DRAFT
Transportation Analysis: Methodologies and Assumptions

SR 520 Multi-Modal Corridor Study

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Stakeholders Group

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INTRODUCTION

WSDOT is working with local communities in King County on a transportation corridor study along a segment of SR 520 that spans the cities of Bellevue and Redmond. This effort will result in a multi-modal corridor plan that includes a list of short and long-term vision and projects addressing safety and multi-modal mobility issues along this route. This multi-modal corridor is one of the two corridors connecting Seattle to the East, also connecting I-5 and I-405 corridors along the way.

This memorandum identifies the geographic limits of the study, the analysis years, forecasting and modeling methodologies, traffic analysis methods and performance measures to evaluate the projects. This memorandum will guide the traffic analysis throughout this project and requires concurrence by the participating agencies.

SECTION 1: STUDY AREA

The study area for the traffic analysis will include the following roadway segment:

- SR 520 from east of the I-405 interchange to east of SR 202 (from SRMP 6.98 / ARM 6.97 to SRMP 12.83 / ARM 12.82). This study will focus only on the SR 520corridor and all ramp termini within the study area. A total of 12 ramp termini intersections will be analyzed on this corridor.

Though the corridor in the study area directly influences the traffic on the streets of Bellevue and Redmond; the travel demand forecasts will be done for a larger area covering the Puget Sound Region to capture the system dynamics and impacts. **Figure 1** presents the SR 520 corridor section that will be analyzed for the study.

SECTION 2: ANALYSIS YEARS AND TIME PERIODS

Assumed Analysis Years are:

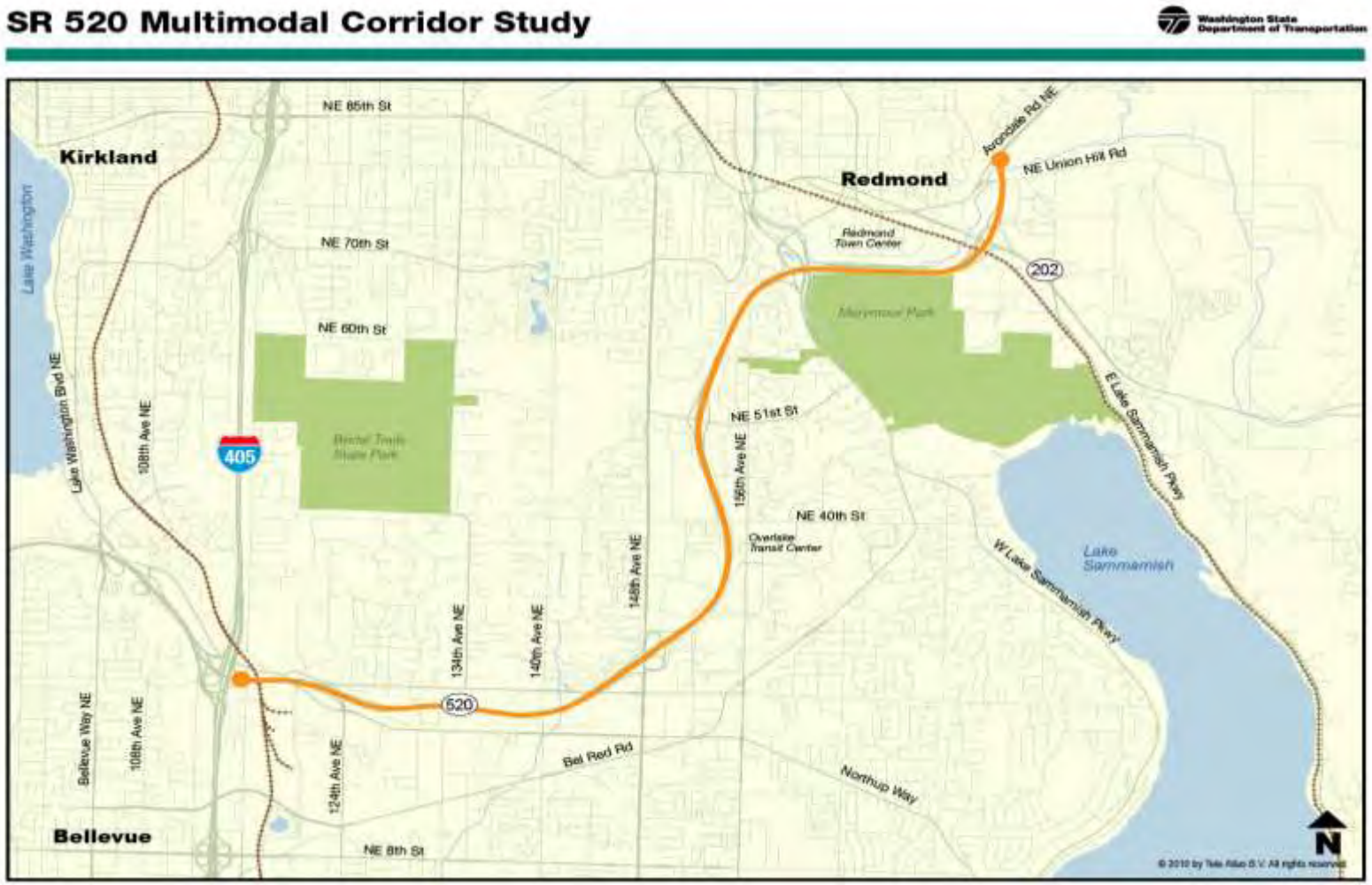
- Existing Year: 2010

- Horizon Year: 2030

All analyses will be carried out for AM and PM peak hours for an average weekday. Existing and horizon year needs will be identified using relevant WSDOT thresholds and performance measures developed as part of this corridor study process. Improvement strategies will be developed, evaluated and modeled if applicable. Based on this evaluation, a set of improvement recommendations will be formulated and sequenced into 6-6-8 year conceptual implementation plan. The sequencing of the improvements into 6-6-8 time periods will be

based on factors such as cost, level and year of need, and forecasted revenue stream over the planning horizon among other factors. These improvements will be included in the WSDOT Highway System Plan and will compete with other similar improvements for future available resources.

Figure 1: SR 520 Multimodal Corridor Study Area



SECTION 3: TRAVEL DEMAND FORECASTING

Key Assumptions

The travel demand forecasts will be carried out using the model used for SR 520 Final Environment Impact Statement. This model is based on Puget Sound Regional Council's (PSRC) regional travel demand model (Version 1.0bb) in EMME software. The 2030 baseline roadway networks will be constrained to only include funded projects.

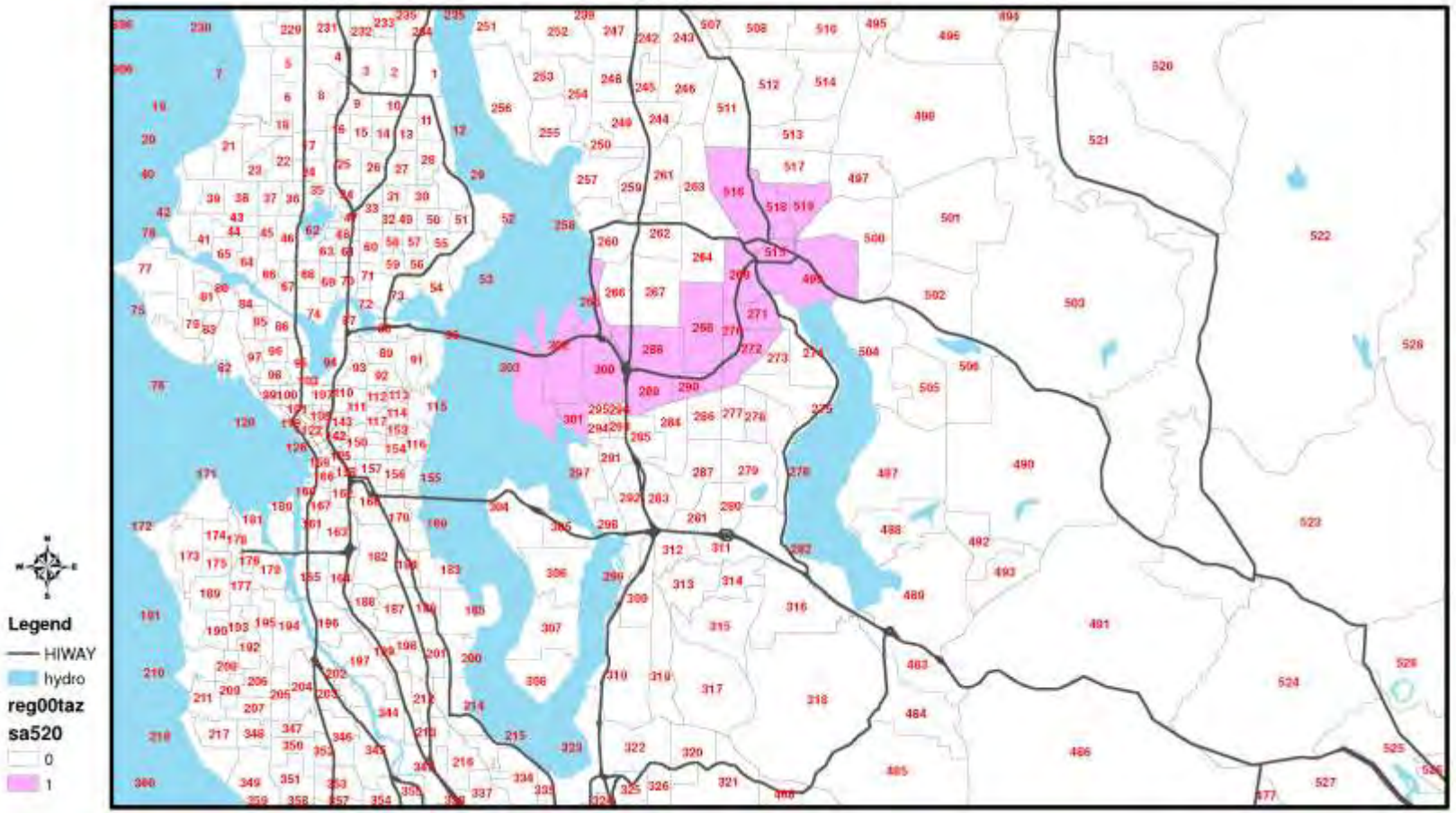
Land use

The zone structure in the PSRC model is larger compared to the Bellevue-Kirkland-Redmond (BKR) model. The land use used in the 520 EIS model as input will be compared with Bellevue's and Redmond's land use for reasonability for the years 2008 and 2030. The land use will be modified in the model to reflect the jurisdictions' forecast in the Overlake area. The 520 FEIS model assumed a reduction of 3% employment and 1% reduction of households to reflect the current recession in 2030 forecast. **Figure 2** shows the traffic analysis zones (TAZs) for PSRC model and highlights the area where jurisdiction's land use will be used.

Future Year Network Assumptions

The Urban Planning Office (UPO) will review the comprehensive plans and transportation improvement programs (TIPs) for the cities of Bellevue, Redmond, King County and WSDOT.

Figure 2: PSRC Model Traffic Analysis Zones along SR 520 Corridor in the Study Area



Roadway Network
Based on our review there are no funded projects in the study area currently. The HOV lanes on SR 520 will be moved from outside to inside. For the baseline or build alternatives the occupancy requirements for the High Occupancy Vehicle HOV lanes will increase to HOV 3+ by 2030.

Transit Network
The transit network will also be based on the PSRC travel demand models. The transit routes and their frequencies using the study corridor will be verified based on the King County metro and Sound Transit Bus schedules. In 2030, Sound Transit East Link Light Rail will be extended to downtown Redmond at 161 Avenue NE.

SECTION 4: EXISTING AND FUTURE ANALYSIS

Existing Year 2010 Condition Analysis
An existing conditions analysis for the SR 520 corridor will be carried out for AM and PM peak hour conditions and will identify safety and mobility needs along the study corridor. This will include identifying key issues on the corridor, level of service (LOS) calculations at ramp termini intersections, corridor LOS for various segments (basic, weave, merge and diverge segments) on the freeway. The freeway segments for the study are shown in **Figure 3**. The 12 intersections to be analyzed are shown in **Figure 4**. **Table 1** lists all the ramp termini intersections.

Future Year Analysis
Future year analysis will focus on 2030 for AM and PM peak hours. This will help to identify corridor's mobility needs in the future. The post-processing methodology will be developed for the corridor by direction and for each of the 12 intersections by approach.

<u>Detailed Simulation Analysis at Ramp Terminals</u>
Based on the study area as defined in Section 1, traffic modeling efforts focus on all ramp termini within the study area. The ramp termini are the intersections where the ramps end. There are a total of 12 intersections that have been analyzed using Synchro 7 (build 763) and HCM methodology for both AM and PM peak hour for existing, and 2030 conditions. The travel demand forecasts were conducted using the SR 520 Final Environmental Impact Statement model. The 12 intersections are listed in Table 1 and illustrated in Figure 4, and the traffic model is described in Section3: Travel Demand Forecasting.

Discussions within WSDOT and with various stakeholders have concluded that analyzing only up to the end of the ramp intersections may not be sufficient in determining potential queue spill-backs onto the SR 520 mainline. To accurately capture queuing issues that may be occurring onto the SR 520 mainline, local intersections in the vicinity of the ramp intersections should be included in the analysis.

Study Segments

Looking at the study vicinity and data provided by the jurisdictions, simulation models will be used to analyze three arterial segments that could have queuing issues and affect traffic operations along the SR 520 mainline. Those segments are:

- 124th Avenue NE – From north of SR 520 to Northup Way;
- 148th Avenue NE – From NE 40th St to Bellevue-Redmond Road;
- SR 202- from west of the SR 520 westbound on ramp to East Lake Sammamish Parkway NE.

The intersections that will be included within the segments in the SimTraffic simulation models are:

- Northup Way & 124th Avenue NE / SR 520 Ramps
- SR 520 Eastbound Ramps & 124th Avenue NE (in future models only)
- SR 520 Westbound Ramps & 124th Avenue NE (in future models only)
- Bellevue-Redmond Road & 148th Avenue NE
- NE 20th Street & 148th Avenue NE
- NE 24th Street & 148th Avenue NE
- SR 520 Eastbound Off Ramp & 148th Avenue NE
- SR 520 Westbound Off Ramp / NE 29th Street & 148th Avenue NE
- NE 36th Street & 148th Avenue NE
- NE 40th Street & 148th Avenue NE
- Redmond Way (SR 202) & SR 520 Westbound On Ramp / NE 76th Street
- Redmond Way (SR 202) & SR 520 Eastbound Off Ramp
- NE 70th Street & Redmond Way (SR 202)
- Redmond Way (SR 202) & East Lake Sammamish Parkway NE

The analysis will focus on the segment performance such as travel time, speed, and queuing instead of individual intersections Level of Service (LOS).

Traffic Model:

Considering the consistency of the study and the time and budget constraints, Synchro 7 (Build 763) will be used to develop the model. SimTraffic will be used for the simulation model. The travel demand forecasts will use the SR 520 Final Environmental Impact Statement model, which has been described in Section 3: Travel Demand Forecasting.

Analysis Years and Time Periods

The analysis year and time periods are:

- 2010 AM and PM peak Hours;
- 2030 AM and PM peak Hours;

SECTION 5: ANALYSIS METHODOLOGY

Analysis Methodology

For this study, the travel forecasts will be done using PSRC's EMME model that was used for the SR 520 FEIS. Model forecasts will be carried out for existing conditions and 2030. Freeway analysis will use Highway Capacity Software which is based on Highway Capacity Manual. Freeway analysis will be carried out for AM and PM peak hours for existing 2030 conditions. The SYNCHRO software (Version 7 Build 763) and HCM methodology will be used to analyze ramp termini intersections for the same period and years as the freeway analysis. Post-processing will be used where appropriate for these analyses.

Figure 3: SR 520 Multi-Modal Corridor Study - Freeway Segment Types in the Study Area for base year conditions

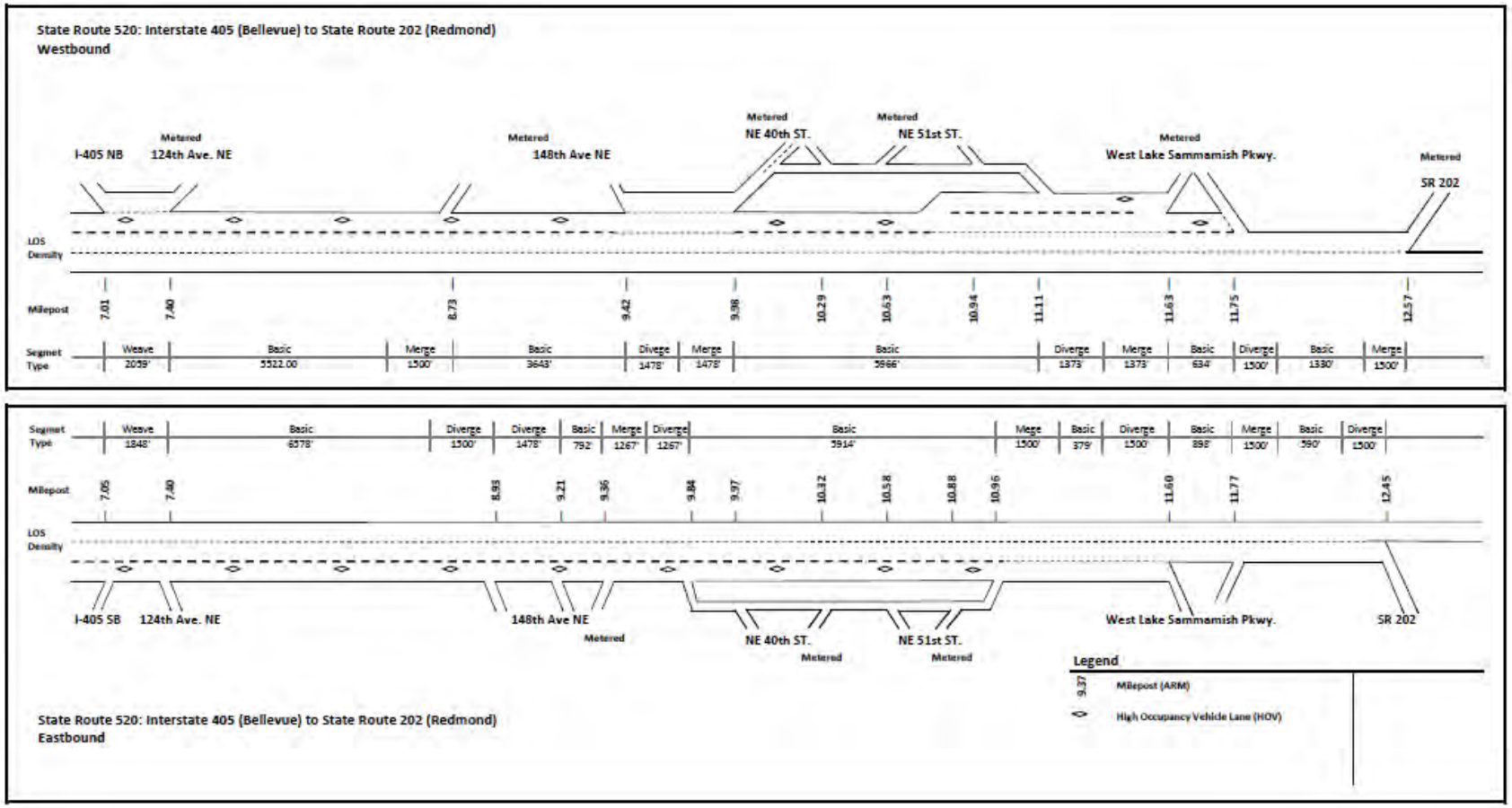


Figure 4: SR 520 Corridor Study – Ramp Termini Intersections for the Analysis

Table 1: SR 520 Multi-modal Corridor Study – Ramp Termini Intersections

ID	Intersection Name
1	NE 20th St & SR 520 WB on Ramp
2	SR 520 EB Off Ramp & 148th Ave NE
3	SR 520 WB On Ramp & 148th Ave NE
4	NE 40th St & SR 520 EB Off Ramp
5	NE 40th St & SR 520 WB On Ramp
6	NE 51st St & SR 520 EB Off Ramp
7	NE 51st St & SR 520 WB On Ramp
8	SR 520 EB Off Ramp & WLS PKWY
9	SR 520 WB On Ramp & WLS PKWY
10	SR 202 & SR 520 EB Off Ramp
11	SR 202 & SR 520 WB On Ramp
12	Union Hill Rd & SR 520

Table 2: Performance Measures for Proposed Recommendations:

CONSISTENCY with PLANS and STANDARDS

Criteria	Measure	Methodology
Consistency with PSRC's T2040 Plan	Is the project in the plan? Stakeholder support for revising the plan?	Stakeholder input
Consistency with PSRC's V2040 Plan	Is the project in the plan? Stakeholder support for revising the plan?	Stakeholder input
Consistency with local land use/comp plans	"	Stakeholder input
Consistency with WSDOT HSP and Moving Washington plans	"	WSDOT input
Consistency with transit agencies' long-range plans	"	Transit agency input
Community Support	Does the project have the support of the local community	Stakeholder input

SAFETY

Criteria	Measure	Methodology
Does the project reduce the number or severity of fatal or serious injury collisions?	Reduction in the number and severity of fatal and serious injury collisions.	Quantitative/Collision Analysis Corridor; Collision Analysis Location; Intersection Analysis Location

PRESERVATION

Criteria	Measure	Methodology
Pavement and structure: use WSDOT maintenance and preservation criteria	Lowest lifecycle costs	Quantitative/WSDOT performance goals

MOBILITY

Criteria	Measure	Methodology
Travel Time	Delay reduction	Regional Model/Highway Capacity Manual
Roadway travel speed deficiency threshold	70% Posted speed	Regional model/HCM
Intersection deficiency threshold	LOS E	HCM
Facility utilization	Volume to Capacity Ratio	Regional Model/Highway Capacity Manual
Does it improve pedestrian and bicycle utilization	Usage Cost and Effectiveness	Stakeholder Input

ENVIRONMENT

Criteria	Measure	Methodology
Energy conservation	Reduction of vehicle miles traveled by offering increased access to transit and non-motorized facilities	Regional model
Protect natural environment	Impacts to known environmentally sensitive areas	GIS database
Transit Oriented Development	Support TOD	Qualitative/stakeholder input
Fish and Stormwater	Retrofit highway needs based on current WSDOT environmental policies	Treatment of barriers and storm water within a project's limits

ECONOMIC VITALITY

Criteria	Measure	Methodology
Support economic development	Enhance access to existing and planned developments	Qualitative/stakeholder input
Enhance freight movement	Improves speed and reliability for freight	Quantitative/WSDOT's Truck Performance Measures

BENEFIT to COST RATIO

Criteria	Measure	Methodology
Project Cost	Cost	WSDOT Planning level
Return on investment	Monetary benefits relative to project cost	WSDOT

Thresholds for needs identification

For the freeway segment analysis, level of service (LOS) based on density at various segments will be used. WSDOT's standard is LOS D. In addition, speed on freeway mainline will be calculated. Based on this future freeway speed will be expressed as a percent of posted speed on the segments. The operating speeds on the freeway corridor will be evaluated against the WSDOT standards of 70% to 85% of posted speed.

The ramp termini intersection Level of Service (LOS) will be evaluated using WSDOT's standards of LOS E as the cut-off to define an intersection to be considered for improvement. In addition, delay in seconds by approach/movement will be evaluated for reasonableness.

SECTION 6: SAFETY ANALYSIS METHODOLOGY

The safety analysis will follow *Target Zero: Washington State's 2010 Strategic Highway Safety Plan*, for improving safety on Washington's highways. Target Zero aims to end traffic deaths and serious injuries by 2030. Target Zero is a Goal that WSDOT has adopted for working toward zero deaths and serious injuries on state highways by 2030. To accomplish the goals established by Target Zero, WSDOT's current procedure for safety analysis evaluates collision frequency and severity at intersections, highway segments, or corridors based on collision history. In future studies WSDOT will be using other analysis tools including 'SafetyAnalyst' (part B of the Highway Safety Manual) to perform network screening and evaluate safety priorities within the corridor.

The safety analysis will include the following methodologies:
-Collision Analysis Corridor
-Collision Analysis Location
-Intersection Analysis Location
-Bicycle/Pedestrian Project Strategies
-Bicycle/Pedestrian Risks

WSDOT safety analysis for corridor studies consists of the following six steps:
1. Crash history review for the most recent five years of data available.
2. Identification of current and programmed projects.
3. Identification of study area locations on existing WSDOT safety priority lists.
4. Identification of crashes that are behavior-related and may benefit from targeted enforcement or community education efforts.
5. Identification of low cost improvements with the potential to reduce fatalities and serious injuries in coordination with WSP and WSTSC.
6. Identification of higher cost improvements with the potential to reduce fatalities and serious injuries.
7. Benefit/cost analysis using MP3

Further information regarding WSDOT's safety program can be found at:
http://wwwi.wsdot.wa.gov/Planning/CPDMO/HighwaySafetyManagement.htm

SECTION 7: DELIVERABLES

At the end of SR 520 corridor study, the deliverables from the technical analysis will be:

- List of identified needs for existing and 2030
- List of recommended improvement strategies and conceptual implementation plan in 6-6-8 year time segments.
- Planning level cost estimate for the mitigation projects
- Technical memorandum on traffic and collision analysis and results