SECTION 3 STUDY APPROACH

What is the study area and how was it determined?

The study area is the section of I-405 between I-5 in Tukwila to SR 169 in Renton, and SR 167 between I-405 and SW 43rd Street in south Renton. In addition to the study area, our analysis included the whole length of the I-405 corridor and adjacent sections of I-5, SR 167, I-90, SR 520, and SR 522. We analyzed this larger area to capture effects outside Tukwila and Renton that may change operations in the study area.

The study area also includes the local streets and intersections adjacent to I-405 and SR 167. We chose these intersections because they may be affected by the improvements to I-405 and SR 167.

What policies or regulations are related to effects on Transportation?

The Tukwila to Renton Project must comply with the State Environmental Policy Act (SEPA), National Environmental Policy Act (NEPA), Federal Highway Administration (FHWA) regulations, Tukwila and Renton plans and policies, and other local and national policies and regulations. See the *Land Use Discipline Report* for a complete description of the policies and regulations related to transportation.

How did we collect information on transportation for this report?

For the Tukwila to Renton Project, we used the year 2005 to represent existing conditions in the corridor. We assembled I-405, SR 167, and I-5 freeway and ramp traffic volumes from available year 2005 WSDOT data. We collected local street traffic volumes from traffic impact studies, the cities of Tukwila and Renton, and we conducted traffic counts for the remaining locations.

How did we develop forecasts of travel demand for the freeway?

The I-405 Team used the Puget Sound Regional Council (PSRC) four-county travel forecast model as a starting point

for determining future travel demand. This model predicts traffic volumes and travel patterns based on adopted land use plans within the region. We then refined the model to include the specific details of the I-405 freeway.

Time Periods

What is the peak period?

The period of the day during which the maximum amount of travel occurs. It may be specified as the morning (a.m.) or afternoon (p.m.) peak.

What is the peak hour?

The hour within the morning or afternoon peak period when the maximum demand occurs on a given transportation facility or corridor.

The year of opening for the Tukwila to Renton Project is 2014. The design year, 2030, is consistent with the corridor planning horizon and federal requirements for environmental documentation because it is 20 years past the start of construction. Also, 2030 is PSRC's forecast year for household, employment, and population projections. We evaluated 2014 and 2030 conditions for the No Build Alternative and the Build Alternative. In this report, we focus on the year 2014; we provide the 2030 results in Appendix B.

The morning and evening commutes using the I-405 corridor last for several hours. To capture these peak commute periods, we considered a 6-hour period in the morning (5:00 to 11:00 AM) and a 6-hour period in the evening (2:00 to 8:00 PM). We evaluated these 6-hour periods to determine how the freeway becomes congested, how it operates during the congested period, and how congestion dissipates. Although we evaluated a 6-hour period, the results in this report reflect the single peak hour (morning and afternoon) when the highest traffic demand occurs.

For the local street network, we used the hour of highest traffic volume to evaluate operations. We used this peak hour because it represents the worst case conditions for the local street operations.

Future Roadway Improvements

The travel forecast model for the Build Alternative and the No Build Alternative includes funded regional improvement projects and other planned projects. We anticipate some projects will be completed by 2014 and others by 2030. Appendix C lists the roadway projects included in the travel forecast model and describes why the projects were included.

Build Alternative

In addition to the projects included in the No Build Alternative (listed in Appendix C), the travel forecast model for the Build Alternative includes capacity improvements

associated with the Tukwila to Renton Project. We assume that funding for the Tukwila to Renton Project will be part of a larger regional investment. In addition to building new lanes to the section of I-405 in the study area between I-5 and SR 169, that investment is assumed to add continuous lanes on I-405, north of SR 169, consistent with the I-405 corridor program. By 2030, it is assumed the investment will also construct an additional lane in each direction on SR 167.

No Build Alternative

The travel forecast model for the No Build Alternative only includes the funded projects and the projects that are planned to be built. We list these projects in Appendix C.

Traffic Volumes

The I-405 Team started with existing general-purpose and HOV lane volumes as measured in 2005. Based on this information, we used the regional travel forecast model to estimate future changes. The forecasts for years 2014 and 2030 both assume the HOV lanes will operate differently in the future than they do today. Based on future growth in HOV volumes and the WSDOT policy on HOV lane operations, this analysis assumes the HOV lanes occupancy requirement will be increased from the existing two or more persons in a vehicle (HOV 2+) to three or more persons (HOV 3+).

How did we evaluate effects on transportation?

Freeway

Traffic analysts used VISSIM microsimulation software to evaluate the freeway traffic operations for the entire I-405 corridor and the adjacent sections of I-5, SR 522, SR 520, I-90 and SR 167. The software models the movement of individual vehicles and can describe how vehicles accelerate, decelerate, and change lanes in response to freeway geometry and the behavior of other vehicles.

In our analysis, we evaluated freeway performance with respect to effectiveness, vehicle trips, person trips, and speed. Vehicle trips are the total number of vehicles that pass through a section of roadway within a specific time period. To calculate person trips, we estimated the number of passengers

in carpools, vanpools, and transit buses. Next, we used the microsimulation model to calculate the average travel speed of vehicles in the general-purpose and high-occupancy vehicle (HOV) lanes over time. For this project, we calculated the speeds on an hourly basis.

Local Streets

What is a signalized intersection?

An intersection that uses a traffic light to control vehicle and pedestrian movements.

What is an unsignalized intersection?

An intersection without a traffic light that uses signs such as "Stop" and "Yield" to control vehicle and pedestrian movements.

For the local streets, we measured the effects on traffic based on intersection delay, which is the average delay experienced by vehicles that travel through an intersection. Transportation analysts rate intersection delay as a level of service (LOS) from A to F. LOS A is the best operating condition with minimal delays. LOS F is the worst condition with very long delays and heavy congestion. We used CORSIM microsimulation software to calculate the intersection delay. Exhibit 3-1 shows the LOS ranking for signalized and unsignalized intersections.

Exhibit 3-1: Level of Service Criteria for Signalized and Unsignalized Intersections

LOS	Signalized Average Delay per Vehicle (seconds)	Unsignalized Average Total Delay per Vehicle (seconds)	Description
A	0 - 10	0 - 10	Little or no delay
B	10 - 20	10 - 15	short delays
C	20 - 35	15 - 25	moderate delays
D	35 - 55	25 - 35	long delays
E	55 - 80	35 - 50	very long delays
F	>80	>50	failure - extreme congestion

Source: Highway Capacity Manual, 2000

We used peak-hour traffic volumes for the morning and afternoon periods to measure delay and LOS in the study area. We evaluated 36 signalized and 11 unsignalized intersections in the study area.