Chapter 4
Identifying and Screening Potential Improvement Projects

Chapter 4 describes how projects were screened and packaged into the options considered for this Corridor Planning Study (CPS).

1 How were potential roadway improvements identified and screened?

Selecting and evaluating potential improvement projects for SR 164 entailed the following process:

1. Compiling and analyzing existing and projected conditions for traffic, existing roadway design compared to current design standards, the surrounding natural environment, the surrounding built environment, and future population and employment growth.
2. In consideration of the above factors, identifying and developing potential projects to improve safety and address congestion along the SR 164 corridor.
3. Performing initial fatal flaw[1] screening of proposed improvement projects to eliminate some potential projects.
4. Performing a final screening and eliminating additional project proposals.

[1] A fatal flaw is a term often used when evaluating potential project designs or routes. If it is found that the proposed design/improvement would have a major engineering, environmental, or community impact which could not be avoided by redesign (or mitigation), the design/improvement would then be considered to have a fatal flaw. Thus, the impact of the proposed design or improvement will cause it to be rejected unless it is modified to avoid the impact.

5. Developing two improvement options containing packages of complementary projects with each successive option building upon the previous package of improvements.

6. Evaluating the two improvement options using a benefit-to-cost analysis.

7. Analyzing the improvement options' impact on traffic operations.

8. Recommending a preferred improvement option for inclusion in this Corridor Planning Study.

Exhibit 4.1 on the next page illustrates the steps taken for this evaluation.

2 What were the Corridor Working Group's goals for the SR 164 Corridor Planning Study?

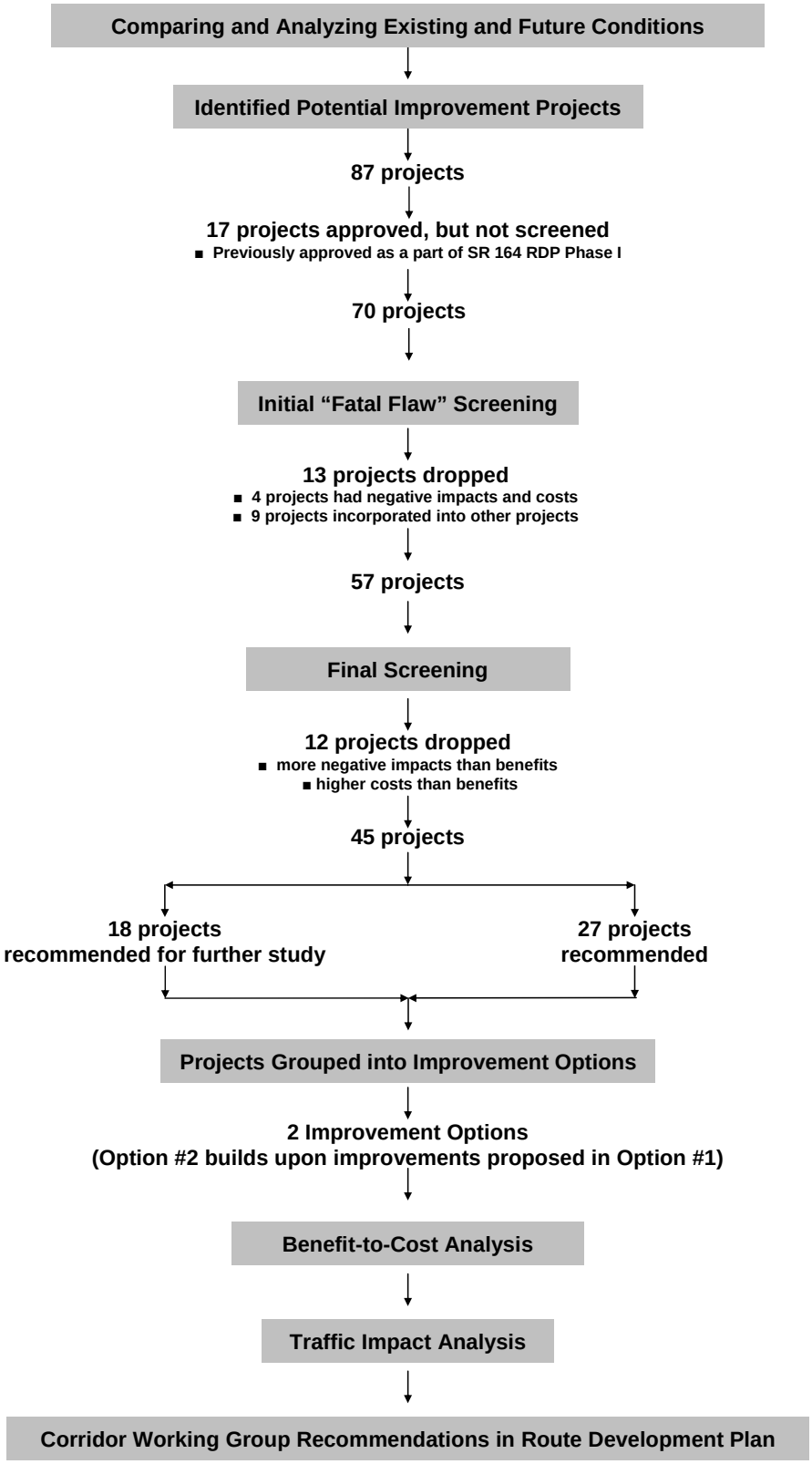
The Corridor Working Group (CWG) was comprised of local jurisdictions which have the responsibility to seek the necessary funding to implement the final CPS recommended transportation improvements. The CWG developed and adopted goals to guide the development of this CPS. These goals helped the CWG evaluate proposed transportation improvement projects within the context of regional, community, and environmental objectives. The goals adopted by the CWG were to:

- improve corridor safety
- improve mobility and reduce delay
- improve freight movement
- minimize environmental impacts
- incorporate effective public outreach
- maximize compatibility of immediate-term, short-term, and long-term improvements

These goals, together with technical analysis, guided the development of evaluation criteria used for identifying and screening potential improvement projects. The CWG Goals and Objectives can be seen in Appendix E: Corridor Working Group.

Exhibit 4.1

SR 164 Corridor Planning Study Screening Process



3 How were projects identified?

Potential projects for this CPS were identified from a number of sources such as WSDOT and each of the jurisdictions along the corridor, plus input received from the public. The resulting list included projects at all stages of advancement. Some projects are designed, environmental review is completed, funding sources have been identified, and construction is imminent. Other projects are planned and not funded, and have had limited or no design and environmental review. Additional projects were ideas that seemed worthy of consideration in response to identified transportation needs and problems identified along SR 164.

The types of projects considered within the SR 164 corridor included:

- improvements to the existing roadway
- transit service improvements
- proposals for new or improved bike, pedestrian, and equestrian trails

A total of 87 projects were initially considered in the SR 164 CPS screening process.

The list of projects included a set of potential Auburn Bypass Options designed to provide additional access to the Enumclaw Plateau. Eight potential bypass routes were considered. That list was narrowed down to two bypass options that were examined further in the SR 164 Feasibility Study which started in 2008.

4 How were projects initially screened?

At the onset of the study process, the CWG identified and agreed upon a set of evaluation criteria to be used for initial screening. The evaluation criteria were:

- safety
- impacts to the natural environment
- impacts to historical, cultural, and architectural resources
- cost

The initial screening employed a number of measures with one or more measures developed from each evaluation criterion. These measures were used to perform the initial "fatal flaw" screening. The purpose of this initial screening was to identify projects for elimination that did little to satisfy the project goals or were estimated to have impacts of sufficient severity to represent a fatal flaw to implementation. These projects would not be given further consideration.

The measures were qualitative evaluations and with the exception of cost, were based on a three-point scale. The initial screening criteria were applied using the following three point scale:

"+" indicates beneficial or positive aspect to the project

"-" indicates a harmful or negative aspect to the project

"0" indicates unknown or neutral aspect to the project

The values assigned were based on professional judgment and did not represent rigorous application of a quantitative method.

Excluding the Auburn Bypass options, approximately 30 projects considered in the initial screening process were found to have fatal flaws. Seventeen projects were previously approved as a part of the SR 164 Phase I short-term list of projects. These 17 projects were removed from consideration as they were already pre-approved projects. Another 13 projects were dropped because they either had negative impacts and costs or

the projects were incorporated into other projects. Therefore, approximately 57 projects remained to be further analyzed in the second screening.

5 How were the Auburn Bypass options screened?

There were eight potential Auburn Bypass Options identified (see Exhibit 4.2 on the next page). Four options were found to reduce traffic and avoid the most serious environmental problems:

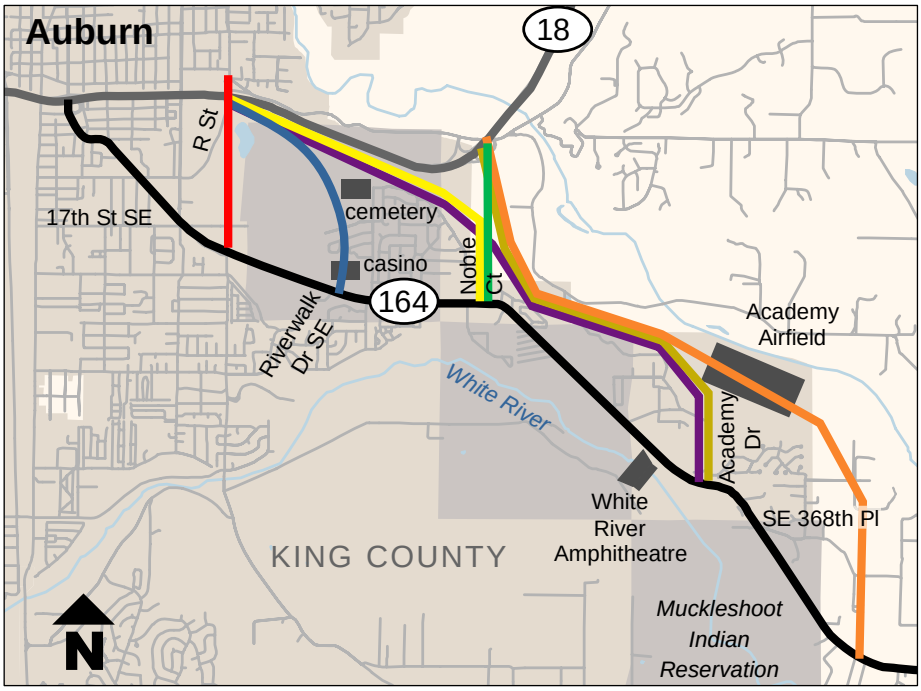
- Bypass Option # 1 - R Street
- Bypass Option # 2 - Riverwalk Drive
- Bypass Option # 3 - Noble Court to R Street
- Bypass Option # 4 - Noble Court to Auburn / Black Diamond Road

The CWG retained these for additional analysis. The other Auburn Bypass options (Options #5, #6, #7, and #8) were eliminated because they:

- provided little relief for the congested portion of SR 164 west of R Street
- presented substantial engineering and environmental challenges
- or both

Exhibit 4.2

Initial Auburn Bypass Options



Bypass Option #1 - R Street
(R Street to a new R Street / SR 18 Interchange)

Bypass Option #2 - Riverwalk Drive
(Riverwalk Drive to a new R Street / SR 18 Interchange)

Bypass Option #3 - Noble Court to R Street
(A raised structure starting at Noble Court, curving along the slope to a new R Street / SR 18 Interchange)

Bypass Option #4 - Noble Court to Auburn Black Diamond Road
(A raised structure starting at Noble Court, curving along the slope and around King County Preserved Farmland and an Agricultural Production District to a rebuilt Auburn Black Diamond Road (ABD) / SR 18 Interchange)

Bypass Option #5 - Academy Drive to R Street
(A raised structure starting in the Academy Drive vicinity, curving along the slope to a new R Street / SR 18 interchange)

Bypass Option #6 - Academy Drive to Auburn Black Diamond Road
(A raised structure starting in the Academy Drive vicinity, curving along the slope to a rebuilt Auburn Black Diamond Road / SR 18 interchange)

Bypass Option #7 - Academy Airfield
(A raised structure starting near the Muckleshoot Reservation / King County unincorporated boundary vicinity and crossing through the old Academy Airfield. Curving along the slope to a rebuilt Auburn Black Diamond Road / SR 18 interchange)

Bypass Option #8 - Combination
(Option #1 + Option #6 - R Street Option AND the Academy Drive to ABD Option)

6 How was the final screening performed?

In the final screening the list of potential CPS projects were subjected to a varied analysis. Each project was evaluated on the basis of its potential transportation benefits, financial costs, policy consistency, environmental impacts, and public support using the categories in the sidebar to the right. The evaluation was based on scoring each project using a series of identified measures. The measures were adapted from the SR 164 Corridor Study Evaluation Criteria Technical Memorandum, dated February 15, 2005 (this memorandum can be found in Appendix E: Corridor Working Group). Adaptations were made on the basis of the available data, redundancy among the measures in the memorandum, and additional insight gained during the course of the study.

Final Screening Criteria

- Safety Benefits
- Mobility Benefits
- Transit Benefits
- Non-Motorized Benefits
- Environmental Impacts
- Land Use and Policy Consistency
- Costs
- Public Support

How was the scoring performed?

Each criteria area was given numeric variable scoring utilizing the “1”, “0”, and “-1” range of scores. Some of the criteria scoring values looked like this:

Environmental Impacts - a project was given a “-1” if it had a negative impact, or lacked support. Otherwise it was given a “0”.

Potential Transportation Benefits - a project was given a “1” if it would provide a potential benefit. A project was given a score of “0” if it would not provide a potential benefit.

Land Use and Policy Consistency - a project was given a “-1” if it had a negative impact, or lacked support. Otherwise it was given a “0”.

Project Cost - a project was given a “-1” for a high cost project, a project was given a “-0.5” for a medium cost project, and “0” for a low cost project.

Public Support - a project was given a “-1” if it had a negative impact, or lacked support. Otherwise it was given a “0”.

The scores were then weighted to account for the relative importance of each measure and any redundancy among the measures. The weights were equalized to normalize (or center) the measurement scale to zero. After equalizing the weights the range of possible scores was -90 to +90. Finally, the evaluation scores for each project were totaled.

7 What were the results of the final screening?

A total of 57 projects were included in the final screening. Based on screening criteria developed by the CWG, total weighted and equalized scores were used to determine those projects with substantially more benefits than impacts and costs.

Each project's score was reviewed and endorsed by the CWG. Twelve (12) projects were removed from further consideration because they had more negative impacts and higher costs than benefits. The 45 remaining projects had scores indicating the benefits outweighed the impacts and cost.

Results of Final Screening

- 57 projects screened
- 12 projects removed
- 45 projects retained and packaged into two improvements

8 How were the improvements packaged?

The remaining 45 projects were grouped together in packages to form two separate improvement options. Each improvement option contained projects addressing safety, operations, and chokepoints along the corridor. Improvement Option 1 contains projects with low cost safety, mobility, and some capacity improvements that would be relatively easy to implement. Improvement Option 2 contains all of the improvements listed in Option 1, but offers additional capacity improvements. The four bypass routes continued to be evaluated as separate bypass options #1 through #4.

9 What is included in Improvement Option #1?

Improvement Option 1 (displayed in Exhibit 4.3 on page 4-12) includes operational, safety, and capacity improvements intended to address the safety and congestion issues along the corridor. Some of these projects are directed at sections of the corridor; other projects will be applied at specific intersections.

The types of corridor safety improvements are:

- implement access management strategies
- construct sidewalks
- improve shoulders
- extend bike lanes
- install guardrail
- install rumble strips
- install street lighting
- install crosswalks
- remove sight obstructions
- stabilize steep slopes
- utilize restrictive medians and U-turns at appropriate intersections.

The intersection improvements are:

- realign approaches
- implement access management strategies[2]
- improve pedestrian crosswalks
- remove sight obstructions

[2] Only those driveways that do not satisfy site-distance standards for safe left turns onto the roadway would be restricted. Where such access must be restricted by a median or C Curb the design shall allow for a U-Turn at the next stop controlled intersection.

- restricting access to and from driveways by installing a median or C curb and allowing for U-turns at the next stop controlled intersection
- install street lighting
- widen intersection
- stabilize steep slopes
- install bus pullouts
- install or extend turn pockets
- install intersection controls, which include adding turn lanes, signals, stop signs, roundabouts, and realignment where warranted.

10 What is included in Improvement Option #2?

Improvement Option 2 (displayed in Exhibit 4.4 on page 4-13) builds upon the list of proposed projects in Improvement Option 1 and adds:

- a capacity improvement project to widen SR 164 to 2 lanes in each direction (with center median and turn lanes, where appropriate, for controlled left turns and access management) from Dogwood Street (MP 2.28) to Academy Drive (MP 4.37).

Exhibit 4.3

SR 164 CPS Improvement Option #1

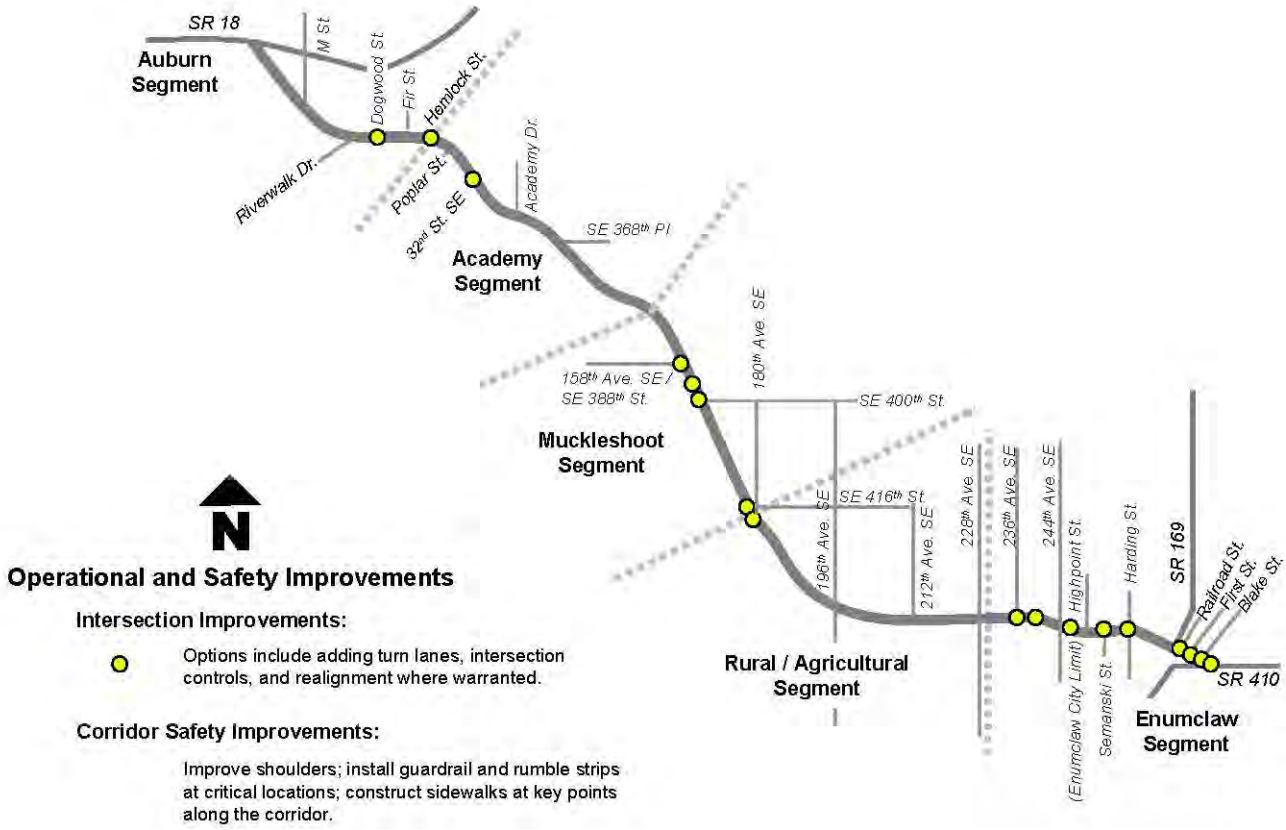
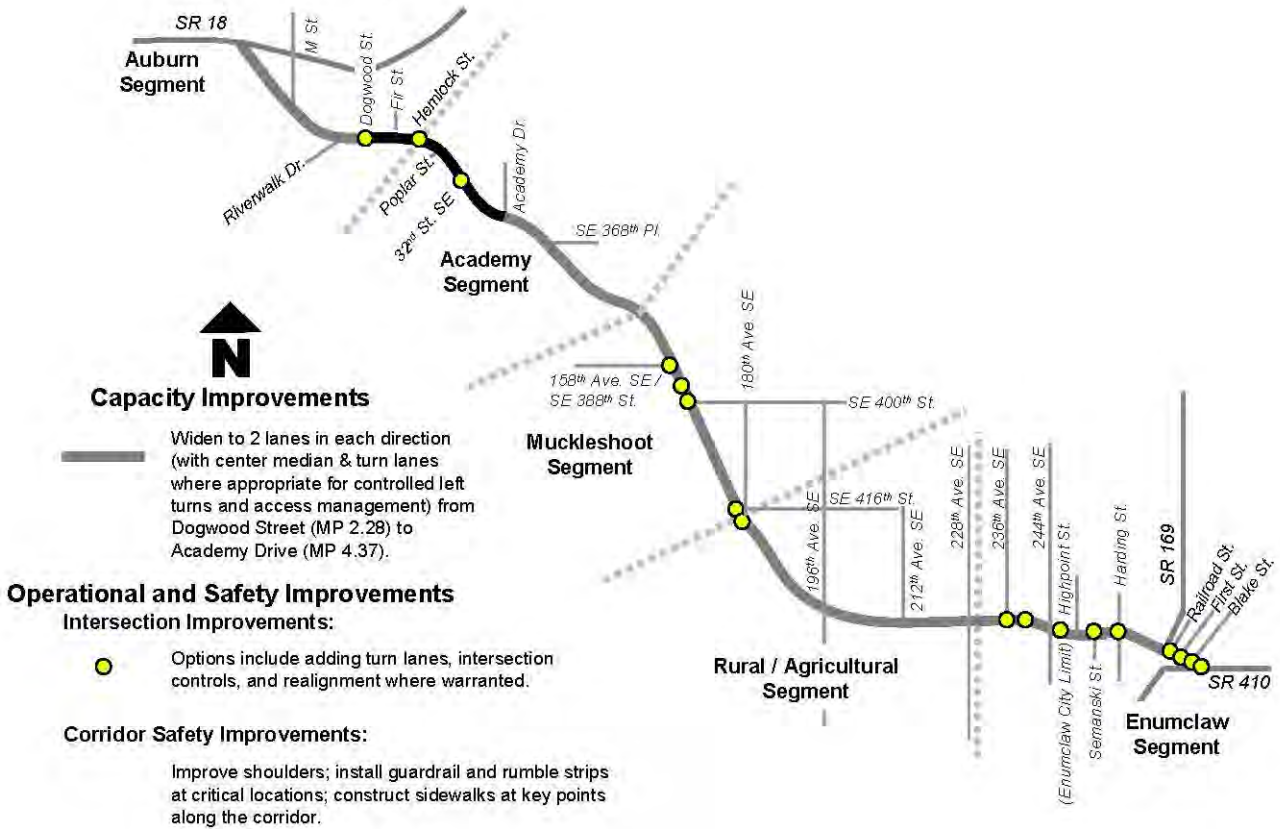


Exhibit 4.4

SR 164 CPS Improvement Option #2



11 What are the four Bypass Options?

The four bypass options are:

- Bypass Option # 1 - R Street
- Bypass Option # 2 - Riverwalk Drive
- Bypass Option # 3 - Noble Court to R Street
- Bypass Option # 4 - Noble Court to Auburn / Black Diamond Road

These options were found to reduce traffic, increase safety, and avoid the most serious environmental problems of the original eight proposed routes. The options are further described in Exhibit 4.5 below and illustrated in Exhibit 4.6 on the next page.

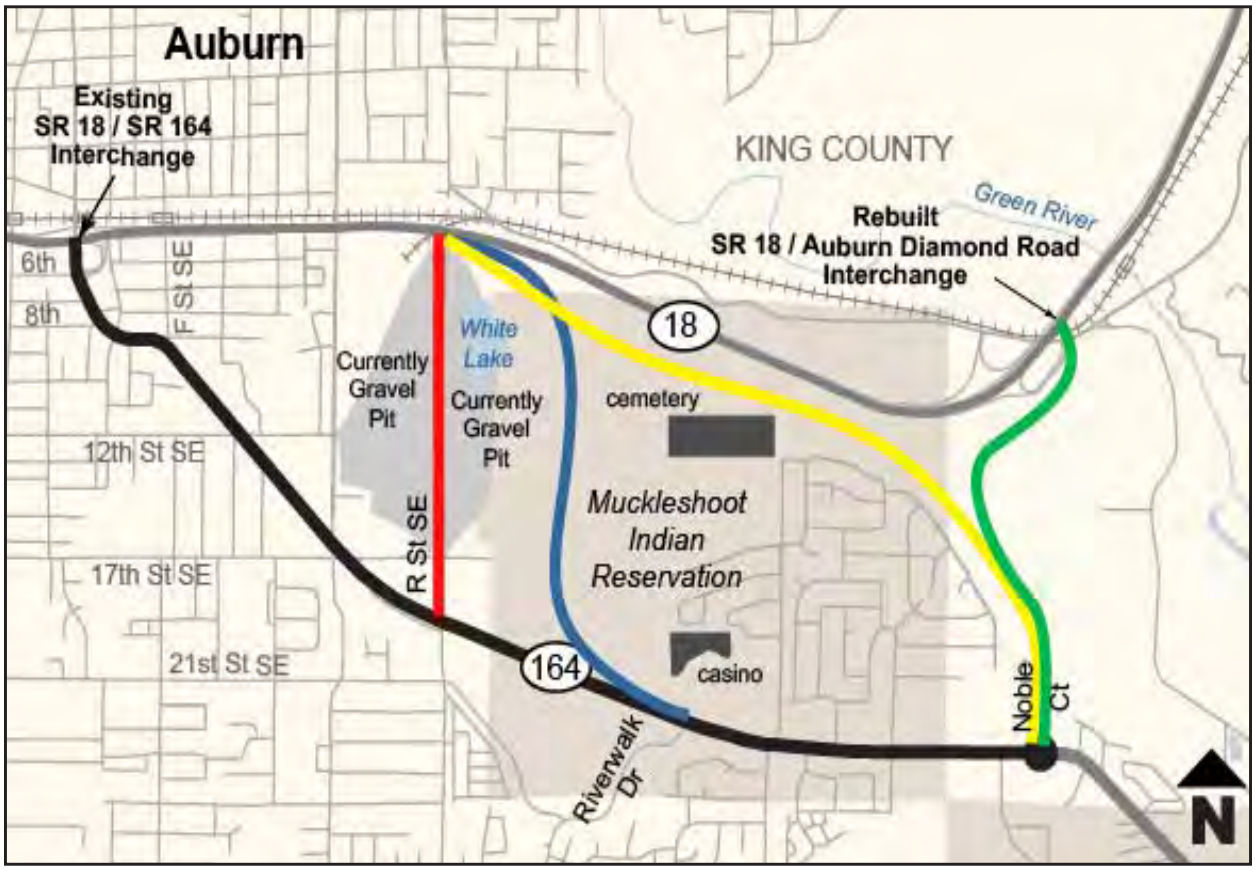
Exhibit 4.5

Description of SR 164 CPS Analyzed Auburn Bypass Options

Bypass Option	Description	Location
This is a list of recommended improvements directed at increasing safety and addressing congestion. While improvements are suggested, future conditions can never be fully predicted. The specific design and detail of improvements will be determined during the design stage of each project. Each Bypass Option is intended to be implemented along with the operational, safety, and capacity projects in Improvement Option #2.		
# 1	R Street Bypass Connecting SR 164 to SR 18 via a new grade-separated R Street / SR 164 interchange and a new R Street / SR 18 interchange via R Street:	Leaving SR 164 via a new grade-separated R Street / SR 164 interchange, traveling north on R Street to a new R Street / SR 18 interchange
# 2	Riverwalk Bypass: Connecting SR 164 to SR 18 via Riverwalk Drive and a new R Street interchange	Leaving SR 164 via Riverwalk Drive heading northwest to a new R Street / SR 18 interchange
# 3	Noble Court to R Street Bypass: Connecting SR 164 to SR 18 via the Noble Court vicinity and a new R Street interchange	Leaving SR 164 in the Noble Court vicinity traveling northwest to a new R Street / SR 18 interchange
# 4	Noble Court / Auburn Black Diamond Road Bypass: Connecting SR 164 to SR 18 via the Noble Court vicinity and a rebuilt Auburn Black Diamond Road interchange	

Exhibit 4.6

SR 164 CPS Analyzed Auburn Bypass Options



Bypass # 1 - R Street
(R Street to a new SR 18 / R Street Interchange)

Bypass #2 - Riverwalk Drive
(Riverwalk Drive to a new SR 18 / R Street Interchange)

Bypass #3 - Noble Court to R Street
(A raised structure starting at Noble Court curving along the slope to a new SR 18 / R Street Interchange)

Bypass #4 - Noble Court to Auburn Black Diamond Road
(A raised structure starting at Noble Court curving along the slope and around King County Preserved Farmland and Agricultural Production District to a rebuilt SR 18 / Auburn Black Diamond Road Interchange)

What was the cost estimating methodology?

Preliminary project costs were prepared by WSDOT for each of the SR 164 improvement options. The cost estimate methodology was developed as part of a Congestion Relief Analysis (CRA) for Washington State's three metropolitan areas - Central Puget Sound, Spokane, and Vancouver. The preliminary project costs are in 2005 dollars, are planning level estimates, and are not based on engineering analysis. The methodology provided a generalized total for each segment based upon WSDOT experience with other projects of similar size and type. They do not account for potential environmental mitigation (including right-of-way needed for wetland reestablishment or other reasons related to environmental mitigation), rising material costs, or other unforeseen expenditures that may occur during design or construction. These factors may increase the final costs of individual projects.

A unit price approach was used that accounts for regional differences, as well as differences in land use types and development density within a region. Quantities per lane mile and unit costs have been developed from historical data on WSDOT projects. Some unit costs are adjusted for differences in area prices, terrain, ground conditions, and design assumptions. Little geotechnical information is assumed.

What was the benefit calculating methodology?

Benefits were calculated based on reductions in collisions and travel delay forecasts over the course of a 20-year period. Collision benefits were based on expected collision reductions resulting from specific types of roadway improvements. Each collision that can be alleviated by an option results in a savings. A minimum three-year collision data set along with appropriate AASHTO (American Association of State Highway and Transportation Officials) reduction factors was used to generate collision reduction benefits for the 20-year benefit period for each option.

Travel delay reduction benefit calculations were based on:

- average vehicle occupancy (AVO)
- truck percentage
- traffic volume
- growth rate
- posted speed

Operating speeds were used to calculate travel-time savings based on build and no-build conditions. Dollar values for these time savings were then assigned to each vehicle. Values varied for different vehicle types. Each passenger vehicle was assigned a value of $14.07 and each truck $56.26 for each vehicle hour reduction in travel time. Benefits were calculated for the 20-year analysis period based on 260 working days per year.

The sum of the monetary savings over 20 years from collision reduction and travel time savings is the benefit of the project for purposes of the benefits-to-costs (B/C) analysis.

12 How were Improvement Option and Bypass Option benefits compared to potential costs?

The next step in the evaluation process involved the Benefit-to-Cost (B/C) analysis. The B/C compares the benefits of a project included in an improvement option (or bypass option) to the project's costs in order to measure the extent to which the benefits exceed the costs. The resulting value (commonly referred to as the B/C ratio) was used to compare the two improvement options and the four bypass options. If the B/C ratio is near zero, the benefits and costs are about equal. The higher the B/C ratio, the more the benefits outweighed the costs.

All costs in the B/C analysis are estimated in 2005 dollars and do not include inflation. The B/C Ratio equals the total 20-year benefits divided by the total costs with depreciation. The benefits are developed by adding the travel time benefits to the safety benefits derived from adding the proposed improvement. The travel time and safety benefits are comprised of the following:

- Travel Time: A project benefit reflecting a dollar value for the expected reduction in delay for the project option.
- Safety: A project benefit reflecting a dollar value for the expected reduction in accidents for the project option.

A proposed improvement's costs are broken out as the total construction costs include:

- Preliminary Engineering: design and preparation of the contract plans, special provisions, and estimate for the final option after an environmental assessment.
- Structures: Estimated equipment, material, and installation costs typically related to the construction of bridge(s) and retaining walls.
- Drainage / Grading: Estimated equipment, material, and installation costs that typically involve roadway embankment and excavation, drainage pipes, etc.
- Other Costs: Estimated equipment, material, and installation costs that typically involve pavement, signing, illumination, roadway signing, etc.

All these costs are combined together to develop the Total Present Value Cost - the value adjusted to account for a project's costs (ROW, Structures, and Drainage / Grading) that last longer than the 20-year Benefit/Cost analysis period.

13 What are the Benefit-Cost Results?

The value of the 20-year benefits is divided by the 20-year project costs to obtain the B/C ratio. The B/C ratios for the two improvement options and the four bypass options with improvement option #2 are shown in Exhibit 4.7 below.

Exhibit 4.7

Benefit-to-Cost Analysis Results[1]

(in millions)

Option	20-Year Benefits			Costs		20-Year B/C Ratio[2]
	Travel Time	Safety	Total	Construction Costs	Total Present Value Costs (w/20-Year Depreciation)	
Improvement Option 1	$174	$42	$216	$120	$92	2.3
Improvement Option 2	$197	$61	$258	$147	$114	2.3
Bypass #1 + Option 2	$204	$61	$266	$188	$144	1.8
Bypass #2 + Option 2	$258	$61	$319	$193	$148	2.2
Bypass #3 + Option 2	$202	$61	$263	$254	$190	1.4
Bypass #4 + Option 2	$193	$61	$254	$222	$167	1.5

[1] All costs are estimated in 2005 dollars and do not include inflation. See text above for explanation of development of benefits, cost, and present value.

[2] The B/C Ratio equals the total 20-year benefits divided by the total costs with depreciation.

Both options score ratios over "1," but the differences between them are not significant. A difference of more than a few whole numbers (such as a 2 to a 7) might sway a decision toward one option or another.

14 How do the improvement options affect traffic conditions and mobility?

The B/C analysis did not help in determining which improvement option to recommend. The CWG requested the study team perform additional traffic analysis based on turning movements at key intersections. The two improvement options were evaluated to assess each proposal's impact on the 2030 traffic conditions along SR 164.

The analysis also assumed all current programmed projects presented in Chapter 2, Exhibit 2.27 on pages 2-58 through 2-60 were completed. The results of the analyses were compared to the 2030 No Build conditions. The comparison evaluated the effectiveness of each option in addressing increased traffic volumes and level-of-service reductions along SR 164 in the year 2030.

The traffic analyses evaluated:

- PM peak hour travel time
- Average daily traffic volumes (ADT)
- Intersection level-of-service
- Intersection turning movements
- Roadway segment level-of-service

The results of the traffic analyses are summarized in Exhibits 4.8 through 4.13 on pages 4-21 to 4-26.

Based on the traffic analysis information and the results of the benefit-to-cost analysis, the CWG chose a recommended improvement option and recommended two remaining bypass options for further study in the SR 164 Bypass Feasibility Study which started in the spring of 2008.

Exhibit 4.8

SR 164 - Summary of Improvement Options and Bypass Options - 2004 and 2030 Corridor Performance Operations

Transportation Element	Existing 2004	Future No Build 2030	Improvement Option 2030		Bypass Option 2030			
			# 1	# 2	# 1 R Street	# 2 Riverwalk	# 3 Noble Ct to R Street	# 4 Noble Ct to Aub / BD Rd
Corridor PM Peak Travel Time	33 mins	48 mins	44 mins	39 mins	35 mins	35 min	36 mins	34 mins
Change in Corridor PM Peak Travel Time over No Build	NA	45% (over 2004)	(-8%)	(-19%)	(-27%)	(-27%)	(-25%)	(-29%)
Average Travel Speed	27 mph	18 mph	20 mph	23 mph	25 mph	25 mph	25 mph	26 mph
Corridor ADT Volume Range	8,400 - 41,400	12,800 - 59,600	12,800 - 59,600	12,800 - 59,600	13,800 - 58,400	14,100 - 62,500	14,400 - 49,200	14,500 - 47,900
Change in Corridor ADT Volume over No Build	NA	44 to 52% (over 2004)	0%	0%	(-2%) to 8%	5 to 10%	(-21%) to 12%	(-24%) to 13%
Total ADT Volumes within Auburn	30,200 - 41,400	35,600 - 59,600	35,600 - 59,600	33,500 - 59,600	31,700 - 58,400	35,700 - 62,500	30,300 - 49,200	32,500 - 47,900
Number of Failing Intersections during PM Peak Hour (LOS E or F)	4	10	4	3	2	3	2	3

* Each of these Bypass Options was analyzed coupled with the operational improvements in Option 2.

Source: TRANSPO, February 2006

Exhibit 4.9

SR 164 - Summary of Improvement Options and Bypass Options Traffic Impacts Auburn Segment (2030)

Auburn Segment/ Transportation Element	Existing 2004	No Build 2030	Improvement Option 2030		Bypass Option 2030			
			# 1	# 2	# 1 R Street	# 2 Riverwalk	# 3 Noble Ct to R Street	# 4 Noble Ct to Aub / BD Rd
ADT Volume Range	30,200	35,600	35,600	33,500	31,700	35,700	30,300	32,500
		-	-	-	-	-	-	-
	41,400	59,600	59,600	59,600	58,400	62,500	49,200	47,900
PM Peak Hour Travel Time	9.6 min	17.9 min	15.9 min.	14.6 min	9.7 min	9.5 min	10.1 min	8.4 min
Auburn Segment's Failing Intersections		SR 18	SR 18	SR 18				
	6th St. SE	6th St. SE	6th St. SE	6th St. SE	6th St. SE	6th St. SE	6th St. SE	6th St. SE
	F St. SE							
	M St. SE	M St. SE	M St. SE	M St. SE		M St. SE	M St. SE	M St. SE
					Riverwalk	Riverwalk		
	Hemlock St.	Hemlock St.	Hemlock St.					
								Noble Ct.

* Each of these Bypass Options was analyzed coupled with the operational improvements in Option 2.

Source: TRANSPO, February 2006

Exhibit 4.10

SR 164 - Summary of Improvement Options and Bypass Options Traffic Impacts Academy Segment (2030)

Academy Segment / Transportation Element	Existing 2004	No Build 2030	Improvement Option 2030		Bypass Option 2030			
			# 1	# 2	# 1 R Street	# 2 Riverwalk	# 3 Noble Ct to R Street	# 4 Noble Ct to Aub / BD Rd
ADT Volume Range	22,000	33,600	33,600	35,200	37,600	38,400	39,100	39,300
	-	-	-	-	-	-	-	-
	22,700	34,600	34,600	36,200	38,800	39,500	40,100	40,400
PM Peak Hour Travel Time	5.0 min	7.3 min	7.3 min	2.9 min	2.9 min	2.9 min	2.9 min	2.9 min
Auburn Segment's Failing Intersections	-	32nd St. SE	-	-	-	-	-	-

* Each of these Bypass Options was analyzed coupled with the operational improvements in Option 2.

Source: TRANSPO, February 2006

Exhibit 4.11

SR 164 - Summary of Improvement Options and Bypass Options Traffic Impacts Muckleshoot Segment (2030)

Muckleshoot Segment / Transportation Element	Existing 2004	No Build 2030	Improvement Option 2030		Bypass Option 2030			
			# 1	# 2	# 1 R Street	# 2 Riverwalk	# 3 Noble Ct to R Street	# 4 Noble Ct to Aub / BD Rd
ADT Volume Range	15,700	27,000	27,000	27,000	30,300	30,900	31,400	31,400
	-	-	-	-	-	-	-	-
	17,400	28,500	28,500	28,500	31,900	32,500	33,200	33,200
PM Peak Hour Travel Time	5.8 min	7.3 min	7.3 min	7.3 min	7.8 min	7.9 min	8.0 min	8.1 min
Muckleshoot Segment's Failing Intersections	-	SE 388th St.	-	-	-	-	-	-

* Each of these Bypass Options was analyzed coupled with the operational improvements in Option 2.

Source: TRANSPO, February 2006

Exhibit 4.12

SR 164 - Summary of Improvement Options and Bypass Options Traffic Impacts Rural / Agricultural Segment (2030)

Rural / Agricultural Segment / Transportation Element	Existing 2004	No Build 2030	Improvement Option 2030		Bypass Option 2030			
			# 1	# 2	# 1 R Street	# 2 Riverwalk	# 3 Noble Ct to R Street	# 4 Noble Ct to Aub / BD Rd
ADT Volume Range	10,800	21,900	21,900	21,900	24,600	25,100	25,600	25,500
	-	-	-	-	-	-	-	-
	12,500	24,500	24,500	24,500	27,200	27,500	28,200	28,400
PM Peak Hour Travel Time	5.2 min	6.0 min	6.0 min	6.0 min	6.3 min	6.3 min	6.4 min	6.4 min
Rural / Agricultural Segment's Failing Intersections	-	196th Ave SE	-	-	-	-	-	-

* Each of these Bypass Options was analyzed coupled with the operational improvements in Option 2.

Source: TRANSPO, February 2006

Exhibit 4.13

SR 164 - Summary of Improvement Options and Bypass Options Traffic Impacts Enumclaw Segment (2030)

Enumclaw Segment / Transportation Element	Existing 2004	No Build 2030	Improvement Option 2030		Bypass Option 2030			
			# 1	# 2	# 1 R Street	# 2 Riverwalk	# 3 Noble Ct to R Street	# 4 Noble Ct to Aub / BD Rd
ADT Volume Range	8,400	12,800	12,800	12,800	13,800	14,100	14,400	14,500
	-	-	-	-	-	-	-	-
	11,700	14,900	14,900	14,900	16,600	16,800	17,300	17,200
PM Peak Hour Travel Time	7.6 min	9.2 min	7.9 min	7.9 min	8.1 min	8.1 min	8.3 min	8.3 min
Enumclaw Segment's Failing Intersections	-	244th Ave	-	-	-	-	-	-
	-	Semanski	-	-	-	-	-	-
	-	SR 410	-	-	-	-	-	-

* Each of these Bypass Options was analyzed coupled with the operational improvements in Option 2.

Source: TRANSPO, February 2006

PM Peak Travel Times

The traffic analysis above shows that both of the proposed improvement options and each of the four bypass options would improve traffic operations on SR 164 compared to the future (2030) No Build projection. Bypass Options 1, 2, and 4 would keep travel times along the corridor similar to the existing (2004) travel times despite an increase of 40 percent or more in average daily traffic volumes (ADT). On page 4-21, Exhibit 4.8: SR 164 - Summary of Improvement Options and Bypass Options - 2004 and 2030 Corridor Performance Operations includes these travel times and ADT ranges.

The individual segment travel time data (Exhibits 4.9 to 4.13) reveals that the only real and significant travel time savings are in the two segments that are closest to the recommended capacity improvements.

Average Travel Speed

Similar to corridor travel times, the proposed bypass options are expected to slightly erode in average travel speed with the projected increase in the corridor's average daily traffic (ADT) volumes.

Intersection Operations

Compared to the 2030 No Build, each of the options will have fewer intersections operating over capacity during the PM Peak hour. Differences in intersection operations between Options 1 and 2 and the bypass options are minor.

ADT is expected to increase by approximately 40 percent for the future (2030) No Build compared to existing conditions. This will result in increased travel times during the PM peak hour if improvements are not made to this section of roadway.

15 How would the proposed improvement options enhance safety?

The ways in which the proposed improvement options will enhance safety on SR 164 include:

- improve sight distance and roadway geometrics (such as the width of the roadway or the alignment of the roadway) to provide drivers with improved visibility
- add turn lanes to help reduce rear-end and other collisions
- add signals or improve roadway channelization to provide protected turning movements
- add or widen roadway shoulders
- close access at awkward intersections or realign awkward intersections
- restrict access to and from driveways by installing a median or C curb and allowing for U-turns at the next stop controlled intersection
- provide lighting along the roadway
- add sidewalks in areas where commercial, residential, or other uses (such as schools) warrant provisions for pedestrians

16 Are the proposed improvements consistent with state and local plans?

The Washington State Highway System Plan (HSP) is the element of Washington's Transportation Plan that addresses the state's highway system. The HSP is an assessment of existing and projected 20-year deficiencies on the state's highway system. It also lists conceptual solutions that address these deficiencies. A CPS is one of the primary methods in which the conceptual strategies identified in the HSP are refined. A number of HSP strategies indicate that further study of highways is needed to identify the appropriate action. This CPS provides the needed detailed analysis to help identify refinements to HSP strategies.

In addition to consistency with state objectives, this CPS must also be consistent with regional and local plans. The limits of the SR 164 corridor traverse four jurisdictions, including the cities of Auburn and Enumclaw, unincorporated portions of King County, and the tribal lands of the Muckleshoot Indian Tribe. The city and county jurisdictions' comprehensive plans must be in accord with the multi-county planning policies that are adopted by the Puget Sound Regional Council (PSRC). These jurisdictions and the PSRC had representatives on the SR 164 Corridor Working Group and actively participated throughout the entire study process. Some suggestions for improvements along the corridor came from jurisdictions' comprehensive plans. The recommended projects were endorsed by those CWG members, indicating consistency with local and regional planning efforts.

In 1990, the Growth Management Act (GMA) was adopted by the Washington State Legislature. This law requires counties and cities to develop a collaborative set of policies to guide in the preparation of their comprehensive plans. The purpose of GMA is to limit urban sprawl, enhance open space, protect rural areas, and more efficiently use land use/zoning, transportation, and utilities to encourage development within the urban growth boundary.

State legislation (Revised Code of Washington [RCW] Sections 25.77, 35.58, 36.70A, and 36.81) require each local government agency to prepare and adopt a six-year comprehensive transportation program that addresses the deficiencies in roadway capacity, and areas that are lacking transit, bicycle, and pedestrian improvements. In addition, local jurisdictions are required under the Washington State Growth Management Act to comply with RCW 36.70 A. According to the code, each jurisdiction must monitor its existing land uses and work with the community to develop future land use visions. This requires that jurisdictions develop roadway and other transportation improvements to support the land use plans. The intent is to coordinate growth with the development of efficient transportation systems.

Concurrency Requirements (Growth Management Act)

The Growth Management Act (GMA) concurrency standard requires each city to monitor the amount of traffic growth caused by new development. The concurrency standard requires that each agency create a method to ensure that new developments do not lower the quality of the roadway (level-of-service threshold) below the locally-adopted minimum standard. This is achieved by requiring transportation improvement(s) 'concurrent' with the proposed development to improve the overall service of the roadway network. The GMA defines 'concurrent' as any development (building or transportation) that is completed at the time of or within six years of each other. This policy is intended to coincide with the six-year-time frame of most capital facilities plans.

Level-of-Service (LOS) standards for Regionally Significant State highways in the Central Puget Sound region, including SR 164, were adopted by the Puget Sound Regional Council in 2003. For urban areas, the adopted LOS standard ranges from LOS E/ mitigated (pm peak hour LOS is below the traditional LOS E) to the traditional LOS.

Each of the jurisdictions along SR 164 requires that the roadway not fall below a level-of-service threshold of D (the city of Enumclaw has set a LOS F standard at unsignalized intersections). This means that a new development cannot generate new trips that result in congested roadway conditions.

The City of Auburn is in the process of developing a set of concurrency standards that will be used for all new developments in their jurisdiction. These policies include:

- Roadway improvements that serve new developments will be constructed as part of the development process. All costs will be borne by the developer. In some instances, the City may choose to participate in construction where improvements serve more than adjacent developments. The City will encourage the use of Local Improvement Districts (LIDs), where appropriate and financially feasible, and to facilitate the development. The City will also consider developing a traffic impact fee system.

- Improvements that are considered to benefit abutting property should be funded by the abutting property owner.

- Revenues for street improvements should provide for the development of the general development of traffic flow in compliance with the six-year street plan. The basic criteria for the funding should be to evaluate how the project improves the general traffic flow and not the benefit that might accrue to properties.

The Muckleshoot Tribal Reservation does not have any concurrency standards, since GMA does not apply to tribal governments. Tribes create and adhere to their own land use and transportation plans and can elect to follow GMA regulations voluntarily. While the Muckleshoot Tribal Reservation does not currently have a concurrency standard, it may consider the possibility of developing one as development needs increase in the future.

The City of Enumclaw has set a LOS D standard for signalized intersections and LOS F standard at unsignalized intersections. This means that any new development cannot generate new trips such that they will cause the level-of-service to decline to a point of unacceptable.

King County uses two sets of measures to determine whether a proposed development meets LOS standards. They include an averaging of traffic congestion on roadways in the area and a measure of traffic congestion in an individual corridor. Area-wide averaging is used to judge the performance of the road system as measured against the adopted LOS standards. An individual corridor measure is used to judge performance of monitored corridors as measured against the LOS standards. The LOS standard for the urban area and rural towns is LOS E. For rural areas outside of towns, the standard is LOS B. In both cases, minor commercial and public facilities allow a standard of LOS F. The King County Transportation Concurrency Management program does not apply to transportation facilities designated by WSDOT as "Highways of Statewide Significance (HSS)", however, since SR 164 is a non-HSS facility, the program does apply.[3]

The Washington State Legislature passed HB 1230 in 2008. This bill designated State Route number 164 as a highway of statewide significance. The designation of SR 164 as an HSS indicates that the highway is now exempt from local transportation traffic-flow concurrency requirements. The HSS designation begins at the junction of SR 18 in Auburn and ends at the junction of SR 410 in Enumclaw. Many persons who supported HB 1230 hope this designation will help secure additional funding for the corridor.

The Washington Transportation Plan (WTP) is a blueprint for transportation programs and investments in Washington State. The plan covers all modes of Washington's transportation system and is required by state and federal law to be regularly updated. The 2005 update was adopted by the Transportation Commission in 2006. The current plan was completed in 2006, and covers the years 2007-2026. It contains an overview of the existing conditions of the statewide transportation system, an assessment of the transportation needs over 20 years, and a statewide policy for transportation.

The 20-Year Transportation Vision in the WTP states that Washington's transportation system should serve our citizens' safety and mobility, the state's economic productivity, our communities' livability, and our ecosystem's viability. Moving

[3] King County Comprehensive Plan, September 2004.

away from the historical practice of using gas tax revenue and attempts to build out of congestion, this 20-year plan warns that as we grow, we must choose strategies to manage growth and strategically invest to better move people and goods. Using current information and data, the Washington Transportation Plan identifies a combined need of $67 billion of transportation investments, both funded and unfunded. These investments for the next 20 years will build the state's economy, meet citizen's social and recreational needs, and enhance personal health and safety.

The State of Washington Transportation Commission spent two years furthering the evolution of the current transportation plan, which culminated in an amended version that was presented to the 2009 legislative session and budget deliberations, as required under statute. The newly updated 2007-2026 Washington Transportation Plan outlines transportation goals and objectives for the entire state, not just for the Washington State Department of Transportation. It is designed to:

- Offer policy guidance for all jurisdictions statewide on matters related to the transportation system over the next 20 years.
- Provide a data-driven guide to transportation priorities that reflect input gathered from many entities, organizations, and citizens across the state, as well as from deliberations by the Transportation Commission.
- Identify the top transportation investment priorities for the entire state in the areas of:

    1. Preservation – Preserve and extend prior investments in existing transportation facilities and the services they provide to people and commerce.
    2. Safety – Target construction projects, enforcement, and education to save lives, reduce injuries, and protect property.
    3. Economic Vitality – Improve freight movement and support economic sectors that rely on the transportation system, such as agriculture, tourism, and manufacturing.

4. Mobility – Facilitate movement of people and goods to contribute to a strong economy and a better quality of life for citizens.

5. Environmental Quality and Health – Bring benefits to the environment and our citizens' health by improving the existing transportation infrastructure.

The 2007-2026 Washington State Highway System Plan (HSP) identifies the objectives of the state highway system and provides recommended actions to meet the objectives. The HSP lists all state highway needs over the 20-year period along with improvement strategies to address the needs. It is used by WSDOT to help prioritize and budget state highway projects.

A technical update was completed on the HSP in December 2008. The purpose of the 2007-2026 Washington State Highway System Plan Technical Update was to focus and expand upon the following subject areas of the 2007-2026 HSP:

- Further analysis of selected mobility solutions. WSDOT prepared planning level traffic and benefit/cost analyses on some of the mobility solutions indentified in the 2007-2026 HSP. Special emphasis was placed on Tier I solutions, which are low-cost projects that deliver a high return on capital investment and have short delivery schedules.

- Intermodal connections with ferries and ports. This area was updated to further develop strategies that improve the connections between state highways, ferry routes and ports.

- Economic vitality-support the economy. This section has been updated to reflect the policies and goals of Washington's Transportation Plan (WTP) and WSDOT's efforts to identify needs, strategies, and performance measures in the Freight Transportation Network, Community Economic Development, and Tourism and Scenic Byways.

- Performance measures - development/refinements. Define and expand on performance measures for the Health and the Environment Section within the following areas: Fish Passage Barrier Removal; Habitat Connectivity; Chronic Environmental Deficiencies; Stormwater Management; Noise Barrier Retrofit; and Bicycle Transportation, Pedestrian Walkways and the Environment.

The 2007-2026 Washington State Highway System Plan uses an incremental approach with three strategies to achieve mobility. Tier I strategies include low-cost projects with short delivery schedules such as Intelligent Transportation System (ITS) solutions, access management projects, ramp modifications, turn lanes, intersection improvements, and incident management. Tier II strategies include moderate to high cost improvements that further reduce congestion such as improvements to parallel corridors, adding auxiliary lanes, and direct access ramps (DAR). Tier III strategies focus on the highest cost improvements that can deliver corridor-wide benefits such as adding general purpose lanes and interchange modifications. If Tier I strategies address the needs of a particular corridor, all Tier II and Tier III proposed strategies can be eliminated. If the Tier II proposed strategies address the needs, then the Tier III proposed strategies can be eliminated.

Guidance on strengthening environmental stewardship continues to develop in Washington State. This Highway System Plan connects to several environmental policies, including but not limited to the five policy goals contained in RCW 47.04.280, the Governor's Priorities of Government, the 2001 WSDOT Environmental Policy Statement, and the 2008 WSDOT Strategic Plan.

WSDOT intends to update the Highway System Plan every two to three years and use it as a guide to the highway portion of the Capital Improvement and Preservation Program. Each update of the Highway System Plan covers emergent issues and builds upon previous plans, refining identified needs, strategies, solutions, and performance measures.

The Corridor Planning Study is one of the primary methods in which the strategies identified in the HSP are refined. A number of HSP strategies indicate that further study of the route is needed to identify the appropriate action. The CPS provides the needed detailed analysis to help identify refinements to the HSP strategies.

Exhibit 4-14 on pages 4-36 through 4-38 provides an overview of the HSP Objectives and Action Strategies that are applicable to the SR 164 Corridor Planning Study.

Exhibit 4.14

Consistency of SR 164 CPS and the Highway System Plan (HSP)

Improvement Category	Objective	Applicable Action Strategies	Proposed Improvements
Maintenance	Maintain the effective and predictable operations of the transportation system to meet customer's expectations.	Perform roadside activities by picking up litter, reducing noxious weeds, and controlling vegetation obstructions to achieve a statewide annual average level-of-service C+.	A number of projects are recommended to improve line of sight that may include removal of vegetation obstructions including projects 18, 20, 22, 23, 26, 27, 30, 33, 37, 41, and 43.
Operations	Increase the efficiency of operating the existing systems and facilities.	Optimize the efficiency of the highway system through traffic management techniques (e.g., ramp metering in peak hours, service patrols and incident response, signal timing and coordination).	A number of projects are recommended to improve the signal timing and coordination along SR 164, including projects 4a, 4b, 4c, 8, 46, and 49.
		In partnership with public and private entities, invest in new traveler information systems to improve system efficiency, safety, and reduce traveler stress.	Project T-9 recommends inclusion of traffic conditions and photo information on the WSDOT Traffic Website, and Project T-10 recommends variable message signs to provide real time information on traffic conditions.
Preservation	Preserve transportation infrastructure to achieve the lowest life cycle cost and prevent failure.	Pavements will be programmed targeting the lowest life cycle cost per the Washington State Pavement Management System "due" date. Existing safety features shall be restored to provide basic design level standards.	Projects 4 and 46 include repaving portions of SR 164.

Exhibit 4.14 (continued)

Consistency of SR 164 CPS and the Highway System Plan (HSP)

Improvement Category	Objective	Applicable Action Strategies	Proposed Improvements
Mobility	Reduce person and freight delay on WTP corridors.	Access Management within developed corridors - along corridors, which are fully developed, reduce the travel delay by utilizing access management techniques where appropriate.	Projects 5, 9, 17, 22, and 62 include access management improvements in the Auburn and Academy segments.
		Where adopted, congestion thresholds are surpassed on non-HSS facilities, partner with regional and local governments to make targeted transportation investments.	Many of the immediate-term projects are being funded and constructed by local governments, and it is assumed that a number of the recommended short- and long-term projects will also be partially funded by local and regional sources.
	Improve existing travel patterns.	Develop bicycle/pedestrian corridors where they support public transportation facilities and are viable commute options.	A number of pedestrian-related projects are recommended to improve pedestrian and bicycle linkages, including projects 5, 9,10b, 12, 26, 27, 34, 38, 42, 43, 48, 51, 53, 56, 57, 58, 59, 60, 63, and 65.
	Create links and remove barriers between transportation facilities and services.	Improve connections at multimodal transportation facilities.	A number of projects recommend new park-and-ride lots, including projects T-2, T-3, and T-4. Project T-6 recommends transit signal priority at future P&R lots to improve connections, and project T-7 recommends Transportation Demand Management (TDM) strategies.
	Create links and remove barriers between transportation facilities and services.	By 2020, increase the number of completed local bicycle and pedestrian networks by completing missing links along or across state highways.	A number of pedestrian-related projects are recommended to improve pedestrian and bicycle linkages, including projects 5, 9, 10b, 12, 26, 27, 34, 38, 42, 43, 48, 51, 53, 56, 57, 58, 59, 60, 63, and 65.

Exhibit 4.14 (continued)

Consistency of SR 164 CPS and the Highway System Plan (HSP)

Improvement Category	Objective	Applicable Action Strategies	Proposed Improvements
Safety	Reduce and prevent deaths and the frequency and severity of disabling injuries, and reduce the societal costs of accidents.	Reduce high accident locations (HALs) on state highways through hazard mitigation.	Project 27 includes removal of obstructions and installing flashing overhead signage to alert drivers of pedestrian crossing to address HAL at 158th Avenue SE (SE 388th Street).
		Reduce pedestrian accident locations (PALs) on state highways through hazard elimination.	Project 9 includes pedestrian enhancements to address PAL near Muckleshoot Casino. Project 10b includes a mid-block pedestrian crossing near Auburn QFC to address PAL in vicinity of Casino.
		Reduce high accident corridors (HACs) using standards based on highway safety improvements.	A number of safety-related projects are recommended along the corridor that address HACs, including projects 17, 18, 20, 22, 26, 28, 30, 40, 41, 42, 45, 47, 51, 53, 62, and 64.
		Construct intersection channelization and/or signals in compliance with federal guidelines to improve safety.	A number of channelization and signal projects are recommended along the corridor to improve safety, including projects 4a, 4b, 4c, 8, 11, 14, 16, 27, 28, 29, 37, 38, 40, 43, 46, 49, 51, 53, 56, 58, 59, 60, and 61.
		Improve roadways where geometrics, traffic volumes, and speed limits indicate a high accident potential by instituting standards based on highway safety improvements.	A number of projects improve the roadway geometrics to address safety issues, such as roadway widening, radius improvements, shoulder widening, lighting, center left-turn lanes, and closing access at skewed intersections. These include projects 5, 10a, 10b, 12, 14, 32, 41, 45, 47, 57, and 64.
		Proactively address pedestrian safety along state highway segments that exhibit high pedestrian use and the potential for future accidents.	A number of pedestrian-related projects are recommended to improve pedestrian safety, including projects 9, 10b, 12, 26, 27, 34, 38, 42, 43, 48, 51, 53, 56, 57, 58, 59, 60, 63, and 65.

The limits of the SR 164 Corridor Planning Study fall within four jurisdictions including Auburn, King County, the Muckleshoot Indian Tribal Area, and Enumclaw.

All of the jurisdictions' comprehensive plans require that their transportation plans are coordinated with regional plans. All four of the jurisdictions were represented as part of the CWG throughout the entire study process. The recommended projects were endorsed by those CWG members, indicating consistency with the local plans.

The SR 164 Corridor Planning Study meets the following Transportation Policy Goals set forth in RCW 47.04.280.

- Preservation: To maintain, preserve, and extend the life and utility of prior investments in transportation systems and services.
- Safety: To provide for and improve safety and security of transportation customers and the transportation system.
- Mobility: To improve the predictable movement of goods and people throughout Washington state.
- Environment: To enhance Washington's quality of life through energy conservation, enhance healthy communities, and protect the environment.
- Stewardship: To continuously improve the quality, effectiveness, and efficiency of the transportation system.

The improvements recommended by this CPS are consistent with the policies and strategies in the Washington State Legislature's Transportation Policy Goals and Investment Strategies contained in the Washington State Department of Transportation (WSDOT) Washington Transportation Plan (WTP) as required by Substitute Senate Bill (SSB) 5412. The improvements in this report that are consistent with safety, mobility, stewardship, environmental quality, and economic vitality goals include: low-cost operational and safety improvements such as turn pockets and turn lanes, traffic signals and stop signs, roundabouts where warranted, improvement of shoulders, installation of guardrail and rumble strips at critical locations, restricting left turns, installing restrictive medians at

appropriate access points, construction of sidewalks and bus pullouts at key points along the corridor to improve transit, bicycle, and pedestrian facilities, and reinforcement of Commute Trip Reduction (CTR) Programs. Bridges located on SR 164 are identified in the description of the existing facility and the Environmental Inventory in Appendix B contains information on soils, steep slopes, and slide prone areas, which address preservation goals.

The recommended improvements are also consistent with the Revised Code of Washington (RCW) 47.06.050, which requires WSDOT to first assess strategies to enhance the operational efficiency of the existing system before recommending system expansion when developing capacity and operational improvement plans. Strategies to enhance the operational efficiencies include, but are not limited to access management, transportation system management, demand management, and high-occupancy vehicle (HOV) facilities.

Moving Washington is WSDOT's three-part strategy to relieve congestion in Washington State and consists of the following:

1. Adding capacity strategically – building is part of the solution
2. Operating roadways efficiently – getting the most out of the infrastructure
3. Managing demand – providing people choices

The improvement options from the SR 164 Corridor Planning Study meet *Moving Washington*'s Strategy to reduce congestion in our state. Option 2 adds capacity strategically by widening SR 164 to two lanes in each direction with center median and turn lanes for controlled left turns and access management from Dogwood Street to Academy Drive. Option 1 adds capacity through turn lanes and realignment. This option increases the efficiency of roadway operations by adding intersection controls at specific intersections and using access management strategies. The improvement options help manage the demand that corresponds with congestion. Working together with cities on the SR 164 corridor to improve transit, bicycle, and pedestrian facilities provides more choices to people who use the corridor.

Chapter 5
Recommended Corridor Improvements

This chapter identifies the improvement option recommended by the Corridor Working Group (CWG).

1 What is the recommended Improvement Option for SR 164?

WSDOT worked with the Corridor Working Group to evaluate and select a recommended improvement option for this Corridor Planning Study (CPS). This CPS is the initial step toward obtaining funding and then implementation by the CWG partners.

- The Corridor Working Group recommends Improvement Option #2 as the locally preferred option for the State Route 164 Corridor Planning Study. (See Exhibit 5.1 - on the next page for an illustration of the recommended Improvement Option #2. See also Exhibit 5.4 and Exhibit 5.5 - later in this chapter - for illustrations of the recommended SR 164 Cross-Section and Cross-Section locations.)

As explained in Chapter Four, Improvement Option #1 and Improvement Option #2 were analyzed through the evaluation process (criteria screenings, benefit-to-cost analysis, traffic impact analysis). Both options are estimated to improve safety and operations along the SR 164 corridor. The projects in