3.1 AIR QUALITY

3.1.1 Regulatory Background and Coordination

Air quality in the affected area is regulated by the U.S. Environmental Protection Agency (USEPA), Washington State Department of Ecology (Ecology), and Puget Sound Clean Air Agency (PSCAA). Under the Clean Air Act, USEPA has established the National Ambient Air Quality Standards (NAAQS), which specify maximum concentrations for carbon monoxide (CO), particulate matter less than 10 micrometers in size (PM_{10}), particulate matter less than 2.5 micrometers in size ($PM_{2.5}$), ozone, sulfur dioxide, lead, and nitrogen dioxide. The standards applicable to transportation projects are summarized in Table 3.1-1. The eight-hour ozone and $PM_{2.5}$ standards have recently been upheld by the Supreme Court, but have not yet been implemented by USEPA. The eight-hour CO standard of 9 parts per million (ppm) is the standard most likely to be exceeded as the result of transportation projects.

Table 3.1-1: Summary of Ambient Air Quality Standards

Pollutant	National Primary Standard	Washington State & PSCAA Regional Standards
CARBON MONOXIDE (CO)		
One-Hour Average (not to be exceeded more than once per year)	35 ppm	35 ppm
Eight-Hour Average (not to be exceeded more than once per year)	9 ppm	9 ppm
PM_{10}		
Annual Arithmetic Mean	50 µg/m^3	50 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	150 µg/m^3	150 µg/m^3
$PM_{2.5}$		
Annual Arithmetic Mean	15 µg/m^3	NS
24-Hour Average Concentration (not to be exceeded more than once per year)	65 µg/m^3	NS
TOTAL SUSPENDED PARTICULATES (TSP)		
Annual Arithmetic Mean	NS	60 µg/m^3
24-Hour Average Concentration (not to be exceeded more than once per year)	NS	150 µg/m^3
OZONE		
One-Hour Average (not to be exceeded more than once per year)	0.12 ppm	0.12 ppm
Eight-Hour Average (not to be exceeded more than once per year)	0.08 ppm	NS

Notes: ppm = parts per million
µg/m^3 = micrograms per cubic meter
NS = No Standard

Sources: 40 CFR Part 50 (1997)
WAC chapters. 173-470, 173-474, 173-175 (1987)
PSCAA Regulation 1 (1994)

Nonattainment areas are geographical regions where air pollutant concentrations exceed the NAAQS for a pollutant. Air quality maintenance areas are regions that were previously in non-attainment but have since attained compliance with the NAAQS. The I-405 corridor lies within ozone and CO maintenance areas. Air quality emissions in the Puget Sound region are currently being managed under the provisions of Air Quality Maintenance Plans (AQMPs) for ozone and CO. The current plans were developed by PSCAA and Ecology and approved by the USEPA in

1996. Any regionally significant transportation project in the Puget Sound Air Quality Maintenance areas must conform to the AQMPs. Conformity is demonstrated by showing that the project would not cause or contribute to any new violation of any NAAQS, increase the frequency or severity of any existing violation of any NAAQS, or delay timely attainment of the NAAQS.

3.1.1.1 Air Quality Monitoring

The evaluation of existing air quality is based on ambient air quality data collected and published by Ecology and PSCAA. Ecology and PSCAA have established air pollution monitoring stations throughout Washington State. In general, these stations are located where air quality problems have been identified. The air quality monitoring stations closest to the I-405 corridor for CO are in downtown Bellevue. One exceedance of the eight-hour NAAQS for CO was observed in 1995. No exceedance of NAAQS for CO was observed at these locations in 1996, 1997, or 1998.

Ozone is also monitored by Ecology; the nearest monitoring station is at Lake Sammamish State Park, approximately 10 kilometers (5 miles) east of I-405. No exceedances of the NAAQS for ozone were observed at this location in 1996 or 1997. There were three exceedances in 1998, all during July. Generally, ozone concentrations in the affected area would be lower than those measured at the Lake Sammamish monitoring station, because the affected area is upwind of the monitoring station. Emissions of ozone precursors from transportation sources in the affected area contribute to ozone concentrations measured at the Lake Sammamish State Park and Enumclaw ozone monitoring stations.

Monitoring stations for PM_{10} are located in Lynnwood, Kent, and downtown Bellevue. The arithmetic mean concentration for 1998 at the Bellevue location was 16.7 micrograms per cubic meter ($\mu g/m^3$), which was below the NAAQS of 50 $\mu g/m^3$ averaged over one year. The highest 24-hour average concentration at that location in 1997 was 48 $\mu g/m^3$, which was below the NAAQS of 150 $\mu g/m^3$ averaged over 24 hours. $PM_{2.5}$ is not monitored in Bellevue. Particulate matter less than 10 micrometers in size is also monitored in Lynnwood and Kent near the north and south ends of the I-405 corridor. In 1998, the arithmetic mean concentrations were 12.6 and 19.9 $\mu g/m^3$ for the Lynnwood and Kent sites, respectively.

3.1.1.2 Climate

Weather directly influences air quality. Important meteorological factors include wind speed and direction, atmospheric stability, temperature, sunlight intensity, and mixing depth. Temperature inversions, which are associated with higher air pollution concentrations, occur when warmer air overlies cooler air. During temperature inversions in late fall and winter, particulates and CO from wood stoves and vehicle sources can be trapped close to the ground, which can lead to violations of the NAAQS. In the Puget Sound area, the highest ozone concentrations occur from mid-May until mid-September, when urban emissions are trapped by temperature inversions followed by intense sunlight and high temperatures.

3.1.1.3 Carbon Monoxide

CO is a colorless, odorless, and poisonous gas that reduces the oxygen-carrying capability of the blood by bonding with hemoglobin, forming carboxyhemoglobin, which prevents oxygenation of the blood. The major sources of CO are vehicular traffic, along with industry, wood stoves, and slash burns. In urban areas, motor vehicles are often the source of more than 90 percent of the CO emissions that cause ambient levels to exceed the NAAQS (USEPA, 1992).

Areas of high CO concentrations are usually localized, occurring near congested roadways and intersections during autumn and winter, and associated with light winds and stable atmospheric conditions. These localized areas of elevated CO levels are referred to as CO hot spots. CO concentration decreases in most areas have resulted from more stringent federal emission standards for new vehicles and the gradual replacement of older, more polluting vehicles. CO levels have been declining in urban areas, but are leveling off or increasing in areas with rapid growth in traffic volumes, including the more remote suburbs of the Puget Sound region.

3.1.1.4 Particulate Matter

Particulate matter includes small particles of dust, soot, and organic matter suspended in the atmosphere. Particulates less than 100 micrometers in diameter are measured as Total Suspended Particulates (TSP). Particles less than 10 micrometers in size are measured as PM_{10}, a component of TSP. Particles less than 2.5 micrometers in size are measured as $PM_{2.5}$, a component of PM_{10} and TSP. The smaller $PM_{2.5}$ and PM_{10} particles can be inhaled deeply into the lungs, potentially leading to respiratory diseases and cancer. Particulate matter may carry absorbed toxic substances, and the particle itself may be inherently toxic. Particulate matter can also affect visibility, plant growth, and building exteriors.

Sources of particulates include motor vehicles, industrial boilers, wood stoves, open burning, and dust from roads, quarries, and construction activities. Most vehicular emissions are in the $PM_{2.5}$-size range, while road and construction dust is often in the larger PM_{10} range. Most vehicle fine particulate emissions result from diesel vehicles, which release fine particulates both directly, mostly as carbon compounds, and indirectly in the form of sulfur dioxide (SO_2), a gas that reacts in the atmosphere to form sulfate particulates. High $PM_{2.5}$ and PM_{10} concentrations occur in fall and winter during periods of air stagnation and high use of wood for heat. In the Puget Sound region, fireplaces and wood stoves account for almost two-thirds of winter $PM_{2.5}$ emissions (PSCAA, 1999). On-road vehicle emissions contribute approximately 12 percent of the region's $PM_{2.5}$ emissions, while construction and other dust sources contribute approximately 6 percent. The USEPA's $PM_{2.5}$ standard (Table 3.1-1) has recently been upheld by the Supreme Court, but has not yet been implemented by USEPA.

Particulates emitted from diesel vehicles pose specific health risks when compared to other types of particulate matter. The USEPA's Clean Air Scientific Advisory Committee is currently reviewing recent health assessment data on diesel emissions; however, the data are not yet available for citation. Previous USEPA research (USEPA, 1993) found that components of diesel particulates, primarily high-molecular-weight organic compounds, have several negative health effects including carcinogenesis, accumulation of particles in the lungs, tissue inflammation, respiratory irritation, and other related effects. Health effects associated with diesel particulates were one of the major contributing factors to establishing the new $PM_{2.5}$ standard.

3.1.1.5 Ozone

Ozone is a highly toxic form of oxygen and is a major component of the complex chemical mixture that forms photochemical smog. Ozone is formed by a reaction between sunlight, nitrogen oxides (NO_x), and hydrocarbons (HC). Ground-level ozone is primarily a product of precursor emissions from regional vehicular traffic, industrial point sources, and fugitive emission sources. Tropospheric (ground-level) ozone is a health-risk, while stratospheric (upper-atmosphere) ozone, which is produced through a different set of chemical reactions that only require oxygen and intense sunlight, protects people from harmful solar radiation. In the remainder of this analysis, the term ozone refers to tropospheric ozone.

Ozone irritates the eyes and respiratory tract and increases the risk of respiratory and heart diseases. Ozone reduces the lung function of healthy people during exercise, can cause breathing difficulty in susceptible populations such as asthmatics and the elderly, and damages crops, trees, paint, fabric, and synthetic rubber products. The severity of the health effects are both dose and exposure-duration related (National Research Council, 1992). The USEPA has recently adopted a new eight-hour ozone standard (Table 3.1-1); however, the old one-hour standard is still applicable for current nonattainment and maintenance areas. The eight-hour standard has recently been upheld by the Supreme Court, but has not yet been implemented by USEPA. Maximum ozone levels generally occur between noon and early evening at locations several miles downwind from the sources, after NO_x and HC have had time to mix and react under sunlight. In the central Puget Sound region, northeasterly winds arising during these conditions result in high ozone concentrations near the Cascade foothills, to the south and southeast of major cities. Ozone precursor emissions in the I-405 corridor create the ozone in the Lake Sammamish area and the Cascade foothills.

3.1.1.6 Hazardous Air Pollutants

Other chemicals or classes of chemicals in motor vehicle emissions that are considered hazardous by USEPA include benzene, formaldehyde, 1,3-butadiene, acetaldehyde, and gasoline vapors (USEPA, 1993). Benzene emissions in the Puget Sound region are substantially higher than the national average. The emission quantities of these hazardous compounds are much lower than the emissions of the pollutants evaluated in this section, making an accurate calculation of their emissions more difficult; however, the emissions of hazardous air pollutants from transportation sources would vary among the alternatives in a fashion similar to the other pollutants presented here.

3.1.1.7 Greenhouse Gases

Automobiles also emit "greenhouse" gases, primarily carbon dioxide (CO_2) that may contribute to global warming. CO_2 emissions are proportional to fuel consumption. Passenger cars emit on average 225 grams CO_2 per kilometer traveled (0.8 pound per mile) and sport-utility vehicles and light trucks emit about 50 percent more CO_2 per mile. Because CO_2 emissions are directly proportional to fuel consumption, they vary with speed and are lowest at a speed of approximately 45 mph, where most automobiles are most fuel efficient. Because the emissions pattern relative to vehicle speed is similar to that of CO, CO_2 emissions would vary among the alternatives in a similar pattern to CO emissions, but the emissions would be an order of magnitude greater than the emissions of CO.

3.1.1.8 Coordination with Agencies and Jurisdictions

The methodology and process used for this review were discussed with WSDOT, USEPA, and the Puget Sound Clean Air Agency (PSCAA) on August 16, 2000. A follow-up meeting was conducted with the Puget Sound Regional Council (PSRC) on August 17. Since that point, there has been ongoing coordination with PSRC to assure that the methodology used in this review is consistent with PSRC's conformity analysis procedures.

3.1.2 Methodology

Air quality impacts were assessed by estimating total daily pollutant emissions from transportation sources within the Puget Sound region.

Outputs from the EMME/2 transportation network model, including link volumes, speeds, and travel distances, were processed using the methodology and programs developed by PSRC to determine regional conformity. Emissions per mile traveled for carbon monoxide (CO), hydrocarbons (HC), and oxides of nitrogen (NO_x) were calculated for the average speed of each scenario using the Puget Sound Regional Council (PSRC) input files to the Mobile5a emissions model. Because the baseline transportation network modeled as part of this study differs from the network modeled for the Metropolitan Transportation Plan (MTP) and Transportation Improvement Plan (TIP) in several areas, the results of this review do not determine conformity; however, they provide a robust means of comparison among the alternatives. The results may also be compared to the model runs completed by PSRC, since methodology and emission assumptions are consistent between the analyses. This analysis references results from PSRC's *1998 MTP Progress Report* (PSRC, 1998); because PSRC is constantly updating the regional models, other PSRC results may differ from those referenced here.

The PSRC MTP modeled roadway network incorporates the region's adopted transportation plan, including projects that are not yet funded. The 2020 baseline (No Action) network used for the I-405 corridor review includes only those projects that have committed funding. The starting point for the network was PSRC's "Six-Year Action Strategy - Funded" which is close to a 2010 network. It includes Phase I of the Sound Transit plan. Also added in were projects in the Eastside Transportation Program that were identified as having committed funding. For each of the action alternatives, the planned improvements for that alternative are added to the baseline network.

In addition to the three computed pollutant emissions, ozone, fine particulate matter, greenhouse gases, and hazardous air pollutants are of concern. Because ozone is not produced directly, but is formed by a reaction between sunlight, nitrogen oxides (NO_x), and hydrocarbons (HC), the values calculated for NO_x and HC emissions are a surrogate for ozone production in the study area. Particulate matter, including PM_{10} and $PM_{2.5}$, are emitted primarily from industrial boilers, wood stoves, open burning, dust from roads, quarries, construction activities, and motor vehicles. Greenhouse gases and hazardous air pollutant emissions would differ among the alternatives similarly to the modeled pollutants.

The effect of changes in arterial traffic on local pollutant emission is discussed qualitatively for the Bothell, Bellevue, and Renton areas. Detailed changes in traffic patterns are presented in the *I-405 Corridor Program Draft Transportation Expertise Report* (Mirai and DEA, 2001).

The air quality analyses in this section are based on the *I-405 Corridor Program Draft Air Quality Expertise Report* (Parsons Brinckerhoff, 2001), herein incorporated by reference.

3.1.3 Affected Environment

The Puget Sound Air Quality Maintenance Plan for CO has established a CO motor vehicle emissions budget of 1,358 metric tons of CO per winter day. The factors for HC and NO_x are 225 and 239 metric tons per summer day after 2010 (Table 3.1-2). The 2020 forecast values for the 1998 update to the Puget Sound region's Metropolitan Transportation Plan (MTP) approach the State Implementation Plan (SIP) budget for CO. Subsequent to completion of the air quality analysis for the I-405 Corridor Program, PSRC adopted a new MTP (*Destination 2030*).

Implications of the new MTP, including effects on air quality, are discussed in Section 3.23 of this EIS. The Preferred Alternative was submitted to PSRC for inclusion in a refined air quality conformity evaluation of the MTP. This analysis is discussed under the Preferred Alternative in Section 3.1.4.6.

Table 3.1-2: Baseline Air Pollutant Emissions (metric tons per day)

Pollutant	1997 SIP Budget	2020 PSRC MTP Forecast
Carbon Monoxide	1,358	1,311
Hydrocarbons	225	148
Nitrogen Oxides	239	186

Source: PSRC, 1998

3.1.4 Impacts

3.1.4.1 No Action Alternative

Construction Impacts

Construction of projects under the No Action Alternative would include temporary air pollutant emissions, including dust and combustion emissions. The impacts from these projects are, or will be, addressed within the environmental analysis, documentation, and review for the individual projects.

Operational Impacts

Regional transportation air pollutant emissions modeled for 2020 under the No Action Alternative (Table 3.1-3) were modeled to be slightly greater than those modeled by PSRC for their 1998 MTP Plan update (Table 3.1-2) (PSRC, 1998). The minor difference between the modeling scenarios is a result of other transportation projects planned outside the I-405 corridor that have been included in the PSRC's MTP model. The daily emission values of 1,315 metric tons CO, 143 metric tons HC, and 182 metric tons NO_x are within the region's SIP budget.

Table 3.1-3: Regional Air Pollutant Emissions by Alternative (metric tons per day)

Pollutant	2020 No Action Alternative	2020 Alt. 1 HCT/TDM Emphasis	2020 Alt. 2 Mixed Mode with HCT/Transit Emphasis	2020 Alt. 3 Mixed Mode Emphasis	2020 Alt. 4 General Capacity Emphasis	2020 Preferred Alternative
Carbon Monoxide	1,315	1,313	1,302	1,294	1,256	1,256 to 1,294
Hydrocarbons	143	143	143	142	139	139 to 142
Nitrogen Oxides	182	182	184	186	181	181 to 186

Source: Parsons Brinckerhoff, 2000

3.1.4.2 Alternative 1: HCT/TDM Emphasis

Construction Impacts

The action alternatives for the I-405 corridor study would include construction activities throughout the I-405 study area. Alternative 1 would have less construction-phase emissions than the other action alternatives, but substantially more emissions than the No Action Alternative, especially in the high-capacity transit corridor.

Particulate emissions would vary from day to day depending on level of activity, specific operations, and weather conditions. Particulate emissions would depend on soil moisture, silt content of soil, wind speed, and amount and type of equipment operating. Larger dust particles would settle near the source, while fine particles would be dispersed over greater distances from the construction site.

The quantity of particulate emissions would be proportional to the area of the construction operations and the level of activity. Based upon field measurements of suspended dust emissions from construction projects, an approximate emission factor for construction operations would be 1.2 tons per acre of construction per month of activity (USEPA, 1995). Emissions would be reduced if less of the site is disturbed or mitigation is performed.

Fugitive dust from construction activities would be noticeable near construction sites if uncontrolled. Construction would require mitigation measures to comply with PSCAA regulations that require the control of dust during construction and preventing deposition of mud on paved streets (PSCAA Regulation 1, Article 9). Measures to reduce deposition of mud and emissions of particulates are identified in the Construction Mitigation Section (Section 3.1.6.1).

In addition to particulate emissions, heavy trucks and construction equipment powered by gasoline and diesel engines would generate CO and NO_x in exhaust emissions. If construction traffic were to reduce the speed of other vehicles in the area, emissions from traffic would increase slightly while those vehicles are delayed. These emissions would be temporary, limited to the immediate area surrounding the construction site, and would contribute a small amount compared with automobile traffic in the study area because construction traffic would be a very small fraction of the total traffic in the area.

Some phases of construction would result in short-term odors, particularly paving operations if asphalt is used. Odors might be detectable to some people near the construction site, and would be diluted as distance from the site increases.

Operational Impacts

Regional transportation air pollutant emissions modeled for 2020 for Alternative 1 (Table 3.1-3) were modeled to be slightly less than for the No Action Alternative. The daily emission values of 1,313 metric tons CO, 143 metric tons HC, and 182 metric tons NO_x are within the region's SIP budget. As a result of shifting person-trips from the congested I-405 corridor (under the No Action Alternative) to high-capacity transit, there would be a small regional decrease in vehicle miles traveled (VMT) relative to the No Action Alternative, resulting in a minor emissions reduction. Regional emissions modeled for Alternative 1 are lower than those modeled for the No Action Alternative. Conformity of the MTP and TIP with the Puget Sound region's air quality maintenance plans with this alternative included cannot be determined unless the alternative is included in the official analysis conducted by the PSRC. Emissions of greenhouse gases are also expected to be lower under Alternative 1 than under the No Action Alternative. The difference in emissions between Alternative 1 and the No Action Alternative for other years would be similar to that modeled for 2020.

Changes in traffic volume on I-405 and major parallel arterials can act as a surrogate for local air pollutant emissions along the I-405 corridor (Table 3.1-4). Comparison of arterial roadway volumes between Alternative 1 and the No Action Alternative shows a minor increase in arterial volumes in the Bothell area, but little change in the Bellevue and Renton areas. The additional volume in the Bothell area would result in a minor increase in local air pollutant emissions near those arterials relative to the No Action Alternative. Regional transportation patterns under Alternative 1 would be similar to the No Action Alternative.

Table 3.1-4: P.M. Peak Period North-South Vehicle Trips at Selected Locations

Location	2020 No Action Alternative		2020 Alternative 1 HCT/TDM Emphasis		2020 Alternative 2 Mixed Mode with HCT/Transit Emphasis		2020 Alternative 3 Mixed Mode Emphasis		2020 Alternative 4 General Capacity Emphasis		2020 Preferred Alternative	
	I-405	Arterial	I-405	Arterial	I-405	Arterial	I-405	Arterial	I-405	Arterial	I-405	Arterial
Bothell, South of the County Line	29,500	39,500	29,500	39,600	40,400	39,800	49,600	40,200	56,700	39,600	54,300	38,600
Bellevue, South of NE 8th St.	49,700	51,800	49,200	51,900	65,800	48,500	81,800	45,400	92,100	42,900	101,800	38,800
Renton, West of Renton CBD	31,200	39,700	31,200	39,500	47,400	36,900	62,400	36,000	67,300	34,900	76,300	31,400

Project-level conformity requirements for the individual elements included in Alternative 1 cannot be determined at this point because project-level transportation data are not available; therefore, project-level air quality analysis would be needed at a later time for those individual elements that are not exempt from project-level conformity analysis (CFR 93.134). Analysis of Alternative 1, with the other transportation improvement projects included in PSRC's MTP, is expected to result in emissions values that would be lower than those presented for Alternative 1 in Table 3.1-3.

3.1.4.3 Alternative 2: Mixed Mode with HCT/Transit Emphasis

Construction Impacts

Construction impacts would be similar to Alternative 1; however, Alternative 2 would include substantial additional construction on I-405. As a result, total construction-phase pollutant emissions would be greater under Alternative 2 than under Alternative 1.

Operational Impacts

Regional transportation air pollutant emissions modeled for 2020 for Alternative 2 (Table 3.1-3) were modeled to be slightly less than for the No Action Alternative and Alternative 1 for CO and slightly higher for NO_x. The daily emission values of 1,302 metric tons CO, 143 metric tons HC, and 184 metric tons NO_x are within the region's SIP budget values. While VMT would increase relative to the No Action Alternative, average speed would also increase, resulting in decreased emissions per mile traveled relative to the No Action Alternative. Regional emissions modeled for Alternative 2 are generally lower than those modeled for the No Action Alternative. Conformity of the MTP and TIP with this alternative included cannot be determined unless the alternative is included in the official analysis conducted by the PSRC. Emissions of greenhouse gases are also expected to be lower under Alternative 2 than under the No Action Alternative.

The difference in emissions between Alternative 2 and the No Action Alternative for other years would be similar to that modeled for 2020.

Changes in traffic volume on I-405 and parallel arterials can act as a surrogate for local air pollutant emissions along the I-405 corridor (Table 3.1-4). Comparison of arterial roadway volumes between Alternative 2 and the No Action Alternative shows a minor increase in arterial volumes in the Bothell area and minor decreases in the Bellevue and Renton areas. The additional volume in the Bothell area would result in a minor increase in local air pollutant emissions near those arterials relative to the No Action Alternative. Reduced arterial volumes in Bellevue and Renton would result in a minor reduction in local air pollutant emissions in those areas. Alternative 2 would result in small shifts in travel patterns within the I-405 corridor.

Project-level air quality analysis would be needed at a later time for those individual elements in Alternative 2 that are not exempt from project-level conformity analysis (CFR 93.134). Analysis of Alternative 2 with the other transportation improvement projects included in PSRC's MTP is expected to result in emissions values that would be lower than those presented for Alternative 2 in Table 3.1-3.

3.1.4.4 Alternative 3: Mixed Mode Emphasis

Construction Impacts

Construction impacts would be similar to Alternatives 1 and 2; however, Alternative 3 would include substantial construction on I-405, but would not include a new high-capacity transit system. As a result, there would be no construction emissions in a high-capacity transit corridor as under Alternatives 1 and 2, but emissions from construction of additional non-transit through-lanes in the I-405 corridor would be substantially greater, resulting in total construction-phase pollutant emissions greater than for Alternative 2.

Operational Impacts

Regional transportation air pollutant emissions modeled for 2020 for Alternative 3 (Table 3.1-3) were modeled to be less than for the No Action Alternative and Alternatives 1 and 2 for CO, and slightly higher for NO_x. The daily emission values of 1,294 metric tons CO, 142 metric tons HC, and 186 metric tons NO_x are within the region's SIP budget. While VMT under Alternative 3 would increase relative to the No Action Alternative, average speed would also increase because of the additional capacity provided for general purpose traffic in the I-405 corridor. The increased speed and reduced congestion would result in decreased emissions per mile traveled relative to the No Action Alternative. Regional emissions modeled for Alternative 3 are generally lower than those modeled for the No Action Alternative. Conformity of the MTP and TIP with this alternative included cannot be determined unless the alternative is included in the official analysis conducted by the PSRC. Emissions of greenhouse gases are also expected to be lower under Alternative 3 than under the No Action Alternative. The difference in emissions between Alternative 3 and the No Action Alternative for other years would be similar to that modeled for 2020.

Changes in traffic volume on I-405 and parallel arterials can act as a surrogate for local air pollutant emissions along the I-405 corridor (Table 3.1-4). Comparison of arterial roadway volumes between Alternative 3 and the No Action Alternative shows a minor increase in arterial volumes in the Bothell area and minor decreases in the Bellevue and Renton areas. The additional volume in the Bothell area would result in a minor increase in local air pollutant emissions near those arterials relative to the No Action Alternative. Reduced arterial volumes in Bellevue and Renton would result in a minor reduction in local air pollutant emissions in those areas.

The major widening of I-405 under Alternative 3 would result in considerable increases in peak period travel demand within the study area. Most of this growth shows up on I-405 itself (increases of 45 to 100 percent). The shift of traffic from arterials to I-405 through much of the project corridor would result in a decrease in emissions and localized pollutant levels near the arterial streets.

Project-level air quality analysis would be needed at a later time for those individual elements in Alternative 3 that are not exempt from project-level conformity analysis (CFR 93.134). Analysis of Alternative 3 with the other transportation improvement projects included in PSRC's MTP is expected to result in emissions values that would be lower than those presented for Alternative 3 in Table 3.1-3.

3.1.4.5 Alternative 4: General Capacity Emphasis

Construction Impacts

Construction impacts would be similar to Alternative 3; however, Alternative 4 would include a greater amount of construction within the I-405 corridor. As a result, construction-phase air pollutant emissions would be greater under Alternative 4 than under any of the other alternatives.

Operational Impacts

Regional transportation air pollutant emissions modeled for 2020 for Alternative 4 (Table 3.1-3) were modeled to be less than for the other alternatives. The daily emission values of 1,256 metric tons CO, 139 metric tons HC, and 181 metric tons NO_x are within the region's SIP budget. For the air quality analysis, the I-405 express lanes were modeled to be operated as a general purpose facility. The substantial increase in capacity in the I-405 corridor under Alternative 4 would result in a shift in traffic from the I-5 corridor; the magnitude of the shift at different locations is detailed in the *I-405 Corridor Program Draft Transportation Expertise Report* (Mirai and DEA, 2001). While VMT would increase relative to the No Action Alternative, average speed would increase substantially, resulting in decreased emissions per mile traveled relative to the No Action Alternative. Regional emissions modeled for Alternative 4 are lower than those modeled for the No Action Alternative. Conformity of the MTP and TIP with this alternative included cannot be determined unless the alternative is included in the official analysis conducted by the PSRC. Emissions of greenhouse gases are also expected to be lower under Alternative 4 than under the No Action Alternative. The difference in emissions between Alternative 4 and the No Action Alternative for other years would be similar to that modeled for 2020.

Changes in traffic volume on I-405 and parallel arterials can act as a surrogate for local air pollutant emissions along the I-405 corridor (Table 3.1-4). Comparison of arterial roadway volumes between Alternative 4 and the No Action Alternative shows a minor increase in arterial volumes in the Bothell area and minor decreases in the Bellevue and Renton areas. The additional volume in the Bothell area would result in a minor increase in local air pollutant emissions near those arterials relative to the No Action Alternative. Reduced arterial volumes in Bellevue and Renton would result in a minor reduction in local air pollutant emissions in those areas.

The major widening of I-405 in Alternative 4, including the express roadway, would result in considerable increases in peak period travel demand within the study area. Most of this growth shows up on I-405 itself (increases of 85 to 102 percent). The shift of traffic from arterials to I-405 through much of the project corridor would result in a decrease in emissions and localized pollutant levels near the arterial streets.

Project-level air quality analysis would be needed at a later time for those individual elements in Alternative 4 that are not exempt from project-level conformity analysis (CFR 93.134). Analysis of Alternative 4 with the other transportation improvement projects included in PSRC's MTP is expected to result in emissions values that would be lower than those presented in Table 3.1-3.

3.1.4.6 Preferred Alternative

Construction Impacts

Construction impacts would be similar to Alternative 3; however, the Preferred Alternative would include a slightly greater amount of construction within some segments of the I-405 corridor. Construction emissions under the Preferred Alternative would be between those for Alternative 3 and for Alternative 4.

Operational Impacts

Regional transportation air pollutant emissions for 2020 for the Preferred Alternative (Table 3.1-3) would be similar to the values for Alternatives 3 and 4 because the Preferred Alternative is generally similar to Alternative 3, but includes additional projects from Alternative 4. The daily emission values would be within the region's SIP budget. While VMT would increase relative to the No Action Alternative, average speed would increase substantially, resulting in decreased emissions per mile traveled relative to the No Action Alternative. Regional emissions for the Preferred Alternative would be generally lower than those modeled for the No Action Alternative.

On April 25, 2002, the PSRC Executive Board approved refinement of the MTP to reflect the project elements of the Preferred Alternative. On May 2, 2002, FHWA and FTA made a conformity determination on the MTP adopted in 2001 (*Destination 2030*). The revised modeling runs show regional emissions below the emission budgets for all pollutants in 2010, 2020, and 2030 for the MTP including the Preferred Alternative. PSRC's modeling demonstrates that air quality in the Puget Sound region, including implementation of the Preferred Alternative, would conform at the regional level to the regional air quality maintenance plans. The Preferred Alternative would not cause any new or contribute to any existing regional exceedances of the NAAQS.

Changes in traffic volume on I-405 and parallel arterials can act as a surrogate for local air pollutant emissions along the I-405 corridor (Table 3.1-4). Comparison of arterial roadway volumes between the Preferred Alternative and the No Action Alternative shows minor decreases in the Bothell, Bellevue, and Renton areas. Reduced arterial volumes in Bothell, Bellevue, and Renton would result in a minor reduction in local air pollutant emissions in those areas. The major widening of I-405 under the Preferred Alternative would result in considerable increases in peak period travel demand within the study area. Most of this growth shows up on I-405 itself (increases of 84 to 140 percent).

While the Preferred Alternative has been demonstrated to conform to the Puget Sound air quality maintenance plans at the regional level, project-level air quality analysis would be needed at a later time for those individual elements in the Preferred Alternative that are not exempt from project-level conformity analysis (CFR 93.134).

3.1.5 Mitigation Measures

Because the No Action Alternative does not include construction beyond the baseline projects, it would not require mitigation beyond that incorporated into the baseline projects. All of the action alternatives could incorporate the following mitigation measures, as well as any other mitigation measures identified as subsequent project-level environmental analysis, documentation, and review is completed.

3.1.5.1 Construction

Fugitive dust would be controlled under the provisions of the 1999 Memorandum of Agreement between WSDOT and PSCAA. In general, the two parties would cooperate to control fugitive dust.

Particulate emissions (in the form of fugitive dust during construction activities) are regulated by PSCAA. Any emission of fugitive dust requires best available control technology (PSCAA Rule 1, Section 9.15). According to PSCAA Rule 1, Section 9.15, fugitive dust from construction activities shall not be injurious to human health, plants and animals, or property, and shall not unreasonably interfere with the enjoyment of life and property. Also, a person may not operate a vehicle that deposits particulate matter on a paved, public highway (PSCAA Rule 1, Section 9.15). Monitoring data from the Central Artery/Tunnel Project in Boston indicates that diligent application of best management practices can reduce particulate emissions from construction activities by approximately one-half (Dolan et al. 2000).

Construction impacts would be reduced by incorporating mitigation measures into the construction specifications for the improvements. Measures such as the following could be used to control PM_{10}, deposition of particulate matter, and emissions of CO and NO_x during construction (Associated General Contractors of Washington, 1997):

- Spraying exposed soil with water would reduce emissions of PM_{10} and deposition of particulate matter.
- Covering all trucks transporting materials, wetting materials in trucks, or providing adequate freeboard (space from the top of the material to the top of the truck) would reduce PM_{10} and deposition of particulates during transportation.
- Providing wheel washers to remove particulate matter that would otherwise be carried off-site by vehicles would decrease deposition of particulate matter on area roadways.
- Removing particulate matter deposited on paved, public roads would reduce mud and dust on area roadways.
- Covering dirt, gravel, and debris piles as needed would reduce dust and wind-blown debris.
- Routing and scheduling construction trucks so as to reduce delays to traffic during peak travel times would reduce secondary air quality impacts caused by a reduction in traffic speeds while waiting for construction trucks.

- Requiring appropriate emission-control devices on all construction equipment powered by gasoline or diesel fuel would reduce CO and NO_x emissions in vehicular exhaust. Using relatively new, well-maintained equipment would reduce CO and NO_x emissions.
- Requiring contractor participation in the Puget Sound Clean Air Agency's Diesel Solutions Program, including use of ultra low sulfur diesel and particulate reduction retrofit kits or the use of biodiesel, would reduce diesel particulate emissions.
- Staging of construction between separate projects to minimize overall system congestion and delays would reduce regional emissions of pollutants during construction.
- Other measures may be considered as appropriate.

3.1.5.2 Operation

Because emissions associated with operation of the action alternatives are expected to be within SIP emission budgets, no significant adverse air quality impacts are expected to result from the alternatives and no mitigation measures would be required. Additional measures could be taken within the region to further reduce transportation pollutants, such as adoption of hybrid transit vehicles by transit agencies and increased stringency in the vehicle inspection and maintenance program.

3.1.6 Conformity

On April 25, 2002, the PSRC Executive Board approved refinement of the MTP to be consistent with the I-405 Corridor Program Preferred Alternative. With this MTP revision, the Preferred Alternative conforms at the regional scale to the Puget Sound region's air quality maintenance plans. The Preferred Alternative would not cause any new or contribute to any existing regional exceedances of the NAAQS. Project-level air quality conformity determination would be needed at a later time for those individual elements in the Preferred Alternative that are not exempt from project-level conformity analysis (CFR 93.134).

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