CHAPTER 5: ENVIRONMENTAL CONSEQUENCES

5.1 AIR QUALITY

This section considers long-term adverse effects and benefits of the project alternatives with regard to regional air quality. It also considers the project's conformity with the applicable State Implementation Plan (SIP) as required under the federal Clean Air Act (CAA) amendments of the 1993 United States Environmental Protection Agency (USEPA) transportation conformity regulations, found in the Code of Federal Regulations, Title 40, Part 93 (40 CFR Part 93), for operations emissions. Adverse effects are assessed by comparing conditions under the No Build, BEP, and SVRTP alternatives and by comparing projected emissions of pollutants to the significance thresholds. Air pollutants of concern include reactive organic gases (ROG), carbon monoxide (CO), nitrogen oxides (NOX), particulate matter 2.5 microns or less in diameter (PM2.5), and particulate matter 10 microns or less in diameter (PM10).

5.1.1 THRESHOLDS

Significance threshold are based on guidance provided by the Bay Area Air Quality Management District (BAAQMD), the USEPA, and the Federal Highway Administration (FHWA). Project alternatives would result in an adverse operational effect if:

- Operational emissions would exceed federal or BAAQMD emissions thresholds, as shown in Table 5.1-1.
- Increased traffic would generate CO concentrations at study intersections that exceed the federal or State one- and eight-hour standards.
- Sensitive receptors would be exposed to levels of toxic air contaminants (TACs) that exceed the probability of contracting cancer for the maximally exposed individual (MEI) by more than 10 in 1 million, or exceed ground-level concentrations of non-carcinogenic TACs in a Hazard Index by greater than 1.0 for the MEI.
- Operational activity would increase greenhouse gas (GHG) emissions above baseline levels.
- Operational activity would not be consistent with the USEPA Transportation Conformity Rule (40 CFR Part 93).

Project alternatives would result in an adverse cumulative effect if:

- Project alternatives exceed any of the operational significance thresholds presented above.
- Project alternatives would not be consistent with the BAAQMD air quality plans.

Table 5.1-1: Operational Emission Thresholds

Criteria Pollutant	Federal Tons per Year	BAAQMD Pounds per Day	BAAQMD Tons per Year
Reactive Organic Gases (ROG)	50	80	15
Nitrogen Oxides (NOX)	100	80	15
Carbon Monoxide (CO)	100	--	--
Particulate Matter (PM2.5)	100	--	--
Particulate Matter (PM10)	100	80	15

Source: United States Code of Federal Regulations, Section 40, Part 93, and BAAQMD, BAAQMD CEQA Guidelines: Assessing the Air Quality Impacts of Projects and Plans, December 1999.

5.1.2 IMPACT DISCUSSION

Regional operational emissions were estimated by multiplying the SVRTC automobile and bus vehicle miles traveled (VMT) by emission factors obtained from EMFAC2007 and the California Air Resources Board (CARB).

Operational Emissions

Based on the operational emission estimates, the No Build Alternative would have no adverse air quality operational effect, the BEP Alternative would not result in an adverse air quality operational effect, and the SVRTP Alternative would have a beneficial air quality operational effect.

No Build Alternative

The No Build Alternative consists of the existing transit and roadway networks and planned and programmed improvements in the SVRTC. Therefore, the No Build Alternative would include physical changes typically associated with transit and highway improvements and their related air quality effects that would be addressed in separate environmental documents. In addition, projects planned under the No Build Alternative would undergo separate environmental review to determine global warming effects to air quality.

BEP Alternative

As shown in Table 5.1-2, the BEP Alternative would result in less tons per year and grams per day of ROG, CO, PM2.5, and PM10 than the No Build Alternative. The BEP Alternative would result in more tons per year and grams per day of NOX than the No Build Alternative. However, the increase in NOX emissions would be less than the federal and BAAQMD significance thresholds. As such, the BEP Alternative would not result in an adverse air quality operational effect and no mitigation is required.

Table 5.1-2: Project Operational Emissions (2030)

Alternative	ROG Tons Per Year	NOX Tons Per Year	CO Tons Per Year	PM2.5 Tons Per Year	PM10 Tons Per Year	ROG Pounds Per Day	NOX Pounds Per Day	PM10 Pounds Per Day
No Build	9,503	6,642	74,326	2,805	2,919	65,314	45,649	20,059
BEP	9,493	6,651	74,250	2,801	2,916	65,243	45,709	20,041
SVRTP	9,482	6,638	74,166	2,799	2,913	65,170	45,662	20,018
BEP vs. No Build	(10)	9	(76)	(4)	(3)	(71)	60	(18)
SVRTP vs. No Build	(21)	(4)	(160)	(6)	(6)	(144)	(27)	(41)
Federal Significance Thresholds	50	100	100	100	100	--	--	--
Exceed Threshold?	No	No	No	No	No	--	--	--
BAAQMD Significance Thresholds	15	15	--	--	15	80	80	80
Exceed Threshold?	No	No	--	--	No	No	No	No

Source: Terry A. Hayes Associates, 2008.

SVRTP Alternative

As shown in Table 5.1-2, the SVRTP Alternative would result in less tons per year and grams per day of ROG, NOX, CO, PM2.5, and PM10 than the No Build Alternative. As such, the SVRTP Alternative would result in a beneficial air quality operational effect.

<u>Localized Carbon Monoxide</u>

CO concentrations in 2030 are expected to be lower than existing conditions due to stringent state and federal mandates for lowering vehicle emissions. Although traffic volumes would be higher in the future both without and with the implementation of the BEP and SVRTP alternatives, CO emissions from mobile sources are expected to be much lower due to technological advances in vehicle emissions systems, as well as from normal turnover in the vehicle fleet. Accordingly, increases in traffic volumes would be offset by increases in cleaner-running cars comprising a higher percentage of the entire vehicle fleet on the road.

CO is a gas that disperses quickly. Thus, CO concentrations at sensitive receptor locations are expected to be much lower than CO concentrations adjacent to the roadway intersections. Additionally, the intersections were selected based on poor LOS and high traffic volumes. Sensitive receptors that are located away from congested intersections or are located near roadway intersections with better LOS would be exposed to lower CO concentrations.

The USEPA CAL3QHC micro-scale dispersion model was used to calculate future CO concentrations at congested and high-volume intersections. Tables 5.1-3a thru 5.1-7b display the CO concentrations associated with each station.

Table 5.1-3a: Future One-Hour Carbon Monoxide Concentrations at Intersections Near Milpitas Station Parts Per Million[a] (2030)

Intersection	BEP Alternative	SVRTP Alternative
Great Mall Parkway / Montague Expressway	2.3	2.3
Main Street / Curtis Avenue	1.9	1.9
Milpitas Boulevard / Yosemite Drive	2.0	2.0
Milpitas Boulevard / Montague Expressway	2.3	2.3
Dempsey Road / Landess Avenue	2.0	2.0
Park Victoria Drive / Landess Avenue	2.1	2.1
Old Oakland Road / Montague Expressway	2.2	2.2
Milpitas Boulevard / Calaveras Boulevard	2.2	2.2
Milpitas Boulevard / Los Coches Street	2.0	2.0
State Standard	**20**	**20**

Note: [a] All concentrations include year 2030 one-hour ambient concentrations of 1.8 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

Table 5.1-3b: Future Eight-Hour Carbon Monoxide Concentrations at Intersections Near Milpitas Station in Parts Per Million[a] (2030)

Intersection	BEP Alternative	SVRTP Alternative
Great Mall Parkway / Montague Expressway	1.6	1.6
Main Street / Curtis Avenue	1.4	1.4
Milpitas Boulevard / Yosemite Drive	1.4	1.4
Milpitas Boulevard / Montague Expressway	1.6	1.6
Dempsey Road / Landess Avenue	1.4	1.4
Park Victoria Drive / Landess Avenue	1.5	1.5
Old Oakland Road / Montague Expressway	1.6	1.6
Milpitas Boulevard / Calaveras Boulevard	1.6	1.6
Milpitas Boulevard / Los Coches Street	1.4	1.4
State Standard	**9.0**	**9.0**

Note: [a] All concentrations include year 2030 eight-hour ambient concentrations of 1.3 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

Table 5.1-4a Future One-Hour Carbon Monoxide Concentrations at Intersections Near Berryessa Station in Parts Per Million[a] (2030)

Intersection	BEP Alternative	SVRTP Alternative
Flickinger Avenue / Berryessa Road	2.2	2.2
Lundy Avenue / Berryessa Road	2.2	2.2
King Road / Marbury Road	2.1	2.1
Oakland Road / Commercial Street	2.0	2.0
Oakland Road / Brokow Road	2.1	2.1
State Standard	**20**	**20**

Note: [a] All concentrations include year 2030 one-hour ambient concentrations of 1.8 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

Table 5.1-4b Future Eight-Hour Carbon Monoxide Concentrations at Intersections Near Berryessa Station in Parts Per Million[a] (2030)

Intersection	BEP Alternative	SVRTP Alternative
Flickinger Avenue / Berryessa Road	1.6	1.6
Lundy Avenue / Berryessa Road	1.6	1.6
King Road / Marbury Road	1.5	1.5
Oakland Road / Commercial Street	1.4	1.4
Oakland Road / Brokow Road	1.5	1.5
State Standard	**9.0**	**9.0**

Note: [a] All concentrations include year 2030 eight-hour ambient concentrations of 1.3 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

Table 5.1-5a: Future One-Hour Carbon Monoxide Concentrations at Intersections Near Alum Rock Station in Parts Per Million[a] (2030)

Intersection	SVRTP Alternative
King Road / McKee Road	2.1
Capitol Avenue / McKee Road	2.2
24th Street / Santa Clara Street	2.1
McLaughlin Avenue / Story Road	2.2
King Road / Story Road	2.2
King Road / Marbury Road	2.0
Capitol Expressway / Capitol Avenue	2.2
State Standard	**20**

Note: [a] All concentrations include year 2030 one-hour ambient concentrations of 1.8 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

Table 5.1-5b: Future Eight-Hour Carbon Monoxide Concentrations at Intersections Near Alum Rock Station in Parts Per Million[a] (2030)

Intersection	SVRTP Alternative
King Road / McKee Road	1.5
Capitol Avenue / McKee Road	1.6
24th Street / Santa Clara Street	1.5
McLaughlin Avenue / Story Road	1.6
King Road / Story Road	1.6
King Road / Marbury Road	1.4
Capitol Expressway / Capitol Avenue	1.6
State Standard	**9.0**

Note: [a] All concentrations include year 2030 eight-hour ambient concentrations of 1.3 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

Table 5.1-6a: Future One-Hour Carbon Monoxide Concentrations at Intersections Near Diridon/Arena Station in Parts Per Million[a] (2030)

Intersection	SVRTP Alternative
The Alameda / Hedding Street	2.1
The Alameda / Taylor Street	2.0
Race Street / The Alameda	2.0
Market Street / Santa Clara Street	2.1
Meridian Avenue / San Carlos Street	2.1
Almaden Boulevard / San Carlos Street	2.1
Market Street / San Carlos Street	2.1
Almaden Boulevard / San Fernando Street	1.9
Cahill Street / Santa Clara Street	2.1
State Standard	**20**

Note: [a] All concentrations include year 2030 one-hour ambient concentrations of 1.8 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

Table 5.1-6b: Future Eight-Hour Carbon Monoxide Concentrations at Intersections Near Diridon/Arena Station in Parts Per Million[a] (2030)

Intersection	SVRTP Alternative
The Alameda / Hedding Street	1.5
The Alameda / Taylor Street	1.4
Race Street / The Alameda	1.4
Market Street / Santa Clara Street	1.5
Meridian Avenue / San Carlos Street	1.5
Almaden Boulevard / San Carlos Street	1.5
Market Street / San Carlos Street	1.5
Almaden Boulevard / San Fernando Street	1.4
Cahill Street / Santa Clara Street	1.5
State Standard	**9.0**

Note: [a] All concentrations include year 2030 eight-hour ambient concentrations of 1.3 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

Table 5.1-7a: Future One-Hour Carbon Monoxide Concentrations at Intersections Near Santa Clara Station in Parts Per Million[a] (2030)

Intersection	SVRTP Alternative
Coleman Avenue / Brokaw Road	2.1
De La Cruz Boulevard / Martin Avenue	2.1
Monroe Street / Benton Street	1.9
San Tomas Expressway / El Camino Real	2.3
State Standard	**20**

Note: [a] All concentrations include year 2030 one-hour ambient concentrations of 1.8 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

Table 5.1-7b: Future Eight-Hour Carbon Monoxide Concentrations at Intersections Near Santa Clara Station in Parts Per Million[a] (2030)

Intersection	SVRTP Alternative
Coleman Avenue / Brokaw Road	1.5
De La Cruz Boulevard / Martin Avenue	1.5
Monroe Street / Benton Street	1.4
San Tomas Expressway / El Camino Real	1.6
State Standard	**9.0**

Note: [a] All concentrations include year 2030 eight-hour ambient concentrations of 1.3 ppm.
Source: Terry A. Hayes Associates, LLC, 2008.

No Build Alternative

The No Build Alternative consists of the existing transit and roadway networks and planned and programmed improvements in the SVRTC. Therefore, the No Build Alternative would include physical changes typically associated with transit and highway improvements and their related CO effects that would be addressed in separate environmental documents. In addition, projects planned under the No Build Alternative would undergo separate environmental review to determine global warming effects to air quality.

BEP Alternative

Intersection Analysis

Tables 5.1-3a thru 5.1.7b show one- and eight-hour intersection CO concentrations for intersections near each of the stations. Future one- and eight-hour CO concentrations would not exceed the standard at any of the analyzed intersections under the BEP Alternative. Therefore, the BEP Alternative would not result in an adverse effect and no mitigation is required.

Park-and-Ride Facility Analysis

The station area concept plans for the BEP Alternative indicate that multi-level parking structures are proposed at the Milpitas and Berryessa stations. Because of the large parking structure capacities proposed (2,030 to 2,850 parking structure spaces), a CO hot spot analysis was conducted to determine whether slow moving and idling vehicles within the parking structures during peak periods would result in CO concentration violations. The USEPA SCREEN3 dispersion model was used for this purpose.

The results of the CO analysis for the two parking structures are shown in Table 5.1-8a and Table 5.1-8b. When the year 2030 ambient 1-hour background concentration of 2.2 parts per million (ppm) and 8-hour background concentration of 1.6 ppm are taken into account, total concentrations would range from 2 to 3 ppm for the 1-hour period and 1.3 to 1.9 ppm for the 8-hour period. The NAAQS of 35 ppm for 1-hour concentrations and 9 ppm for the 8-hour period would not be exceeded, and no adverse effect would occur and mitigation is not required.

Table 5.1-8a: BEP Alternative - One-Hour Carbon Monoxide Concentrations Near Station Parking Structures in Parts Per Million (2030)[a]

Station	Milpitas	Milpitas	Berryessa	Berryessa
Spaces in structure	516	2,030	2,520	2,850
Acres of structure	2.0	2.0	2.7	3.2
Parking Levels	2	8	8	8
50 feet	2	2	3	2
100 feet	2	2	3	2
500 feet	2	2	3	2
1,000 feet	2	2	2	2
1,500 feet	2	2	2	2
3,000 feet	2	2	2	2

Source: Terry A. Hayes Associates LLC, 2008.

Table 5.1-8b: BEP Alternative - Eight-Hour Carbon Monoxide Concentrations Near Station Parking Structures in Parts Per Million (2030)[a]

Station	Milpitas	Milpitas	Berryessa	Berryessa
Spaces in structure	516	2,030	2,520	2,850
Acres of structure	2.0	2.0	2.7	3.2
Parking Levels	2	8	8	8
50 feet	1.6	1.7	1.9	1.8
100 feet	1.3	1.4	1.6	1.5
500 feet	1.3	1.4	1.6	1.5
1,000 feet	1.3	1.3	1.4	1.4
1,500 feet	1.3	1.3	1.4	1.3
3,000 feet	1.3	1.3	1.3	1.3

Note: [a] CO concentrations assume peak evening operations at parking structures. EMFAC2007 emission factors for running exhaust emissions and starting emissions were used. The USEPA SCREEN3 dispersion model was used to estimate concentrations at ground level from mobile sources on each level of a multi-level parking structure. Parking garages are assumed to have sufficient egress capacity to clear the peak parking demand during a 1-hour period. All concentrations include year 2030 1- and 8-hour ambient concentrations of 2.2 ppm and 1.6 ppm, respectively.

Source: Terry A. Hayes Associates LLC, 2008.

SVRTP Alternative

Intersection Analysis

Tables 5.1-3a thru 5.1-7b show one- and eight-hour intersection CO concentrations for intersections near each of the stations. Future one- and eight-hour CO concentrations would not exceed the standard at any of the analyzed intersection under the SVRTP Alternative. Therefore, the SVRTP Alternative would not result in an adverse effect and no mitigation is required.

Park-and-Ride Facility Analysis

The station area concept plans for the SVRTP Alternative indicate that multi-level parking structures are proposed at the Milpitas, Berryessa, Alum Rock, Diridon/Arena, and Santa Clara stations. Because of the large parking structure capacities proposed (1,300 to 5,200 spaces), a CO hot spot analysis was conducted to determine whether slow moving and idling vehicles within the parking structures during peak periods would result in CO concentration violations. The USEPA SCREEN3 dispersion model was used for this purpose.

The results of the CO analysis for the five parking structures are shown in Tables 5.1-9a and 5.1-9b. When the year 2030 ambient 1-hour background concentration of 2.2 ppm and 8-hour background concentration of 1.6 ppm are taken into account, total concentrations would range from 2 to 4 ppm for the 1-hour period and 1.3 to 2.3 ppm for the 8-hour period. The NAAQS of 35 ppm for 1-hour concentrations and 9 ppm for the 8-hour period would not be exceeded, and no adverse effect would occur. Therefore, no mitigation is required.

Table 5.1-9a: SVRTP Alternative - One-Hour Carbon Monoxide Concentrations Near Station Parking Structures in Parts Per Million (2030)[a]

Station	Milpitas	Milpitas	Berryessa	Berryessa	Alum Rock	Alum Rock	Diridon/ Arena	Santa Clara	Santa Clara
Spaces in structure	1,388	2,030	4,320	5,200	2,000	2,500	1,300	2,167	2,467
Acres of structure	2.0	2.0	4.7	6.2	3.9	3.9	4.5	3.3	3.3
Parking Levels	6	8	8	8	4	5	8	5	6
50 feet	2	2	3	3	2	2	2	2	2
100 feet	2	2	3	3	2	2	2	2	2
500 feet	2	2	3	4	2	2	2	2	2
1,000 feet	2	2	3	3	2	2	2	2	2
1,500 feet	2	2	3	3	2	2	2	2	2
3,000 feet	2	2	2	2	2	2	2	2	2

Source: Terry A. Hayes Associates LLC, 2008.

Table 5.1-9b: SVRTP Alternative - Eight-Hour Carbon Monoxide Concentrations Near Station Parking Structures in Parts Per Million (2030)[a]

Station	Milpitas	Milpitas	Berryessa	Berryessa	Alum Rock	Alum Rock	Diridon/ Arena	Santa Clara	Santa Clara
Spaces in structure	1,388	2,030	4,320	5,200	2,000	2,500	1,300	2,167	2,467
Acres of structure	2.0	2.0	4.7	6.2	3.9	3.9	4.5	3.3	3.3
Parking Levels	6	8	8	8	4	5	8	5	6
50 feet	1.6	1.7	2.3	2.3	1.6	1.8	1.6	1.7	1.8
100 feet	1.3	1.4	2.0	2.1	1.3	1.5	1.3	1.4	1.5
500 feet	1.3	1.3	2.1	2.2	1.3	1.5	1.3	1.4	1.4
1,000 feet	1.3	1.3	1.7	1.8	1.3	1.4	1.3	1.3	1.4
1,500 feet	1.3	1.3	1.5	1.6	1.3	1.3	1.3	1.3	1.3
3,000 feet	1.3	1.3	1.4	1.4	1.3	1.3	1.3	1.3	1.3

Note: [a] CO concentrations assume peak evening operations at parking structures. EMFAC2007 emission factors for running exhaust emissions and starting emissions were used. The USEPA SCREEN 3 dispersion model was used to estimate concentrations at ground level from mobile sources on each level of a multi-level parking structure. Parking garages are assumed to have sufficient egress capacity to clear the peak parking demand during a 1-hour period. All concentrations include year 2030 1- and 8-hour ambient concentrations of 2.2ppm and 1.6 ppm, respectively.

Source: Terry A. Hayes Associates LLC, 2008.

Toxic Air Contaminant Analysis

The FHWA published project-level mobile source air toxic assessment (MSAT) guidance in February 2006.[1] The guidance indicates that a qualitative analysis should be completed for projects with low potential for MSAT effects. The BEP and SVRTP alternatives would generate less regional VMT than the No Build Alternative. Therefore, the BEP and SVRTP alternatives would have low potential for MSAT effects and the MSAT analysis followed the FHWA qualitative guidance.

In addition to the criteria air pollutants for which there are NAAQS, the USEPA also regulates air toxics. Most air toxics originate from on-road mobile sources, non-road mobile sources (e.g., airplanes), area sources (e.g., dry cleaners), and stationary sources (e.g., factories or refineries).

Mobile source air toxics are a subset of the 188 air toxics defined by the CAA. Mobile source air toxics are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuels and are emitted to the air when

[1] Federal Highway Administration, Interim Guidance on Air Toxic Analysis in NEPA Documents, February 3, 2006.

the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline.

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

Unavailable Information for Project Specific Mobile Source Air Toxic Impact Analysis

Evaluating the environmental and health impacts from mobile source air toxics on a proposed highway project would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the mobile source air toxic health impacts of this project.

- **Emissions:** The USEPA tools to estimate mobile source air toxic emissions from motor vehicles are not sensitive to key variables determining emissions of mobile source air toxics in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model--emission factors are projected based on a typical trip of 7.5 miles (12.1 kilometers), and on average speeds for this typical trip. This means that MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. Because of this limitation, MOBILE 6.2 can only approximate the operating speeds and levels of congestion likely to be present on the largest-scale projects and cannot adequately capture emissions effects of smaller projects. For particulate matter, the model results are not sensitive to average trip speed although the other mobile source air toxic emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and mobile source air toxics are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of particulate matter under the conformity rule, the USEPA has identified problems with MOBILE 6.2 as an obstacle to quantitative analysis.

These deficiencies compromise the capability of MOBILE 6.2 to estimate mobile source air toxic emissions. MOBILE 6.2 is an adequate tool for projecting emissions trends and performing relative analyses between alternatives for very large projects, but it is not sensitive enough to capture the effects of travel changes tied to smaller projects or to predict emissions near specific roadside locations.

- **Dispersion:** The tools to predict how mobile source air toxics disperse are also limited. The USEPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at transportation project locations across an urban area to assess potential health risk. The National Cooperative Highway Research Program is conducting research on best practices in applying models and other technical methods in the analysis of mobile source air toxics. This work also will focus on identifying appropriate methods of documenting and communicating mobile source air toxic impacts in the National Environmental Policy Act (NEPA) process and to the general public. Along with these general limitations of dispersion models, the FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific mobile source air toxic background concentrations.

- **Exposure Levels and Health Effects:** Finally, even if emission levels and concentrations of mobile source air toxics could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is hard to accurately calculate annual concentrations of mobile source air toxics near roadways and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various mobile source air toxics because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Consequently, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Therefore, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project effects that are better suited for quantitative analysis.

Summary of Existing Credible Scientific Evidence Relevant to Evaluating the Impacts of Mobile Source Air Toxics

Research into the health impacts of mobile source air toxics is ongoing. For different emission types, scientific studies show that mobile source air toxics are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of USEPA efforts. Most notably, the USEPA conducted the National Air Toxics Assessment in 1996 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the National Air Toxic Assessment database best illustrate the levels of various toxics when aggregated to a national or state level.

The USEPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The USEPA Integrated Risk Information System is a database of human health effects that may result from exposure to various substances found in the environment. The Integrated Risk Information System database is located at http://www.epa.gov/iris. The following toxicity information for the six prioritized mobile source air toxics was taken from the Integrated Risk Information database Weight of Evidence Characterization summaries. This information is taken verbatim from the USEPA's Integrated Risk Information System database and represents the USEPA's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.

  The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.

- **Formaldehyde** is a probable human carcinogen based on limited evidence in humans, and sufficient evidence in animals.

- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.

- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.

- **Diesel exhaust** is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.

- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary noncancer hazard from mobile source air toxics. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address mobile source air toxic health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by the USEPA, the FHWA, and industry, has undertaken a major series of studies to research near-roadway mobile source air toxic hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of the series is not expected for several years.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes -- particularly respiratory problems.2 Much of this research is not specific to mobile source air toxics, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

Evaluation of Impacts Based upon Qualitative Approach

Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health cannot be made at the project level. While available tools do allow us to reasonably predict relative emissions changes between alternatives for larger projects, the amount of mobile source air toxic emissions from the BEP and SVRTP alternatives and mobile source air toxic concentrations or exposures created by each of the alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts (as noted above, the current emissions model is not capable of serving as a meaningful emissions analysis tool for smaller projects). Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination of whether any of the alternatives would have “adverse impacts on the human environment."

In this document, the FHWA has provided a qualitative analysis of mobile source air toxic emissions relative to the various alternatives and has acknowledged that the BEP and SVRTP alternatives may result in increased exposure to mobile source air toxic emissions in certain locations, although the concentrations and duration of exposures

[2]South Coast Air Quality Management District, Multiple Air Toxic Exposure Study-II (2000); Highway Health Hazards, The Sierra Club (2004) summarizing 24 Studies on the relationship between health and air quality; National Environmental Policy Act's Uncertainty in the Federal Legal Scheme Controlling Air Pollution from Motor Vehicles, Environmental Law Institute, 35 ELR 10273 (2005) with health studies cited therein.

are uncertain. Because of this uncertainty, the health effects from these emissions cannot be estimated.

As discussed above, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects prevent meaningful or reliable estimates of mobile source air toxic emissions and effects of this project. However, even though reliable methods do not exist to accurately estimate the health impacts of mobile source air toxic at the project level, it is possible to qualitatively assess the levels of future mobile source air toxic emissions under the project. Although a qualitative analysis cannot identify and measure health impacts from mobile source air toxics, it can give a basis for identifying and comparing the potential differences among mobile source air toxic emissions, if any, from the various alternatives. The qualitative assessment presented below is derived in part from a study conducted by the FHWA entitled *A Methodology for Evaluating Mobile Source Air Toxic Emissions Among Transportation Project Alternatives*, found at:

www.fhwa.dot.gov/environment/airtoxic/msatcompare/msatemissions.htm.

No Build Alternative

The No Build Alternative consists of the existing transit and roadway networks and planned and programmed improvements in the SVRTC. Therefore, the No Build Alternative would include physical changes typically associated with transit and highway improvements and their related TAC effects that would be addressed in separate environmental documents. In addition, projects planned under the No Build Alternative would undergo separate environmental review to determine global warming effects to air quality.

BEP Alternative

The amount of mobile source air toxics emitted would be proportional to the vehicle miles traveled. The BEP Alternative would result in 0.13 percent less VMT than the No Build Alternative. There would be a corresponding decrease in MSAT emissions. Also, emissions would likely be lower than present levels in the design year as a result of USEPA's national control programs that are projected to reduce mobile source air toxic emissions by 57 to 87 percent between 2000 and 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, vehicle miles traveled growth rates, and local control measures. However, the magnitude of the USEPA-projected reductions is so great (even after accounting for vehicle miles traveled growth) that mobile source air toxic emissions in the SVRTC are likely to be lower in the future in nearly all cases. As such, the BEP Alternative would not result in an adverse TAC or MSAT effect. Therefore, no mitigation is necessary.

SVRTP Alternative

The amount of mobile source air toxics emitted would be proportional to the vehicle miles traveled. The SVRTP Alternative would result in 0.22 percent less VMT than the No Build Alternative. There would be a corresponding decrease in MSAT emissions.

Also, emissions would likely be lower than present levels in the design year as a result of USEPA's national control programs that are projected to reduce mobile source air toxic emissions by 57 to 87 percent between 2000 and 2020. Local conditions may differ from these national projections in terms of fleet mix and turnover, vehicle miles traveled growth rates, and local control measures. However, the magnitude of the USEPA-projected reductions is so great (even after accounting for vehicle miles traveled growth) that mobile source air toxic emissions in the SVRTC are likely to be lower in the future in nearly all cases. As such, the SVRTP Alternative would not result in an adverse TAC or MSAT effect. Therefore, no mitigation is necessary.

Global Climate Change

No Build Alternative

The No Build Alternative consists of the existing transit and roadway networks and planned and programmed improvements in the SVRTC. Therefore, the No Build Alternative would include physical changes typically associated with transit and highway improvements and their related global warming effects that would be addressed in separate environmental documents.

BEP Alternative

As shown in Table 5.1-10, the BEP Alternative would decrease GHG emissions compared to No Build Alternative conditions by 4,138 tons per year. This decrease is due to 0.11 percent less VMT when compared to baseline conditions. The BEP Alternative would result in less GHG emissions than baseline conditions and, as such, would result in a beneficial global warming effect. Therefore, no mitigation is necessary.

Table 5.1-10: Estimated GHG Emissions (2030)

Scenario	Carbon Dioxide Equivalent (Tons Per Year)
No Build Alternative	28,414,800
BEP Alternative	28,410,662
SVRTP Alternative	28,398,647

Source: Terry A. Hayes Associates LLC, 2008.

SVRTP Alternative

As shown in Table 5.1-10, the SVRTP Alternative would decrease GHG emissions compared to No Build Alternative conditions by 16,153 tons per year. This decrease is due to 0.22 percent less VMT when compared to baseline conditions. The SVRTP Alternative would result in less GHG emissions than baseline conditions and, as such, would result in a beneficial global warming effect. Therefore, no mitigation is necessary.

Compliance with Transportation Conformity Guidelines

No Build Alternative

The No Build Alternative consists of the existing transit and roadway networks and planned and programmed improvements in the SVRTC. Therefore, the No Build Alternative would include physical changes typically associated with transit and highway improvements and their related air quality effects that would be addressed in separate environmental documents. In addition, projects planned under the No Build Alternative would undergo separate environmental review to determine global warming effects to air quality. If a federal action is involved, the planned and programmed improvements would need to demonstrate compliance with transportation conformity guidelines.

BEP Alternative

Since the BEP Alternative is essentially a shorter segment, refer to the SVRTP Alternative transportation conformity discussion that follows.

SVRTP Alternative

The Transportation 2035 Plan (T2035) was found to conform to the State Implementation Plan by the Metropolitan Transportation Commission (MTC) on April 22, 2009. The United States Department of Transportation (US DOT) adopted the air quality conformity finding on May 29, 2009. All elements of the project, including the BEP and SVRTP Alternatives are included in the fiscally constrained T2035 program. The fiscally constrained T2035 program is the part of the Regional Transportation Plan (RTP) for which conformity was determined.

The USEPA has published guidance for completing PM2.5 and PM10 hotspot analyses as it relates to transportation conformity (USEPA, 2006).[3] The guidance relates to projects that have been identified as potentially resulting in increased diesel emissions. These projects are typically new or expanded highway projects that have a significant number of diesel vehicles, projects that affect congested intersections by adding a significant number of diesel vehicles, and new or expanded bus and rail terminals that have a significant number of diesel vehicles congregating at a single location. As shown in Table 5.1-2, the SVRTP Alternative would result in less PM2.5 and PM10 emissions when compared to the No Build Alternative. The SVRTP Alternative would be beneficial to regional PM emissions. As such, PM2.5 or PM10 hotspot analyses are not required.

[3] USEPA, Transportation Conformity Guidance for Qualitative Hot-spot Analyses in PM2.5 and PM10 Nonattainment and Maintenance Areas, March 2006.

5.1.3 CUMULATIVE IMPACTS

No Build Alternative

The No Build Alternative consists of the existing transit and roadway networks and planned and programmed improvements in the SVRTC. Therefore, the No Build Alternative would include physical changes typically associated with transit and highway improvements and their related air quality effects that would be addressed in separate environmental documents. In addition, projects planned under the No Build Alternative would undergo separate environmental review to determine cumulative effects.

BEP Alternative

According to the BAAQMD, the BEP Alternative would result in a cumulative effect if the operational significance thresholds presented in Table 5.1-1 were exceeded or if it was not consistent with BAAQMD air quality plans. As presented in Table 5.1-2, the BEP Alternative would not exceed the BAAQMD operational significance thresholds. In addition, the BEP Alternative would reduce regional VMT by 0.11 percent from the No Build Alternative. As such, the BEP Alternative would not result in an adverse cumulative effect.

SVRTP Alternative

According to the BAAQMD, the SVRTP Alternative would result in a cumulative effect if the operational significance thresholds presented in Table 5.1-1 were exceeded or if it was not consistent with BAAQMD air quality plans. As presented in Table 5.1-2, the SVRTP Alternative would not exceed the BAAQMD operational significance thresholds. In addition, the SVRTP Alternative would reduce regional VMT by 0.22 percent from the No Build Alternative. As such, the SVRTP Alternative would not result in an adverse cumulative effect.

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