlap with most of the MTC's Communities of Concern (COC)—which are low income and minority communities defined by MTC as experiencing potential transportation accessibility disparities.[12] MTC's evaluation of the proposed Plan's transportation investments on COCs will be addressed in the Plan Bay Area Equity Analysis, prepared as a Supplemental Report and available at www.onebayarea.org. The analysis in this EIR focuses on potential impacts in CARE communities alone because these areas have been identified as those with the highest existing emissions of TACs and $PM_{2.5}$ and are currently disproportionately impacted when compared to other communities in the Bay Area.

Figure 2.2-3 below highlights the region's six CARE communities and demonstrates how the CARE communities overlap with the majority of MTC's COCs.

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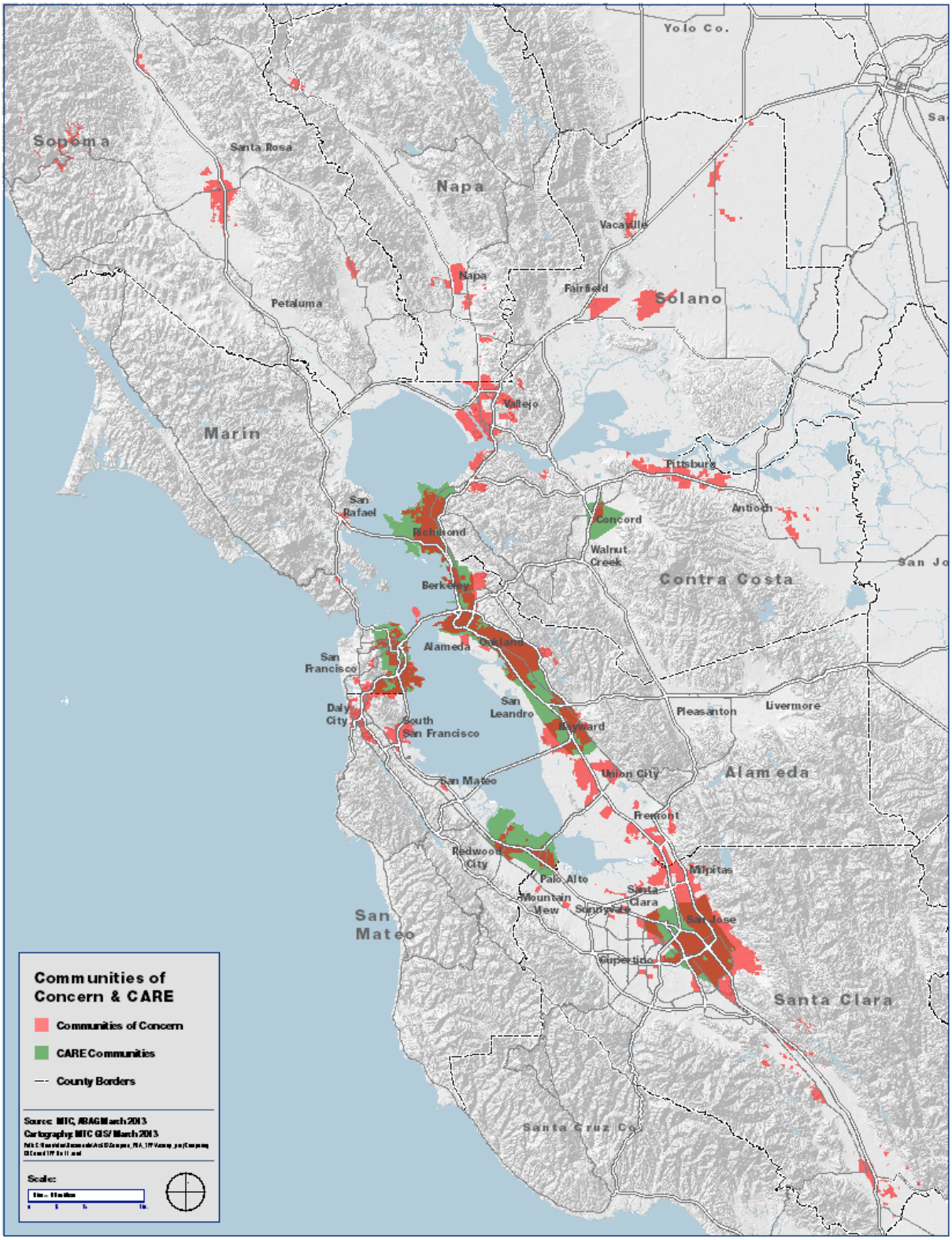
[11] http://baaqmd.gov/Divisions/Planning-and-Research/CARE-Program.aspx.

[12] More information on MTC's Communities of Concern is available here, http://www.mtc.ca.gov/planning/snapshot/

Figure 2.2-3: Communities of Concern and CARE



Motor Vehicle Emissions

Travel activity data for the roadway network in CARE communities and the Bay Area in general were derived from MTC's travel demand forecasting model. The model produced forecasts of travel behavior and vehicle activity for the proposed Plan's base year, 2010; the horizon year 2040 with Project; and the horizon year 2040 without the Project. The model provides outputs for VMT, along with daily vehicle trips and distribution of vehicle miles of travel by speed. This data is then imported into EMFAC2011, the motor vehicles emissions model developed and maintained by ARB to obtain emissions data.

In this analysis, MTC only included in its model runs roadway links that carry 10,000 or more vehicles per day with sensitive land uses (including residential, schools, and day cares) within 1,000 feet of the roadway's centerline. Roadway links without any sensitive land uses within 1000 feet of the roadway centerline were not included in the analysis. This approach was developed through MTC's Equity Analysis workgroup and is consistent with BAAQMD's methodology for evaluating TACs and $PM_{2.5}$ impacts. MTC then identified all the roadway links that run through identified CARE communities and non-CARE communities per the criteria listed above. TAC and $PM_{2.5}$ emissions were then estimated for CARE and non-CARE roadway links in each county. For example, the emission estimates for CARE communities in Contra Costa County reflect vehicle activity on the roadway links in the Concord and Richmond/San Pablo CARE communities.

SUMMARY OF IMPACTS

The combined impact of the land use and transportation changes anticipated from implementation of the proposed Plan would not conflict with or obstruct implementation of the applicable air quality plans. The overall impact of the proposed Plan due to construction of land-use and transportation projects would result in a direct but short-term impact as projects advance into construction at different times, over the horizon of the proposed Plan.

Compared to existing conditions, the impacts in 2040 with the proposed Plan show lower ROG, NOx (summertime and wintertime), CO, and $PM_{2.5}$ emissions, largely because of stringent controls for new vehicles, engines and fuels. However, due to growth in VMT and generation of road dust, emissions for PM_{10} are expected to increase under the proposed Plan compared to existing conditions.

The impacts for TACs (diesel PM, 1,3-butadiene, and benzene) show lower emissions in 2040 with the implementation of the proposed Plan, also as a result of stronger state regulations for vehicles and fuels. There would be a net increase in sensitive receptors located in TPP corridors (including PDAs located within TPPs) where TAC concentrations result in a cancer risk greater than 100/million or a $PM_{2.5}$ concentration greater than 0.8 $\mu g/m^3$; or within set distances to mobile and/or stationary sources of TAC or $PM_{2.5}$ emissions; however, in jurisdictions with an adopted CRRP, any proposed project that includes sensitive land uses and or receptors should be evaluated against the standards, thresholds and mitigation measures in those adopted plans and where a proposed project is consistent with an adopted CRRP, the impact would be less than significant.

Between CARE and non-CARE communities there are slight differences in the percent reductions in TACs and $PM_{2.5}$ expected in 2040 under the proposed Plan and 2010 existing conditions. When re-entrained road dust is included in total emissions, some CARE communities will experience an increase in emissions while non-CARE communities will experience either a smaller increase or a decrease in

these emissions. This disproportionate effect in CARE communities would result in a potentially significant impact.

IMPACTS AND MITIGATION MEASURES

Impact

2.2-1(a) Implementation of the proposed Plan could conflict with or obstruct implementation of the primary goals of an applicable air quality plan.

The region's most recent ozone plan, the Bay Area 2010 Clean Air Plan (2010 CAP), prepared by BAAQMD, was developed in response to ozone planning requirement in the California Health and Safety Code. The 2010 CAP set forth a control strategy that includes control measures to reduce emissions and atmospheric concentrations of ozone and its precursors, $PM_{2.5}$, key toxic air contaminants, as well as the "Kyoto 6" greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulpher hexafluoride).[13]

The primary goals of the 2010 CAP are to improve Bay Area air quality and protect public health. The control strategy in the 2010 CAP recognizes the need to reduce motor vehicle travel and emissions by integrating transportation, land use, and air quality planning. Cleaner fuels and improved emission controls have substantially reduced emissions from mobile sources in recent decades. However, growth in motor vehicle use (as measured in VMT on both a per capita and an absolute basis) has offset some of the benefit of the improved emission controls. This increase in VMT has been caused or facilitated by dispersed development patterns that result in people being dependent on motor vehicles for all types of trips and activities, in addition to increases that are the result of population and job growth. Therefore, the 2010 CAP recognizes the need to encourage future population and job growth in areas that are well served by transit and where mixed-use communities provide jobs, housing, and retail in close proximity.

Key themes embedded in the 2010 CAP include:

- The need to reduce motor vehicle emissions by driving cleaner, driving smarter, and driving less;
- Reducing per capita VMT and promoting policies that enable families to choose reduce their motor vehicle ownership;
- Designing communities where people can walk, bike, or use transit on a convenient basis; and
- Ensuring that focused growth in priority areas is planned and designed so as to protect people from both existing sources and new sources of emissions.

Consistent with the 2010 CAP, the proposed Plan is based on the goals of reducing emissions of greenhouse gases from the transportation sector, reducing VMT on a per capita basis, and focusing growth in areas that are well-served by transit and existing infrastructure.

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[13] The 2010 Clean Air Plan prepared by BAAQMD can be found here:
http://www.baaqmd.gov/Divisions/Planning-and-Research/Plans/Clean-Air-Plans.aspx

Both the land use patterns and the transportation investments defined in the proposed Plan support the primary goals of the Bay Area 2010 Clean Air Plan. The proposed Plan would therefore not conflict with or obstruct implementation of the primary goals of an applicable air quality plan and the impact is less than significant (LS). No mitigation measures are required.

Mitigation Measures

None required.

Impact

2.2-1(b) Implementation of the proposed Plan could conflict with or obstruct implementation of applicable control measures of an applicable air quality plan.

Numerous transportation projects included in the proposed Plan will help implement the applicable control measures listed in the 2010 CAP. **Table 2.2-6** provides a summary of the proposed Plan transportation investments that will help implement relevant control measures in the 2010 CAP. For purposes of evaluating consistency with the proposed Plan, the relevant 2010 CAP control measures include mobile source measures (MSMs) A-1 and A-2, the full set of 17 transportation control measures (TCMs), and local impact measure (LUM) #4.

TABLE 2.2-6: PROPOSED PLAN INVESTMENTS AND POLICIES THAT SUPPORT IMPLEMENTATION OF 2010 CAP CONTROL MEASURES

Relevant Control Measures in 2010 Clean Air Plan	*Supporting Policies and Investments in the proposed Plan **
MSM A-1: Promote Clean and Fuel-Efficient Vehicles: Promote the use of clean and fuel-efficient vehicles, and efficient driving habits and proper vehicle maintenance to reduce emissions.	The Climate Policy Initiatives in the proposed Plan (RTP ID # 230550) will include measures to promote efficient driving habits.
MSM A-2: Zero Emission Vehicles and Plug-In Hybrids: Acquire and deploy battery-electric and plug-in hybrid electric vehicles. Install and expand public charging infrastructure. Promote the use of public charging infrastructure.	As an element of the Climate Policy Initiatives (RTP ID # 230550), the proposed Plan will allocate approximately $170 million over ten years to promote electric vehicles, including consumer incentives, education, and installation of charging stations.
TCM A-1: Local and Area-Wide Bus Service Improvements: Sustain and improve bus service by funding existing service, implementing Bus Rapid Transit (BRT) in key corridors, and implementing transit priority measures to improve the speed of bus service.	The proposed Plan includes substantial funding for bus operators throughout the region, including funding to implement BRT in key corridors. Projects to fund bus service improvements include RTP ID #s 21017, 94526, 94527, 94558, 94572, 94610, 94636, 94666, 94683, 98207, 22455, 240526, 230161, 230164 and 240077.
TCM A-2: Local and Regional Rail Service Improvements: Sustain and expand rail service providing funding for rail cars and stations. Fund BART extensions, Caltrain electrification, new Transbay Terminal, Capitol Corridor, and SMART commuter rail in the North Bay.	The proposed Plan includes substantial funding for commuter rail operators throughout the region. This includes BART (RTP ID #s 21132, 94525, 240196, 21211, 240374 and 240375); Transbay Transit Center/Caltrain extension (RTP ID #s 21342 and 230290); Caltrain electrification and improvements (RTP ID #s 22481, 21627, 240019, 240031, 240048); SMART rail (RTP ID #s 22001 and 240736); Capitol Corridor (RTP ID # 22009); and ACE commuter rail (21790).
TCM B-1: Freeway and Arterial Operations Strategies: Implement freeway and arterial performance improvements, including the Freeway Performance Initiative, the Bay Area Freeway Service Patrol, and the Arterial Management Program.	The proposed Plan projects 230221, 230222, 230419, and 230597 will all help to implement TCM B-1 by improving traffic flow on freeways and key arterials.
TCM B-2: Transit Efficiency and Use Strategies: Improve transit efficiency and rider convenience through continued operation of 511 Transit, and full implementation of Clipper fare payment system and the Transit Hub Signage Program.	The proposed Plan includes funds to implement the regional Transit Performance Initiative (RTP ID # 240735), MTC's Transit Connectivity Plan (RTP ID # 230336), as well as projects in specific counties, such as Contra Costa (230196) and the San Francisco Transit Effectiveness Project (240171).
TCM B-3: Bay Area Express Lane Network: Implement the regional express lane network; provide express bus service in these corridors.	The proposed Plan includes funds to implement the regional express lane network via 25 specific projects, including 22002, 22042, 230088, 230656, and 230657.
TCM B-4: Goods Movement Improvements and	The proposed Plan projects that will help to

TABLE 2.2-6: PROPOSED PLAN INVESTMENTS AND POLICIES THAT SUPPORT IMPLEMENTATION OF 2010 CAP CONTROL MEASURES

Relevant Control Measures in 2010 Clean Air Plan	*Supporting Policies and Investments in the proposed Plan **
Emission Reductions Strategies: Reduce diesel emissions from trucks used in goods movement. Implement seven Proposition 1B Trade Corridors Improvement Fund projects identified in this measure.	implement TCM B-4 include Alameda County Goods Movement Program (RTP ID # 22082, 22760, and 240394); Martinez Rail Corridor improvements (240738); and relocation of Cordelia truck scales facility in Solano County (230322).
TCM C-1: Voluntary Employer Trip-Reduction Programs: Work with employers, transit agencies, and shuttle providers to promote ridesharing, transit, cycling and walking for work trips. Consider adopting a commute benefits ordinance to reduce out-of-pocket transit costs to employees.	The proposed Plan Climate Policy Initiatives (see RTP ID # 230550), including vanpool incentives, will support implementation of TCM C-1. The proposed Plan policy initiatives also include adoption and implementation of a regional commute benefits ordinance, a key element of TCM-1.
TCM C-2: Safe Routes to Schools and Safe Routes to Transit Programs: Implement Safe Routes to Schools (SR2S) programs and other measures to promote safe access for pedestrians and cyclists to schools and transit.	The proposed Plan includes $30 million to implement Safe Routes to Transit (RTP ID # 22245). Additional projects that will help to implement TCM C-2 include Alameda County Transportation Demand Management Program (240393), and Safe Routes to Schools programs in Napa County (22417), San Mateo County (240084), and Sonoma County (240561).
TCM C-3: Ridesharing Services and Incentives: Encourage ridesharing and promote and expand car-sharing services.	The proposed Plan includes $5 million to expand City Carshare (RTP ID #22244). The proposed Plan also earmarks $6 million for vanpool incentives as part of the Climate Policy Initiatives.
TCM C-4: Conduct Public Education and Outreach: Implement the Spare the Air program and related elements in the regional Transportation Climate Action Campaign.	The proposed Plan includes approximately $700 million to implement various Climate Policy Initiatives (RTP ID #230550), including public outreach and education.
TCM C-5: Promote "Smart Driving": Promote smart driving, compliance with posted speed limits, and related efforts to reduce greenhouse gas emissions from the transportation sector.	The proposed Plan includes approximately $700 million to implement various Climate Policy Initiatives (RTP ID #230550), including a public education campaign, a tire pressure cap rebate program, and a fuel economy meter rebate program.
TCM D-1: Bicycle Access and Facilities Improvements: Provide a comprehensive network of bicycle lanes, routes, and pathways, as well as continued and routine maintenance on existing bicycle facilities. Implement "complete streets" policies to ensure that cyclists and pedestrians are safely accommodated on all streets and roads. Maintain and expand facilities to accommodate bicycles on rail transit, buses and ferries. Consider implementing bicycle-sharing programs.	The proposed Plan will provide funding to implement bicycle projects throughout the region, including: Alameda County: 24003, 240206, 240227, Contra Costa County: 240381, 21225, 230542, 240459, 240637 Marin County: 240678 Napa County: 230527, 240612 San Francisco: 240488, 240533, 240551 San Mateo County: 230430, 240590 Santa Clara County: 240509 Solano County: 98212, 2405566, 240558

TABLE 2.2-6: PROPOSED PLAN INVESTMENTS AND POLICIES THAT SUPPORT IMPLEMENTATION OF 2010 CAP CONTROL MEASURES

Relevant Control Measures in 2010 Clean Air Plan	*Supporting Policies and Investments in the proposed Plan **
	Sonoma County: 240651
TCM D-2: Pedestrian Access and Facilities Improvements: Provide a comprehensive network of facilities, including sidewalks, pathways and provide for pedestrian access in their development plans. Implement "complete streets" policies to ensure that cyclists and pedestrians are safely accommodated on all streets and roads. Adopt land use policies that support more compact, infill development to make neighborhoods more walkable.	The proposed Plan projects to improve pedestrian facilities include the City of Berkeley Pedestrian Master Plan (240197), the Napa County Safe Routes to Schools program (22417), and projects to implement bike and ped improvements in San Mateo County (230430). (Also see pedestrian improvements in Santa Clara, Solano and Sonoma counties described for TCM D-1 above.)
TCM D-3: Local Land-Use Strategies: Update general plans and area plans to promote infill development and support land use that allows residents and employees to walk, bicycle, and use transit, instead of relying on private automobiles. Create mixed-use transit-oriented developments in proximity to transit stations and key bus routes.	Many of the policies and investments in the proposed Plan, such as the One Bay Area Grant (OBAG) program, are directed toward implementation of the land-use strategies described in TCM D-3. Examples of local projects include projects # 21624 (incentive program to support transit-oriented development) and # 240086 (Transportation for Livable Communities program) in San Mateo county.
TCM E-1: Value-Pricing Strategies: Implement value pricing policies and programs such as time-of-day pricing on trans-bay bridges and cordon pricing recommendations from San Francisco County's Mobility, Access, and Pricing Study.	The proposed Plan includes funding to implement the San Francisco congestion pricing program, including Treasure Island pricing program and cordon pricing (240728).
TCM E-2: Promote Parking Policies to Reduce Motor Vehicle Travel: Implement parking policies to reduce motor vehicle travel, such as limiting the supply of off-street parking in areas well served by transit, eliminating or reducing minimum parking requirements, unbundling the price of parking spaces from rents, and implementing performance-based pricing for curb parking in high-use areas.	Policy Action 4.2 (see Table __ above) calls for revising parking policies to support infill development. PDA earmarks funding to expand San Francisco's innovative *SFpark* program (RTP ID # 240334 and 240476).
TCM E-3: Implement Transportation Pricing Reform: Develop and implement policies to ensure that user costs to own and operate motor vehicles reflect the full environmental and social costs related to vehicle use.	The proposed Plan includes funding to implement the San Francisco congestion pricing program, including Treasure Island pricing program and cordon pricing (240728) and programs that MTC has underway, including bridge tolls and express lane network.
LUM 4: Land Use Guidance: Provide tools and resources to local agencies to help them develop policies and plans to improve air quality, reduce motor vehicle travel, and reduce population exposure to air pollutants.	PDA Policy Action # 1.6 calls for regional agencies to provide tools to help local jurisdictions develop and implement plans to focus new growth in priority development areas.

TABLE 2.2-6: PROPOSED PLAN INVESTMENTS AND POLICIES THAT SUPPORT IMPLEMENTATION OF 2010 CAP CONTROL MEASURES

Relevant Control Measures in 2010 Clean Air Plan	*Supporting Policies and Investments in the proposed Plan **

Note:

* The proposed Plan investments shown in Table 2.2-6 are intended to demonstrate how the proposed Plan will help to implement the 2010 CAP. There may be additional proposed Plan investments not shown in Table 2.2-6 that also help to implement the 2010 CAP control measures.

Both the policies and the transportation investments defined in the proposed Plan are consistent with the relevant control measures in the 2010 CAP and the impact is less than significant (LS). No mitigation measures are required.

Mitigation Measures

None required.

Impact

2.2-1(c) Implementation of the proposed Plan could conflict with or obstruct implementation of any control measures in an applicable air quality plan.

As a whole, the proposed Plan investments described in **Table 2.2-6** support the goals of the 2010 CAP and will help implement key control measures in the 2010 CAP. However, it is possible that certain proposed Plan investments could increase VMT and/or emissions of air pollutants and GHGs, including projects that increase highway capacity, such as expansion of express lanes in the region. The expanded regional ferry network was changed from a TCM to a further study measure (FSM) in the 2010 CAP due to uncertainty as to whether expanded ferry service will actually achieve a net reduction in emissions of air pollutants and GHGs. These issues should be addressed in the project-level CEQA analyses prepared for these projects.

A key theme in the 2010 CAP is the need to ensure that the region plans for focused growth in PDAs in a way that protects people from both existing sources and new sources of emissions.[14] Protecting Bay Area residents who live and/or work in areas identified for future development in the proposed Plan will require a combination of good land use planning and project design to identify and avoid potential impacts to public health, in addition to appropriate measures to mitigate any potentially significant impacts that are identified.

Issues related to potential localized air quality impacts from specific projects will be addressed in the sections below which analyze potential impacts in terms of short-term construction emissions, cumulative increase of criteria pollution from on-road mobile sources, and avoiding exposure of sensitive receptors to substantial concentrations TACs and $PM_{2.5}$.

[14] See discussion on pages 4-21 to 4-23 in Volume I of the 2010 Clean Air Plan, as well as the description of LUM 4 in Volume II of the 2010 Clean Air Plan

Based on the assessment of each measure of consistency, the combined impact of the land use and transportation changes anticipated from implementation of the proposed Plan would not conflict with or obstruct implementation of the applicable air quality plan. As discussed above, proposed Plan investments could be inconsistent with the 2010 CAP goals of reducing VMT. However, subsequent project level review of those investments should ensure any potential impacts are identified and mitigated. Therefore, the impact on the implementation of other applicable air quality plans would be less than significant (LS). No mitigation measures are required.

Mitigation Measures

None required.

Impact

2.2-2 Implementation of the proposed Plan could result in a substantial net increase in construction-related emissions.

The U.S. EPA and the ARB have adopted rules and regulations establishing criteria pollutant and hazardous emissions limits for diesel powered on-road vehicles and off-road equipment. The current EPA and ARB rules and emission standards are in the process of being implemented and are therefore reasonably foreseeable. They will continue to be phased in over the next 10 years and are expected to reduce diesel PM emissions by 90 percent or more when compared to vehicles and equipment built prior to 2004. EPA and ARB on-road and off-road regulations target the primary sources of emissions at construction sites. These include on-road heavy duty trucks, and cranes and off-road aerial lifts, backhoes, crawler tractors, excavators, forklifts, graders, loaders, mowers, rollers, scrapers, skid steer loaders, tractors, trenchers, two engine vehicles and workover rigs. In addition, ARB's cleaner fuel standards will reduce emissions from all internal combustion engines and their stationary and portable equipment regulations will reduce emissions from the smaller equipment used at construction sites, such as portable generators and tub grinders.

The most effective way to ensure that construction projects do not adversely impact local and regional air quality and therefore public health is to minimize the amount of criteria and TACs associated with each individual projects' construction activity. The EPA and ARB have adopted stringent air emission regulations for new and existing fleets of construction equipment that is common to all construction sites. However, these regulations alone cannot assure that all projects consistent with the proposed Plan will use only the lowest emission construction equipment due primarily to the fleet averaging component of the regulations compliance requirements. Therefore, construction impacts are considered potentially significant (PS). Mitigation measure 2.2(a) is described below.

Mitigation Measures

Implementing agencies and/or project sponsors shall consider implementation of mitigations measures including but not limited to those identified below.

2.2(a) Mitigation measures that shall be considered by implementing agencies and/or project sponsors where feasible based on project-and site-specific considerations include, but are not limited to best management practices (BMPs), such as the following:[15]

Construction Best Practices for Exhaust

- The applicant/general contractor for the project shall submit a list of all off-road equipment greater than 25 hp that will be operating for more than 20 hours over the entire duration of the construction activities at the site, including equipment from subcontractors, to BAAQMD for review and certification. The list shall include all of the information necessary to ensure the equipment meets the following requirement:
    - All off-road equipment shall have: 1) engines that meet or exceed either USEPA or ARB Tier 2 off-road emission standards; and 2) engines are retrofitted with an ARB Level 3 Verified Diesel Emissions Control Strategy (VDECS), if one is available for the equipment being used.[16]
- Idling time of diesel powered construction equipment and trucks shall be limited to no more than two minutes. Clear signage shall be provided for construction workers at all access points.
- All construction equipment shall be maintained and properly tuned in accordance with the manufacturers' specifications.
- Portable diesel generators shall be prohibited. Grid power electricity should be used to provide power at construction sites; or propane and natural gas generators may be used when grid power electricity is not feasible.

Construction Best Practices for Dust

- All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day. For projects over five acres of size, soil moisture should be maintained at 12 percent. Moisture content can be verified by lab samples or moisture probe.
- All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
- 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 should be done in conjunction with thorough watering of the subject roads.
- All vehicle speeds on unpaved roads shall be limited to 15 mph.
- All roadway, driveway, and sidewalk paving shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading.

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[15] Adapted from BAAQMD, CEQA Air Quality Guidelines (May 2011).

[16] Equipment with engines meeting Tier 4 Interim or Tier 4 Final emission standards automatically meet this requirement, therefore a VDECS would not be required.

- All construction sites shall provide a posted sign visible to the public with the telephone number and person to contact at the Lead Agency regarding dust complaints. The recommended response time for corrective action shall be within 48 hours. BAAQMD's Complaint Line (1-800 334-6367) shall also be included on posted signs to ensure compliance with applicable regulations.
- All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.
- Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.
- Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.
- The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.
- All trucks and equipment, including their tires, shall be washed off prior to leaving the site.
- Site accesses to a distance of 100 feet from the paved road shall be treated with a six- to 12-inch compacted layer of wood chips, mulch, or gravel.
- Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than 1 percent.

Significance after Mitigation

The measures described above are intended to keep dust from becoming airborne and to keep diesel PM emissions as low as possible through the use of readily available, lower-emitting diesel equipment, and/or equipment using alternative cleaner fuels, such as propane, natural gas, and electricity, as well as on-road trucks using diesel PM filters.

Projects taking advantage of CEQA Streamlining provisions of SB 375 (Public Resources sections 21155.1, 21155.2, and 21159.28) must apply the mitigation measures described above, as feasible, to address site-specific conditions. To the extent that an individual project adopts and implements all feasible mitigation measures described above, the impact would be less than significant with mitigation (LS-M).

MTC/ABAG cannot require local implementing agencies to adopt the above mitigation measures, and it is ultimately the responsibility of a lead agency to determine and adopt mitigation. Therefore it cannot be ensured that this mitigation measure would be implemented in all cases, and this impact remains significant and unavoidable (SU).

Impact

2.2-3(a) Implementation of the proposed Plan could cause a net increase in emissions of criteria pollutants ROG, NO_x, CO, and $PM_{2.5}$ from on-road mobile sources compared to existing conditions.

As shown in **Table 2.2-7**, the emissions for criteria pollutants ROG, NO_x (summertime and wintertime), CO, and $PM_{2.5}$ from mobile sources would decrease between 2010 and the 2040 horizon for the proposed Plan (emissions of PM_{10} would increase and are described under Impact 2.2-3b). When compared to existing conditions (2010), the proposed Plan reduces ROG emissions by 61 percent, summertime NO_x emissions by 70 percent, wintertime NO_x emissions by 71 percent, CO emissions by 70 percent, and $PM_{2.5}$ emissions by five percent. A major reason for these reductions is the increasingly stringent emission controls ARB has adopted for new vehicle engines and fuels over the past few decades. This includes the Truck and Bus Regulation which requires diesel trucks and buses to be upgraded to reduce emissions. As of January 1, 2012, heavier trucks must be retrofitted with PM filters; older trucks must be replaced starting January 1, 2015, and nearly all trucks and buses will need to have 2010 model year engines or equivalent by January 1, 2023. Other contributors include emission-control devices, the Enhanced Smog Check Program, and fleet turnover wherein older polluting cars are retired and replaced with newer and substantially less polluting cars. Additionally, the land use pattern in the proposed Plan includes concentrating future growth at higher densities around existing and proposed transit investments, which would reduce driving and motor vehicle emissions. Therefore, there is no adverse impact (NI).

TABLE 2.2-7: EMISSION ESTIMATES FOR CRITERIA POLLUTANTS USING EMFAC2011 EMISSION RATES (TONS PER DAY)

	2010	*2040 Plan*	*Change 2010 to 2040 Plan*	
			Numerical	*Percent*
ROG	93.7	36.5	-57.1	-61%
NOx (Summertime)	164.3	48.5	-115.8	-70%
NOx (Wintertime)	185.3	53.7	-131.5	-71%
CO	879.9	266.5	-613.4	-70%
$PM_{2.5}$	10.4	9.9	-0.5	-5%

Source: Metropolitan Transportation Commission, 2012.

Mitigation Measures

None required.

Impact

2.2-3(b) Implementation of the proposed Plan could cause a net increase in emissions of PM_{10} from on-road mobile sources compared to existing conditions.

As shown in **Table 2.2-8**, PM_{10} emissions from mobile sources would increase by 12 percent during the proposed Plan's timeframe compared to existing conditions. The higher levels of PM_{10} emissions in 2040 conditions are due to the fact that these emissions are strongly influenced by the 20 percent growth in VMT (which directly affects entrained roadway dust), with some contributions from tire and brake wear and exhaust. The reason particulate matter emissions from mobile sources are not expected to increase at the same rate as VMT (20 percent) is the stringent emission control ARB has adopted for new vehicle engines, particularly diesel engines, including the Truck and Bus Regulation. Note that daily VMT and daily VHD are increasing when comparing the proposed Plan to existing conditions, but to a large

degree, these increases are offset by the regulatory and fleet improvements. PM control programs implemented by local Air Districts also contribute to the emission reductions relative to VMT.

In addition to the Truck and Bus Regulation, there are already ongoing State and regional efforts to mitigate the effects of particulate matter emissions. For instance, the ARB adopted a Diesel Risk Reduction Plan (DRRP) in October 2000, and as a part of that, has since adopted a series of regulations to require cleaner diesel fuel, to restrict idling of diesel engines, and to reduce emissions from both old and new on-road and off-road diesel engines. In 2005, MTC implemented a $14 million program to retrofit 1,700 diesel bus engines operated by Bay Area transit agencies to reduce particulate matter emissions, and in 2006, MTC and BAAQMD implemented a $2 million incentive program to reduce emissions from solid waste collection vehicle fleets that operate within BAAQMD. Furthermore, BAAQMD implements a variety of incentive programs that help fleet operators offset the cost of purchasing low-emission vehicles, re-powering old polluting heavy duty engines with cleaner, lower-emission engines, and installing control devices that reduce particulate and NO_x. Nonetheless, this increase in PM_{10} emissions overall represents a potentially significant (PS) impact. Mitigation measures 2.2(b) and 2.2 (c) are described below.

TABLE 2.2-8: EMISSION ESTIMATES FOR CRITERIA POLLUTANTS USING EMFAC2011 EMISSION RATES (TONS PER DAY)

	2010	*2040 Plan*	*Change 2010 to 2040 Plan*	
			Numerical	*Percent*
PM_{10}	36.4	41.0	4.5	12%

Source: Metropolitan Transportation Commission, 2012.

Mitigation Measures

2.2(b) MTC and ABAG, in partnership with BAAQMD, and other partners who would like to participate, shall work to leverage existing air quality and transportation funds and seek additional funds to continue to implement BAAQMD and ARB programs aimed at retrofits and replacements of trucks and locomotives.

2.2(c) MTC and ABAG, in partnership with BAAQMD and the Port of Oakland, and other partners who would like to participate, shall work together to secure incentive funding that may be available through the Carl Moyer Memorial Air Quality Standards Attainment Program to reduce port-related emissions.

Mitigation Measures 2.1 (a), 2.1(b), and 2.1 (c) (included in *Chapter 2.1: Transportation*) as well as 2.2 (d) and 2.2 (e) (included below under Impacts 2.2-5(b) and 2.2-6) could help reduce the increase in PM_{10}.

Significance after Mitigation

The increase in PM_{10} represents a significant impact compared to existing conditions. The mitigation measures identified above are anticipated to reduce this potentially significant impact. However, the exact reductions are not known at this time. Therefore, the impact is determined to remain significant and unavoidable (SU).

Impact

2.2-4 Implementation of the proposed Plan could cause a cumulative net increase in emissions of diesel PM, 1,3-butadiene, and benzene (toxic air contaminants) from on-road mobile sources compared to existing conditions.

As shown in **Table 2.2-9**, there would be a 71 percent decrease in diesel PM, a 70 percent decrease in 1,3-butadiene, and a 70 percent decrease in benzene compared to existing conditions. These reductions can be attributed to California's state laws to evaluate and control TACs, namely AB 1807 that created the Toxic Air Contaminant Identification and Control Act, SB 2588 that established the Air Toxics "HOT Spots" Information and Assessment Act, and SB 656 that requires ARB and local Air Districts to identify control measures for PM. Other state regulations that reduce smog or other pollutants also reduce TACs, such as the standards for low emission vehicles, clean fuels, reformulated gasoline, diesel fuel specifications, and ARB's Heavy Duty Diesel Inspection Programs. In addition, there are a number of regional programs in place to address PM in general and TACs in particular, including the ARB, BAAQMD, and Port of Oakland's Bay Area Goods Movement Program that provides financial incentives to owners of equipment used in freight movement to upgrade to cleaner technologies, and numerous Port of Oakland Clean Air Programs such as the Maritime Air Quality Improvement Plan, Comprehensive Truck Management Plan, Truck Air Quality Project, Vision 2000 Program and Air Emissions, and West Oakland Particulate Air Quality Monitoring Program. Overall, the reduction in TAC emissions and ongoing regulations and programs would ensure there would be no adverse impact (NI).

TABLE 2.2-9: EMISSION ESTIMATES FOR TOXIC AIR CONTAMINANTS POLLUTANTS (KILOGRAMS PER DAY)

	2010	*2040 Plan*	*Change 2010 to 2040 Plan*	
			Numerical	*Percent*
Diesel PM	2,599.6	755.9	-1,843.8	-71%
1,3-Butadiene	162.4	48.2	-114.1	-70%
Benzene	731.2	219.3	-511.9	-70%

Source: Metropolitan Transportation Commission, 2012.

Mitigation Measures

None required. However, see also mitigation measures for Impact 2.2-3(b) above, which have co-benefits for addressing TAC emissions.

Local Impact

2.2-5(a) Implementation of the proposed Plan could cause a localized net increase in sensitive receptors located in Transit Priority Project (TPP) corridors where TACs or fine particulate matter ($PM_{2.5}$) concentrations result in a cancer risk greater than 100/million or a concentration of $PM_{2.5}$ greater than 0.8 µg/m³.

The local pollutant analysis quantified and mapped the anticipated increased risk and $PM_{2.5}$ concentrations within TPPs throughout the Bay Area based on existing conditions. Any areas identified as having an increased cancer risk greater than 100 in a million or $PM_{2.5}$ concentration greater than 0.8

$\mu g/m^3$ would result in a potentially significant and unavoidable impact. TAC and $PM_{2.5}$ sources that were evaluated in this analysis include freeways, high volume roadways, ports, rail yards, refineries, chrome plating facilities; dry cleaners using perchloroethylene, gas stations and numerous other Air District permitted stationary sources. The emission sources and GIS spatial analysis that makes up the local pollutant analysis is described in more detail below.

Note that, for future projects not within one of these mapped areas, the significance of impacts is considered in the analyses presented under impacts 2.2-5(b) and 2.2-5(c) below.

Stationary Source Data

Using air pollutant emissions data from 2012 stationary source permits, BAAQMD developed a stationary source screening tool that contains cancer risk and $PM_{2.5}$ concentration data for all stationary sources in the Bay Area, available on BAAQMD's website.[17] The stationary source screening tool provides estimated cancer risk and $PM_{2.5}$ concentrations for stationary sources based on conservative modeling parameters, including worst case assumptions for meteorology. The estimated cancer risk and $PM_{2.5}$ concentration are considered "worst case" potential impacts since consideration of source specific conditions, such as exhaust stack heights, exhaust flow rates, and more site specific meteorology would result in lower estimates of cancer risk and $PM_{2.5}$ concentrations.

Where data were available, cancer risk and $PM_{2.5}$ concentrations were adjusted to reflect decreasing values based on distance from a source. For example, BAAQMD developed distance multiplier tools for gas stations and diesel back-up generators (also known as emergency or standby generators). These multiplier tools, available on BAAQMD's website, provide dispersion values to estimate the reductions in cancer risk and $PM_{2.5}$ concentrations expected further away from the source of emissions.[18] For other sources besides gas station and generators, where BAAQMD could not identify dispersion values, the cancer risk and $PM_{2.5}$ concentrations for each source were assumed to be the same at the source and up to 1,000 feet from the source.

BAAQMD's stationary source data also includes the effects of the ARB's air toxics control measure (ATCM) for dry cleaners using perchloroethylene (PERC). The ATCM regulation requires that dry cleaners using PERC be phased out by January 2023. The cancer risk estimates in the stationary source screening tool are based on a 70 year exposure rate, the health risk exposure standard used by OEHHA. The cancer risks for dry cleaners used in the GIS model were adjusted to be based on a 13-year exposure, from the years 2010 to 2035, to reflect the phasing out of PERC.

Large sources, such as refineries, ports, and land use sources without available emissions data, such as truck distribution centers, are addressed below under Impact 2.2-5(b).

Mobile Source Data

For freeways, BAAQMD conducted dispersion modeling, using vehicle activity data for 2009 and vehicle fleet emissions data for 2014, to estimate cancer risk and $PM_{2.5}$ concentrations for every freeway link in

[17] http://baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx

[18] http://baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Tools-and-Methodology.aspx.

the Bay Area. The 2009 activity data was the most recent available from Caltrans at the time of the BAAQMD modeling in 2012. The 2014 vehicle fleet emissions data reflects the best available emissions data available from ARB's EMFAC2011 model. Known as the highway screening tool, it considers average annual daily traffic (AADT) counts, fleet mix and profiles, ARB emission factors using EMFAC 2011, vehicle speeds from MTC's travel demand model, and other modeling parameters per freeway link. The screening tool captures anticipated diesel PM emission reductions from ARB's on-road heavy duty diesel vehicle regulations, specifically the On-Road Heavy Duty Diesel Vehicles Regulation targeting trucks and buses. The tool provides estimated cancer risk and $PM_{2.5}$ concentration data measured from the edge of the freeway for distances from 10 to 1,000 feet on either side of the freeway, demonstrating how health risks lessen with distance from the freeway.[19]

For roadways with over 30,000 AADT, BAAQMD conducted dispersion modeling to develop a roadway screening tool. The tool, available on BAAQMD's website, is organized as county specific tables based on: a roadways AADT count, percent of heavy duty trucks and truck profiles, distance from roadway (10 to 1000 feet), north/south or east/west direction from roadway, ARB emission factors (EMFAC 2007 was best available data at time of modeling), and county-specific meteorological data from Air District monitoring stations. The roadway tool also reflects anticipated diesel PM emission reductions from ARB's On-Road Heavy Duty Diesel Vehicles Regulation.

BAAQMD estimated cancer risk and $PM_{2.5}$ concentrations for railroads and rail stations. Rail emissions were estimated along existing passenger and freight lines as well as proposed future lines in Marin County (i.e., SMART line) and eBART along Highway 4 in Contra Costa County. Emissions along freight corridors were estimated based on fuel consumption and passenger rail emissions were estimated based on the rail activity, idling times at stations, and speeds of individual trains. Passenger and freight (including switchers) emissions that run on parallel or shared tracks were aggregated to estimate total emissions along rail corridors. Site-specific meteorological conditions for each rail link were used. Estimates of cancer risk and $PM_{2.5}$ concentrations at various distances from the edge of the rail lines were provided in the GIS layer for railroad emissions.

Local Pollutant Impact Conclusion

The GIS spatial analysis model was used to compile and process all the stationary and mobile source cancer risk and $PM_{2.5}$ concentration data described above to identify areas in and within 1,000 feet of the TPP areas where an increased cancer risk is greater than 100 in a million and/or $PM_{2.5}$ concentrations exceed 0.8 $\mu g/m^3$. **Figures 2.2-4** through **2.2-21** below display the results of the GIS spatial analysis by county. In general, the figures show that areas over the threshold tend to occur along high traffic freeways, high use rail lines, locations with numerous stationary sources, and locations where a single stationary source has very high estimated cancer risk or $PM_{2.5}$ concentration levels.

TPP areas with cancer risk and $PM_{2.5}$ concentrations estimated to be below the thresholds; and that are not within the set distances (described in Impact 2.2-5(b) below); and are compliant with an adopted Community Risk Reduction Plan (described in Impact 2.2-5(c) below) are considered to have a less than

[19] The screening tool provides modeled health risks at 6 feet and 20 feet heights. The 20 feet heights are meant for project level analysis where residents may only be located on the second floor and above. The GIS model applies the modeled health risks at 6 feet, which is the worst case scenario.

significant impact to locating new sensitive receptors within these areas of TPPs and do not present a significant public health risk from localized TAC and $PM_{2.5}$ emissions.

TPP areas with an increased cancer risk and/or $PM_{2.5}$ concentration over the thresholds do present a potential public health impact and are considered to have potentially significant impacts for locating new sensitive receptors. Any future land use proposals for these areas that include sensitive receptors should evaluate potential TAC and $PM_{2.5}$ impacts during project level environmental review.[20] It is anticipated that future project level environmental review will in most cases result in less conservative and therefore lower estimates of cancer risk and $PM_{2.5}$ concentrations from existing sources. This would be due primarily to the use of more site specific TAC and $PM_{2.5}$ emissions and meteorology data. In some cases, estimated increased cancer risks or $PM_{2.5}$ concentrations may be found to be less than the preliminary estimates provided here.

The results of the GIS spatial analysis are based on increased cancer risk and $PM_{2.5}$ data for existing stationary and mobile sources in and within 1,000 feet of TPP areas. Proposed projects that include a new source of TAC and/or $PM_{2.5}$ or are located within a source that was not included in this analysis should conduct project specific environmental review to assess their potential increased cancer risk and $PM_{2.5}$ concentrations. Any new stationary sources of emissions subject to a BAAQMD permit will be required to analyze TAC and $PM_{2.5}$ emissions which will ensure that they do not adversely impact existing or new sensitive receptors above MTC thresholds. Projects locating sensitive receptors in areas mapped above the significance thresholds would result in potentially significant (PS) impacts.

Mitigation Measures

Implement Mitigation Measure 2.2(d) under Impact 2.2-5(b) below.

Significance after Mitigation

Implementation of Mitigation Measure 2.2(d) would reduce the severity of the impacts identified for projects that would locate sensitive receptors in TPP areas where the increased cancer risk is greater than 100 in a million or $PM_{2.5}$ concentrations are greater than 0.8 $\mu g/m^3$. However, the mitigation measure may not be sufficient to reduce all impacts to less than significant in all areas above the thresholds. Additional site specific analysis would be needed when a project is proposed in these areas to determine the actual level of impact and if feasible mitigation measures exist for the project to implement to get them below the thresholds.

Projects taking advantage of CEQA Streamlining provisions of SB 375 (Public Resources Code sections 21155.1, 21155.2, and 21159.28) must apply the mitigation measures described above, as feasible, to address site-specific conditions. To the extent that an individual project adopts and implements all feasible mitigation measures described above, the impact would normally be less than significant with mitigation (LS-M). However, there may be instances in which site-specific or project-specific conditions

[20] Lead agencies for proposed projects should contact BAAQMD if they are unsure whether their project site falls in an impacted area or not.

preclude the reduction of all project impacts to less than significant levels. For purposes of a conservative analysis, therefore, this impact remains significant and unavoidable (SU).

MTC/ABAG cannot require local implementing agencies to adopt the above mitigation measures, and it is ultimately the responsibility of a lead agency to determine and adopt mitigation. Therefore it cannot be ensured that this mitigation measure would be implemented in all cases. Further, there may be instances in which site-specific or project-specific conditions preclude the reduction of all project impacts to less-than-significant levels. For purposes of a conservative analysis, therefore, this impact remains significant and unavoidable (SU).

Figure 2.2-4

San Francisco Bay Area Local Pollutant Analysis

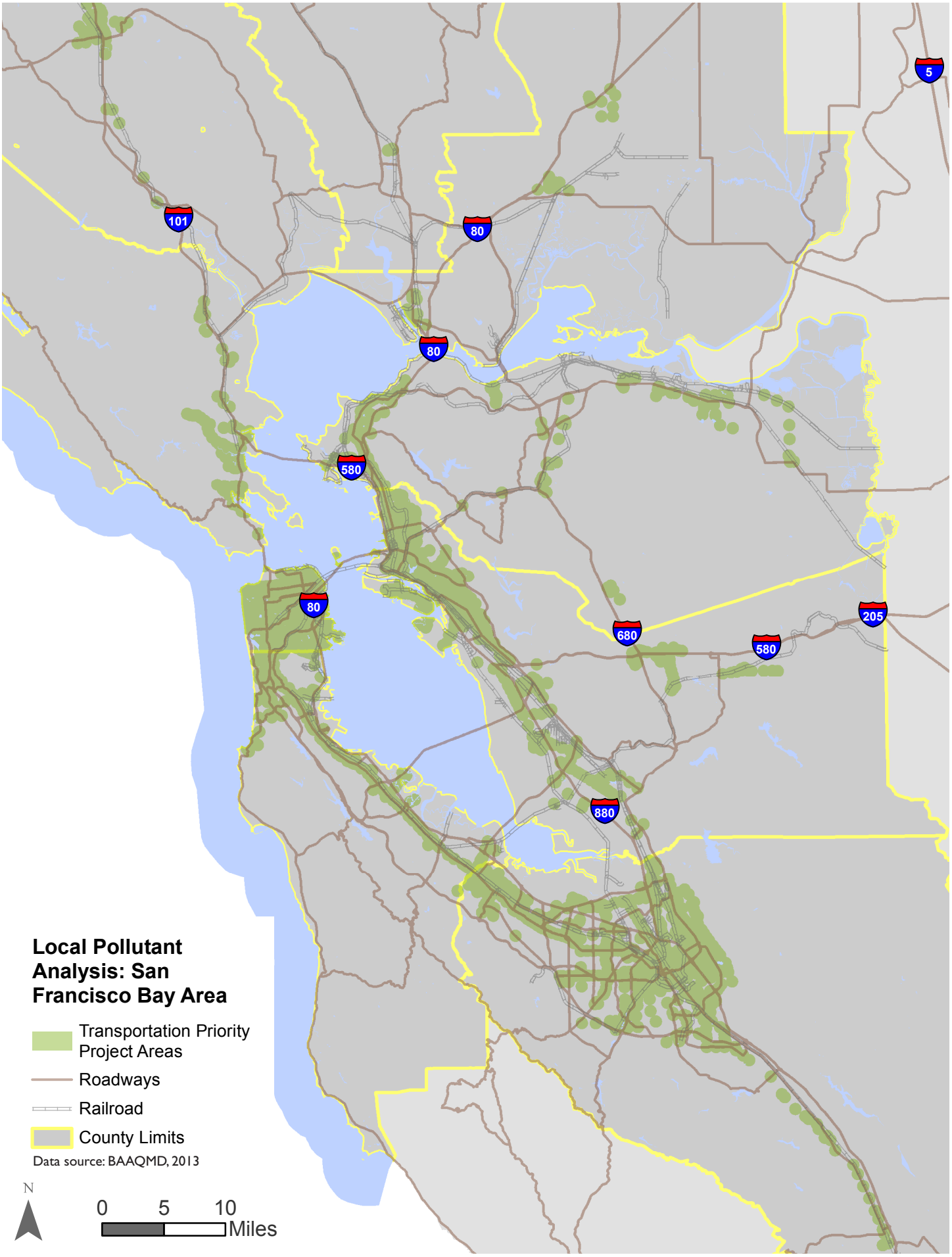

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Figure 2.2-5

Northern Alameda County Local Pollutant Analysis

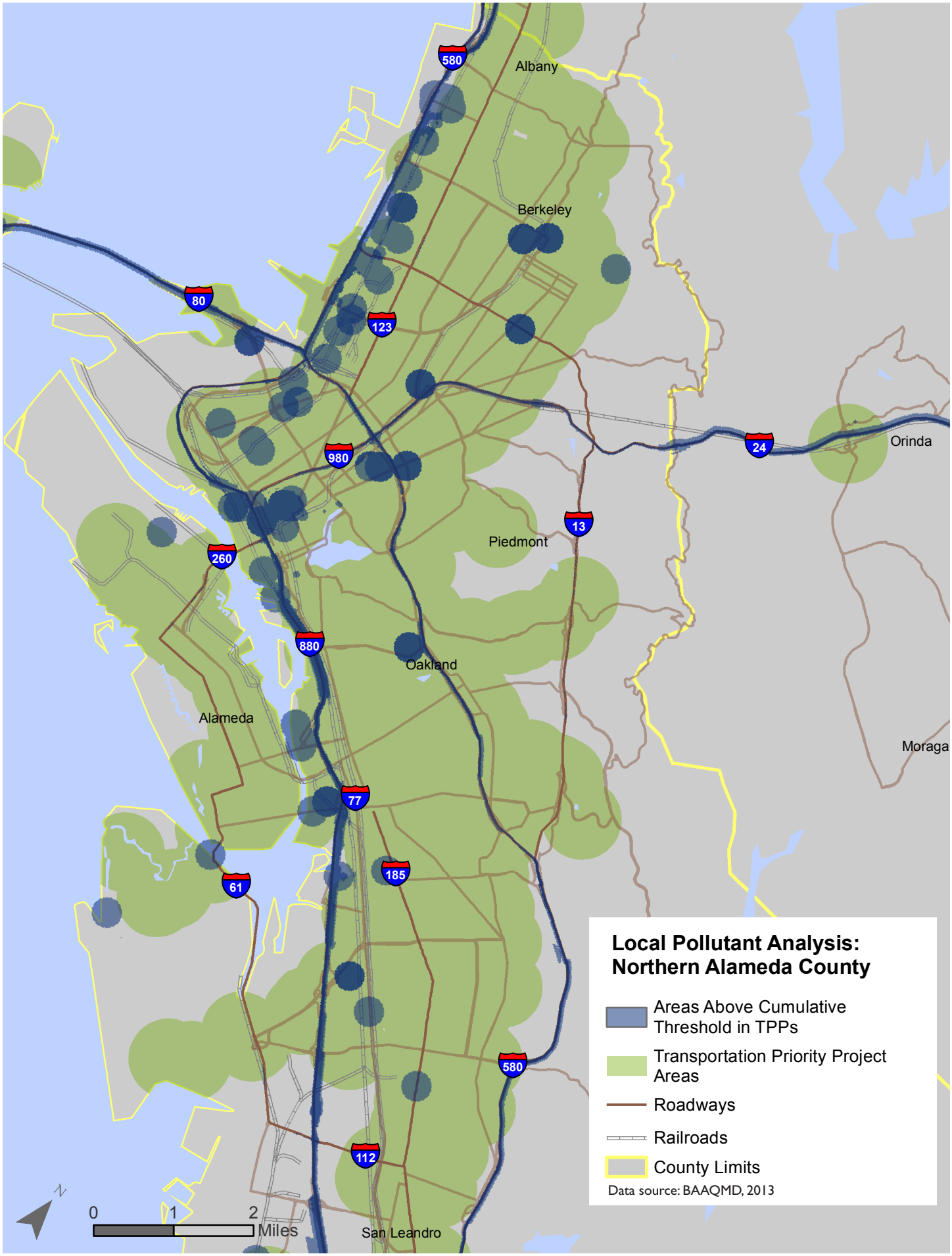

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Figure 2.2-6

Eastern Alameda County

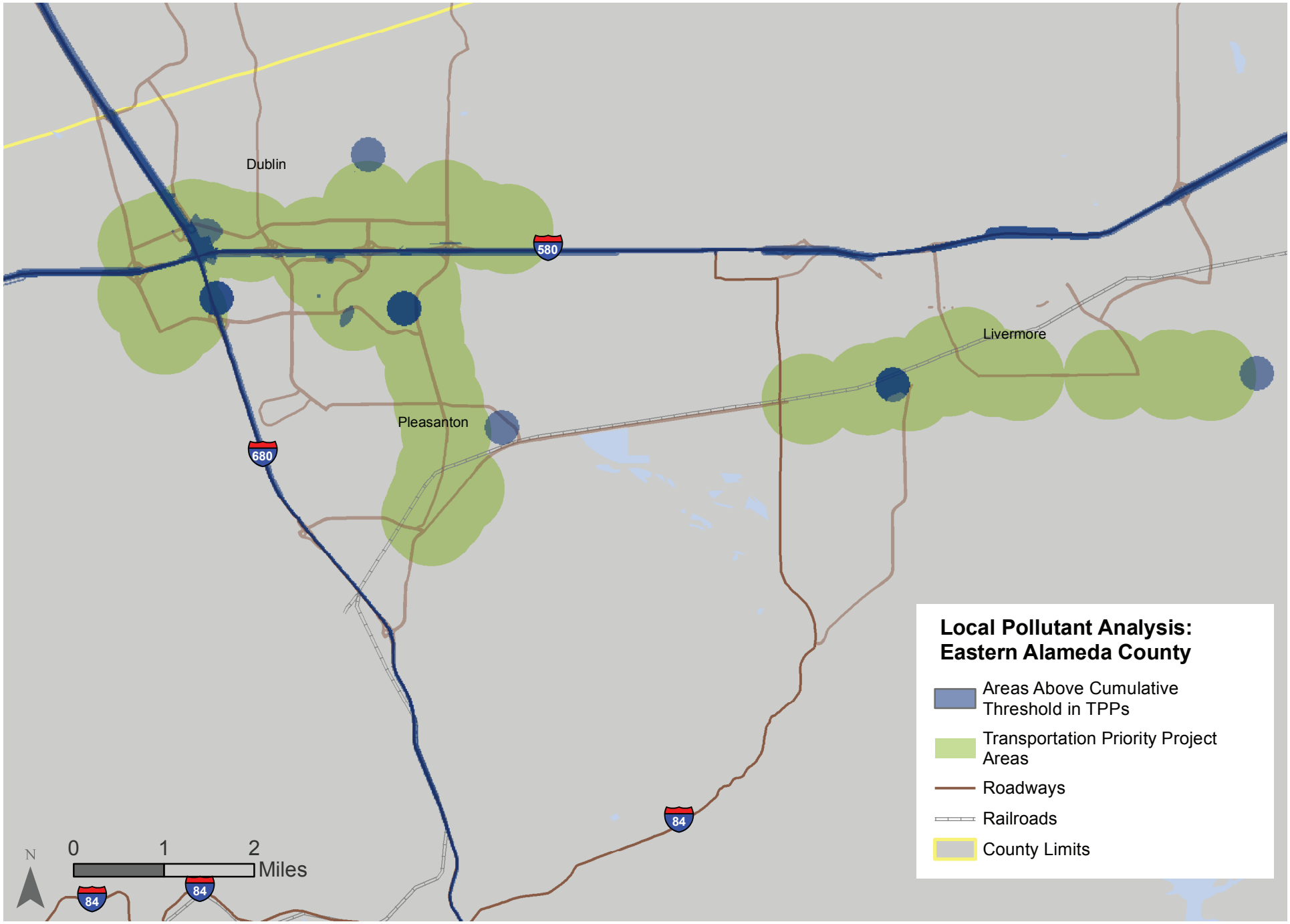

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Figure 2.2-7

Southern Alameda County Local Pollutant Analysis

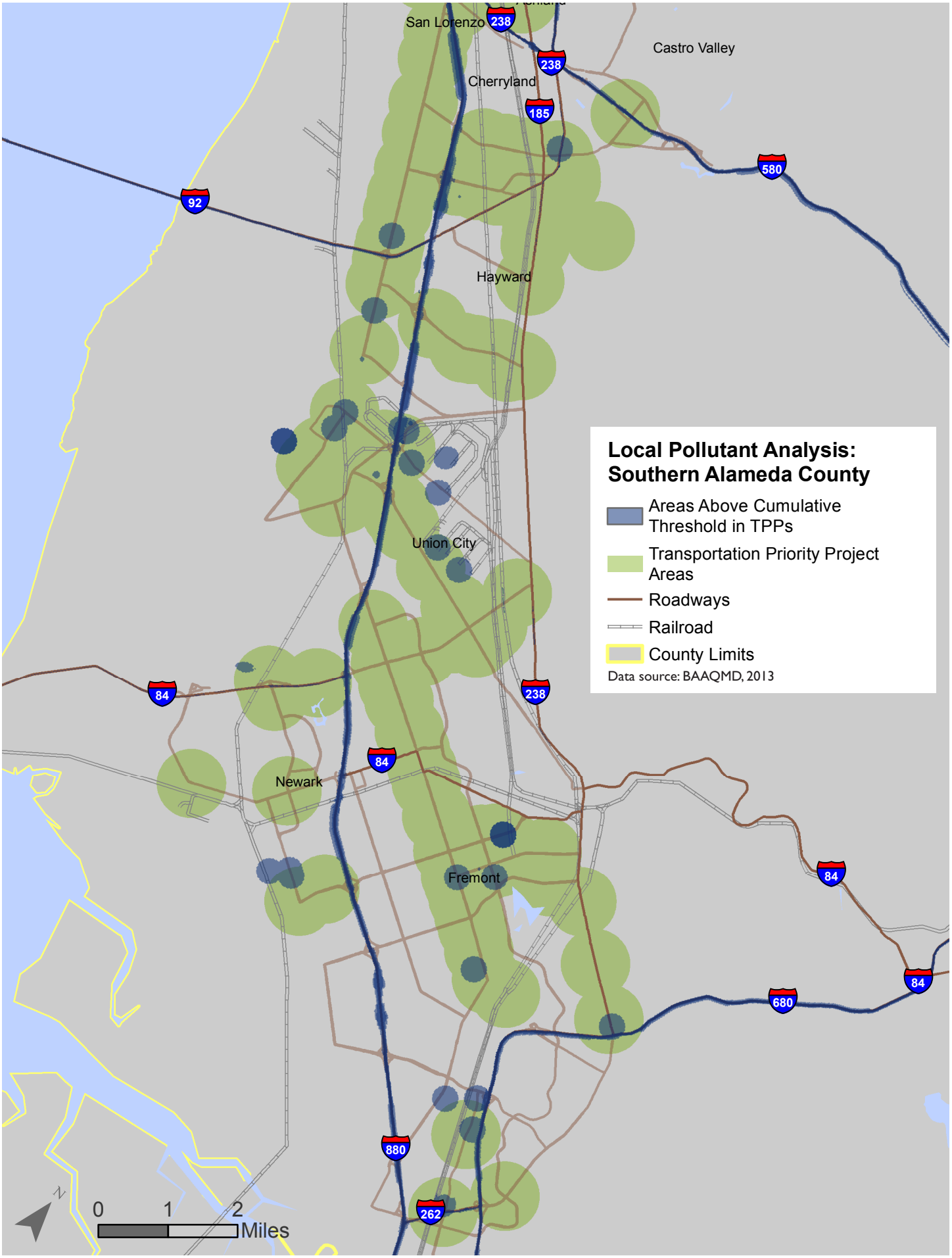

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Figure 2.2-8

Western Contra Costa County

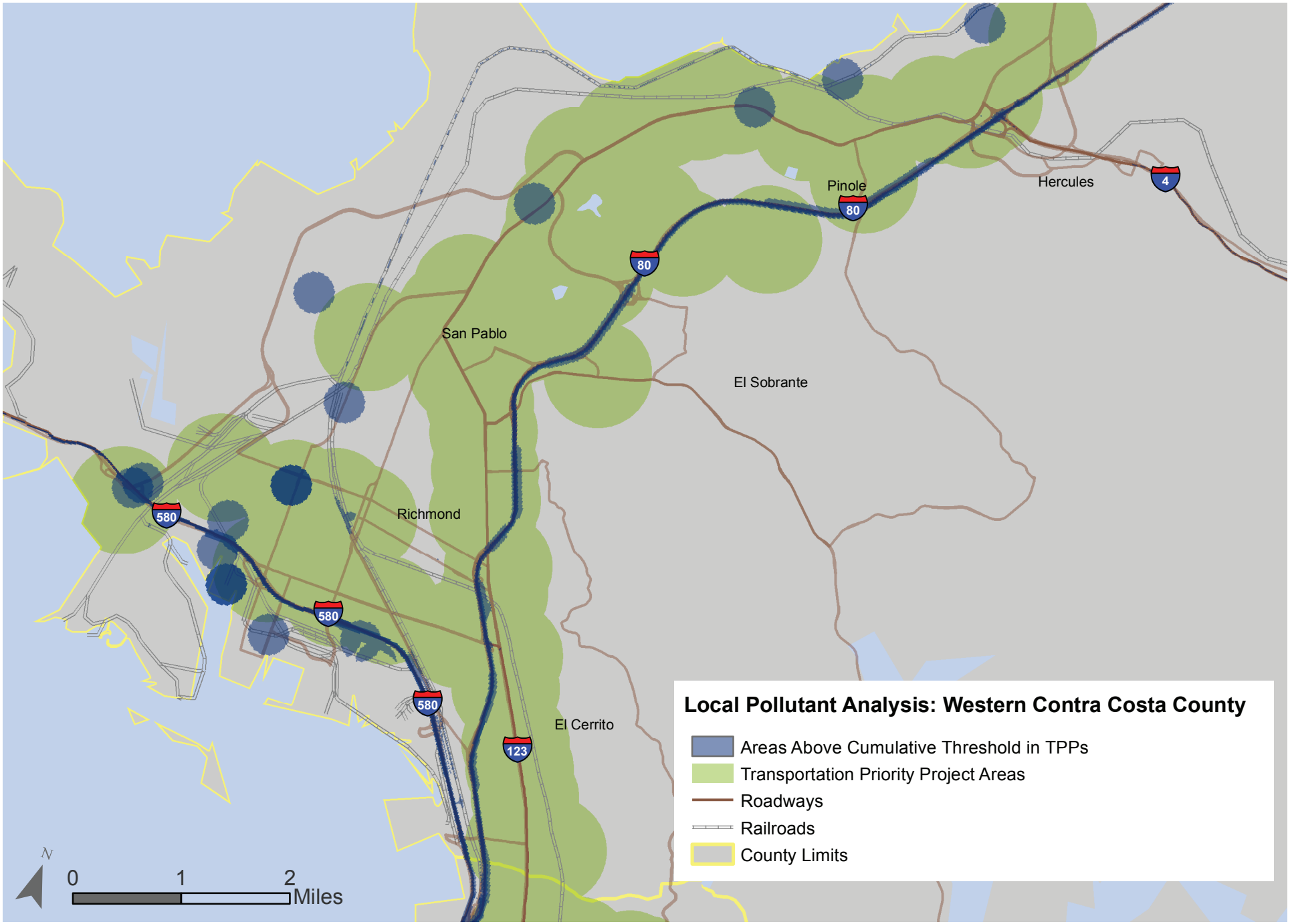

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Figure 2.2-9

Central Contra Costa County

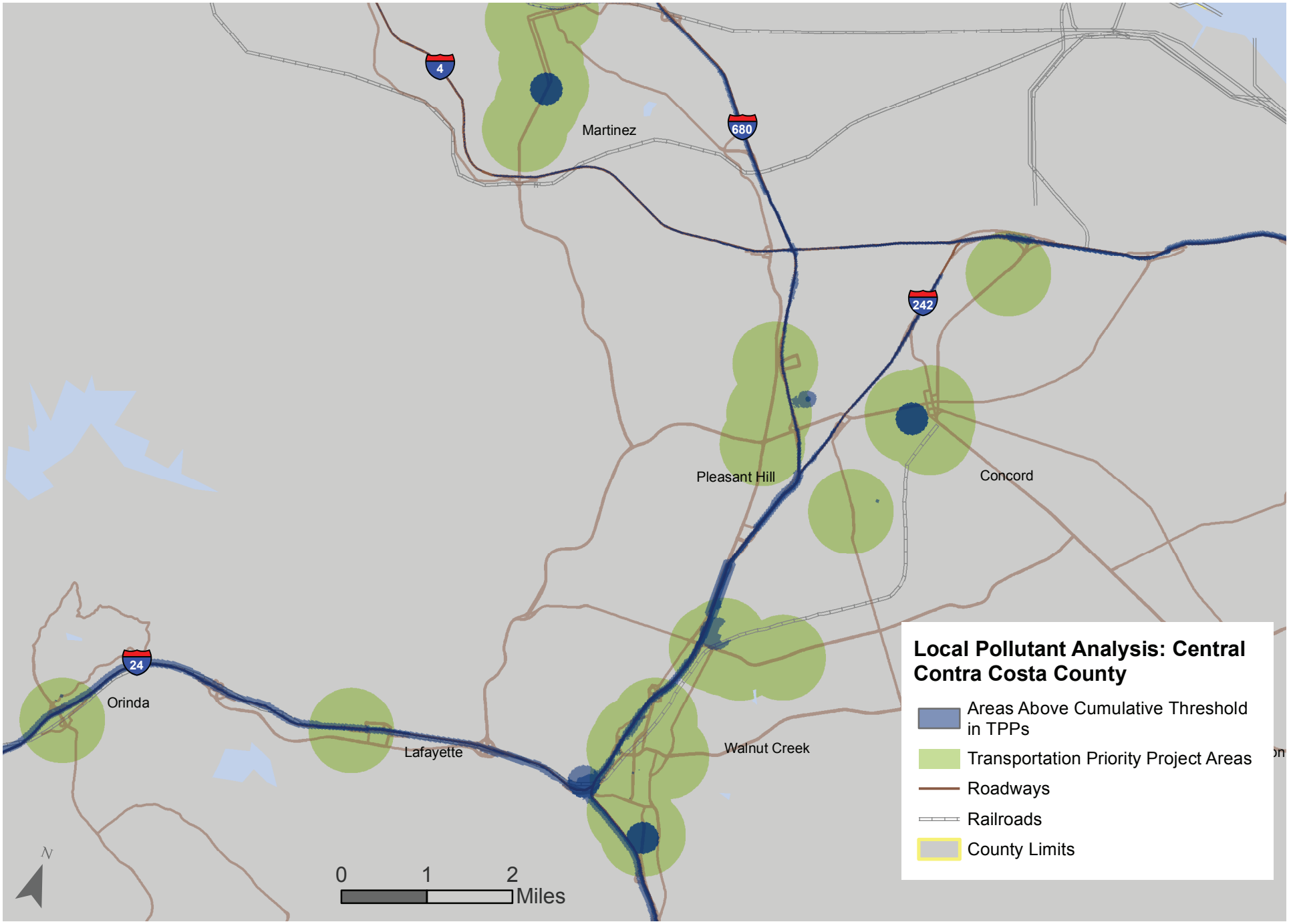

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Figure 2.2-10

Eastern Contra Costa County

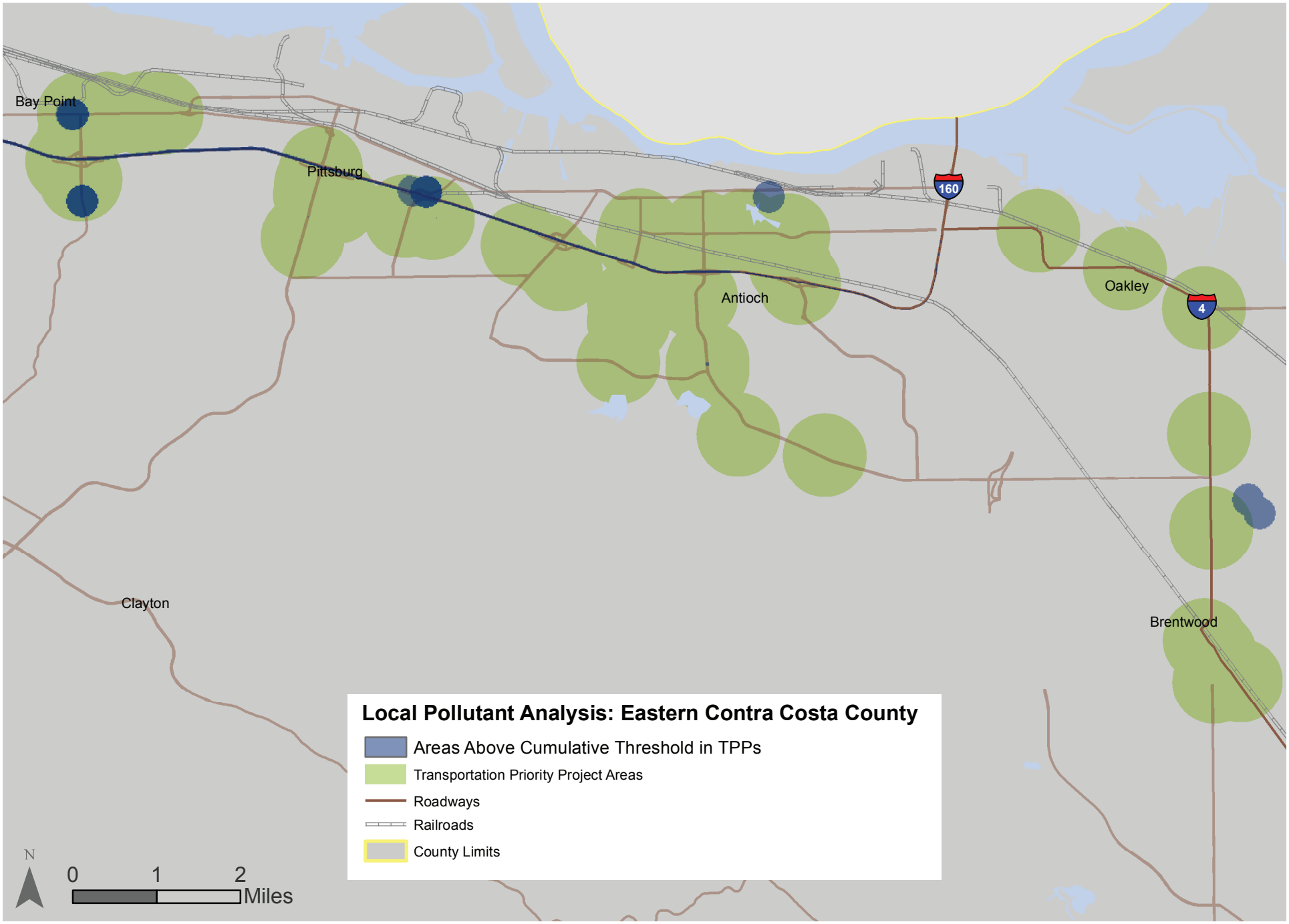

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Figure 2.2-11

Northern Marin County Local Pollutant Analysis

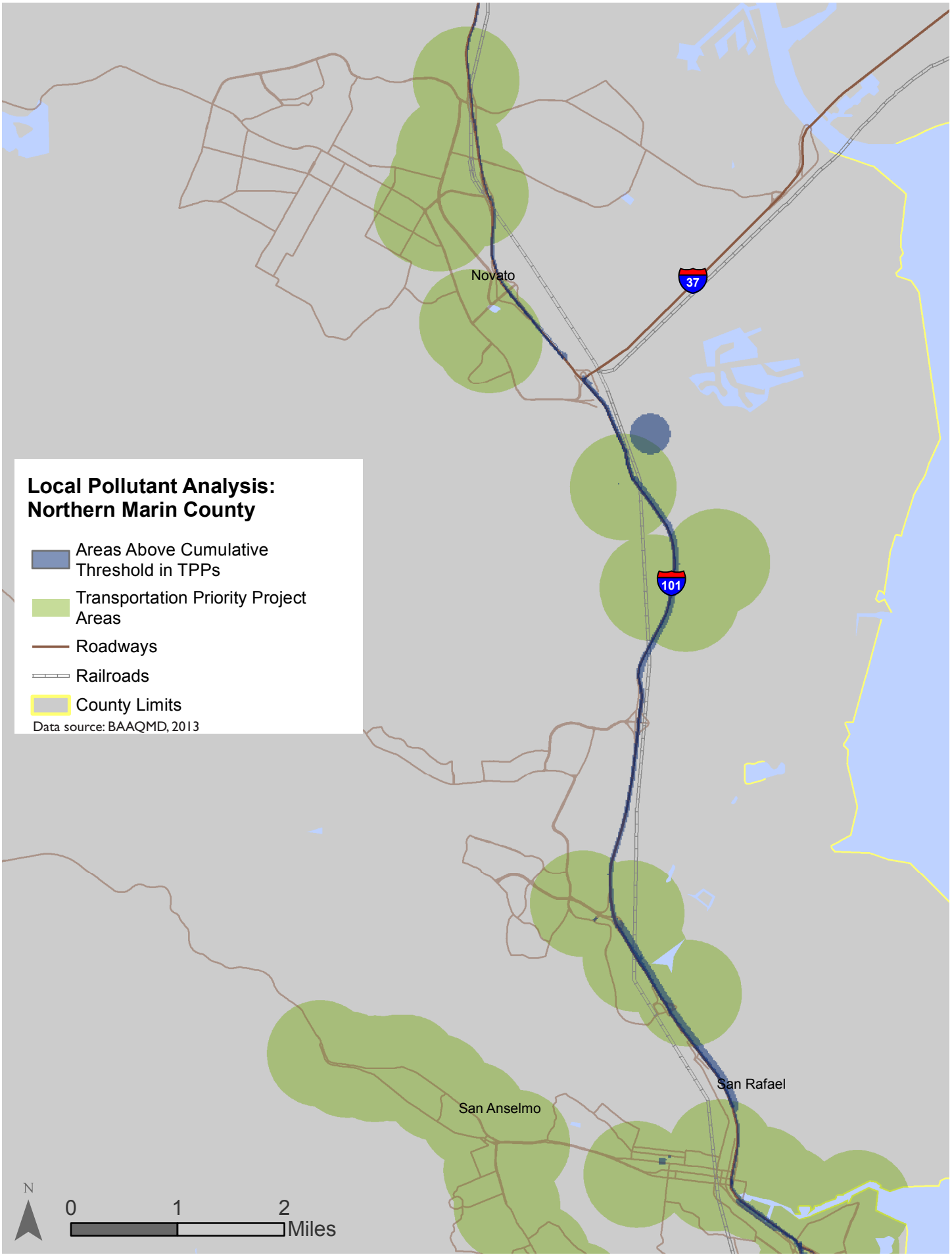

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Figure 2.2-12

Southern Marin County Local Pollutant Analysis

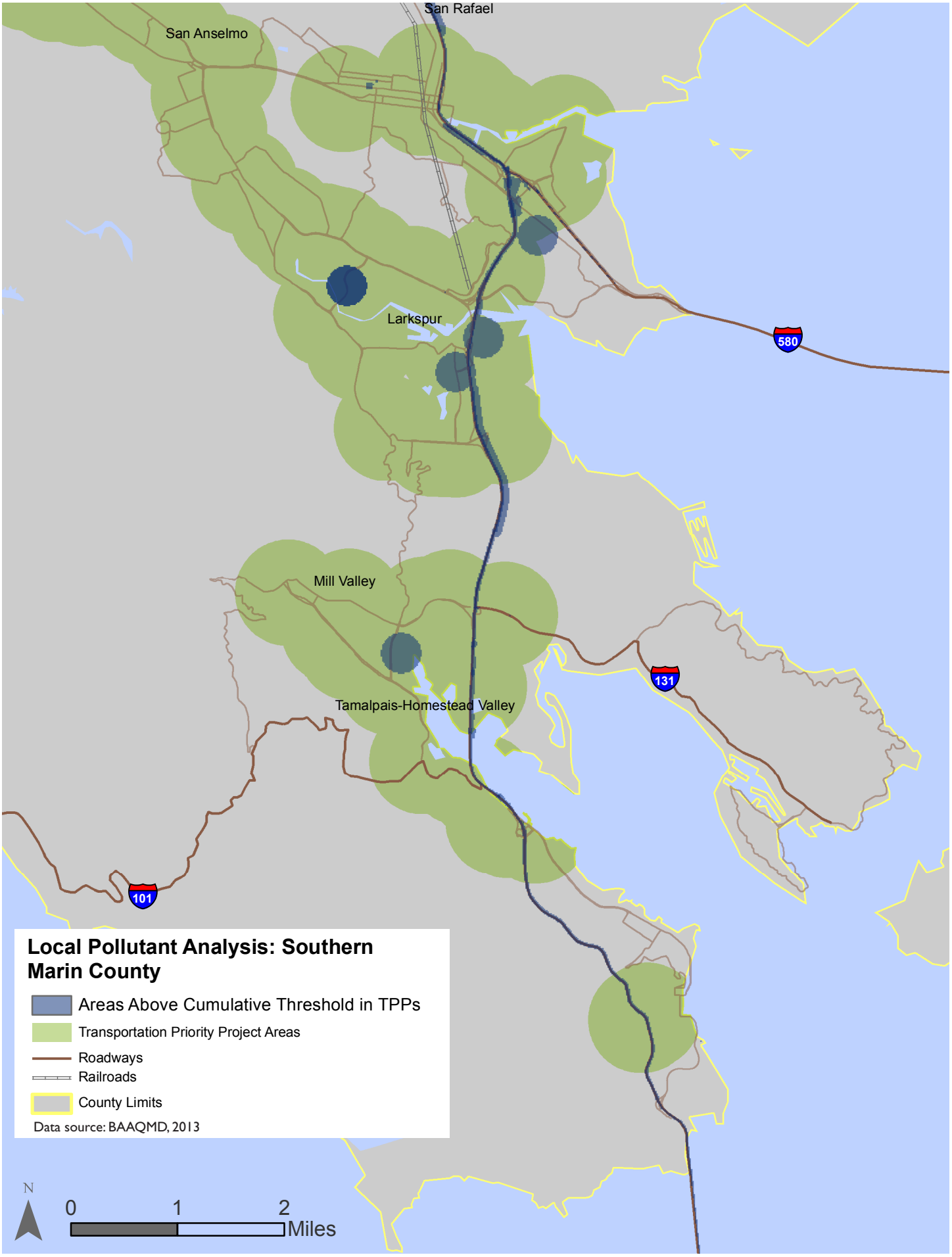

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Figure 2.2-13

Napa County Local Pollutant Analysis

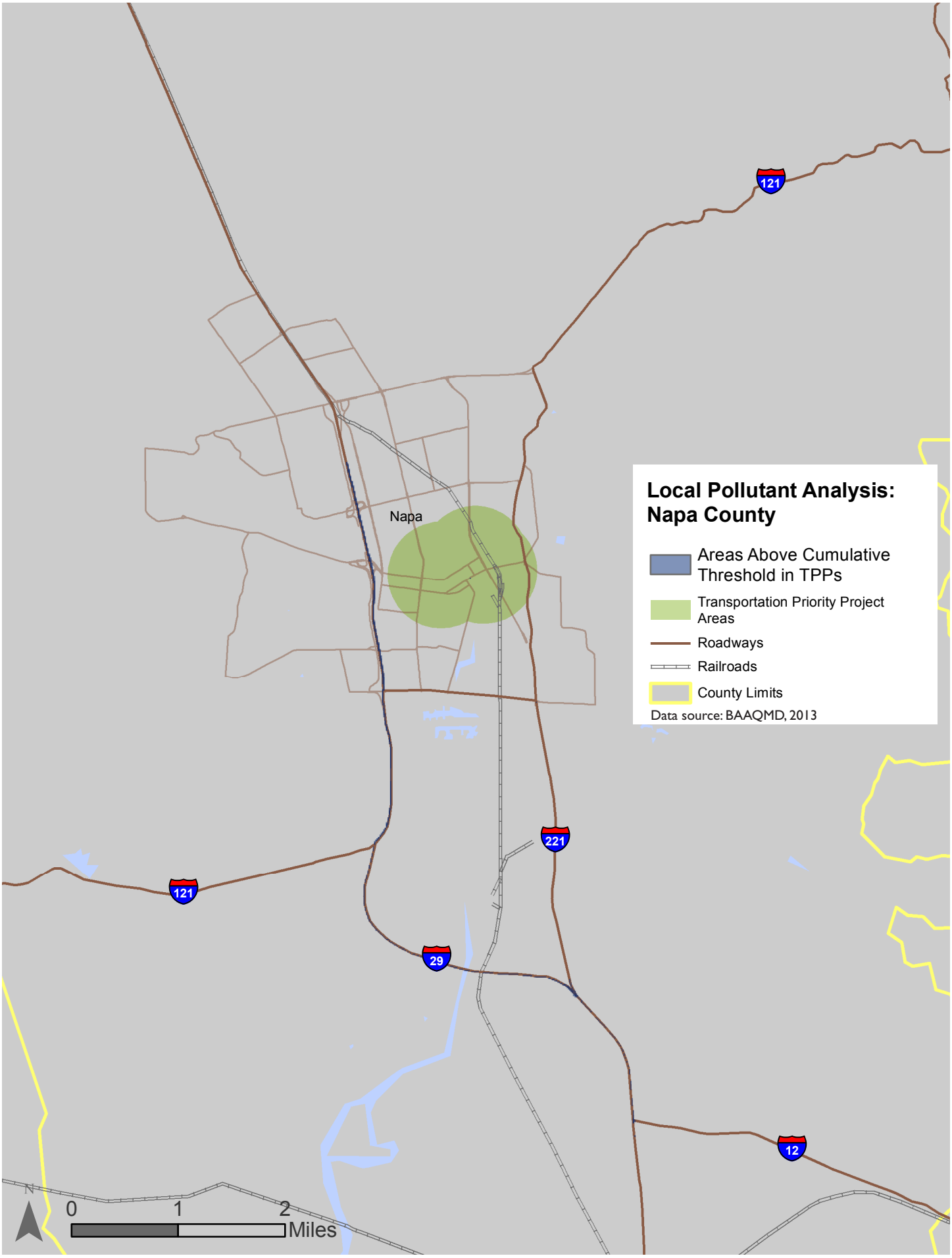

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Figure 2.2-14

Northern Santa Clara County Local Pollutant Analysis

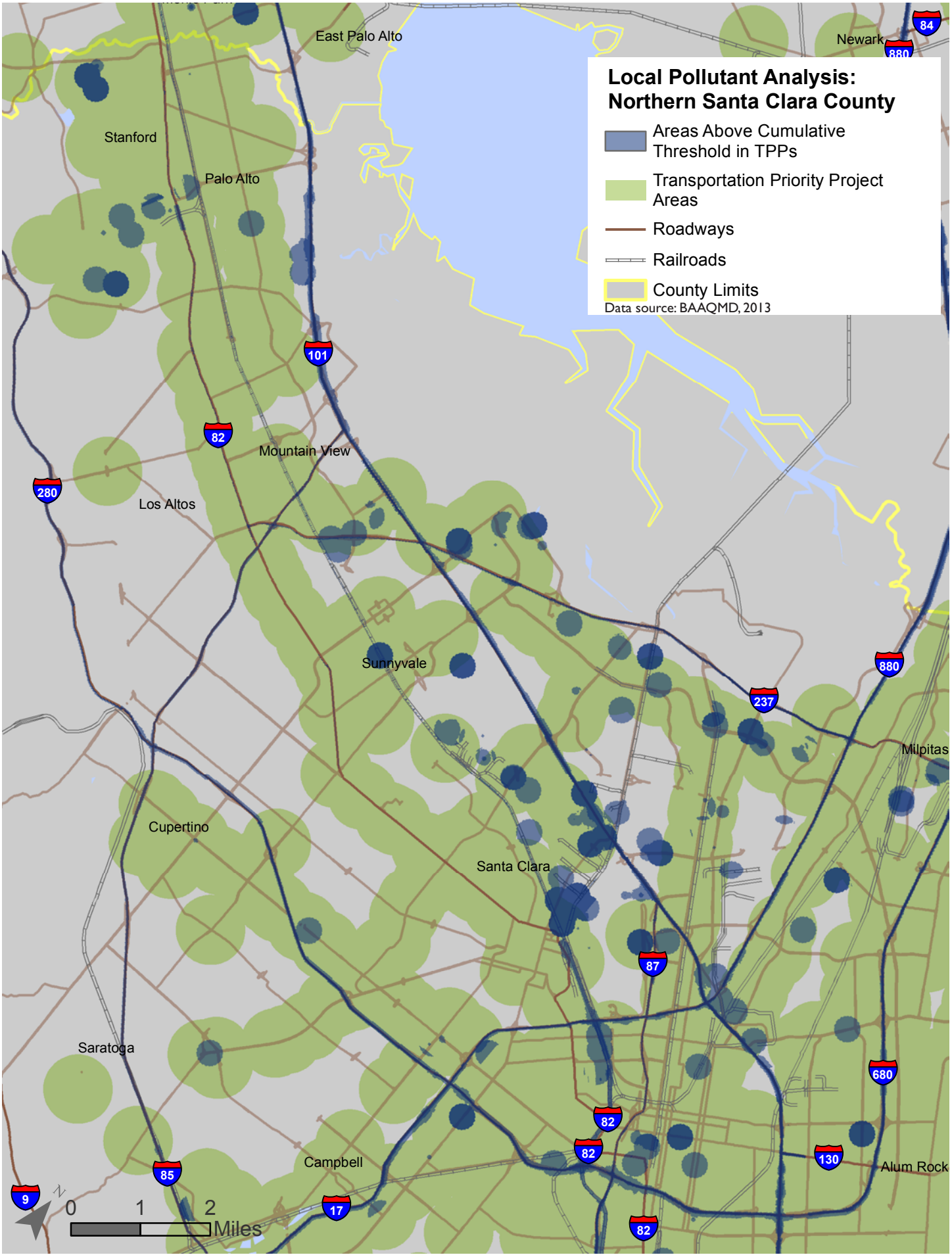

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Figure 2.2-15

Central Santa Clara County Local Pollutant Analysis

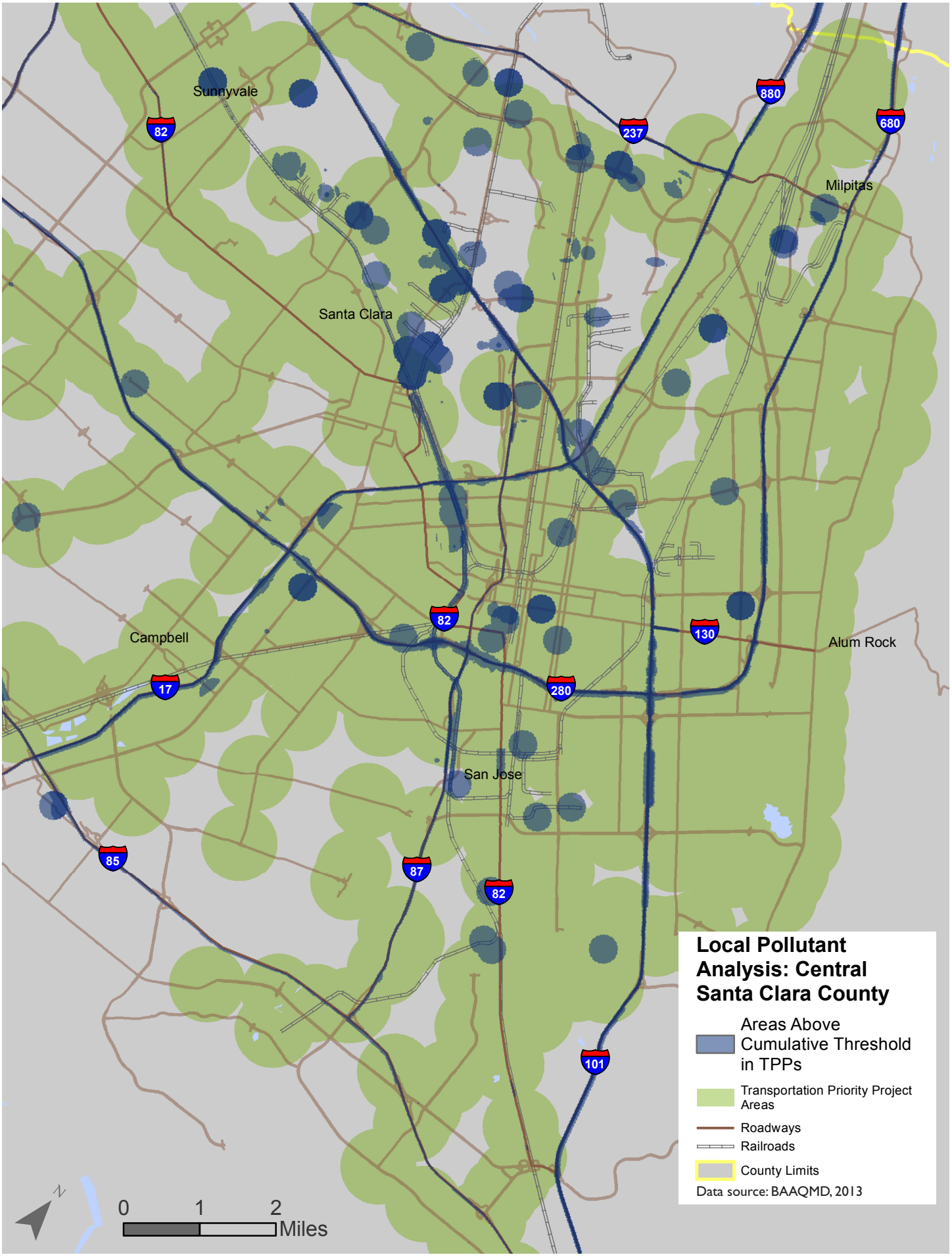

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Figure 2.2-16

Southern Santa Clara County Local Pollutant Analysis

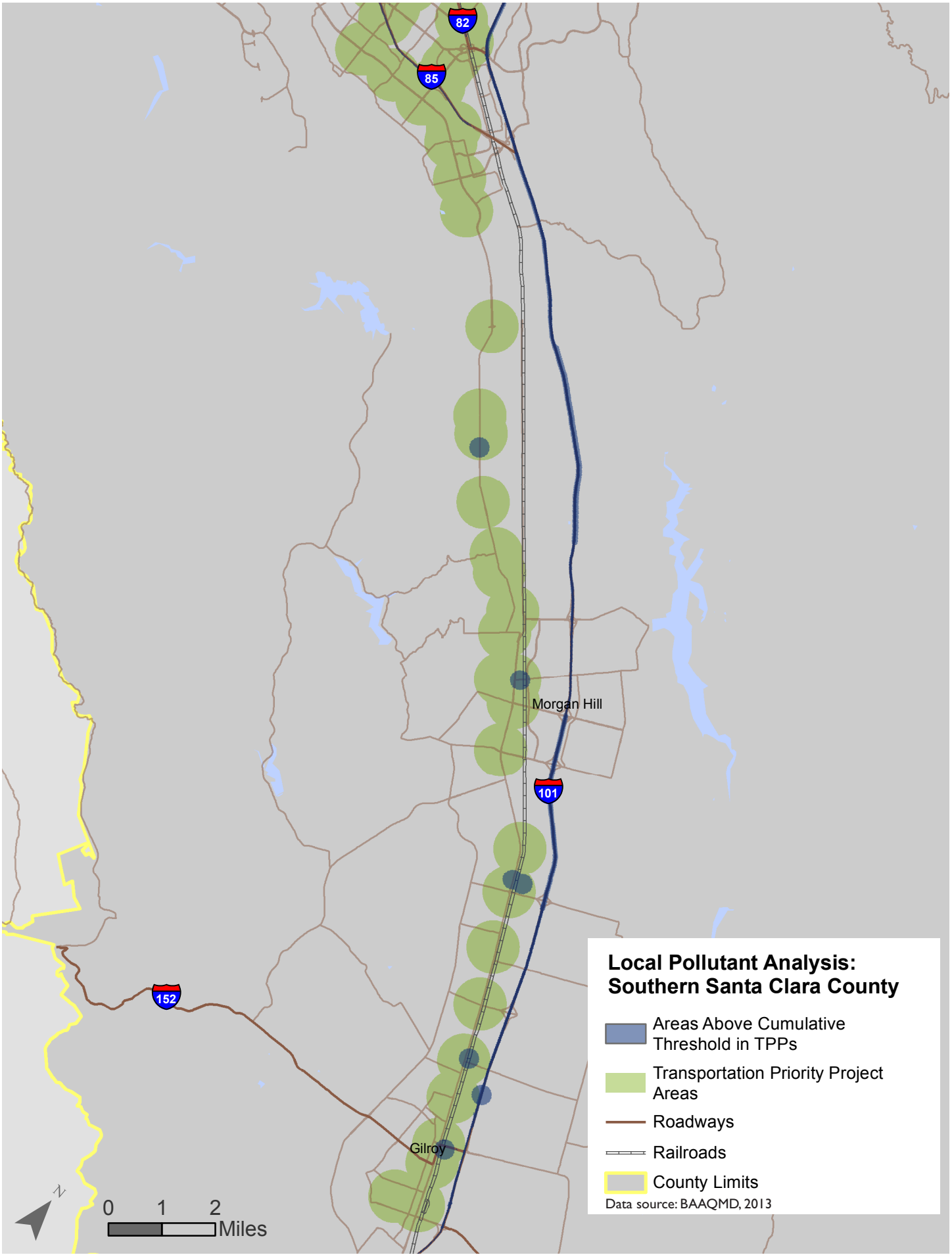

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Figure 2.2-17

San Francisco County

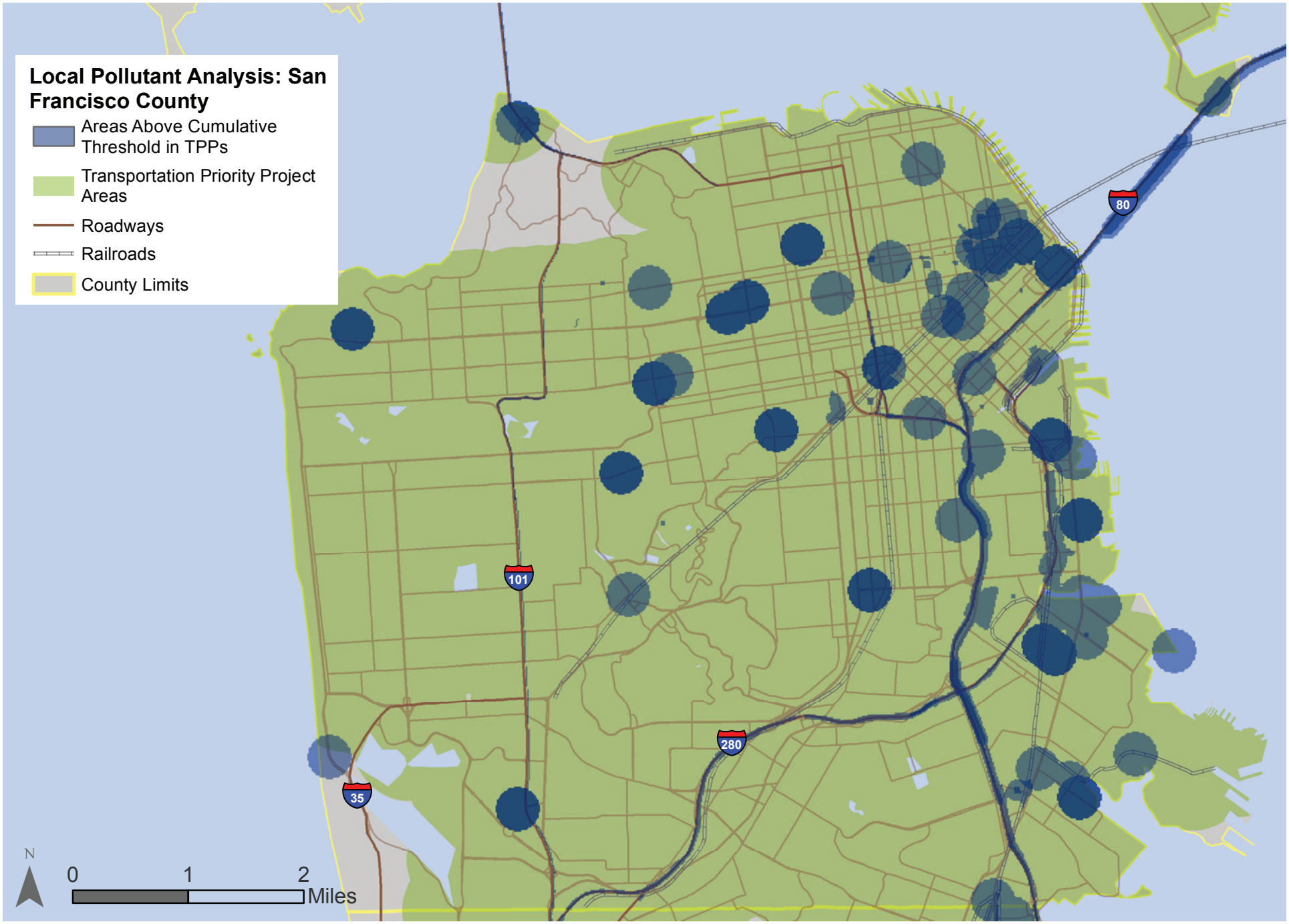

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Figure 2.2-18

Northern San Mateo County Local Pollutant Analysis

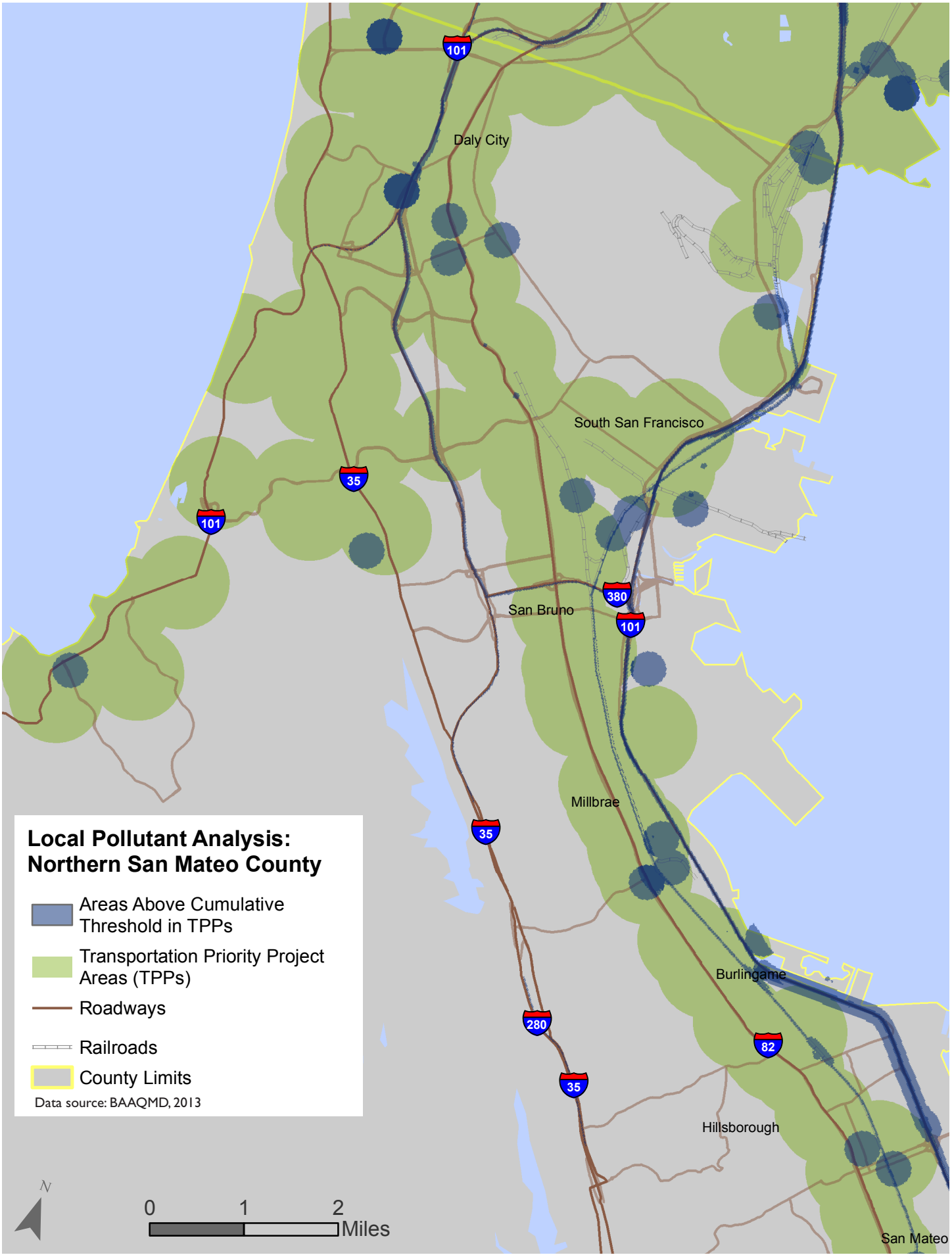

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Figure 2.2-19

Southern San Mateo County Local Pollutant Analysis

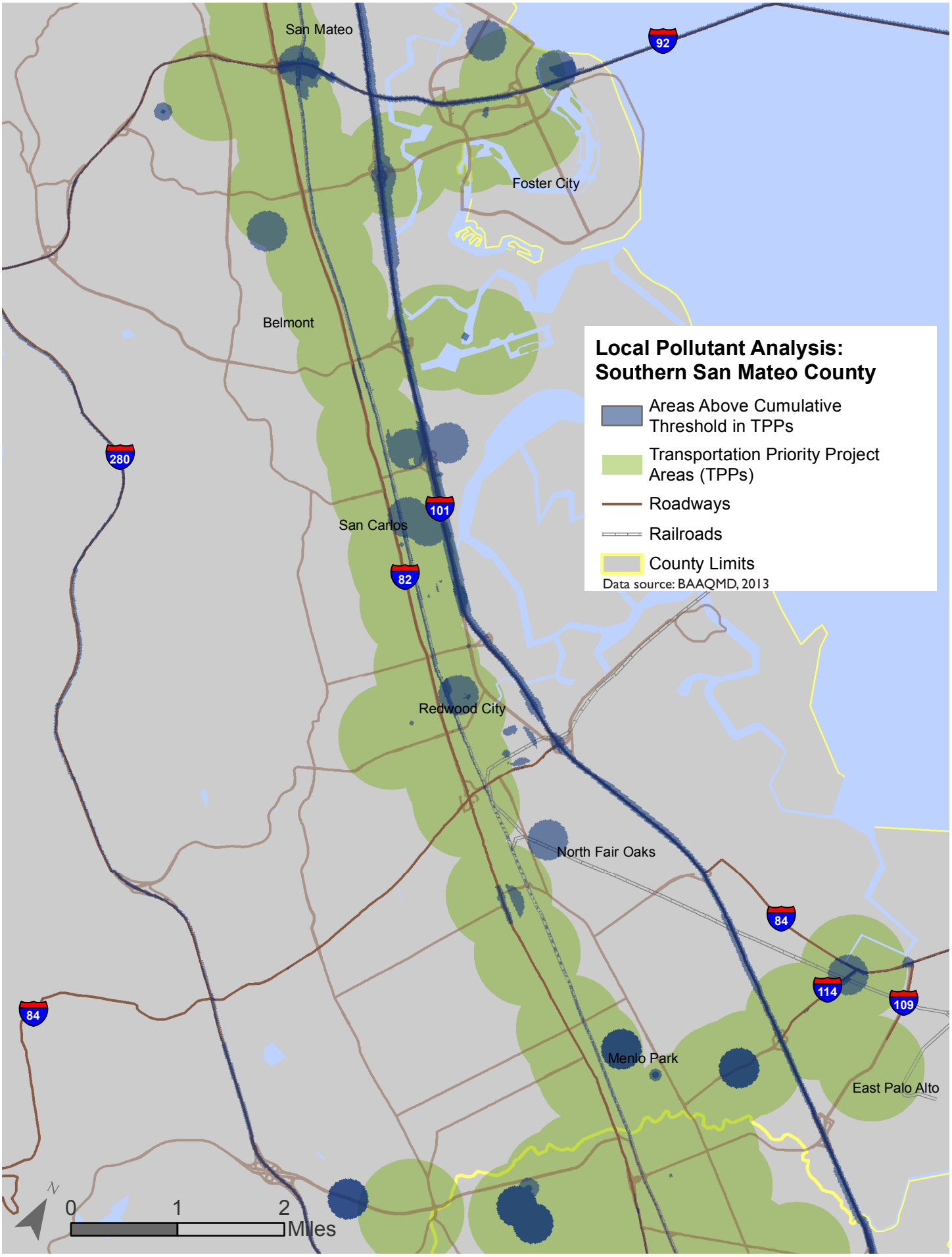

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Figure 2.2-20

Southern Solano County Local Pollutant Analysis

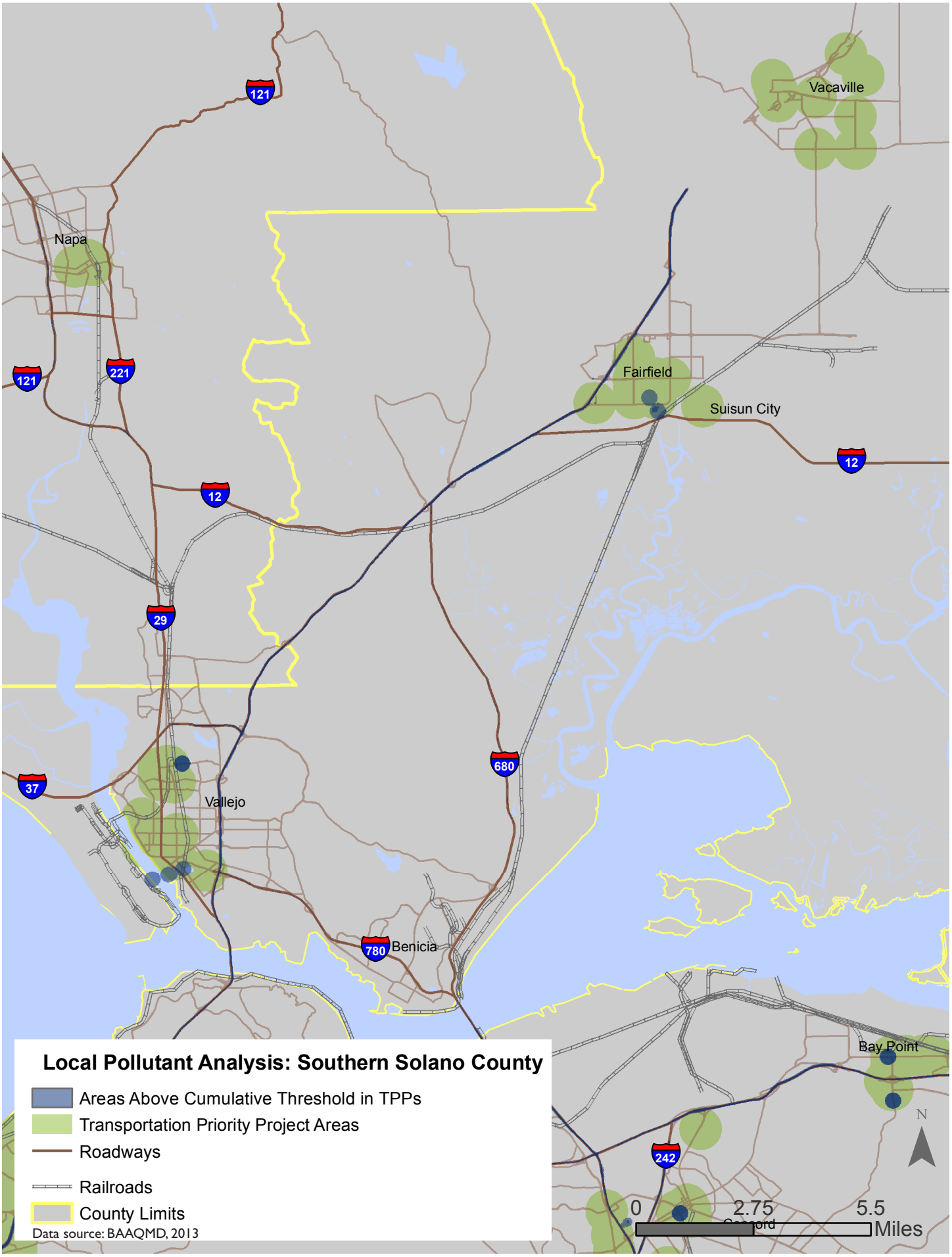

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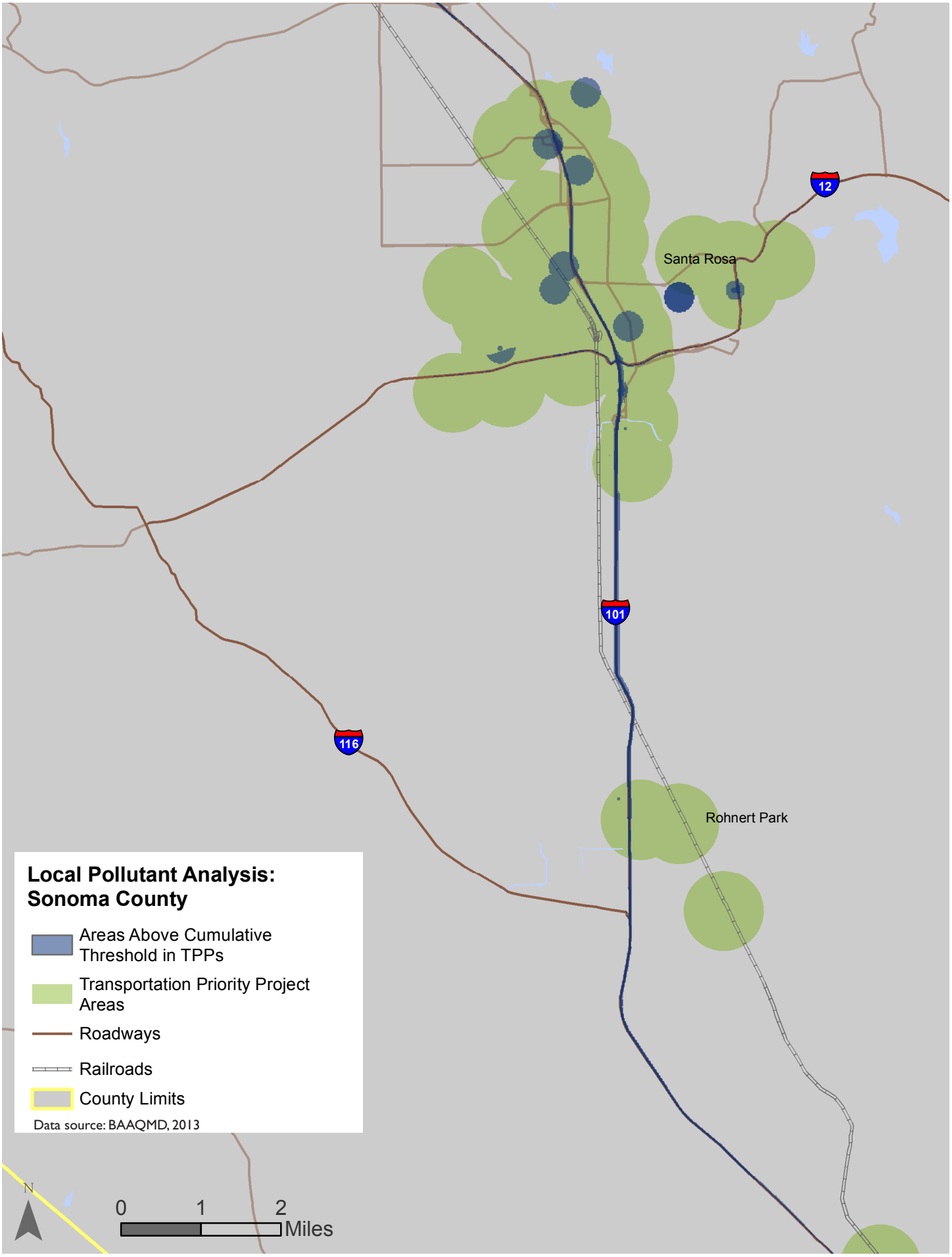
Figure 2.2-21

Sonoma County Local Pollutant Analysis



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Impact

2.2-5(b) Implementation of the proposed Plan could cause a localized net increase in sensitive receptors located in Transit Priority Project (TPP) corridors within set distances (Table 2.2-10) to mobile or stationary sources of TAC or $PM_{2.5}$ emissions.

New research on the health effects of TACs and $PM_{2.5}$ reinforces earlier findings regarding adverse health impacts on both respiratory and cardiovascular health but also a wider range of potential effects, such as diabetes, autism, cognitive functions in older adults, and oxidative damage to DNA. In addition, US EPA has not identified a level of TAC/ $PM_{2.5}$ concentration where no negative health effects are observed.[21]

In general, the closer one gets to a source of emissions, the higher the pollutant concentrations one will be exposed to. Ideally, sensitive land uses would be set back an appropriate distance such that sensitive receptors would not be exposed to TAC and $PM_{2.5}$ concentrations that could adversely affect their health. However, this is the central issue surrounding infill development, such as in TPPs and PDAs, where the objective is to locate jobs and housing in close proximity to each other to reduce automobile trips and therefore mobile source emissions. In doing so, sensitive receptors can be located too close to stationary or mobile sources and exposed to unhealthy levels of TACs and $PM_{2.5}$ concentrations.

To help identify the appropriate distances that sensitive receptors should be protected from these stationary and mobile sources, MTC utilized work prepared by ARB 2005 *Air Quality and Land Use Handbook: A Community Health Perspective* (Handbook), and BAAQMD permit data. ARB developed the Handbook to bring attention to the potential health impacts associated with locating sensitive receptors in close proximity to air pollution sources. Using available health data, air quality modeling, and monitoring studies, the Handbook provides recommendations for how far sensitive land uses should be located away from some specific sources of air pollution. The ARB recommended distances are based primarily on data showing that air pollution exposure from TACs and $PM_{2.5}$ can be reduced as much as 80 percent when sensitive land uses are set back the recommended distance. The distance recommendations were based on existing health studies and data available at that time. ARB distance recommendations were only made when the relative exposure and health risk from a source could be reasonably characterized from the available data. For each source type, the Handbook summarizes the key health and distance related findings that helped form the distance recommendation for that source.

ARB recommends using local air pollution source data, where appropriate and if available, to better determine specific health risk near local TAC and $PM_{2.5}$ sources, especially for sources not included in ARB's Handbook, or to identify more appropriate distance recommendations than they provide in the Handbook.

For sources of TACs and $PM_{2.5}$ not included in ARB's Land Use Handbook or for sources where Air District data was more site specific than ARB's data, MTC and ABAG worked with BAAQMD to develop distance recommendations for siting new sensitive land uses for use in this analysis. BAAQMD provided site specific stationary source permit data or existing studies to support the distance

[21] "Understanding Particulate Matter: Protecting Public Health in the San Francisco Bay Area," Bay Area Air Quality Management District, November 2012.

recommendations for diesel generators, refineries, sea ports, airports, railroads, rail stations, and ferry terminals.

The specific set distances recommended for avoiding locating sensitive land uses are listed below in **Table 2.2-10**. For detailed explanations of set distances recommended by ARB, see the 2005 *Air Quality and Land Use Handbook: A Community Health Perspective*. Recommended distances used for this analysis are summarized below and described in detail in Appendix E.

The ARB recommends that land use agencies "avoid siting" any sensitive land uses within the set distances identified within the Handbook. This recommendation is due to potential adverse health impacts that could affect sensitive receptors from prolonged exposure to higher concentrations of TACs and $PM_{2.5}$. Therefore, any future land use development that includes sensitive receptors within any of the set distances identified above would be considered a potentially significant (PS) impact. Mitigation Measure 2.2(d) is described below.

TABLE 2.2-10: DISTANCE RECOMMENDATION FROM SENSITIVE RECEPTORS

Source	*Distance Recommendation from Sensitive Receptors*
Freeway/Highway, Roadway	500 feet of a freeway, urban roads with 100,000 vehicles/day, or rural roads with 50,000 vehicles/day.
Distribution Center	1,000 feet of a distribution center with over 100 daily truck trips.
Gas Dispensing Facility	300 feet of a large gas dispensing facility (a facility with a throughput of 3.6 million gallons or more per year); 50 feet of a small gas dispensing facility (a facility with a throughput of less than 3.6 million gallons per year).
Dry Cleaning Operation	300 feet of dry cleaning operation using PERC; 500 feet of dry cleaning operations with two or more machines using PERC.
Chrome Plating Facility	1,000 feet of a chrome plating facility.
Railyard	1,000 feet of BNSF Richmond; BNSF Railway, Pittsburg; Union Pacific, Martinez; and Union Pacific, Milpitas. 0.5 miles of Maritime Port of Oakland/UP Railyard.
Railroad and Rail Station	200 feet of a railroad or rail station.
Ferry Terminal	500 feet of a ferry terminal.
Diesel Generator	350 feet of a diesel generator with an estimated cancer risk greater than 10 in a million.
Sea Port	0.5 miles of Maritime Port of Oakland/UP Railyard; 1,000 feet of Port of Benicia, Port of Redwood City; Port of Richmond.
Oil Refinery	0.5 miles of Chevron, Richmond; Shell, Martinez; Phillips 66, Rodeo; Tesoro, Martinez; and Valero, Benicia.
Airport	0.5 miles of all major airports, including San Francisco International, Oakland International Airport, and Norman Y. Mineta San José International Airport.

Source: The Bay Area Air Quality Management District, 2013.

Mitigation Measures

Implementing agencies and/or project sponsors shall consider implementation of mitigations measures including but not limited to those identified below.

2.2(d) Mitigation measures that shall be considered by implementing agencies and/or project sponsors where feasible based on project-and site-specific considerations include, but are not limited to best management practices (BMPs), such as the following:

- Installation of air filtration to reduce cancer risks and PM exposure for residents, and other sensitive populations, in buildings that are in close proximity to freeways, major roadways, diesel generators, distribution centers, railyards, railroads or rail stations, and ferry terminals. Air filter devices shall be rated MERV-13 or higher. As part of implementing this measure, an ongoing maintenance plan for the building's HVAC air filtration system shall be required.
- Phasing of residential developments when proposed within 500 feet of freeways such that homes nearest the freeway are built last, if feasible.
- Sites shall be designed to locate sensitive receptors as far as possible from any freeways, roadways, diesel generators, distribution centers, and railyards. Operable windows, balconies, and building air intakes shall be located as far away from these sources as feasible. If near a distribution center, residents shall not be located immediately adjacent to a loading dock or where trucks concentrate to deliver goods.
- Limiting ground floor uses in residential or mixed-use buildings that are located within the set distance of 500 feet to a non-elevated highway or roadway. Sensitive land uses, such as residential units or day cares, shall be prohibited on the ground floor.
- Planting trees and/or vegetation between sensitive receptors and pollution source, if feasible. Trees that are best suited to trapping PM shall be planted, including one or more of the following: Pine (*Pinus nigra* var. *maritima*), Cypress (*X Cupressocyparis leylandii*), Hybrid popular (*Populus deltoids X trichocarpa*), and Redwoods *(Sequoia sempervirens*).
- Within developments, sensitive receptors shall be separated as far away from truck activity areas, such as loading docks and delivery areas, as feasible. Loading dock shall be required electrification and all idling of heavy duty diesel trucks at these locations shall be prohibited.
- If within the project site, diesel generators that are not equipped to meet ARB's Tier 4 emission standards shall be replaced or retrofitted.
- If within the project site, emissions from diesel trucks shall be reduced through the following measures:
    - Installing electrical hook-ups for diesel trucks at loading docks.
    - Requiring trucks to use Transportation Refrigeration Units (TRU) that meet Tier 4 emission standards.
    - Requiring truck-intensive projects to use advanced exhaust technology (e.g. hybrid) or alternative fuels.
    - Prohibiting trucks from idling for more than two minutes as feasible.

- Establishing truck routes to avoid residential neighborhoods or other land uses serving sensitive populations. A truck route program, along with truck calming, parking and delivery restrictions, shall be implemented to direct traffic activity at non permitted sources and large construction projects.

Significance after Mitigation

The mitigation measures described above may result in cancer risk and $PM_{2.5}$ concentration reductions of 40 to 90 percent, depending on their applicability in a proposed project. See Appendix E for more information on the effectiveness of each mitigation measure.

Projects taking advantage of CEQA Streamlining provisions of SB 375 (Public Resources Code sections 21155.1, 21155.2, and 21159.28) must apply the mitigation measures described above, as feasible, to address site-specific conditions. To the extent that an individual project located within a set distance to a freeway or roadway, diesel generator, distribution center, rail line or railyard as defined above adopts and implements all feasible mitigation measures described above, the impact would be less than significant with mitigation (LS-M) (so long as the proposed project is not located in an area above the 100/million cancer risk or $PM_{2.5}$ concentration of 0.8 $\mu g/m^3$, as outlined in Impact 2.2-5(a)). However, for future development with sensitive land uses within set distances for gas stations, dry cleaners, airports, sea ports, chrome plating facilities, and oil refineries, implementation of Mitigation Measure 2.2(d) may not be sufficient to reduce the impact in all cases. Additional site specific analysis would be needed when a project is proposed in these areas to determine the actual level of impact and if feasible mitigation measures exist for the project to implement to get them below the thresholds. The impact for these projects would therefore remain significant and unavoidable (SU).

MTC/ABAG cannot require local implementing agencies to adopt the above mitigation measures, and it is ultimately the responsibility of a lead agency to determine and adopt mitigation. Therefore it cannot be ensured that this mitigation measure would be implemented in all cases. Further, there may be instances in which site-specific or project-specific conditions preclude the reduction of all project impacts to less-than-significant levels (as described above). For purposes of a conservative analysis, therefore, this impact remains significant and unavoidable (SU).

Impact

2.2-5(c) Implementation of the proposed Plan could cause a localized net increase in sensitive receptors located in Transit Priority Project (TPP) corridors where TACs or fine particulate matter ($PM_{2.5}$) concentrations result in noncompliance with an adopted Community Risk Reduction Plan.

BAAQMD launched an initiative in 2010 to assist cities and counties in reducing TACs and $PM_{2.5}$ through a plan-based, comprehensive, community-wide approach, commonly known as a community risk reduction plan (CRRP). BAAQMD prepared a guidance document, *Draft Guidelines for a Plan Approach for Reducing TACs and $PM_{2.5}$*, and partnered with the cities of San Francisco and San José to prepare CRRPs. BAAQMD provided funding, staff time, and technical resources, including emissions data and dispersion modeling, to each of the cities. At the time of this EIR's publication, BAAQMD completed the emissions inventory and dispersion modeling for San Francisco and the emissions inventory for San José. According to BAAQMD, the dispersion modeling for San José is anticipated to be completed in spring 2013.

In jurisdictions with an adopted CRRP, any proposed project that includes sensitive land uses and or receptors should be evaluated against the standards, thresholds and mitigation measures in those adopted plans. Where a proposed project is consistent with an adopted CRRP, the impact would be less than significant (LS).

Mitigation Measures

None required.

Impact

2.2-6 Implementation of the proposed Plan could result in a localized larger increase or smaller decrease of TACs and or $PM_{2.5}$ emissions in disproportionally impacted communities compared to the remainder of the Bay Area communities.

The method of analysis described above was used to determine if the investments and land use scenario would result in a larger increase or smaller decrease in TAC and $PM_{2.5}$ emissions in disproportionately impacted communities when compared to the Bay Area at large. TAC and $PM_{2.5}$ emissions were estimated along the major transportation corridors within the CARE communities for the proposed Plan's base year (2010) and the horizon year (2040).

Table 2.2-11 lists MTC's modeling results, expressed as a percentage change in TAC and $PM_{2.5}$ exhaust emissions when compared to the base year emissions for each county with a CARE community and the entire region. Overall TAC and $PM_{2.5}$ exhaust emissions from diesel and gasoline vehicles decrease significantly throughout the Bay Area between existing conditions in 2010 and the proposed Plan's horizon year 2040. Diesel PM, benzene, and 1, 3 butadiene TAC emissions from on-road vehicle exhaust are estimated to decrease between 68 and 75 percent. Region-wide $PM_{2.5}$ emissions from all on-road vehicle exhaust are expected to decrease by approximately 55 percent. These reductions are largely attributed to the implementation of ARB's On-Road Heavy-Duty Diesel Vehicle Regulations, which aims to achieve an 85 percent reduction in diesel PM by 2023.

Between CARE and non-CARE communities there are slight differences in the percent reductions expected in 2040. There are certain instances where non-CARE communities are estimated to have slightly higher $PM_{2.5}$ and TAC exhaust emission reductions than the CARE communities. The CARE community in Santa Clara County is an example where this occurs. These results may be explained by the fairly substantial increase expected in VMT within the Santa Clara CARE community when compared to the anticipated increase in VMT for the remainder of Santa Clara County. Then there are instances where a CARE community is expected to result in slightly higher reductions in TACs and $PM_{2.5}$, such as in Alameda County. While the percent difference in estimated $PM_{2.5}$ and TAC emissions isn't substantial between CARE and non-CARE communities, it does suggest that these disproportionally impacted communities may not realize the same level of $PM_{2.5}$ and TAC emission reductions expected throughout the remainder of the county.

TABLE 2.2-11: PERCENT CHANGE IN ON-ROAD MOBILE SOURCE EXHAUST EMISSIONS, YEARS 2010 - 2040

	Exhaust Only $PM_{2.5}$	*Diesel PM*	*Benzene*	*1, 3 Butadiene*	*VMT*
Alameda CARE Community	-56.11%	-69.23%	-71.16%	-71.56%	18.64%
Remainder of County	-55.13%	-67.24%	-69.27%	-69.58%	24.69%
Contra Costa CARE Community	-57.54%	-69.35%	-71.82%	-72.15%	14.56%
Remainder of County	-57.69%	-68.71%	-70.57%	-70.84%	15.92%
San Francisco CARE Community	-53.23%	-70.01%	-74.02%	-74.47%	11.57%
Remainder of County	-46.22%	-69.78%	-75.53%	-75.80%	7.89%
San Mateo CARE Community	-56.91%	-69.90%	-70.68%	-71.19%	19.00%
Remainder of County	-57.67%	-69.16%	-71.20%	-71.51%	15.53%
Santa Clara CARE Community	-50.86%	-66.16%	-67.58%	-68.08%	31.63%
Remainder of County	-54.14%	-67.23%	-69.55%	-69.92%	23.00%
Regionwide CARE Communities	-54.49%	-68.43%	-70.55%	-70.99%	21.12%
Remainder of Region	-55.64%	-67.66%	-69.97%	-70.27%	20.21%

Source: The Bay Area Air Quality Management District, 2013.

Table 2.2-12 lists MTC's modeling results, expressed as a percentage change in Total $PM_{2.5}$ emissions when compared to the 2010 base year emissions, for each county with a CARE community and the entire region. Total $PM_{2.5}$ includes exhaust from all vehicles, as well as re-entrained road dust, brake wear and tire wear, and does not include TACs from gasoline vehicles. Brake wear and tire wear emission rates are estimated in EMFAC2011. Road dust emissions are estimated from ARB's paved road dust methodology, which is based on EPA's dust emission rates estimates (EPA, AP-42 13.2.1, January 2011). When all sources of $PM_{2.5}$ are aggregated, the anticipated $PM_{2.5}$ emission reductions are much smaller than the emission changes presented in **Table 2.2-11**, which only show vehicle exhaust emissions. In fact, when Total $PM_{2.5}$ is estimated some counties even show an increase between 2010 and 2040.

This outcome may be explained by a number of factors. Emissions from gasoline and diesel on-road vehicles have been substantially reduced by stringent California and federal exhaust emission standards. ARB on-road Heavy-Duty Diesel Regulations are expected to reduce diesel PM by 85 percent by 2020. In addition, $PM_{2.5}$ from brake and tire wear from passenger vehicles is expected to represent approximately 85 to 90 percent of particulate matter from vehicles well into the future.[22] Currently, there are no regulations that have been adopted that will reduce future levels of particulate matter from tire and brake wear and re-entrained road dust emissions. Therefore, EMFAC2011 does not consider any improvements in brake and tire wear and re-entrained road dust emissions in future year's emission estimates. This means that as VMT increases, so do $PM_{2.5}$ emissions from brake and tire wear and re-entrained road dust. This is an example where increases in VMT are outstripping the technological advances of low emission vehicles.

[22] EMFAC 2011 Technical Documentation, ARB, September 19, 2011, p. 112.

Table 2.2-12 also shows that the CARE community in Santa Clara County, as well as regionwide CARE communities, will experience higher total $PM_{2.5}$ emissions between 2010 and 2040 in comparison with non-CARE portions of the County, and the region as a whole. As a result of the projected increase of $PM_{2.5}$ emissions in the CARE communities from 2010 to 2040, a potentially significant (PS) impact will occur based on the impact criteria for disproportionally impacted communities. Mitigation measures 2.2 (e) and 2.2 (f) are described below.

TABLE 2.2-12: PERCENT CHANGE IN ON-ROAD MOBILE SOURCE TOTAL PM EMISSIONS, YEARS 2010–2040 (TOTAL $PM_{2.5}$ INCLUDES VEHICLE EXHAUST, RE-ENTRAINED ROAD DUST, TIRE AND BRAKE WEAR)

Alameda CARE Community	**-1.36%**
Remainder of County	**2.49%**
Contra Costa CARE Community	**-3.64%**
Remainder of County	**-3.70%**
San Francisco CARE Community	**-3.62%**
Remainder of County	**-2.35%**
San Mateo CARE Community	**-1.53%**
Remainder of County	**-4.82%**
Santa Clara CARE Community	**10.53%**
Remainder of County	**2.89%**
Regionwide CARE Communities	**1.65%**
Remainder of Region	**-0.23%**

Source: The Bay Area Air Quality Management District, 2013.

Mitigation Measures

Mitigation measures to reduce TAC and $PM_{2.5}$ emissions from on-road trucks and locomotives that shall be implemented by MTC/ABAG and BAAQMD include, but are not limited to the following:

2.2(e) MTC/ABAG shall partner with BAAQMD to develop a program to install air filtration devices in existing residential buildings, and other buildings with sensitive receptors, located near freeways or sources of TACs and $PM_{2.5}$.

2.2(f) MTC/ABAG shall partner with BAAQMD to develop a program to provide incentives to replace older locomotives and trucks in the region to reduce TACs and $PM_{2.5}$.

In addition, Mitigation Measures 2.1 (a), 2.1(b), and 2.1 (c) (included in *Chapter 2.1: Transportation*) and 2.2 (d) (included under Impact 2.2-5(b)) could help reduce TAC and $PM_{2.5}$ emissions.

Significance after Mitigation

The proposed Plan could result in a larger increase or smaller decrease of TACs and $PM_{2.5}$ emissions in disproportionally impacted communities. These impacts vary across counties. The mitigation measures

identified above are anticipated to reduce this potentially significant impact. However, the exact reductions are not known at this time. Therefore, this impact remains significant and unavoidable (SU).