Section 8: Long-Term Improvement Options

The long-term improvement options represent the milestones the region should strive to achieve over the next 20 year period regarding expansion/development of the SR 167 Corridor. An incremental implementation approach can be utilized and this concept is expanded upon in Section 9.

Several long-term improvement options were analyzed. This section describes the options that were examined, the criteria used to screen those options, and the results of the screening.

What is Proposed at the North and South Ends of the SR 167 Corridor?

To better understand what improvement options should be considered for the SR 167 Corridor, it is necessary to understand the improvements that are currently being developed or are under construction at the north and south ends of the corridor. The improvements within the limits of this study must work in harmony with the improvements being developed outside the limits of the study at either end of the corridor.

North End:

I-405 Interchange and Interstate 405

At the north end of the corridor, SR 167 connects to I-405 through an existing clover leaf style interchange in the city of Renton. Based on the *I-405 Corridor Plan*, this interstate highway has a defined list of improvements. There are three key improvements that directly impact SR 167.

- The first improvement extends the southbound I-405 to southbound SR 167 ramp to the S 180th Street interchange. This is a funded improvement that will improve traffic flow for all southbound vehicles on SR 167 between I-405 and S 180th Street by reducing traffic weaving movements.

Exhibit 8-1
I-405 to SR 167 HOV-to-HOV Direct Connection Ramp

Artists rendering of incremental improvements to the I-405/SR 167 Interchange as designed in the I-405 Master Plan.

- The second improvement will add additional lanes in each direction of I-405 between I-5 and SR 169 in Renton. This will benefit SR 167 by providing additional capacity for northbound SR 167 to merge into I-405 with reduced congestion in the ramp areas. This improvement is funded.

- The third improvement is a direct access HOV/HOT to HOV/HOT connection flyover ramp between SR 167 and I-405. Funding for this project has not been secured. This project will improve traffic flow for all users in both corridors by eliminating the weave across multiple lanes of general purpose traffic that HOV/HOT lane users must currently make to access the respective off-ramps (see Exhibit 8-1).

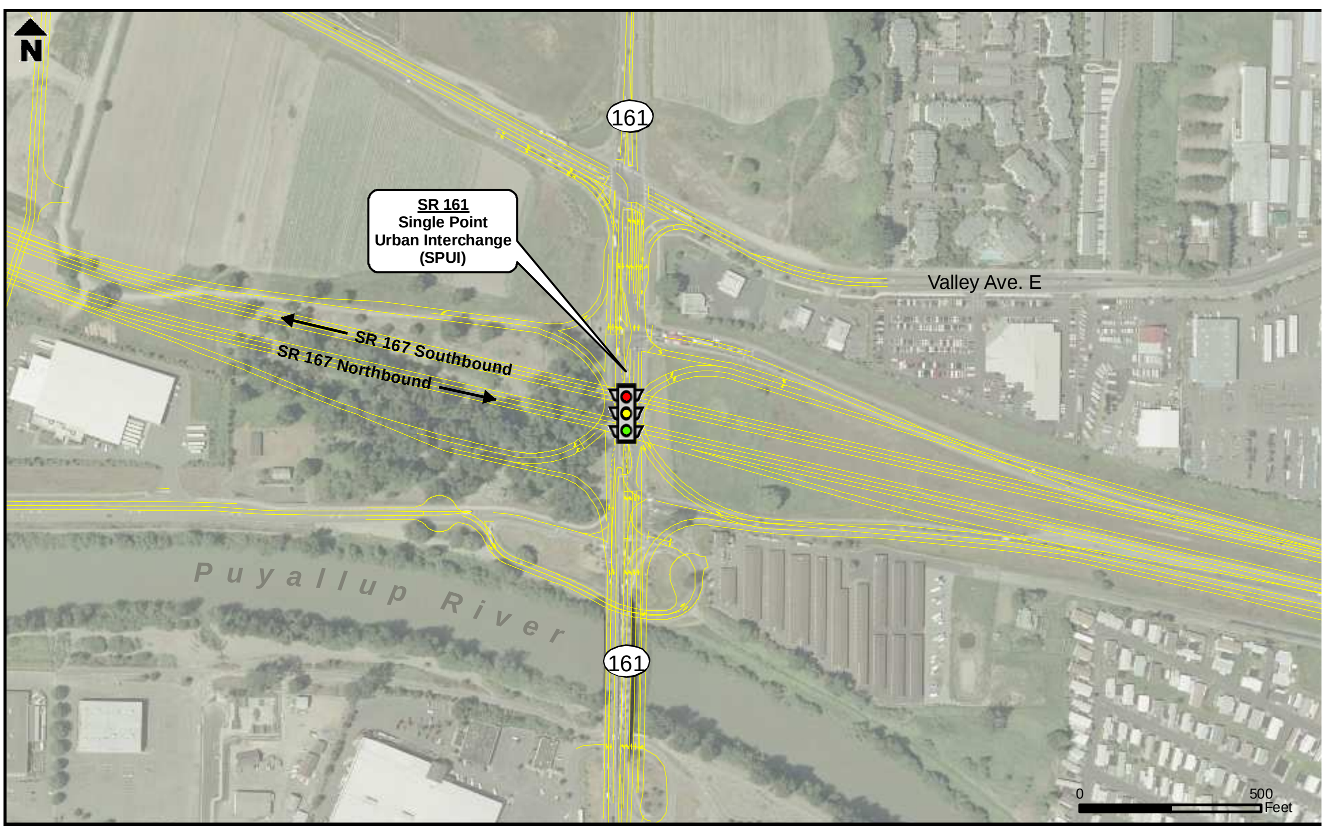
South End:

SR 161 Interchange and SR 167 Extension

At the south end of the corridor in Puyallup, the freeway currently comes to an end at the SR 161 interchange. From that point to I-5 in Tacoma, the existing SR 167 is a signal-controlled arterial roadway. WSDOT has developed a plan for extending the freeway section of SR 167 from SR 161 northwest to the Port of Tacoma. This project is known as the SR 167 Extension Project. Most of the funding required to implement this project must still be secured.

The future interchange of SR 167 and SR 161 has been designed as a single point urban interchange as illustrated in Exhibit 8-2. This configuration will improve access to I-5 and Tacoma for travelers from the cities of Puyallup, Sumner, Fife, Edgewood, and Milton.

Exhibit 8-2
SR 161 Proposed Single Point Urban Interchange (draft design)



What Agencies Were Involved in Selecting the Long-Term Improvement Options and What Was the Screening Criteria?

For the complete list of Corridor Working Group Members, see ***Technical Memorandum No. 2: Improvement Options Screening Criteria, Appendix D.***

WSDOT worked with the local cities, counties, and agencies from the SR 167 Corridor Working Group (CWG) to develop the improvement options screening criteria (the information used to measure the success and effectiveness of each option). Those involved included representatives from the cities and counties SR 167 passes through, as well as from the state and regional transportation agencies.

The group developed a list of goals that any SR 167 improvement should help to achieve.

Goals:

- Provide an efficient set of transportation solutions for the SR 167 Corridor
- Make the communities within the corridor more livable
- Maintain or improve air quality, protect and enhance fish-bearing streams, and continue to protect the integrity of the local natural environment
- Contribute to a vigorous state and regional economy by satisfying existing and future travel needs
- Accommodate planned regional growth

The group then defined the screening criteria that any long-term option should be measured and screened by.

Screening Criteria:

- Move More People
- Reduce Congestion
- Reduce Arterial Volumes
- Save Time

- Improve Safety
- Minimize Environmental Effects
- Be Cost Effective
- Improve Freight Mobility

Using the results of the Baseline Scenario model as a way to understand what travel conditions might be like in the year 2030, if no additional improvements are made, the CWG developed some long-term options for consideration and study.

What Long-Term Improvement Options Were Considered?

The SR 167 Corridor Plan considered two types of improvement options: long-term improvement options that would meet the corridor goals and smaller bottleneck/segment improvements that would constitute incremental steps towards achieving the long-term goals. This section describes the long-term improvement options and the following sections detail the bottleneck/segment improvement options.

For the complete list of long-term improvement options, see ***Technical Memorandum No. 1: Goals and Objectives.***

Four long-term improvement options were evaluated for the SR 167 Corridor. These options were developed following review of a No Build scenario approach - only construct those few projects currently funded and nothing more. Transportation modeling work was done to assess the operation of the corridor with no additional improvements made by the year 2030 beyond those currently funded and scheduled for construction in the next few years. The four improvement options were then modeled to determine the congestion relief benefits of each option when compared to the No Build scenario.

As discussed in *Section 1 – Introduction*, the options were developed, evaluated, and screened in two phases:

Phase 1: First-level screening (2003)

Phase 2: Second-level screening (2005)

The initial options were developed in the first level screening (Phase 1) and were based on past WSDOT studies and recommendations from the corridor cities.

The four options developed during Phase 1 were:

Option 1: Expand the SR 167 Corridor to seven lanes, including one HOV/HOT lane and two general purpose lanes in each direction and one reversible HOV/HOT lane.

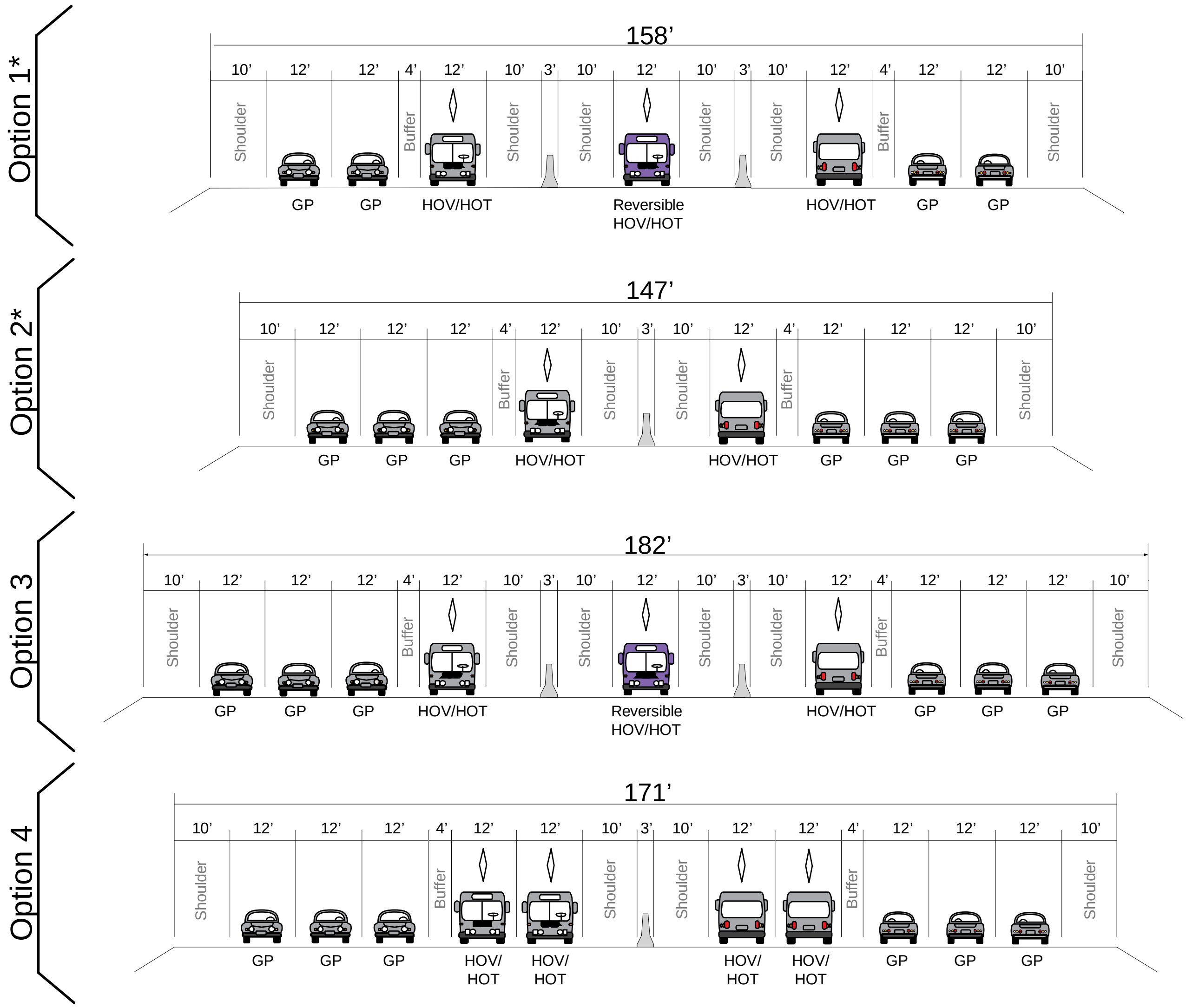
Option 2: Expand the SR 167 Corridor to eight lanes, including three general purpose lanes and one HOV/HOT lane in each direction.

Option 3: Expand the SR 167 Corridor to nine lanes, including one HOV/HOT lane and three general purpose lanes in each direction and one reversible HOV/HOT lane.

Option 4: Expand the SR 167 Corridor to 10 lanes, including three general purpose lanes and two HOV/HOT lanes in each direction.

All options assume that the portion of SR 167 between SR 161 and SR 512 will be improved by the SR 167 Extension project to match the proposed lane configuration. Exhibit 8-3 illustrates the section views of each of the four options. More specific descriptions of each option follow.

Exhibit 8-3
Phase 1 Corridor Options



* One additional 12-foot wide auxilary lane in each direction from I-405 to S 180th Street and SR 516 to S 277th Street not shown.

Option 1: Seven lanes total

This option calls for completing the HOV/HOT lane system south to SR 410 and adding a reversible HOV/HOT lane in the median of SR 167 resulting in a seven lane cross section. Auxiliary lanes are included in two key areas. In addition to these improvements, an aggressive transportation demand management (TDM) program is integral to this option (see Exhibit 8-4). Specific Option 1 improvements include:

What is a reversible lane?

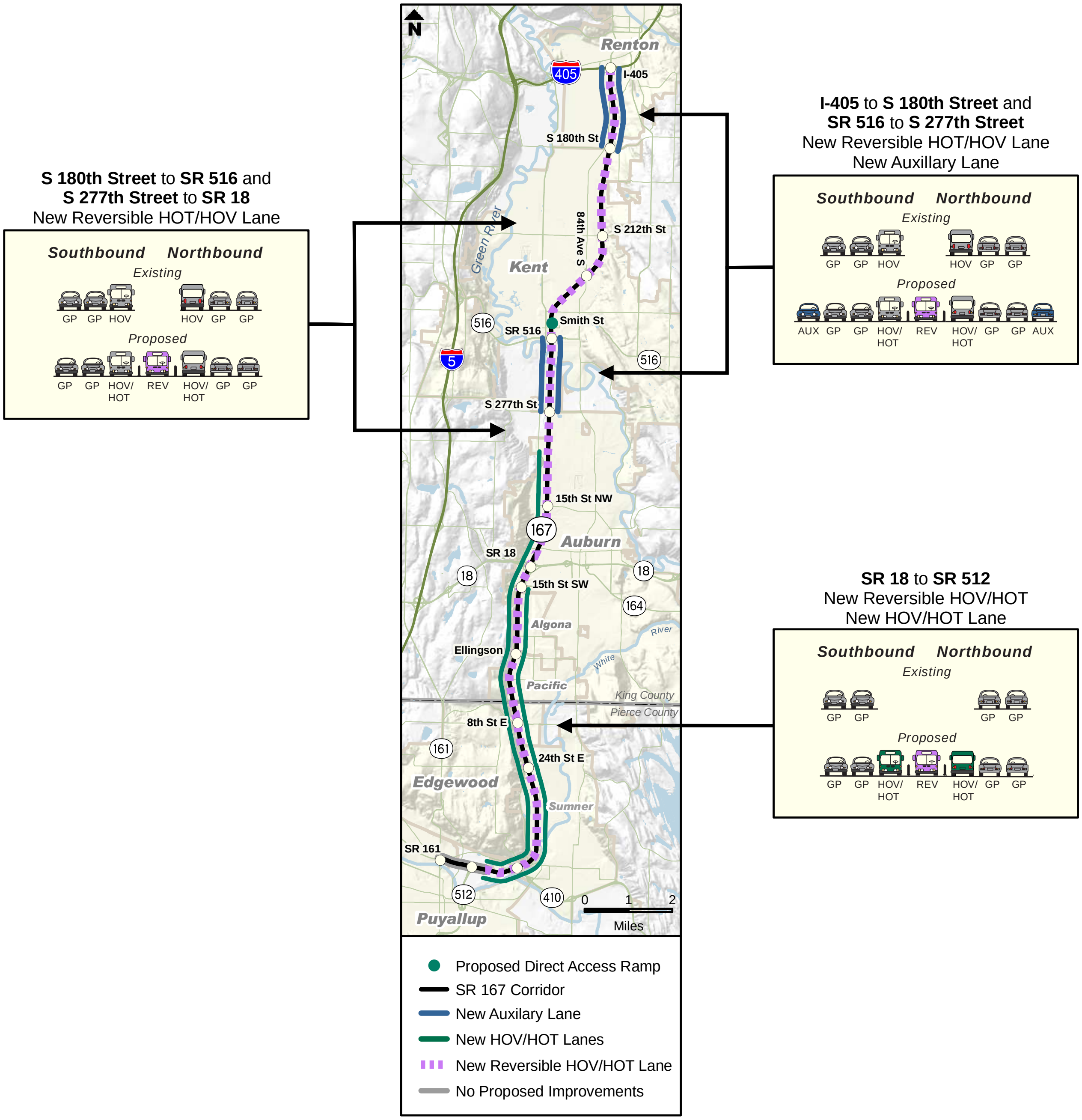
A reversible lane is a lane that can change from northbound in the morning to southbound in the afternoon during peak travel periods to relieve congestion. I-5 and I-90 each have reversible express lanes that have controlled access through the use of gates, lights and signs.

- Completing the HOV/HOT system south to SR 410
- An additional reversible HOV/HOT lane in the median of SR 167 between SR 410 and I-405 operating in the northbound direction in the morning and the southbound direction in the afternoon
- An additional auxiliary lane between S 277th Street and SR 516 and between S 180th Street and I-405 in each direction
- A new direct access HOV/HOT ramp accessing SR 167 from Smith Street in Kent
- Interchange improvements along the corridor to improve traffic operations

In addition to these physical improvements, an aggressive transportation demand management program is proposed which would include:

- Increasing express bus service in the corridor
- Increasing connecting feeder route bus service
- Expanding existing and adding new park and ride lots along the corridor
- Expanding the vanpool program
- Developing a public information program that encourages the use of alternative transportation modes
- Encouraging employer-based carpool programs

Exhibit 8-4
Option 1: Seven Lanes - Conceptual Design



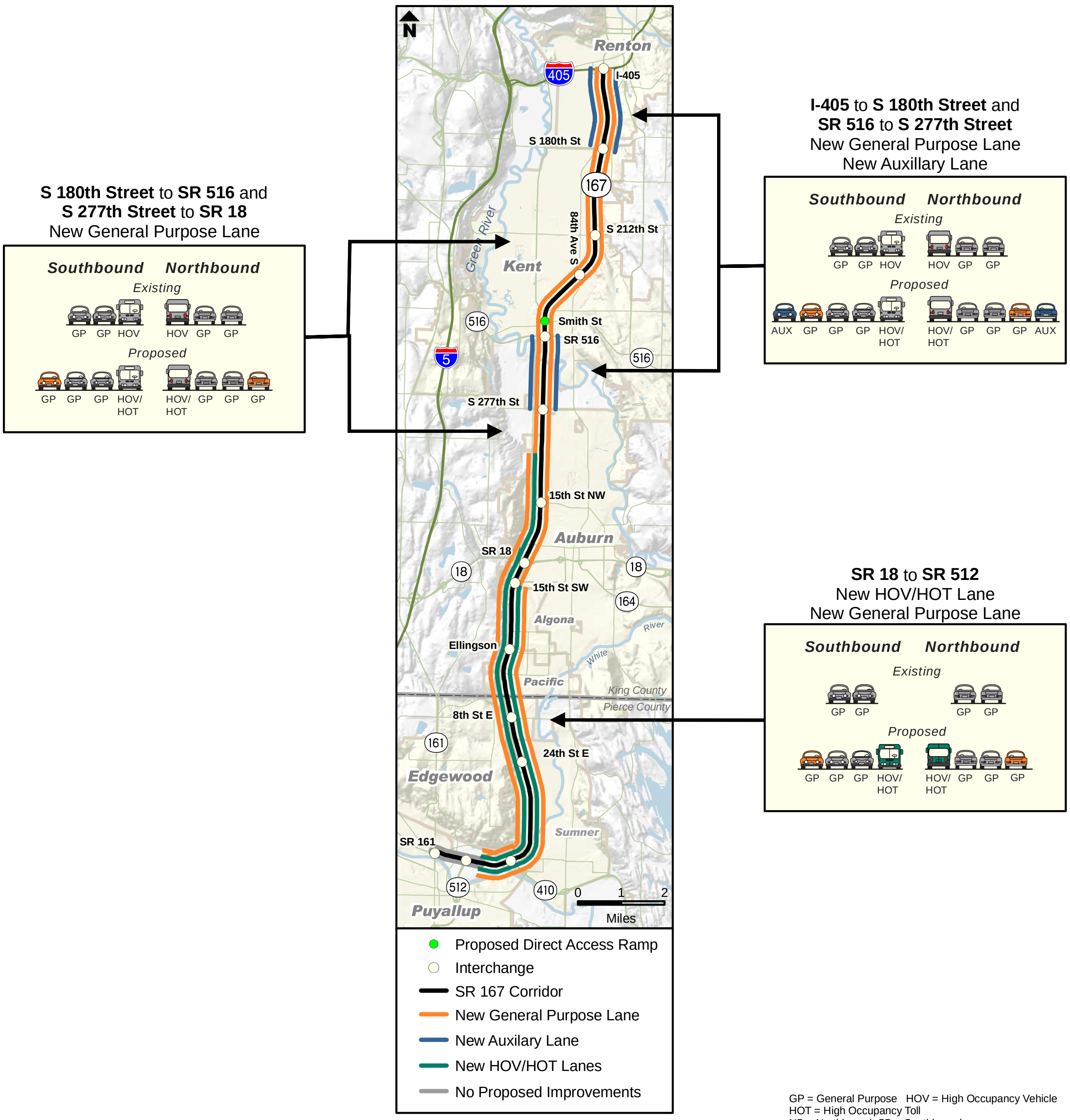
GP = General Purpose HOV = High Occupancy Vehicle
HOT = High Occupancy Toll REV = Reversible Lane
NB = Northbound SB = Southbound

Option 2: Eight lanes total

This option calls for the completion of the HOV/HOT lane system south to SR 410 and the addition of another general purpose lane in each direction throughout the corridor resulting in an eight lane cross section. In two specific segments of the corridor, additional auxiliary lanes between interchanges would result in a ten lane roadway section (see Exhibit 8-5). Specific Option 2 improvements include:

- Completing the HOV/HOT system south to SR 410
- One new lane of general purpose capacity in each direction throughout the corridor
- An additional auxiliary lane between S 277th Street and SR 516 and between S 180th Street and I-405 in each direction
- Expanded transit service including additional park and ride locations
- A strong TDM program similar to Option 1
- A new direct access HOV/HOT ramp accessing SR 167 from Smith Street in Kent
- Upgrades to some interchanges to accommodate mainline widening

Exhibit 8-5
Option 2: Eight Lanes - Conceptual Design



GP = General Purpose HOV = High Occupancy Vehicle
HOT = High Occupancy Toll
NB = Northbound SB = Southbound

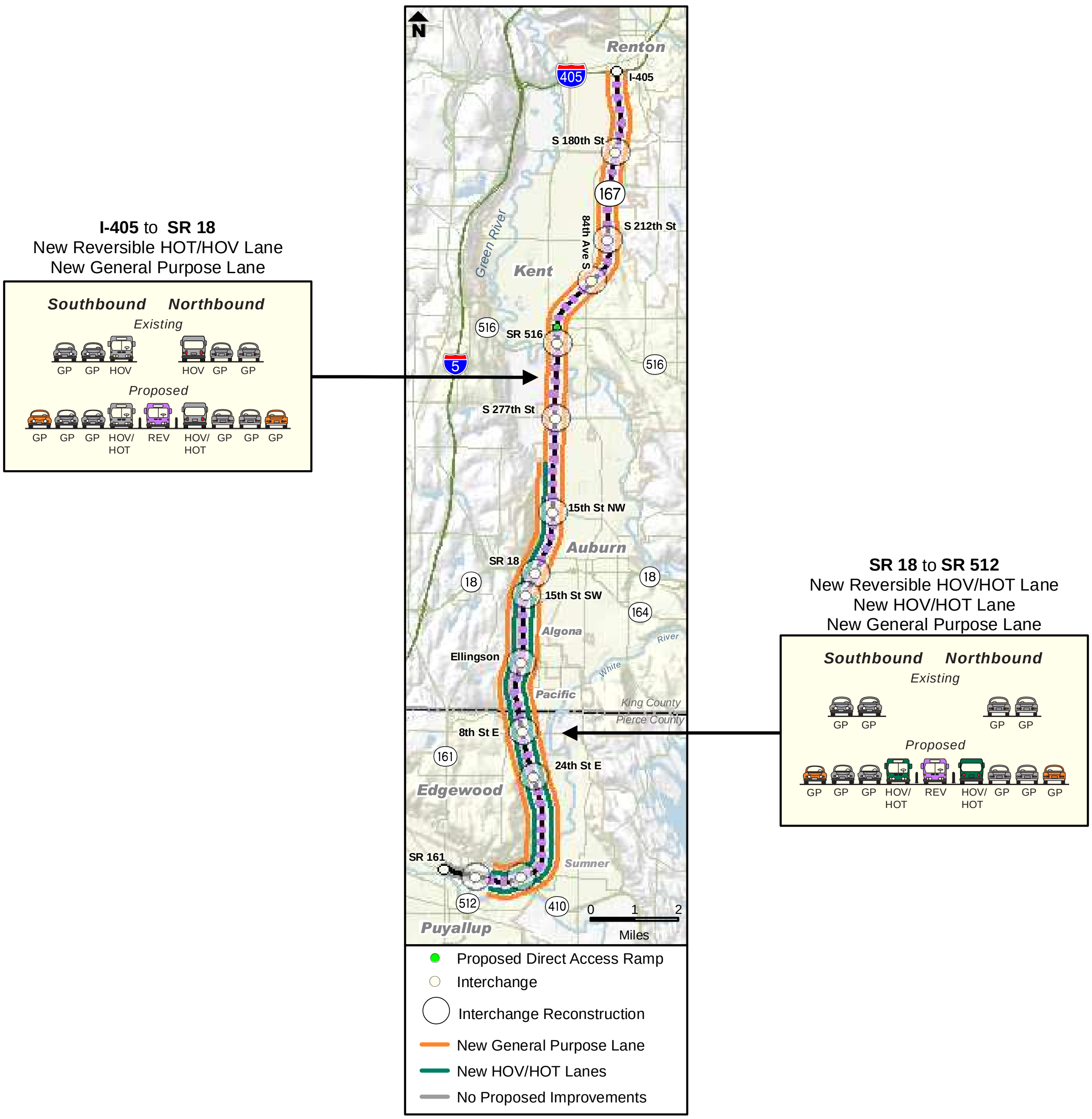
Option 3: Nine lanes total

The third option is similar to Option 2, but it includes a reversible HOV/HOT lane in the SR 167 median. As in Option 1, this reversible lane would accommodate northbound travel during the morning peak period and southbound travel during the evening peak (see Exhibit 8-6). Specific Option 3 improvements include:

- Completing the HOV/HOT system south to SR 410
- An additional reversible HOV/HOT lane in the median of SR 167 between SR 410 and I-405 operating in the northbound direction in the morning and the southbound direction in the afternoon
- A new general purpose lane in each direction from SR 512 in Puyallup to I-405 in Renton
- A new direct access HOV/HOT ramp accessing SR 167 from Smith Street in Kent
- Upgrades to all interchanges to accommodate the mainline widening

Option 3 does not provide additional demand management programs beyond those currently in existence today.

Exhibit 8-6
Option 3: Nine Lanes - Conceptual Design



GP = General Purpose HOV = High Occupancy Vehicle
HOT = High Occupancy Toll
NB = Northbound SB = Southbound

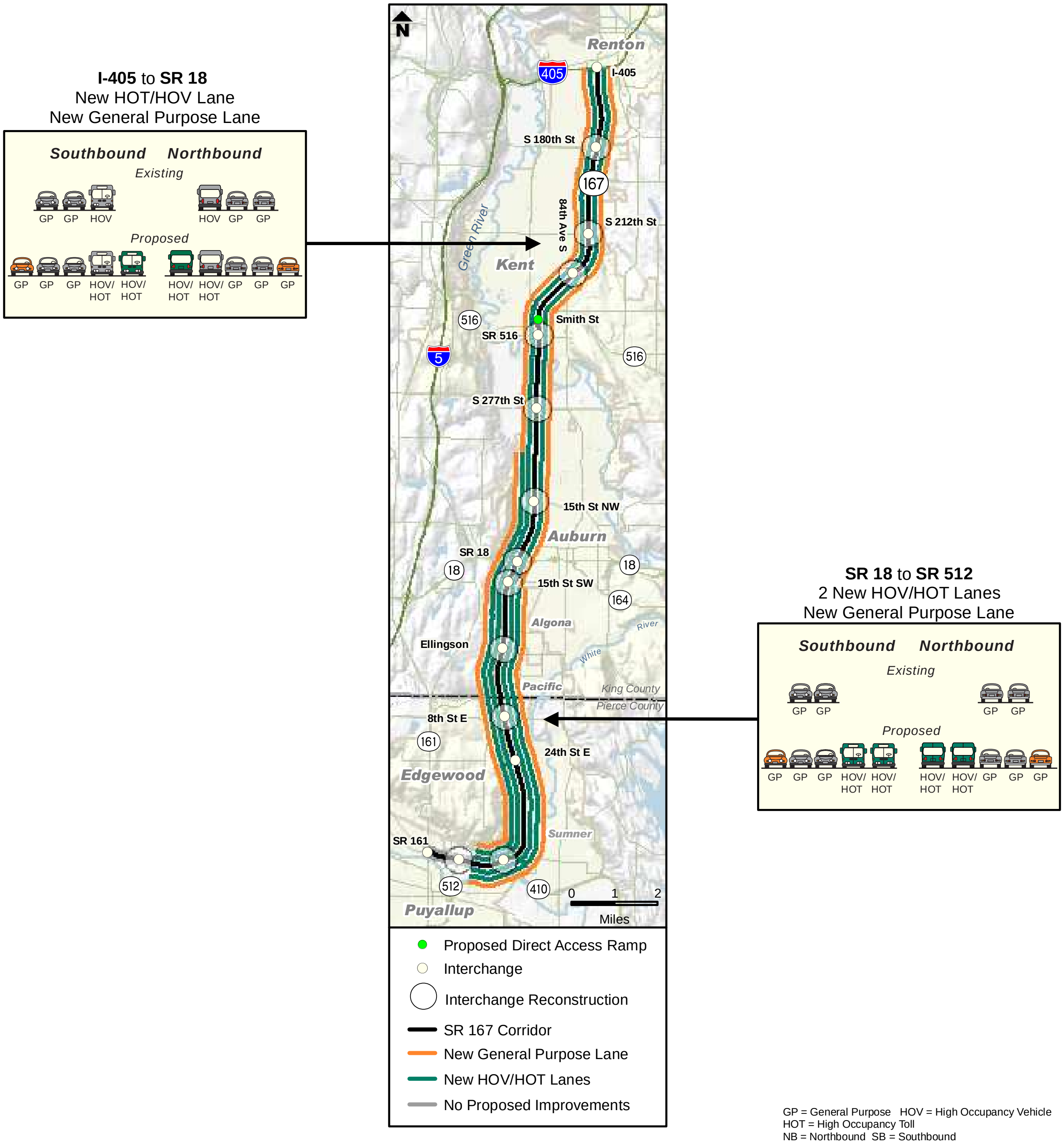
Option 4: Ten lanes total

The fourth option would expand the corridor to ten lanes with five lanes in each direction of travel. Two of the lanes in each direction would be operated as HOV/HOT lanes (see Exhibit 8-7). Specific Option 4 improvements include:

- There would be a total of three general purpose lanes in each direction from I-405 in Renton to SR 512 near Puyallup
- There would be a total of two HOV/HOT lanes in each direction from I-405 to SR 512
- A new direct access HOV/HOT ramp accessing SR 167 from Smith Street in Kent
- Upgrades to all interchanges to accommodate the mainline widening

As in Option 3, this option does not provide additional demand management programs beyond those currently in use today.

Exhibit 8-7
Option 4: Ten Lanes - Conceptual Design



For Which Interchanges Were Conceptual Designs Developed?

If the SR 167 Corridor is expanded at a future date to a 10-lane footprint (Options 4 and 4A), reconstruction of all interchanges will be required, with the exception of the recently constructed 24th Street E interchange. Eight lanes will geometrically fit through each existing interchange, but 10 lanes will not.

Three interchanges will require significant improvements:

- S 180th Street Interchange
- SR 18 Interchange
- SR 410 and SR 512 Interchange

WSDOT asked design engineers to develop interchange concepts that address the future needs of the SR 167 Corridor. The engineers used forecasted traffic volumes and forecasted traffic patterns to develop the conceptual designs.

WSDOT developed several concepts for each interchange and reviewed them with the CWG. From the conceptual design review, the interchange options were further analyzed and the designs were modeled.

These possible interchange improvement concepts are merely engineered ideas and will require much more analysis, public involvement, and design when funding becomes available in the future. The ultimate design may be different but these concepts help this planning effort by providing a "book mark" in this Corridor Plan for some form of interchange improvement to solve the inherent problem.

S 180th Street Interchange Improvement Concept

The Corridor Working Group (CWG) narrowed the options for potential improvements at this interchange to a single point urban interchange (SPUI) configuration. The preferred concept selected is illustrated in Exhibit 9-2. The benefits of a SPUI are that it requires just one signalized intersection and creates better spacing between it and other signalized intersections on

S 180th Street which allows for more efficient traffic flow through the interchange (see Exhibit 8-8).

The southbound off-ramp to S 180th Street would bridge up and over the southbound on- and off-ramps to SW 41st Street. This eliminates exiting traffic from weaving through traffic that is entering the freeway. This improvement is called a "braided ramp".

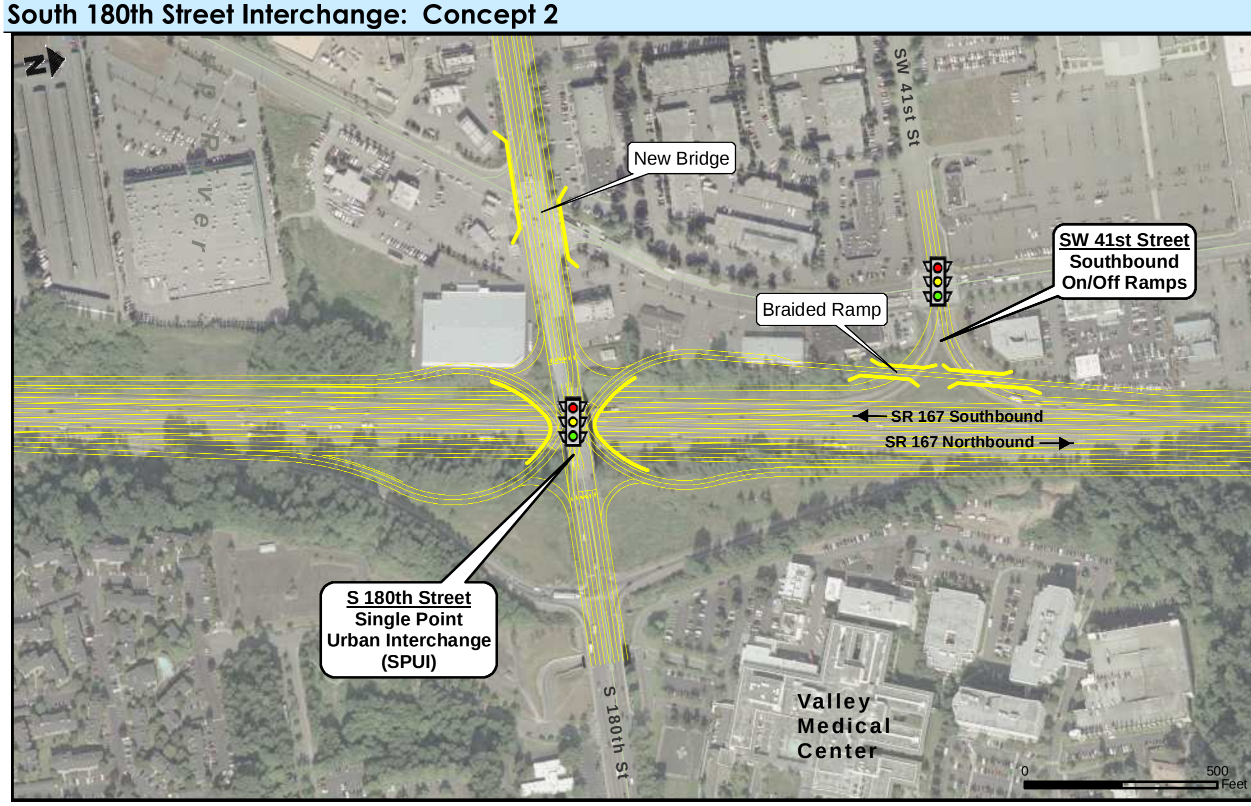
This concept includes bridging S 180th Street over East Valley Highway and it reduces both the steepness of S 180th Street and the close proximity of an intersection to the interchange, which provides more space for left-turn lanes. This option should reduce collisions because it reduces the number of conflict points.

Because there is a major hospital adjacent to this interchange, improvements to the interchange will improve emergency vehicle response times.

Braided Ramp

When an on-ramp and an off-ramp are very close to each other traffic is often competing for lane space, one vehicle weaves onto the freeway in the same space another is trying to weave to the exit ramp. A braided ramp is where one ramp is designed to bridge up and over the other, avoiding the weaving conflicts.

Exhibit 8-8
South 180th Street Interchange: Concept 2

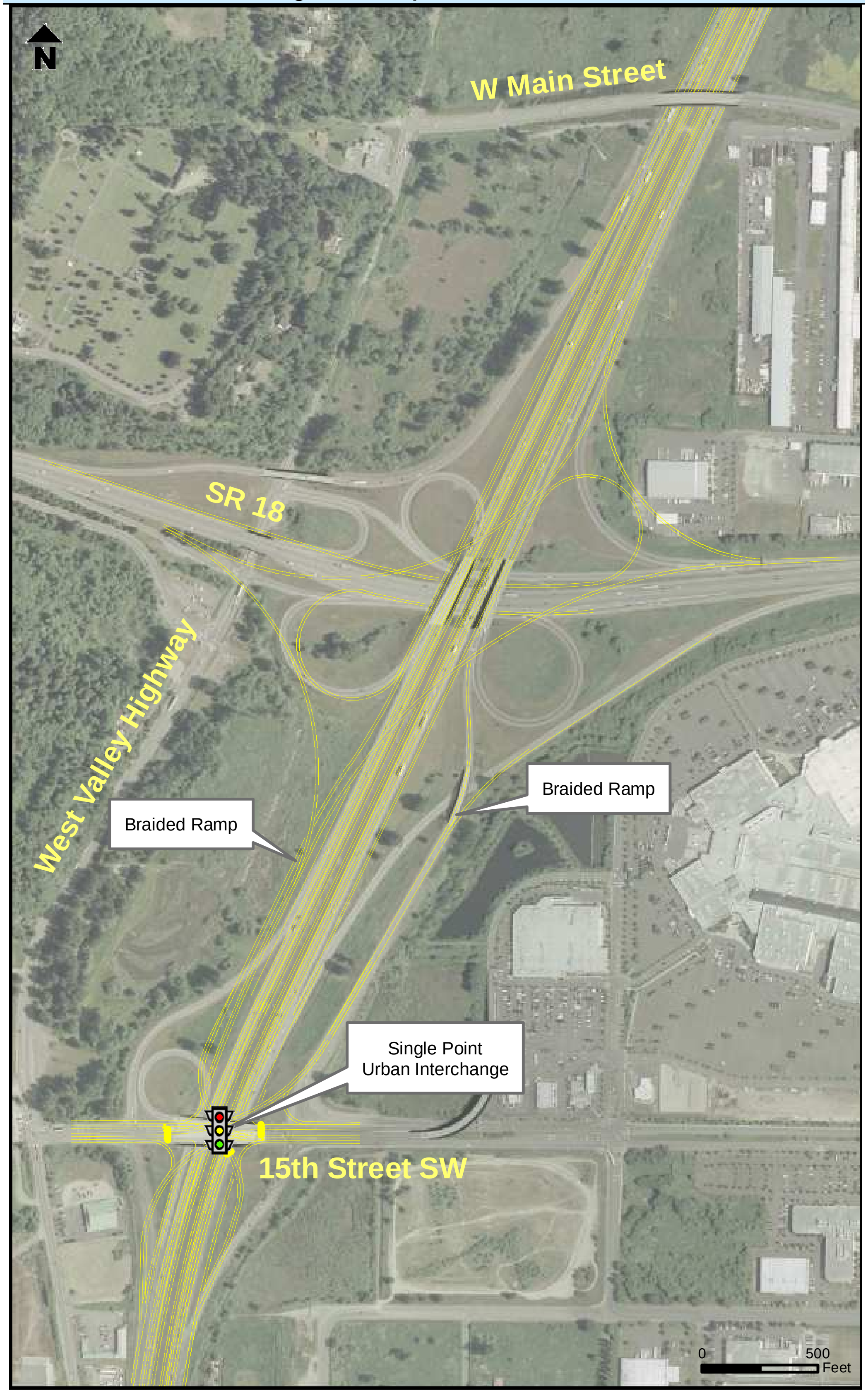


SR 167 and SR 18 Interchange Improvement Concept

This bottleneck/segment improvement project would reconstruct the ramps at the SR 18 interchange, allowing all movements between SR 18 and SR 167. The preferred concept includes direct freeway-to-freeway connections from eastbound SR 18 to northbound SR 167 and from westbound SR 18 to southbound SR 167. To improve merges and handle growing traffic volumes, the interchange at 15th Street SW would become a Single Point Urban Interchange (SPUI). This improvement project would remove the existing ramps connecting to/from the West Valley Highway. Traffic will exit at the 15th Street SW interchange to access West Valley Highway (see Exhibit 8-9).

These improvements would provide enhanced mobility for all vehicles. In particular, the heavy volume of trucks would be able to move more efficiently and safely through this interchange.

Exhibit 8-9
SR 18 and SR 167 Interchange: Concept 4

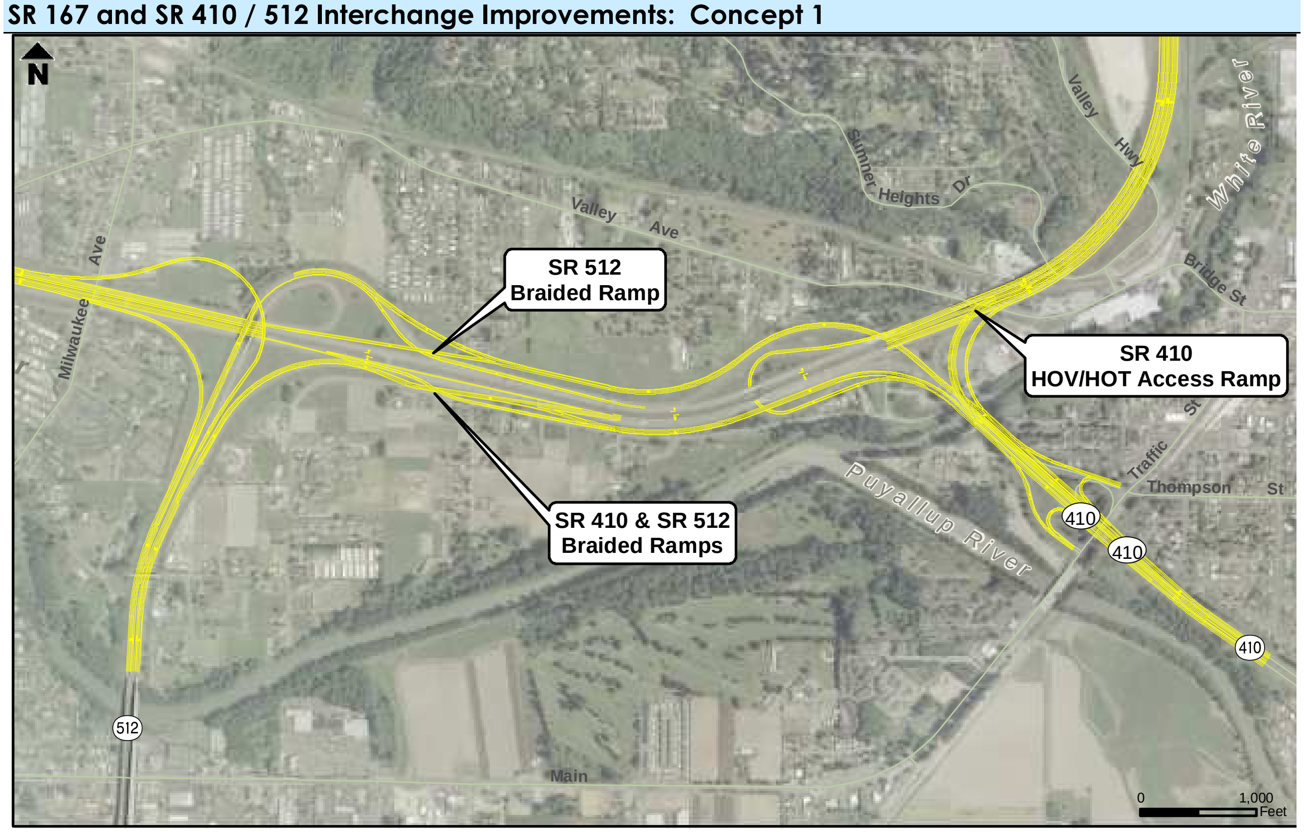


SR 410/SR 512 Interchange Improvements

Both SR 512 and SR 410, two existing limited access freeways, connect to SR 167 in close proximity to one another in a portion of unincorporated Pierce County sandwiched between the cities of Puyallup, Edgewood, and Sumner. Due to the close proximity of the interchanges and the complexity of the traffic movements, congestion related to merging and weaving is prevalent. In addition, the associated collision experience in this area is high. For those unfamiliar with these connections, the existing interchange configurations can be very confusing.

The preferred concept would modify the interchanges and ramp connections to provide more space for merging and to make direction finding more intuitive for the driver. A primary component of this concept is braided ramps on SR 167 separating the on- and off-ramp movements between SR 410 and SR 512 (see Exhibit 8-10).

Exhibit 8-10
SR 167 and SR 410 / 512 Interchange Improvements: Concept 1



These two interchanges provide a series of complex choices for drivers because of the short distance between SR 410 and SR 512. There are conflict points on SR 167 due to short-distance weaving between the ramps and tight loop ramps connecting SR 512 and SR 410 with SR 167. A large volume of traffic uses this section of SR 167 to travel between SR 410 and SR 512.

This section of SR 167 has a high number of collisions due to the proximity of the interchanges and their design. Between 2002 and 2005, there were 130 collisions (74 southbound, 56 northbound) in the vicinity of the two interchanges.

There are two collision areas in this vicinity which have collision rates higher than the statewide average, the loop ramp from SR 512 to southbound SR 167 and the ramp from SR 410 to northbound SR 167. When entering either of these ramps, drivers adjust their speed to the curve, however, the curve sharpens and many drivers are unprepared for the tighter curve. Many of the collisions at these locations involved vehicles overturning. There are also significant numbers of freight-related collisions on the northbound SR 167 on-ramp from SR 512 and on the SR 512 off-ramp southbound from SR 167.

Did you know?

A Collector-Distributor System is:
An off-shoot of the mainline freeway that serves multiple consecutive on- and off-ramps, before rejoining the mainline. This prevents the merging and diverging traffic from causing congestion to the mainline traffic.

Weaving is:
Is a situation in which traffic changing lanes to the right and traffic changing lanes to the left must cross paths within a limited distance.

How Was the Screening Done?

Initial screening of the improvement options was accomplished in 2003 and 2004. The screening took place in 2003 to provide information for the Regional Transportation Investment District process by identifying the improvements on SR 167 that should be included in a regional transportation ballot measure. Phase 1 screening evaluated the four build options by considering the following performance measures:

- How well does the option move people?
- To what extent does the option reduce congestion?
- To what extent do the options shift traffic from local arterials to SR 167?

- How much travel time improvement does the option offer?
- To what extent does the option impact the environment?
- How much benefit does the option offer in relationship to the cost?

In 2004, an additional performance measure was added to the process. In order to recognize the importance of the manufacturing and warehouse concentration in the Green River Valley, how the option improves freight mobility was added to the list of performance measures provided above.

What Were the Results of the Screening Process?

The screening process led the CWG to conclude that Options 1 and 2 have similar costs, but Option 2 provides superior benefits. Similarly, Options 3 and 4 have similar costs but Option 4 provides more benefit. As a result, Options 1 and 3 were eliminated from further consideration.

Variations based on Options 2 and 4 were developed to better understand the differences in performance between adding general purpose capacity and adding managed lane (HOV/HOT) capacity.

Milestone

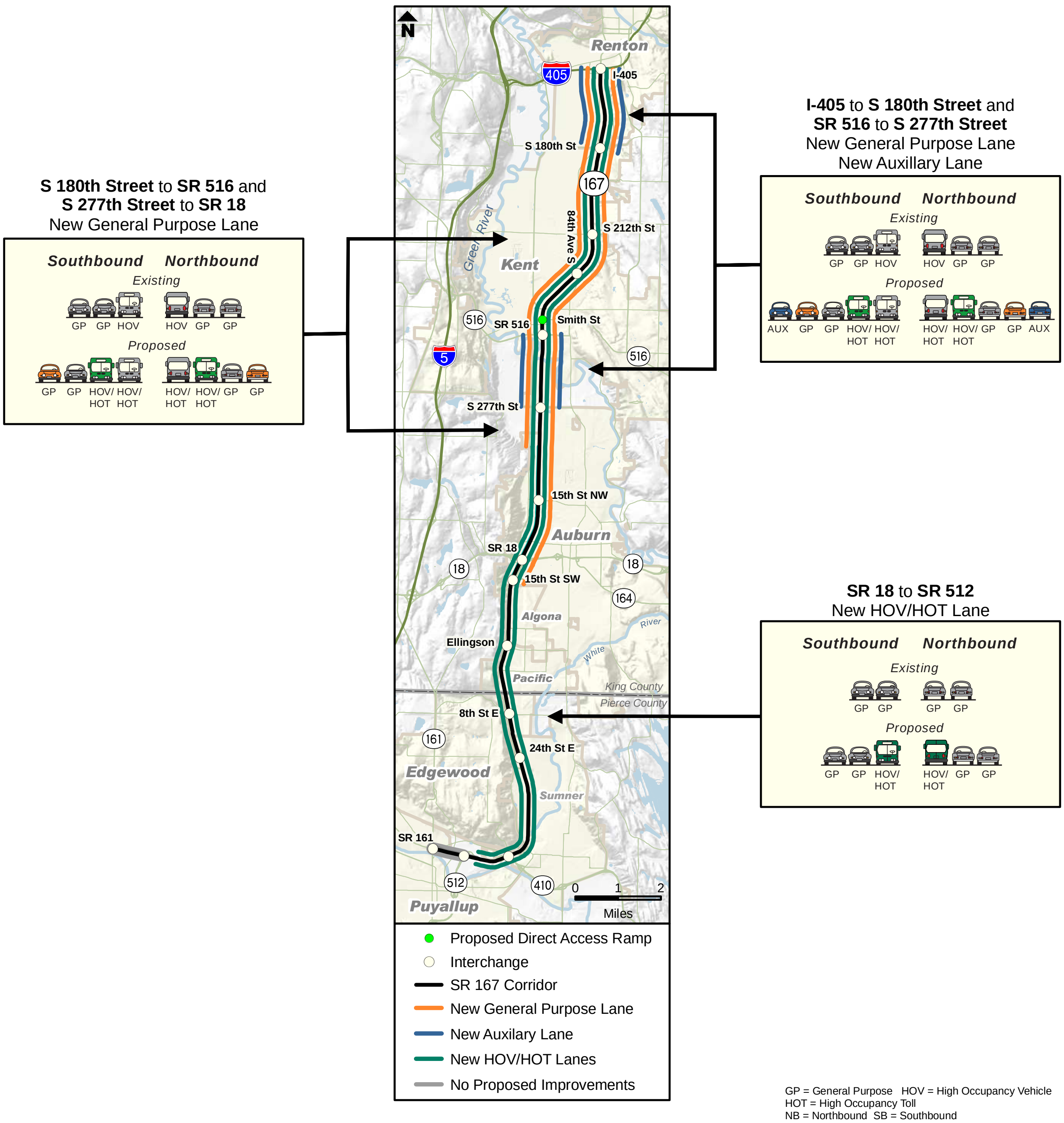
Based on these comparisons, the Corridor Working Group chose to remove Options 1 and 3 from further consideration. This is due to the fact that for approximately the same amount of pavement, you could get one lane in each direction available during all hours instead of just one reversible lane during peak hours in the peak direction.

Option 2A (see Exhibit 8-11) adds a second HOV/HOT, rather than an additional general purpose lane between SR 18 and I-405. It does retain the northbound and southbound auxiliary lanes between S 277th Street and SR 516 and between S 180th Street and I-405. South of SR 18 Option 2A adds an HOV/HOT lane in each direction.

Option 4A (see exhibit 8-12) provides two HOV/HOT lanes throughout the corridor. It also provides auxiliary lanes north of SR 18 similar to Option 2A.

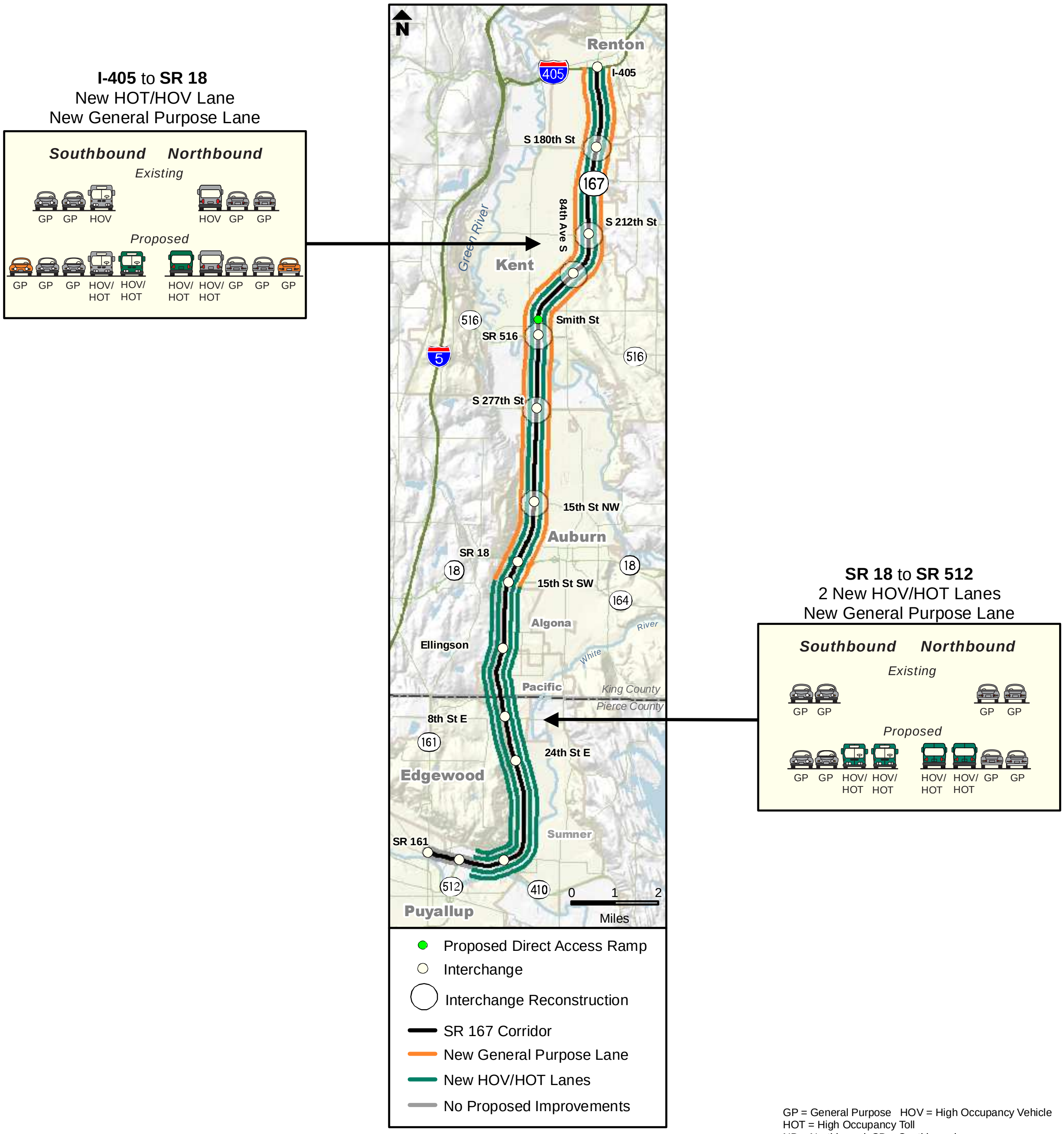
When the modeled performance of additional managed lanes was compared to the modeled performance of additional general purpose lanes, it was found that overall corridor performance improved with the managed lane system. However, there were some concerns from members of the CWG towards adding managed lane capacity beyond completing the currently defined HOV system south of the King/Pierce County line (which will likely be operated as HOV/HOT lanes). Therefore, the decision was made to carry Options 2, 2A, 4 and 4A forward for further analysis.

Exhibit 8-11
Option 2A: Conceptual Design



GP = General Purpose HOV = High Occupancy Vehicle
HOT = High Occupancy Toll
NB = Northbound SB = Southbound

Exhibit 8-12
Option 4A: Conceptual Design



GP = General Purpose HOV = High Occupancy Vehicle
HOT = High Occupancy Toll
NB = Northbound SB = Southbound

Key Findings of This Section

Options Screened

Four long-term improvement options were developed. Each of the options recommends completing the HOV/HOT lane system south to SR 410. The other improvements associated with each option are:

- Option 1 – Add a reversible HOV/HOT lane in the SR 167 median the length of the corridor resulting in a seven lane cross section.

- Option 2 – Add one general purpose lane in each direction throughout the corridor resulting in an eight lane cross section.

- Option 3 – Similar to option 2 but with a reversible HOV/HOT lane in the median of SR 167 running the length of the corridor. This option results in a nine lane cross section.

- Option 4 – Expand the corridor to ten lanes, five in each direction. Two of the five lanes in each direction would operate as HOV/HOT lanes.

Interchanges

- To facilitate the expansion of SR 167 to ten lanes, the following interchanges will require significant modifications. This will allow the interchange to be improved to relieve congestion. Design concepts for the following interchanges were developed.

    - S 180th Street Interchange
    - SR 18 Interchange
    - SR 410 and SR 512 Interchange

Results of the Screening Process

Each of the improvement options were evaluated to determine how well they address the following performance measures: moving people; reducing congestion on the mainline; reducing congestion on the connecting arterials; travel time improvement; environmental impacts; freight mobility; and costs as compared to benefits.

As a result of the screening process, two of the original options were eliminated and two were moved forward for further evaluation. The two options moved forward are Options 2 and 4. Additionally, two "hybrid" options were also moved forward. They are described as follows:

- Option 2A – Maintain 2 general purpose lanes throughout the corridor. An additional HOV/HOT lane (for a total of two lanes) is added in both the north and southbound directions between I-405 and SR 18. An HOV/HOT lane is added for both directions from SR 18 to SR 512. Additional auxiliary lanes are added between I-405 and S 180th Street and between SR 516 and S 277th Street in both directions.

- Option 4A – Provides two HOV/HOT lanes throughout the corridor but provides only one new general purpose lane south of SR 18.

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