Basalt Creek Transportation Refinement Plan

Technical Report

November 2012

DKS

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November 29, 2012

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Subject: Basalt Creek Transportation Refinement Plan P11022-001

Dear Russell,

DKS Associates is pleased to submit the final Basalt Creek Transportation Refinement Plan Technical Report to Washington County. This final report reflects comments and revisions collected from the Technical Working Group and Policy Advisory Group.

It has been our pleasure to work with you and the rest of the project team in completing this document that will help direct future transportation investments in the Basalt Creek area of Washington County.

Regards,

Chris Maciejewski, P.E., PTOE
Principal
DKS Associates

Acknowledgements

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Executive Summary

This report documents the background, purpose, development of alternatives, and findings for the Basalt Creek Transportation Refinement Plan. The refinement planning effort is intended to determine the major transportation system connecting Tualatin-Sherwood Road to I-5 in North Wilsonville through the Basalt Creek Planning Area, which is currently an unincorporated urban area of Washington County lying between the cities of Tualatin to the north, and Wilsonville to the south (see Figure 1 on next page). This refinement will better define recommendations from the I-5/99W Connector Study (see below) and the Regional Transportation Plan, setting the stage for concept planning and comprehensive plan development for the Basalt Creek area.

Project Background and Purpose

The need to plan for the future transportation system in the Basalt Creek area is driven not only by future growth in the Basalt Creek Planning area itself, but by future growth in adjacent areas such as the Southwest Tualatin Concept Planning Area and the Tonquin Employment Planning Area in Sherwood, and the Coffee Creek Planning Area in Wilsonville, also shown in Figure 1. Several related planning efforts provide direction and context for the Basalt Creek Transportation Refinement Plan:

- The **I-5/99W Connector Study** recommended an alternative that spreads east-west traffic across three smaller arterials rather than a single expressway. Although a specific alignment was not defined, the eastern end of the southern arterial was generally located within the Basalt Creek Planning Area, south of Tonquin Road. The present planning effort aims to further define the location of the connection from SW 124th Avenue to the I-5/Elligsen interchange in a manner that does not preclude the future Southern Arterial west of SW 124th.
- The **2035 Regional Transportation Plan** (RTP) calls for detailed project planning and near-term construction of an extension of SW 124th Avenue from Tualatin-Sherwood Road to the I-5/Elligsen Road interchange, supporting industrial access from the Tonquin, Southwest Tualatin, and Basalt Creek Planning Areas.
- The **Tonquin Employment Area, Southwest Tualatin Concept Planning Area, and Coffee Creek Planning Area** (all shown in Figure 1) together comprise about 1,000 acres surrounding the Basalt Creek area that are planned for primarily industrial use. These areas are expected to generate growing freight and work-related travel demands on the transportation network that runs through the Basalt Creek area.

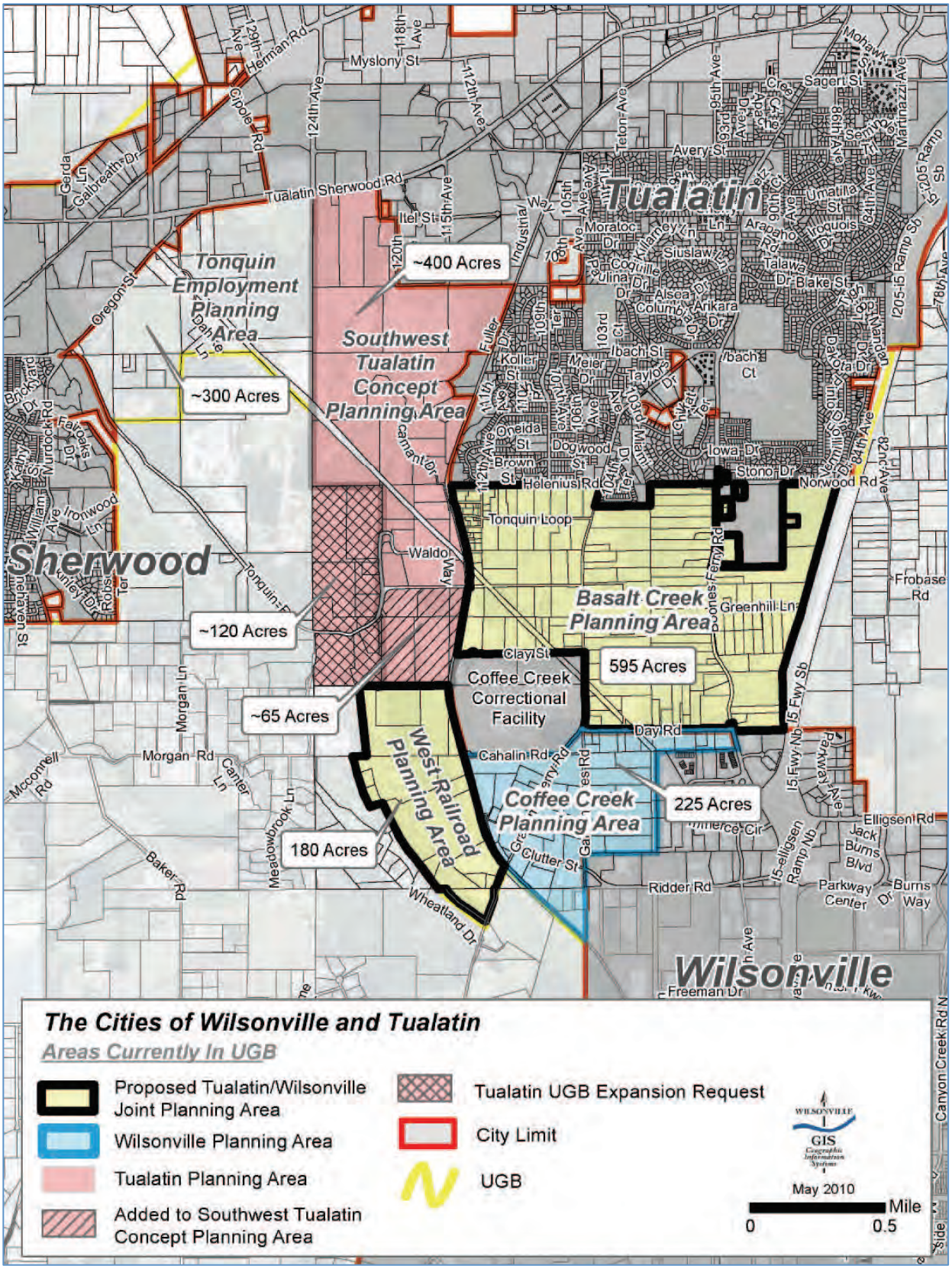


Figure 1: Basalt Creek and other planning areas

- The **SW 124th Avenue Extension** Project, currently underway, is planning and designing the corridor described in the RTP from Tualatin-Sherwood Road to Tonquin Road. The present planning effort aims to extend the corridor to I-5 as envisioned in the RTP and ensure consistency with current SW 124th Avenue project.
- The **Boones Ferry Road** improvement project, also currently underway, provides pedestrian and bicycle improvements and an intermittent center turn lane between Norwood Road and Day Road. It is an assumed improvement for the Basalt Creek area.
- The **Tonquin Trail** master plan identifies an alignment for new bicycle and pedestrian connections between Sherwood, Tualatin, and Wilsonville, with connections to the larger regional trail system. The Tonquin Trail will travel through the Tonquin Employment Concept Plan Area and the Southwest Tualatin Concept Plan Area, and is an assumed improvement within the Basalt Creek Transportation Refinement Plan.

Finally, completion of this transportation refinement plan sets the stage for the Cities of Tualatin and Wilsonville to begin joint land use concept planning for the Basalt Creek area, including further refinement of the local transportation system.

Guiding Considerations

Prior to developing alternatives, partner agencies articulated a set of considerations to guide selection, and preferred characteristics of the primary east-west facility through the area.

- **Guiding considerations** included: ability to fund and phase improvements, level of impacts (environmental, right-of-way, etc.), support for development, consistency with regional policy, and traffic operations performance.
- **Facility characteristics** included: for the primary arterial connection, a 45 mph prevailing speed and access spacing of one-half mile to one mile to improve capacity.

Alternatives Considered

Using the considerations and preferred characteristics described above, the multi-agency group developed alternatives for the major transportation system in the Basalt Creek area. Three roadway network concepts emerged, each featuring a main east-west arterial:

Improve Existing. This concept (Figure 2) proposed to widen Tonquin Road, Grahams Ferry Road, and Day Road to five lanes, providing a single corridor connecting the 124th Avenue Extension to the I-5/Elligsen Road interchange.

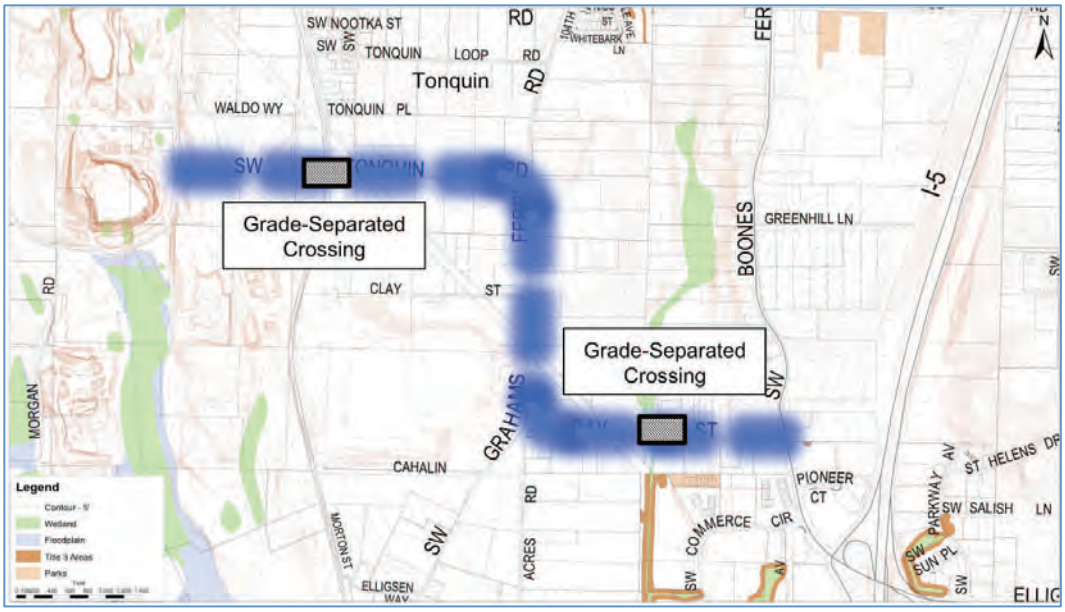


Figure 2: Improve Existing network concept

Diagonal Alignment. This concept (Figure 3) proposed to widen Tonquin Road to five lanes and construct a new, diagonally-aligned facility between the Tonquin/Grahams Ferry intersection and the I-5/Elligsen Road interchange area. Between Grahams Ferry and Boones Ferry, the alignment stays south of a major hill and canyon.[1]

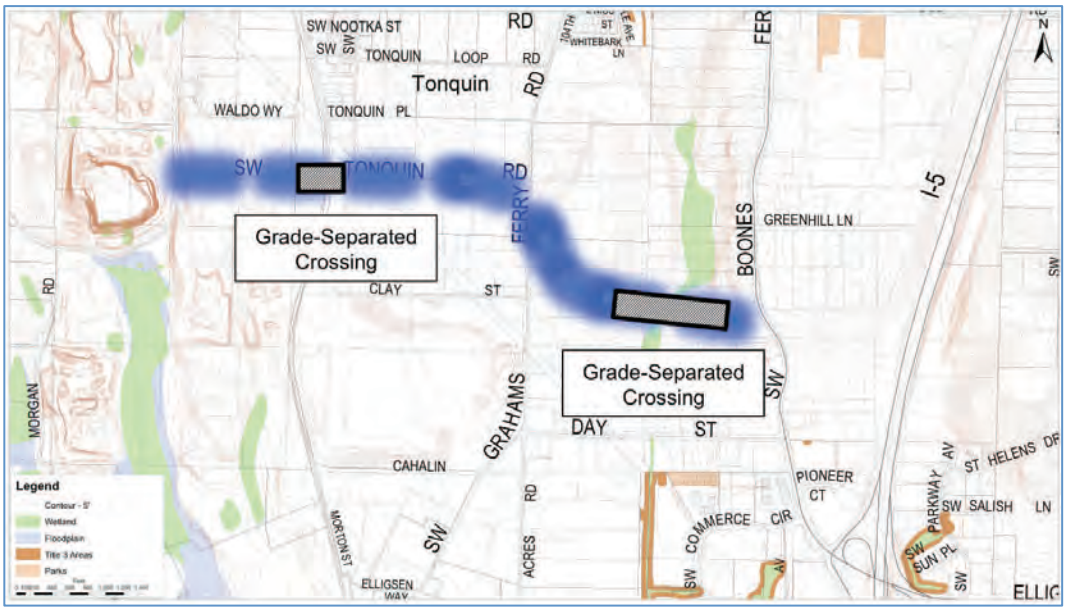


Figure 3: Diagonal Alignment network concept

[1] See Chapter 4 for more detail on topographical considerations.

East-West Alignment. This concept (Figure 4) proposed a new five-lane east-west facility from the 124th Avenue Extension towards I-5, leaving Tonquin Road to develop as a parallel three-lane road for property access. Between Grahams Ferry and Boones Ferry, the alignment crosses over the hill and canyon at a well-identified location that minimizes canyon crossing distance.

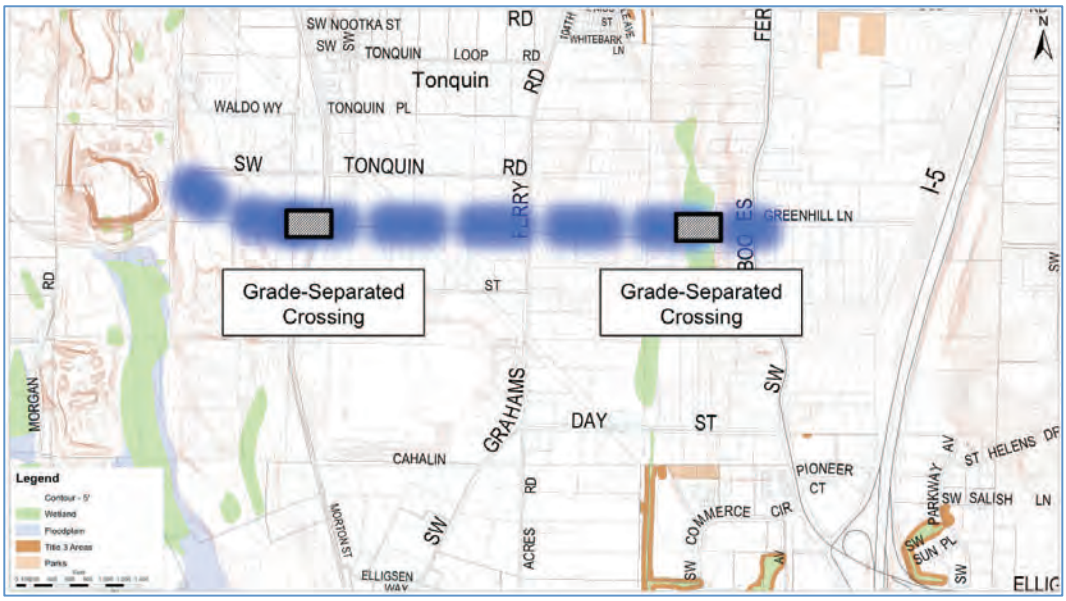


Figure 4: East-West Alignment network concept

Also, near the end of the evaluation process, a fourth network concept, the **Diagonal Hybrid**, was developed. This concept included elements similar to the Diagonal described above, with the following differences:

- 3-lane Tonquin Road
- New east-west facility between the 124th Avenue Extension and Grahams Ferry Road, similar to the facility included in the East-West concept
- Connection from the east-west facility to a diagonal crossing of the area between Grahams Ferry Road and Boones Ferry Road, similar to the crossing in the Diagonal concept

The Diagonal Hybrid was suggested through public input and forwarded for evaluation by the project's Technical Working Group (TWG) as a concept that would combine the diagonal footprint with some of the traffic benefits seen in the East-West concept. This concept is illustrated in Figure 5.

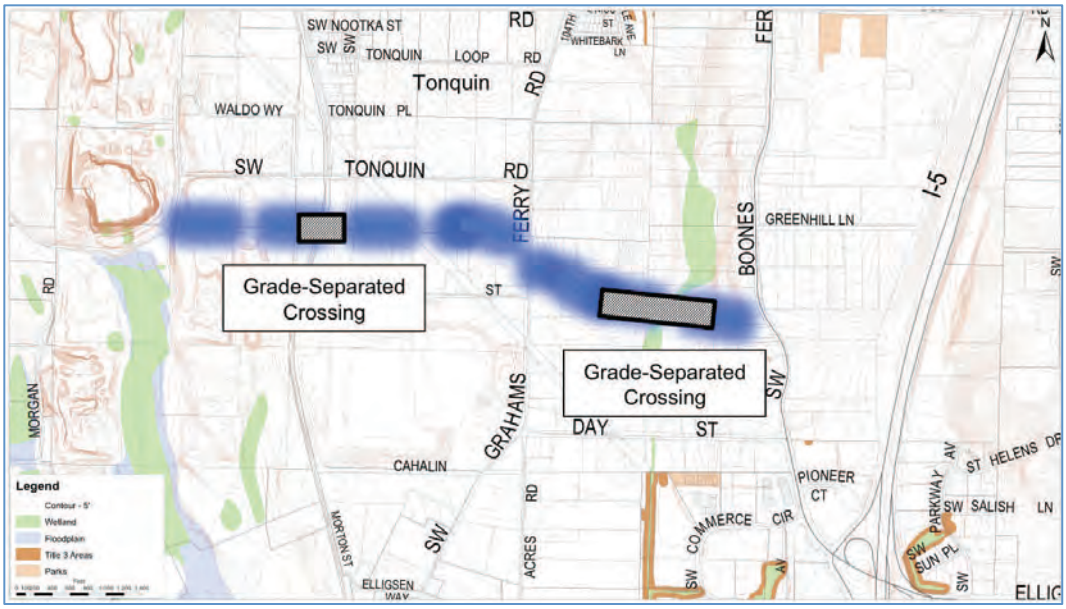


Figure 5: Diagonal Hybrid Alignment network concept

Additionally, four I-5 interface concepts were developed:

- **Improve Existing Interchange.** This concept would make incremental improvements to the existing I-5/Elligsen Road interchange configuration, such as widening off-ramps.
- **Overcrossing to Elligsen Road.** This concept would either extend Day Road east over I-5, looping down to Elligsen Road, or extend a new diagonally-aligned facility over I-5 to Elligsen Road.
- **Northern Overcrossing.** This concept would extend a new east-west facility over I-5 in the vicinity of Greenhill Road on the west and Frobase Road on the east, connecting into the Stafford urban reserve area.
- **Split Diamond.** This concept would modify the interchange, moving the I-5 southbound off and I-5 northbound on ramp terminals to a Day Road or Diagonal overcrossing, and provide collector-distributor roads. The Split Diamond concept was developed with the understanding that it should be considered a last resort for accommodating long-term needs, and all other viable concepts should be considered first.

Among the network concepts, only the East-West allows for the possibility of both I-5 overcrossing concepts in the long term if the urban reserves begin to develop and increase travel demand. The other three network concepts only accommodate the overcrossing to Elligsen Road.

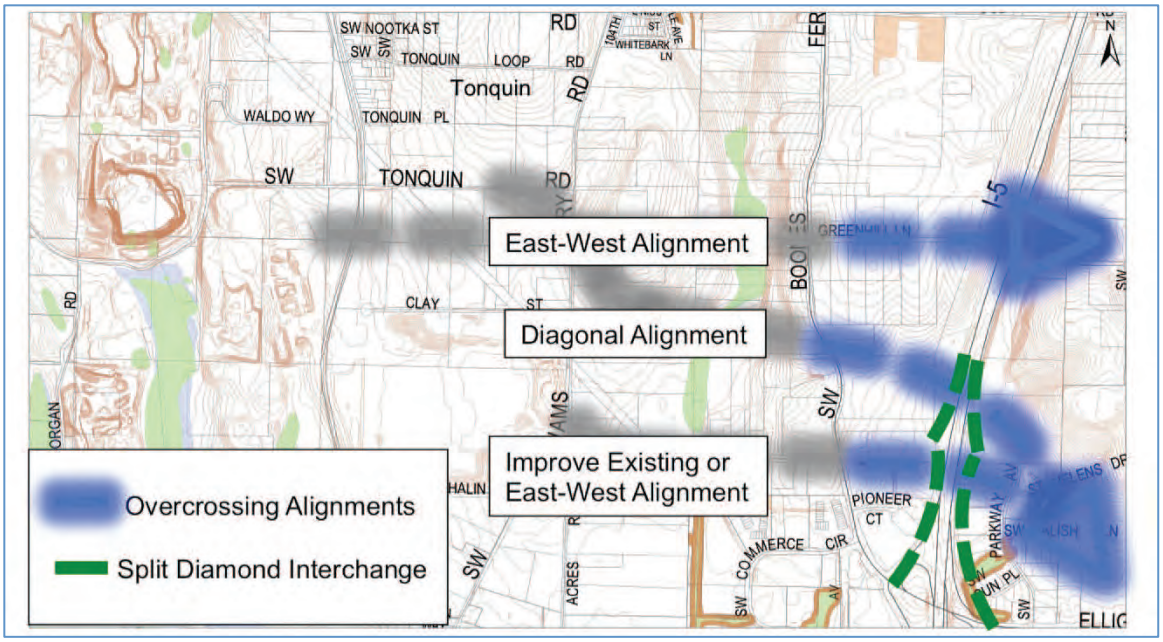


Figure 6: I-5 Interface concepts

Findings

The three original network concepts and four I-5 interface concepts were evaluated according to the guiding considerations developed at the beginning of the process. Table 1, below, summarizes how the concepts performed by each evaluation measure. A more detailed evaluation matrix is included at the end of Chapter 4. **Note that the Improve Existing network concept was not evaluated to the same level of detail as the other two concepts**, as initial traffic analysis screening showed that improving existing roads only would not provide acceptable performance in 2035. Also, the Diagonal Hybrid concept, introduced later in the evaluation process, was only analyzed for long-term (2035 with growth in urban reserves) traffic performance.

Table 1: Evaluation Summary

Evaluation Measure	Network Concepts			
	East-West	Diagonal Hybrid	Diagonal	Improve Existing
Network Cost	$139M	$149M	$130M	$82M
Future I-5 Connection Cost	$72-82M*	$34-44M	$34-44M	$34-44M
Ability to Phase	+	+	+	+
Supportive of Development	+	✓	✓	-
Environmental Impact	-	--	--	+
Consistency with RTP	+	+	+	✓
Traffic Operations	+	- **	-	--
Constructability	+	✓	✓	+

Sources: DKS Associates and Quincy Engineering, 2012

+ Performs well ✓ Performs adequately - Does not perform well – Performs poorly

* The East-West concept provides flexibility for a second overcrossing, at an additional cost of $38M.

** The Diagonal Hybrid concept performs better than the Diagonal, but fails to serve forecast traffic demand.

Key findings from the evaluation are:

- Of the network concepts, only the East-West Alignment provides acceptable traffic operations under 2035 conditions, assuming growth in the region's urban reserves areas consistent with Metro's RTP. **It provides the best operations because it has adequate east-west capacity west of Grahams Ferry Road, and it is the only concept that accommodates two I-5 overcrossings.** Note that the modeling for this effort includes travel demand for urban reserves areas as they may develop in the future. However, this plan does not advocate for or against urban reserves being brought into the urban growth boundary or when and where future development should occur.
- While the Diagonal Hybrid does have the traffic benefits of a new 5-lane arterial as in the East-West concept, the intersections of the new arterial with Grahams Ferry Road and with Boones Ferry Road exceed capacity. Traffic is also heavier on the Hybrid Diagonal crossing between Grahams Ferry and Boones Ferry than the comparable East-West crossing because it connects to the concept's only I-5 overcrossing, where traffic in the East-West concept may use another facility (Day Road) to access an I-5 crossing.
- The Improve Existing Interchange concept is a key part of potential improvement phasing, as it improves traffic conditions in north Wilsonville and helps to delay the need for a new I-5 overcrossing, but is insufficient in itself to address needs in 2035.
- All alternatives are compatible with the Tonquin Trail. Roadway cross-sections and right of way purchases for the future roadway network will consider needs for the Tonquin Trail and its connections to the larger regional trail system. This includes incorporating the trail into the design for the railroad overpass for a new east-west roadway, and to

provide a potential multi-use path on a future east-west roadway and east-west I-5 overcrossing. The Basalt Creek Transportation Refinement Plan will also meet the needs of bicycle and pedestrian facilities for planned roadways and for crossing of planned roadways.

- The East-West concept, with two overcrossings, creates different traffic patterns in the area in 2035 from the network currently assumed in the RTP (see Chapter 4 of this report for more detail):
    - Compared to the RTP projects, the East-West concept removes a significant number of vehicles from the street network around downtown Tualatin, including Tualatin-Sherwood Road and also off of local neighborhood streets in southwest Tualatin.
    - The East-West concept significantly increases vehicle volumes on SW 124th Avenue, and on Tualatin-Sherwood Road west of 124th.
    - In north Wilsonville, the East-West concept increases vehicle volumes on Parkway Center Drive, but generally reduces volumes on the west side of the I-5/Elligsen interchange, particularly on Grahams Ferry Road and Ridder Road.
- The Day Road overcrossing to Elligsen Road is effective in drawing traffic off of Boones Ferry Road and Elligsen Road, as well as improving conditions at the I-5/Elligsen Road ramp terminals. This improvement (or the northern overcrossing improvement) would be needed by 2035 regardless of growth in urban reserves areas to provide adequate operation at the I-5/Elligsen Road interchange.
- Assuming the inclusion of urban reserves east of I-5 into the urban growth boundary in 2035, a second overcrossing in the vicinity of Greenhill Road/Frobase Road will be needed to provide new east-west connectivity and to continue to relieve the interchange of through traffic.
- The split diamond interchange concept, as an addition to the two new overcrossings, appears to have no clear traffic operations benefit for the transportation system in the area due to constraints west of I-5. However, any I-5 overcrossing in the vicinity of Day Road should be designed so as not to preclude a future split diamond, with room under the overcrossing for collector-distributor roads.

Improving the existing facilities as mentioned above, adding a new arterial road, and adding new I-5 interface improvements would total up to $220 million. However, many of these are improvements that have been planned previously:

- Several of the network improvements are already included in the financially constrained (Federal) RTP.[2] The RTP cost estimates for these projects total about $120 million.
- Other improvements similar to those included in the network and I-5 interface concepts are included in the State RTP, which assumes additional revenue sources.[3] The RTP cost estimates for these projects represent an additional $130 million of planned improvements, including portions of the I-5 to 99W Southern Arterial (east of 124th Avenue).

This is a total of $250 million in RTP projects that can potentially be refined based on the outcome of this effort.

Table 2, on the following page, compares cost elements among the Diagonal, Diagonal Hybrid, and East-West alternatives, including the I-5 treatments. Phasing years shown reflect the year by which a project should be complete in order to maintain acceptable traffic operations in the Basalt Creek area. While a separate phasing analysis was not done for the Diagonal Hybrid, it was assumed that the general phasing would be the same as the other two concepts.

Full costs for each project are provided by potential phasing year (current dollars), although design and right of way costs could be incurred earlier. The Tonquin Trail is not included, as cost estimates are not yet available, but this project is included in the financially constrained RTP as well. Potential phasing for the Diagonal and East-West alternatives is illustrated in Figures 7 and 8.

[2] The Financially Constrained RTP assumes existing and proposed funding sources that can reasonably be expected to be available for transportation uses during the plan period. Financial constraint is required by federal transportation planning regulations and constitutes the federally recognized plan.

[3] The State RTP assumes additional funding sources beyond those included in the Federal RTP, including increases in the state vehicle registration fee, increased in local system development charges, and local street utility fees.

Table 2: Cost Estimates for Diagonal and East-West Alignment Alternatives with Potential improvement Phasing

Improvement	Diagonal Alt Cost ($M)	Diag. Hybrid Alt Cost ($M)	East-West Alt Cost ($M)	Previously Planned?*
2020				
3-lane 124th Avenue Extension [a]	$20.0	$20.0	$20.0	Federal RTP
Improve Tonquin Road to 3 lanes (124th Avenue Extension to Grahams Ferry Road) [b]	$10.5	$10.5	$10.5	Federal RTP
Improve Grahams Ferry Road to 3 lanes (Tonquin to Day) [b]	$5.4	$5.4	$5.4	Federal RTP
Improve Boones Ferry Road to 3 lanes (Norwood Road to Day Road) [a]	$10.8	$10.8	$10.8	In design
Boones Ferry Road/Commerce Circle/95th Avenue Intersection Improvements [c]	$2.5	$2.5	$2.5	Federal RTP
Construct Tonquin Trail **	-	-	-	Federal RTP
TOTAL 2020	**$49.2**	**$49.2**	**$49.2**	***$49.2***
2030				
Improve 124th Avenue Extension to 5 lanes [a]	$14.0	$14.0	$14.0	Federal RTP
5-lane East-West facility (124th Avenue Ext to Boones Ferry Rd) [b]	N/A	N/A	$57.9	State RTP
Improve Tonquin Road to 5 lanes (124th Avenue to Grahams Ferry) [b]	$6.7	N/A	N/A	State RTP
5-lane Diagonal facility (Grahams Ferry Road to Boones Ferry Road) [b]	$42.9	N/A	N/A	State RTP
5-lane Hybrid facility (124th Avenue Ext to Boones Ferry Road) [b]	N/A	$69.1	N/A	State RTP
5-lane Boones Ferry Road (new facility to Day Road) [b]	$0.8	$0.8	$1.1***	State RTP
5-lane Day Road (Kinsman Extension to Boones Ferry Road) [b]	$5.8	$5.8	$5.8	Similar to RTP project
3-lane Kinsman Road Extension [c]	$10.4	$10.4	$10.4	Federal RTP
Boones Ferry Road/Commerce Circle/95th Avenue Access Control	minimal	minimal	minimal	No
TOTAL 2030	**$80.6**	**$100.1**	**$89.2**	***$156.2***
2035 UGB				
5-lane Overcrossing of I-5 (Day Road/Boones Ferry Road intersection to Elligsen Road) [b]	$33.7-$44.1	$33.7-$44.1	$33.7-$44.1	State RTP
TOTAL 2035 UGB	**$33.7-$44.1**	**$33.7-$44.1**	**$33.7-$44.1**	***$50.0***
2035 RTP				
5-lane Overcrossing of I-5 (East-West facility/Boones Ferry Road intersection to Stafford Road) [b]	N/A	N/A	$38.0	State RTP
TOTAL 2035 RTP	**$0**	**$0**	**$38.0**	**$0**
GRAND TOTAL	**$165-$175**	**$185-195**	**$210-220**	***$250***

Source of cost estimates: [a] Washington County, [b] Quincy Engineering, [c] 2035 Regional Transportation Plan

* Totals for each interim year in this column, as well as grand total, represent total dollar amount either allocated in the RTP or committed for projects already in development. See Chapter 4 for more information on RTP comparison projects.

** Tonquin Trail costs are being estimated outside of this transportation refinement plan process.

*** Boones Ferry Road improvement costs are higher for the East-West because the segment south to Day Road is longest in this concept.

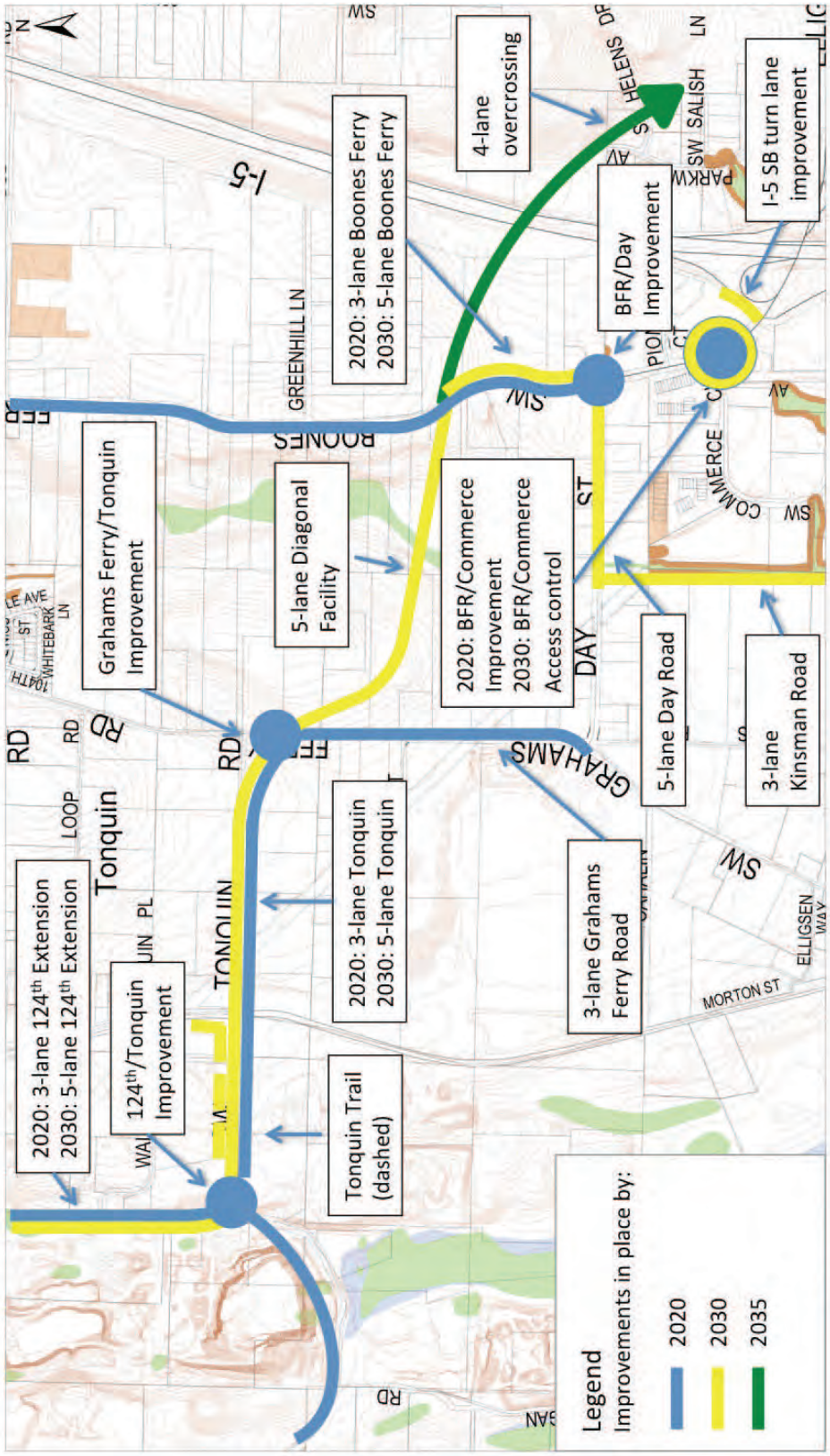


Figure 7: Summary of Potential Phasing (Diagonal Concept)

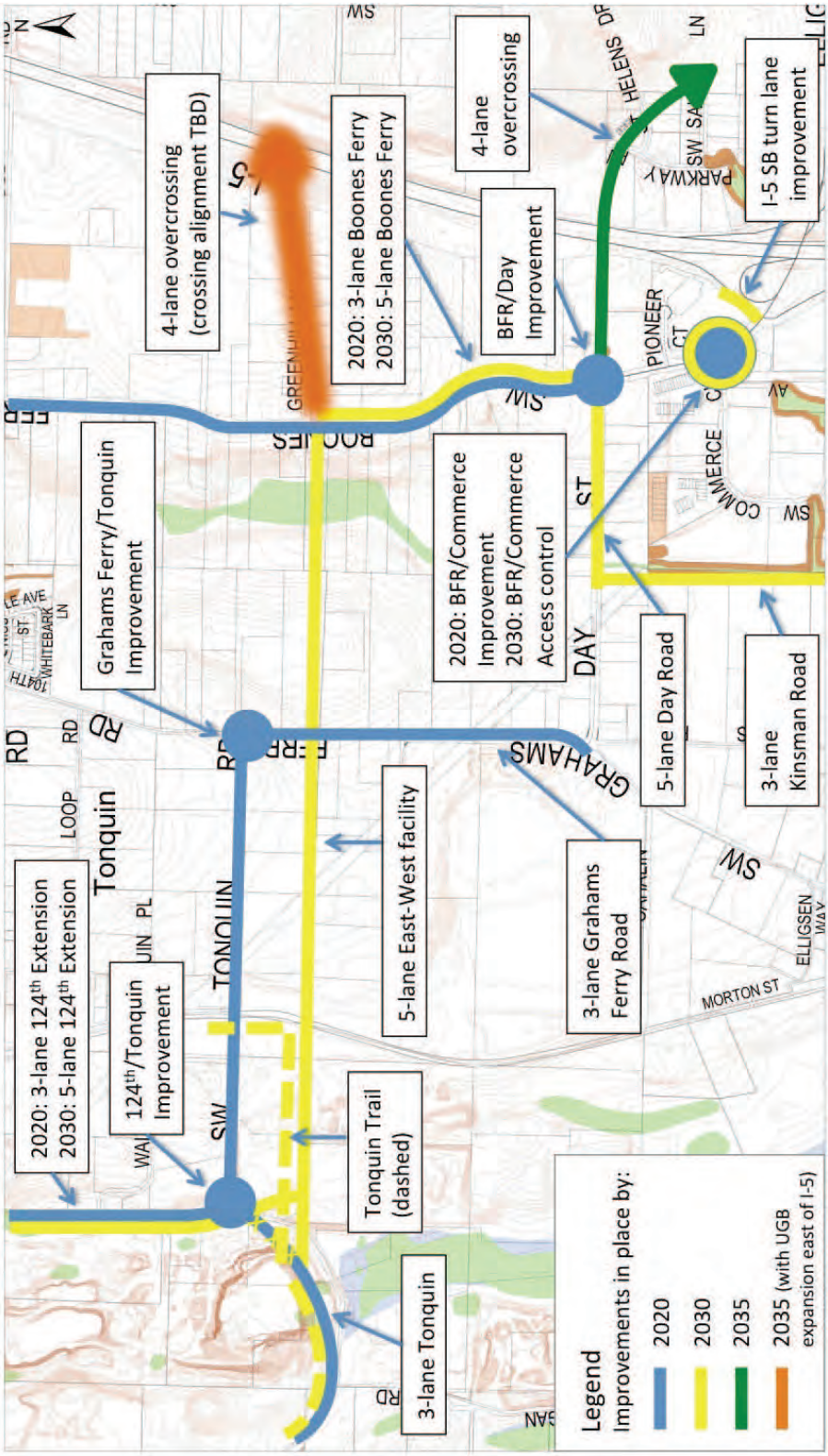


Figure 8: Summary of Potential Phasing (East-West Concept)

Chapter 1: Background

In 2011 and 2012, Washington County, in cooperation with Metro, the Cities of Tualatin and Wilsonville, and the Oregon Department of Transportation, undertook a planning effort to determine the future major transportation system within the Basalt Creek Planning Area. This report documents the process, alternatives considered, evaluation, and recommendations for this major transportation system.

Planning the major transportation system sets the stage for the Cities of Tualatin and Wilsonville to begin comprehensive planning for future development of the Basalt Creek Planning Area. The sections below describe the Cities' land use concept planning effort, and other related efforts, that could impact any development of the major transportation system in the area.

Basalt Creek Concept Planning

The Basalt Creek Planning Area is in a currently unincorporated area of Washington County between the cities of Tualatin and Wilsonville (see Figure 9). This area was brought into Metro's Urban Growth Boundary (UGB) in 2004, with the condition that it undergo Title 11 concept planning.[4] Title 11 concept planning calls for collaboration between Metro and local jurisdictions to plan how new communities will be developed and served by roads, schools, and other urban services. The Basalt Creek concept planning process will also involve agreement on the future city limit boundary between Tualatin and Wilsonville, within the planning area.

It is important to distinguish between Title 11 concept planning and the transportation refinement planning effort described in this report. Agreement on the major transportation system, particularly the east-west connection between the 124th Avenue extension, which extends south from Tualatin-Sherwood Road, and Boones Ferry Road, was considered a necessary step before Title 11 concept planning could begin. Therefore, Washington County, the Cities of Tualatin and Wilsonville, and Metro entered into an intergovernmental agreement (IGA) to address the following transportation issues:

- Conditions related to the Southern Arterial in the Metro 2035 Regional Transportation Plan (RTP)
- Strategies for maintaining freight access, through and within the planning area
- Potential improvements to the I-5/Elligsen Road interchange, including a split diamond interchange option

[4] Metro Ordinance 04-1040B

- I-5 overcrossing options north of the I-5/Elligsen Road interchange
- Potential roadway connections directly to I-5

Addressing these issues was considered key not only for both city governments, but also to provide timely answers for property owners who may be impacted by network, alignment, and I-5 interface concepts, and to provide the major elements of the road system to allow the remaining details of comprehensive planning to proceed. Note that the last item, direct connections to I-5, was not considered for further study after discussion among the multi-agency group.

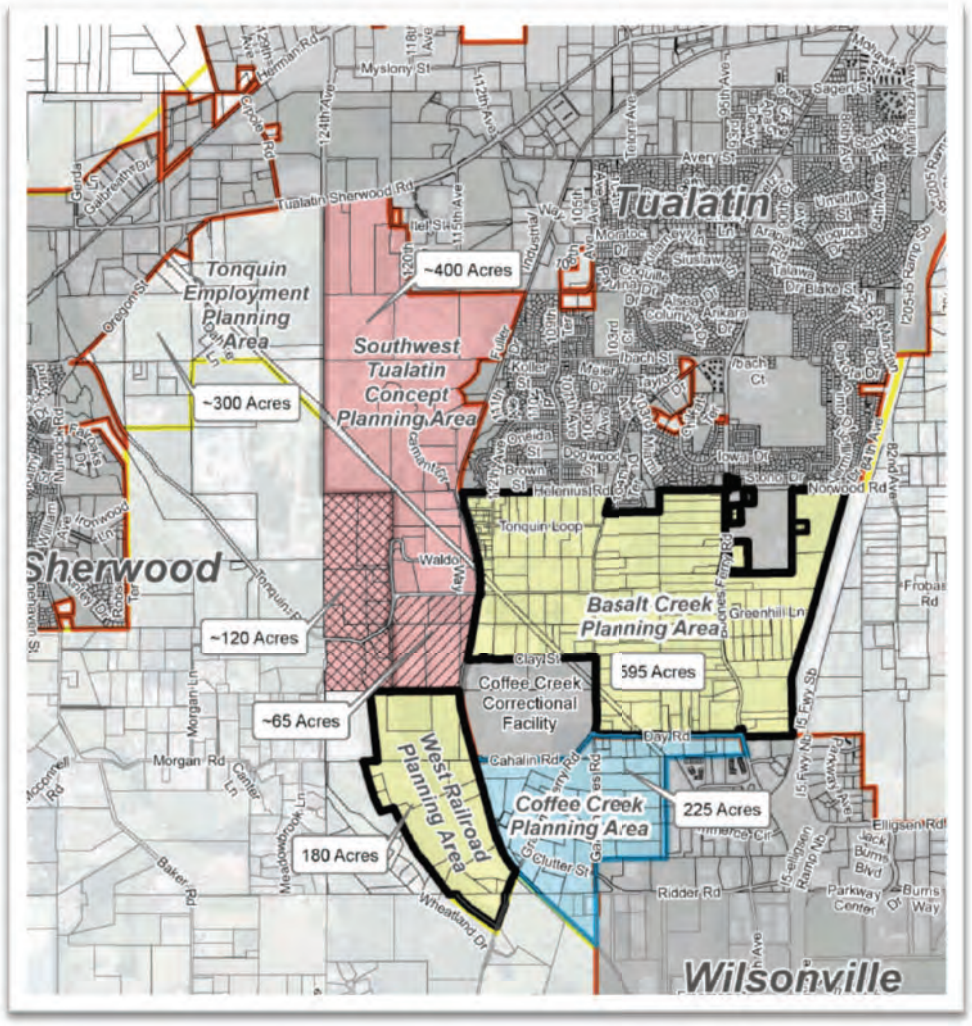


Figure 9: Basalt Creek Planning Area and adjacent planning areas

I-5 to 99W Connector Study: Southern Arterial

Between 2006 and 2009, the I-5 to 99W Connector Study[5] identified a number of improvements in the Basalt Creek Planning Area and adjacent areas to support future land uses, address existing deficiencies, and serve increased travel demand. The study's recommended alternative (Alternative 7) included the concept of spreading east-west travel demand across three smaller arterials (Northern, Central, and Southern) rather than one large expressway (Figure 10).

Figure 10: Arterial concept for I-5/99W Connector Study Alternative 7 (Metro 2035 RTP)

In February 2009, the I-5/99W Connector Project Steering Committee (PSC) was unable at the end of its process to reach a unanimous recommendation for the I-5/99W Corridor Study as required by the PSC Partnership Agreement in order to forward a Recommended Corridor Alternative to the RTP. However, there was unanimous agreement on some aspects of the Connector that could be reflected in the RTP:

- Identify projects for inclusion in the RTP with minimal extra conditions, particularly the extension of SW 124th from SW Tualatin Sherwood Road to the I-5/North Wilsonville Interchange,
- Identify conditions to be met before a new Southern Arterial is implemented to ensure integration with surrounding land use and transportation plans, particularly an I-5 South Corridor Study,
- Determine an incremental phasing plan to ensure the projects with the most benefit that can reasonably be built within the 20-year horizon be included in the RTP Financially Constrained list.

[5] For more information, see www.i5to99w.org

The recommendations for the I-5/99W Corridor Study proposed for inclusion in the RTP are based upon the conclusions reached by the Project Steering Committee (PSC) as follows:

- The 3 options consisting of a new limited access expressway from I-5 to OR 99W (2 alignments north of Sherwood and 1 alignment south of Sherwood) were unacceptable due to high impact on the natural and built environment, the need for extensive improvements to I-5, high cost and concern about the potential for induced growth to Yamhill County, and
- The option focused on expanding Tualatin-Sherwood Road was unacceptable due to the very large size it would need to be and the resulting impacts on the Tualatin and Sherwood Town Centers.
- The alternative recommended is based upon the principle that it is preferable to spread the traffic across three smaller arterials rather than one large expressway. The analysis concluded this approach could effectively serve the traffic demand, would provide better service to urban land uses in the Tualatin/Sherwood area, especially industrial lands, and could be built incrementally based upon need to serve growth and revenue availability. The overall concept is structured around a Northern, Central and Southern arterial providing east-west access between OR 99W and I-5 with an extension of SW 124th providing north-south connectivity (see Figure 3).

The Basalt Creek transportation planning effort is not intended to develop the full Southern Arterial concept, which would extend west all the way to Highway 99W. Rather, the east-west connections evaluated in this report are considered extensions of 124th Avenue eastward and therefore are not subject to the above conditions. However, in developing the concepts described in this report, the Alternative 7 conditions were considered so as not to preclude future development of the full Southern Arterial. This refinement plan sets the stage for shorter-term improvements to facilitate development of the Basalt Creek area, provide access to Tualatin and Sherwood industrial areas, and allow for future consideration of the Southern Arterial.

Southwest 124th Avenue Extension

Planning of the major roadway system in the Basalt Creek Planning Area includes incorporating ongoing work on a separate but related Washington County project, the Southwest 124th Avenue extension. This current project is a north-south 2-3 lane arterial connecting Tualatin-Sherwood Road to Tonquin Road with a likely alignment matching the red corridor in Figure 11. In the longer term, this section of 124th Avenue may be reconstructed and follow the blue

alignment shown in the figure, and could be five lanes as an interim phase depending on how the Southwest Tualatin Concept Plan area develops.

The IGA for this refinement work calls for preliminary project development of the full 124th Avenue extension east to Boones Ferry Road, with the new east-west part of the corridor either following existing right-of-way alignments (such as Tonquin Road) or new alignments. The IGA states that this alignment may include portions of an east-west arterial that is consistent with the future Southern Arterial elements outlined in Metro's 2035 RTP.

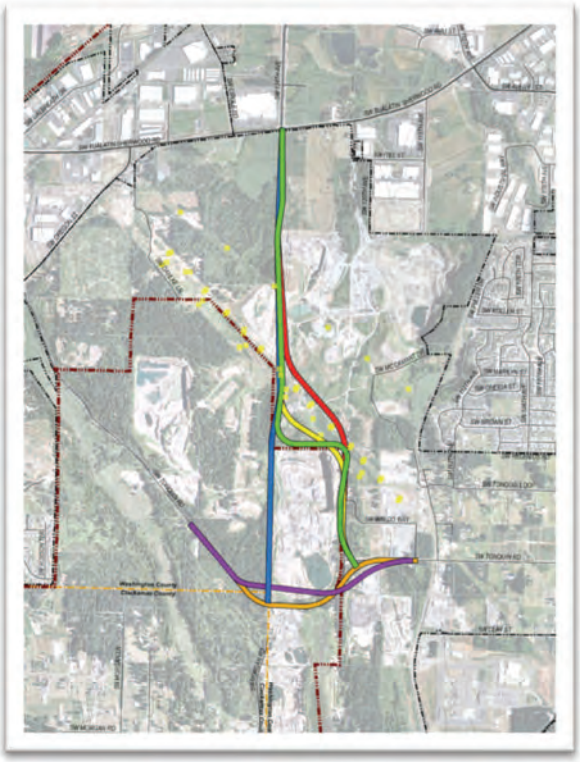


Figure 11: Alignment options for the Southwest 124th Avenue Extension

Tonquin Trail

Metro, in partnership with the cities of Wilsonville, Sherwood and Tualatin, and Clackamas and Washington counties, is currently leading the development of the Tonquin Trail master plan. The project is identifying a preferred alignment for the trail, design guidelines and cost estimates, and identifying the jurisdictions that will operate and maintain the trail. Following public involvement and a thorough technical analysis, a recommended alignment, shown in Figure 12 was developed and agreed upon by the project steering committee.

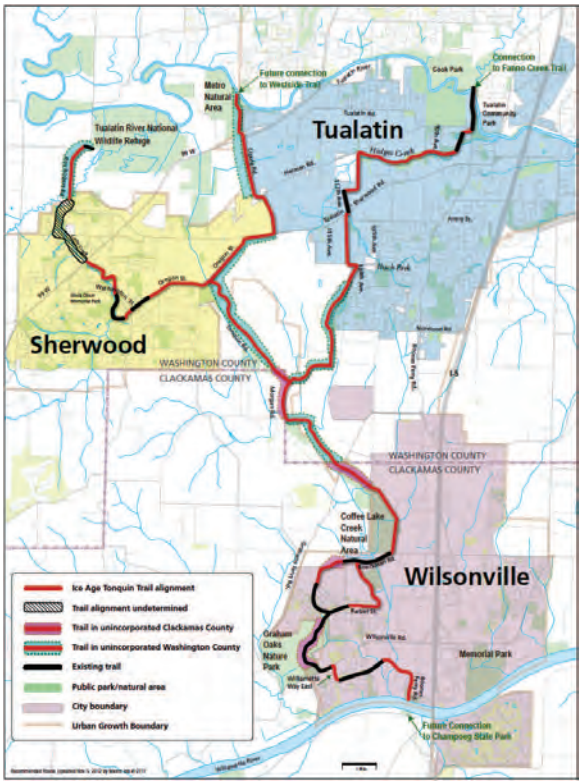


Figure 12: Tonquin Trail recommended alignment

In addition to planning for the alignment shown in Figure 12, the Basalt Creek Transportation Refinement Plan will accommodate future connections to the larger regional trail system. Future connection opportunities include a separated multi-use path to continue east from

the vicinity of Tonquin Road to Boones Ferry Road and a multi-use path connection across I-5 to the Stafford area.

Cost estimates for elements of the Tonquin Trail are not yet available at publication of this report, and so are not included here. However, the recommended alignment is assumed to be included as part of all primary transportation network alternatives considered in this report and should be incorporated into further refinements at the concept planning stage.

Boones Ferry Road Improvements

Boones Ferry Road between Norwood Road and Day Road is currently a two-lane arterial with minimal shoulders and no bicycle or pedestrian facilities. This stretch of the road has hills, substandard curves, and sight distance issues at driveways and intersections.

The improvement project, currently in progress, will add a center turn lane at key locations as well as bike lanes on both sides and pedestrian facilities on one side. The roadway will be realigned to meet 45 mph design standards as well.

Chapter 2: Process Overview

This chapter documents the planning process, including key considerations and assumptions regarding land use and transportation facilities in the Basalt Creek area.

Transportation Refinement Plan Development Process

At the outset of this planning effort, it was important to define and gain mutual agreement on roles and responsibilities for the agencies involved. Four of the agencies, Washington County, Metro, and the Cities of Tualatin and Wilsonville, had entered into an IGA in May 2011 to start concept planning for the Basalt Creek Planning Area. The IGA directed Washington County to coordinate with the parties to the IGA as well as ODOT, provide funding, establish a scope of work, retain a consultant, and assume project management for planning of the major roadway system. Roles of agencies involved in this transportation refinement plan are shown in Figure 13.

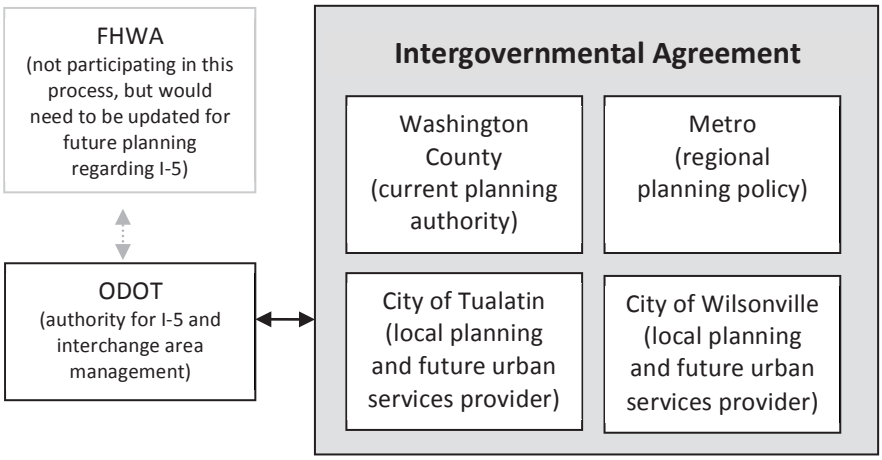


Figure 13: Transportation Refinement Plan Roles and Responsibilities

The IGA between the County, the Cities, and Metro specified a six-month time frame for this transportation refinement planning to be substantially completed so that concept planning could begin. However, there was agreement at the outset of the process that the six month time frame might not be viable, given the level of coordination needed among agency staff and elected officials. Therefore, the participating agencies agreed to a set of process steps designed to fulfill IGA requirements and to meet the guiding considerations and analytical needs described later in this chapter, with the understanding that the majority of the technical information would be gathered within about six months. The general process steps that were agreed to are shown in Table 3.

Table 3: Transportation Refinement Plan Process Steps

Multi-Agency Technical Working Group (TWG) #1 Partnering work session (August 2011)
Project Purpose (technical questions to be answered)
Define process and timeline (decision-making, protocols, agreements, scope and responsibilities for technical work, relationship to other projects, etc.)

↓

Multi-Agency Policy Advisory Group (PAG) #1 Partnering session (September 2011)
Confirm project purpose and partnering agreements/process/protocols/schedule

↓

Design Charrette (for TWG #2 and PAG #2) (October-November 2011)
Review existing information
Develop network and I-5 interface alternatives for evaluation

↓

Technical evaluation of alternatives and Public Open House (December 2011)

↓

TWG #3 (January 2012)
Preliminary review of evaluation for completeness

↓

TWG #4 (March 2012)
Approval of evaluation and findings to forward to PAG

↓

PAG #3 (April 2012)
Review evaluation and findings

↓

Briefings, Open House , Public Review and Comment (April-May 2012)

↓

TWG #5 (June 2012)
Develop staff recommendations based on technical evaluation, forward to PAG
(Resulted in further information added to report)

↓

PAG #4 (December 2012)
Final decision on transportation refinement plan to propose to decision making bodies

↓

County TSP Amendment/Update

↓

City TSP and Concept Planning through adoption

In addition to the process steps shown, additional meetings and coordination occurred in order to allow review and acceptance of the evaluation as complete.

Guiding Considerations

The following were identified by the participating agencies as guiding considerations for selecting a preferred transportation framework for the Basalt Creek area:

- Cost (ability to fund)
- Ability to phase improvements
- Support for development
- Impacts such as environmental, right of way, etc.
- Consistency with the RTP
- Traffic operations

Facility Characteristics

The participating agencies identified key characteristics that should be included in a new east-west facility:

- Designed for 45 mph and posted speed limit of 45 mph
- Access spacing of one-half mile to one mile (similar to the Milwaukie Expressway) to provide for increased corridor capacity

For a five-lane facility, this speed and access spacing provide a capacity of approximately 2,400 vehicles per hour in each direction (in terms of general corridor throughput). Access spacing of about a half-mile would allow intersections at the 124th Avenue extension, Grahams Ferry Road, and Boones Ferry Road.

It was also agreed that the east-west facility should be compatible with future Tonquin Trail alignments.

Methods and Assumptions

The multi-agency group reviewed and came to consensus on the framework and level of effort for analyzing alternative roadway alignments and connections. This section summarizes this framework and documents the following assumptions, methods, and standards:

- Land use and roadway network assumptions for the study area, with particular attention to interim years and phasing considerations
- Methods for forecasting future traffic volumes and turning movements
- Agency mobility standards within the study area

Level of Analysis

Given the guiding considerations listed above, the alternatives evaluation focused on answering questions about performance, costs, and impacts at a sufficient level of detail to make decisions

about general corridor alignments and phasing of improvements. The alternatives evaluation includes the following types of data:

- Topographical constraints (e.g., contour maps)
- Environmental constraints (e.g., wetlands and other Goal 5 resources)
- Property impacts (e.g., aerial photos and GIS parcel data)
- Roadway network performance (e.g., roadway congestion and freight travel patterns)

Because of the importance of cost and phasing considerations, the evaluation includes interim analysis years in 2020 and 2030, as well as a planning horizon year of 2035.

Land Use Scenarios

Data for estimating growth and roadway performance relied primarily on travel demand forecasting from Metro's regional travel demand model. The long-range horizon year (2035) for this effort used the land use assumptions from the currently adopted RTP, which includes some assumed future development in designated urban reserves. During the Basalt Creek transportation refinement planning process, the Metro model was in the process of being updated with new land use assumptions. However, the multi-agency group agreed to move forward with the existing RTP model land use assumptions rather than waiting for the new model or making any new land use assumptions for the 2035 horizon year.

In addition, the multi-agency group considered it important to analyze the transportation system under an alternate 2035 scenario with no growth outside of the existing UGB, as this scenario could more accurately reflect future travel patterns in the case of an extended economic downturn. The following summarizes the land use scenarios that were considered to evaluate the need for improvements and potential project phasing:

- 2020 UGB (growth within the existing UGB only)
- 2030 UGB (growth within the existing UGB only)
- 2035 UGB (growth within the existing UGB only)
- 2035 RTP (additional growth within the urban reserves outside the existing UGB, as assumed in the adopted RTP forecasts)

Interim year travel demand was generally based on an interpolation of Metro's year 2005 and year 2035 regional travel demand models. For each interim year (2020 and 2030), an incremental portion of regional growth was assumed to occur at a compounded rate across the region and did not assume certain locations would grow before others. For scenarios that assumed growth within the UGB only, trip growth that included an origin or destination outside the UGB was removed. Growth in neighboring communities (e.g., Sandy and Canby) and in Washington State – areas that are within Metro's regional model but outside the UGB – were

kept consistent with the RTP model. The 2035 RTP scenario retained the growth outside the UGB in urban reserves. Figure 14 indicates locations where significant growth was removed in the UGB growth scenarios in the southwest Metro area.

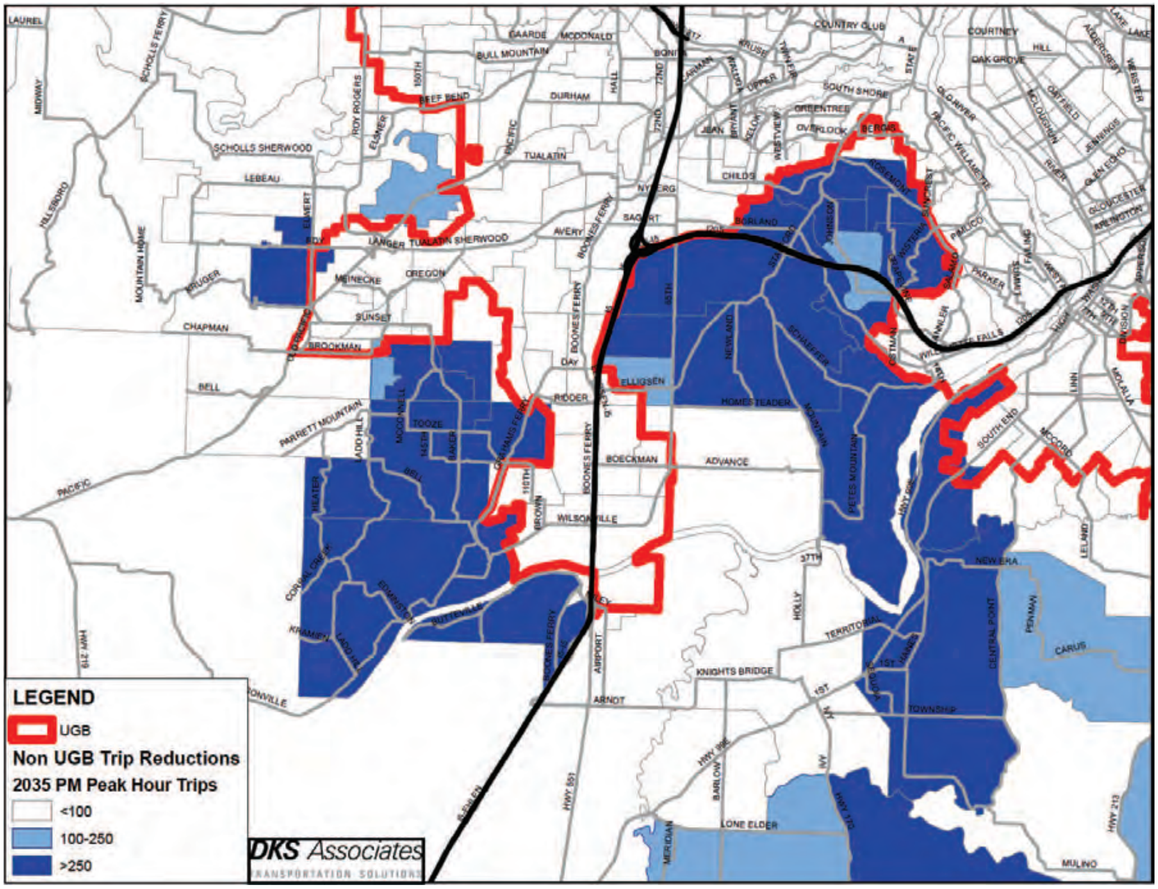


Figure 14: Assumed trip reductions outside Urban Growth Boundary (UGB scenarios)

In addition to accounting for growth in the region and recently studied areas such as the Southwest Tualatin Concept Plan Area and the Tonquin Employment Area in Shwerwood, the Metro model also contains estimates about growth and change in land use in the Basalt Creek Planning Area between 2005 and 2035.[6] Table 4 shows these estimates and rates of growth between the base year and planning horizon year.

[6] Subsequent to this analysis, Metro revised regional population and employment numbers downward. Because timeliness was important to the multi-agency group, it was decided that analysis should proceed with the population and employment numbers that were immediately available rather than waiting for new assumptions to be finalized.

Table 4: Metro Model Land Use Assumptions for Basalt Creek Planning Area

Land Use Measure	2005	2035	+/- Change
Households	148	1,351	+1,203
Retail Employees	6	331	+325
Service Employees	18	469	+451
Other Employees	45	1,033	+988

Source: Metro
Model TAZs 1013 and 1014 are assumed to represent the Basalt Creek Planning Area

The land use assumptions for the Basalt Creek area have a significant impact on the intensity of traffic and the type of travel patterns on the future roadway network, with the significant increase in households creating mainly inbound p.m. peak hour trips, and the increase in employees generally creating outbound trips.

Roadway Network Assumptions

Travel forecasting is a key analytical step in determining the future transportation needs in the planning area. Therefore, it was important to account for currently planned projects as part of the travel demand modeling process. The future Metro RTP Financially Constrained[7] network and assumptions were reviewed to make sure already-planned projects were represented and to inform later consideration of how to phase Basalt Creek-area projects in future years. Table 5 lists projects within Basalt Creek and the surrounding study area that are likely to impact travel pattern and phasing issues. Note that projects listed here may or may not move forward, depending on the outcome of ongoing city and county transportation system plan updates.

[7] For a full project list including all Financially Constrained and other RTP projects, see http://www.oregonmetro.gov/index.cfm/go/by.web/id=25038

2035 Financially Constrained RTP Projects near Basalt Creek area, Including Committed Projects

Metro Project ID	Nominating Agency	Facility Owner / Operator	Project/Program Name	Project Start Location (Identify starting point of project)	Project End Location (Identify terminus of project)	Local Functional Classification	Project Purpose	Description	Estimated Cost ($2007)	Estimated Cost (YOE$)	Time Period	Financially Committed
10092	Wilsonville		Tonquin Trail	Washington/Clackamas County line	Boones Ferry Landing	Other	Regional trail would connect Tualatin/Sherwood with west Wilsonville, Coffee Lake Natural Area, Villebois, and the Grahams Oak Natural Area. Connections to the trail will be provided at	Shared use path with some on-street portions.		$ 3,000,000	$ 4,440,733	No
10132	Wilsonville	Wilsonville	Boeckman Rd./I-5 Overcrossing Improvements	Boberg Rd.	Parkway Ave.	Minor Arterial	Boeckman Road is designated as an arterial street in the City's TSP. It provides an east-west connection in Wilsonville between Tooze Road/Graham's Ferry Road on the west and Stafford Road on the east, serving as an important non-interstate alternate.	Widen Boeckman Road bridge over I-5 to 3 lanes. Add bike/pedestrian connections to regional trail system.	$ 13,600,000	$ 20,131,322	2008-2017	No
10568	Washington Co.	Washington Co.	Tualatin-Sherwood Rd. Improvements	Hwy. 99W	Teton Ave.	Arterial	Provide congestion relief.	Widen from three to five lanes with bike lanes and sidewalks.	$ 49,150,000	$ 99,568,882	2018-2025	No
10588	Washington Co.	Washington Co.	Grahams Ferry Rd Improvements	Helenius St.	Washington/Clackamas County line	Arterial/Collector	Provide freight access and capacity to link the Coffee Creek I RSIA and the industrial area north of Wilsonville Road as well as the I-5/Wilsonville Road Interchange.	Widen Grahams Ferry Rd to 3 lanes, add bike/pedestrian connections to regional trail system and fix undersized railroad overcrossing.	$ 28,000,000	$ 41,446,840	2008-2017	No
10590	Washington Co.	Washington Co.	Tonquin Rd. Improvements	Grahams Ferry Rd.	Oregon St.	Arterial	Address recurring safety issue.	Realign and widen to three lanes with bike lanes and sidewalks.	$ 28,406,000	$ 57,545,344	2018-2025	No
10682	Sherwood	Sherwood	Brookman Rd	99W	Ladd Hill Rd	Collector	Provide congestion relief and economic development.	Reconstruct road to collector standards.	$ 20,510,000	$ 41,549,497	2018-2025	No
10720	Tualatin	Tualatin	Boones Ferry	Tualatin-Sherwood	Ibach	Minor Arterial	Provide congestion relief.	Widen to 5 lanes from Tualatin-Sherwood to Ibach.	$ 16,500,000	$ 49,478,605	2026-2035	No
10728	Tualatin	Tualatin	Boones Ferry	N/A	N/A	Minor Arterial	Provide congestion relief.	Interconnect signals on Boones Ferry Road from Tualatin-Sherwood Road to Ibach (6 signals).	$ 78,000	$ 115,459	2008-2017	No
10736	Tualatin	Tualatin	124th Ave	Tualatin-Sherwood	Tonquin	Minor Arterial	Economic development and freight movement.	Construct new street from Tualatin-Sherwood to Tonquin Rd - 5 lanes.	$ 82,500,000	$ 122,120,154	2008-2017	No
10852	Wilsonville		95th/Boones Ferry/Commerce Circle Intersection Improvements	95th Ave.	Southbound off-ramp of I-5/Stafford Interchange	Major Arterial	Reduce congestion & improve feight access into regionally signficant industrial lands	Construct dual left-turn and right-turn lanes; improve signal synchronization, access manaagement & sight-distance	$ 2,500,000	$ 3,700,611	2008-2017	No
10853	Wilsonville	Wilsonville	Kinsman Rd. Extension	Ridder Rd.	Day St.	Local	Improve freight access to Coffee Creek regionally significant industrial area	Construct three lane road extension with sidewalks & bike lanes	$ 6,500,000	$ 9,621,588	2008-2017	No
10854	Metro	To be determined	Tonquin Trail	Tualatin-Sherwood Rd.	Clackamas Co. Line	NA	Connect Tualatin area with Coffee Creek Natural Area, Tonquin Geologic Area & Grahams Oak Natural Area	Construct mult-use trail with some on-street segments connecting multiple communities in Washington and Clackamas County. Targeted as Metro Strategic Investment priority.	$ 3,000,000	$ 4,440,733	2008-2017	No
11177	ODOT	ODOT	I-5 northbound auxiliary lane from Elligsen Road interchange to I-205 interchange	Elligsen Rd	I-205	Interstate	Relieve congestion.	Construct northbound auxiliary lane on I-5 between Elligsen Road interchange and I-205 interchange.	$ 11,000,000	$ 16,282,687	2008-2017	Yes
11179	ODOT	ODOT	I-5 to 99W replacement projects	N/A	N/A	N/A	Improve statewide mobility and access to Portland metropolitan area.	Construct improvements consistent with recommendations from I-5/99W connector process.	$ 10,000,000	$ 14,802,443	2008-2017	Adams Ave.
11243	Wilsonville	Washington Co.	Day Street	Grahams Ferry Rd.	Boones Ferry Rd.	Arterial	Improve structural integrity of road to accommodate increased freight traffic to industrial areas	Reconstruct road to accommodate increasing volumes of heavy trucks	$ 3,200,000	$ 4,736,782	2008-2017	No

Note that project 10132 is described as a 5-lane overcrossing in the 2003 Wilsonville TSP (long range project W-4)

Travel Forecast Methods

Future traffic volume forecasts for the weekday PM peak hour were developed from base year (2005), future year (2035), and interim year (2020 and 2030) Metro travel demand forecast model output. Interim and future year roadway networks were modified to reflect phasing assumptions described in Chapter 3 in this report.

Model outputs were post-processed to better reflect anticipated turning movements at intersections, consistent with standard practice for traffic forecasting as outlined in National Cooperative Highway Research Program Report 255.[8] The difference between base year and future year model output was used to estimate traffic growth. This growth in turning movements was added to existing (2011) traffic volumes at each study intersection and balanced.

Forecast turning movement volumes for all scenarios and years are included in the intersection operations 2000 Highway Capacity Manual[9] evaluation reports, which can be found in the appendix to this document.

Applicable Mobility Standards

Intersections within the study area fall under the jurisdiction of Washington County and ODOT. Both jurisdictions use volume-to-capacity (V/C) ratio as the performance measure for their mobility standard. V/C takes into account the total volume entering an intersection and compares it to the overall capacity at that intersection to determine a ratio on a scale from 0.0 to 1.0 and above. As the V/C ratio approaches and exceeds 1.0, the intersection becomes more congested and has longer queues and higher delay.

The applicable public agency performance standards for existing and potential future intersections in this study are presented in Table 6. Note that the standard for newly constructed ramp terminals on a potential split diamond interchange would be based on Highway Design Manual standards, which are more stringent than Oregon Highway Plan mobility targets.

[8] *National Cooperative Highway Research Program Report 255, Highway Traffic Data for Urbanized Area Project Planning and Design,* Pedersen and Samdahl, Transportation Research Board, 1982.
[9] *2000 Highway Capacity Manual,* Transportation Research Board, Washington DC, 2000.

Table 6: Mobility Standards for Study Area Intersections

Intersection	Jurisdiction	V/C Ratio
I-5 Northbound/Elligsen Road	ODOT	0.85
I-5 Southbound/Elligsen Road	ODOT	0.85
I-5 Northbound/Diagonal Arterial	ODOT	0.75
I-5 Southbound/Diagonal Arterial	ODOT	0.75
I-5 Northbound/Day Road	ODOT	0.75
I-5 Southbound/Day Road	ODOT	0.75
Boones Ferry Road/Commerce Circle	ODOT	0.99
Boones Ferry Road/Day Road	Washington County	0.99
Boones Ferry Road/Diagonal Arterial	Washington County	0.99
Boones Ferry Road/East-West Arterial	Washington County	0.99
Kinsman Road/Day Road	Washington County	0.99
Grahams Ferry Road/Day Road	Washington County	0.99
Grahams Ferry Road/Tonquin Road	Washington County	0.99
Grahams Ferry Road/East-West Arterial	Washington County	0.99
124th Avenue/Tonquin Road	Washington County	0.99
124th Avenue/East-West Arterial	Washington County	0.99

Sources: Oregon Highway Plan, 1999 (amended 2006), Maximum Volume-to-Capacity Ratios Inside Portland Metro Area, Table 7, p. 84; and Policy 1F, p. 79. ODOT Highway Design Manual, 2003. Washington County Engrossed Ordinance No. 588, Exhibit 8, Table 5: Washington County Motor Vehicle Performance Measures, October 9, 2002.

Chapter 3: Development of Alternatives

This chapter documents the process for developing and refining alternative alignments for roadway connections from the 124th Avenue extension east to Boones Ferry Road and for alternative I-5 overcrossing and interchange improvement options.

Design Workshop

Early in the process, a design workshop was held to bring together technical staff from the participating jurisdictions to:

- Review available information about existing and future conditions in the area
- Develop concepts and consider phasing for an east-west connection between the Southwest 124th Avenue extension project and SW Boones Ferry Road consistent with IGA (taking into account alignments and cross sections planned as part of the Southwest 124th Avenue extension project)
- Develop concepts and consider phasing for addressing potential I-5/SW Elligsen Road interchange improvements consistent with the IGA

The design workshop also provided a forum for the multi-agency group to discuss and come to consensus on guiding considerations, methods, and assumptions (described in Chapter 2 of this report) that informed the development of the alternatives. The workshop also included a review of relevant policies, such as County access spacing standards and ODOT interchange standards.

Figure 15: Developing alternatives at the design workshop

Information pertaining to many of the key considerations was provided at the meeting, with maps showing aerial, contour, environmental resource, and tax lot data. Figure 16 shows an example of the data used by the design workshop group to help guide the development of alternatives.

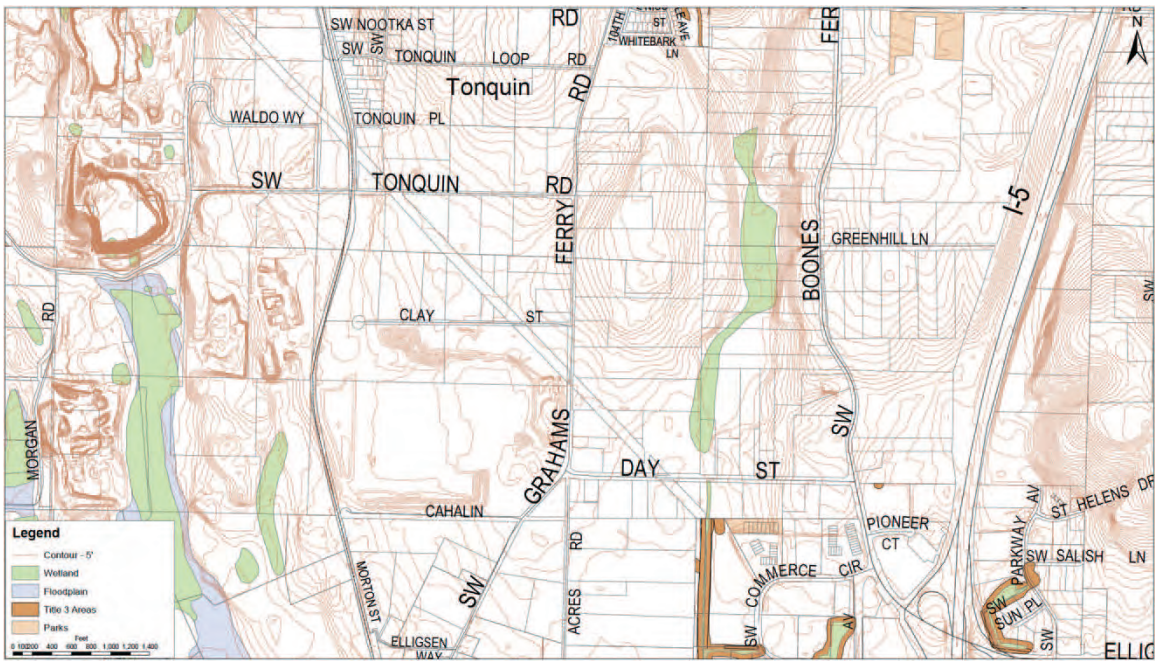


Figure 16: Contours, Environmental Constraints, and Tax Lots in the Planning Area

Particular topographical and environmental constraints were called out during the workshop, including:

- Wetland/creek area and stormwater issues west of I-5
- Shallow bedrock east of I-5
- Major constraints in the built environment, such as a railroad and two power line corridors

In addition, roadway capacity needs were discussed. The workshop group agreed that a new 5-lane facility should have design speed and access spacing characteristics appropriate to provide a capacity of 2,400 vehicles per hour (vph) in each direction based on peak hour need. The following capacities were assumed for other facility types in the Basalt Creek area network:

- 3-lane collector: 900-1200 vph each direction
- 2-lane collector: 700 vph each direction
- 2-lane freeway off-ramp: 1400 vph
- Metered on-ramp to freeway: 900-1400 vph

An initial analysis of capacity needs in the planning area, using the Metro travel demand model under 2035 RTP land use conditions, revealed vehicle demand as shown in Figure 17. The figure shows demands in the peak direction. Since Basalt Creek and surrounding areas are assumed to

be employment centers, the peak direction tends to be away from I-5 in the AM peak hour, and toward I-5 in the PM peak hour.

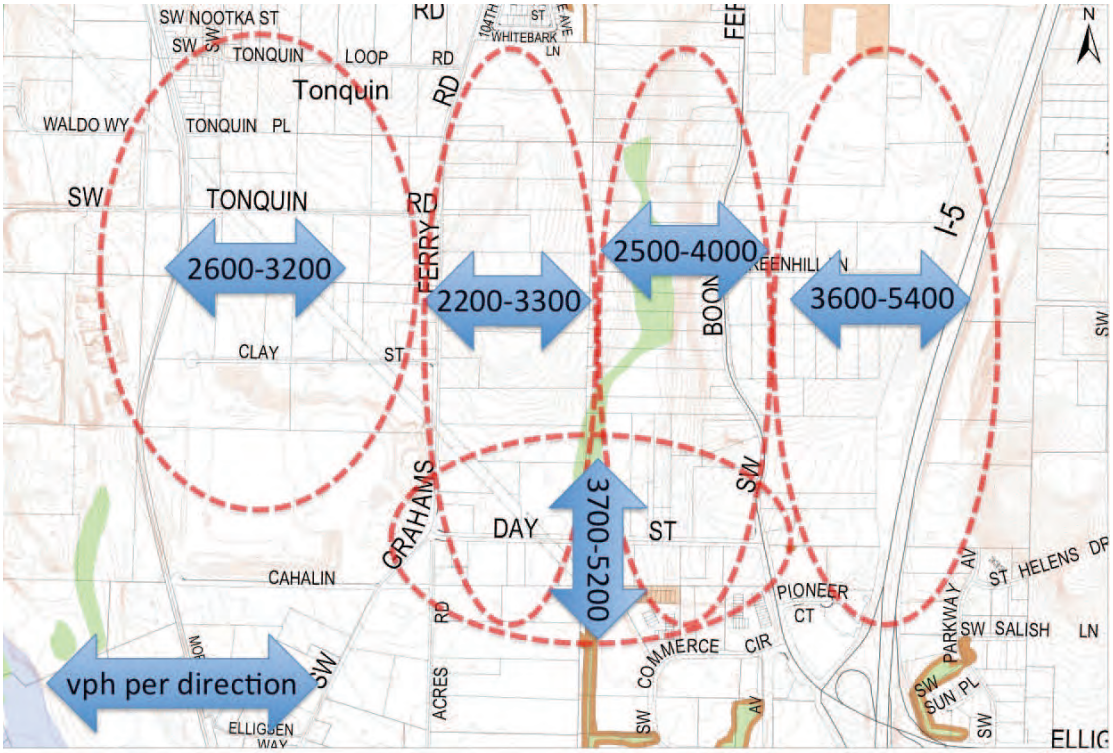


Figure 17: Vehicular capacity needs within the Basalt Creek area (2035 RTP conditions)

This assessment used a screen-line analysis to determine east-west capacity needs between the future north-south facilities (Southwest 124th Avenue extension, Grahams Ferry Road, Kinsman Road, Boones Ferry Road, and I-5) as well as north-south demands across Day Road. Analysis suggested that, with a forecast demand of 2,600 to 3,200 vehicles, a single 5-lane east-west arterial would be insufficient to accommodate needs between the Southwest 124th Avenue extension and Grahams Ferry Road.

After being given all of the information on physical constraints and future traffic needs, the workshop attendees broke into groups to design roadway concepts for the connection from the 124th Avenue Extension to Boones Ferry Road. Three concepts were put forward for further assessment in this process:

- Improve Existing
- Diagonal Alignment
- East-West Alignment

These concepts were further assessed for engineering and traffic following the design workshop. The three concepts are described in the following sections.

Improve Existing

This concept proposed by the design workshop group does not add any new facilities, and instead it relies on widening existing facilities in order to meet future needs. The primary future connection between the Southwest 124th Avenue extension and the I-5 interchange area is assumed to be provided by a continuous five-lane facility on the alignment of Tonquin Road, Grahams Ferry Road, and Day Road, with improved geometrics through curves. Figure 18 shows a preliminary alignment for the Improve Existing concept.

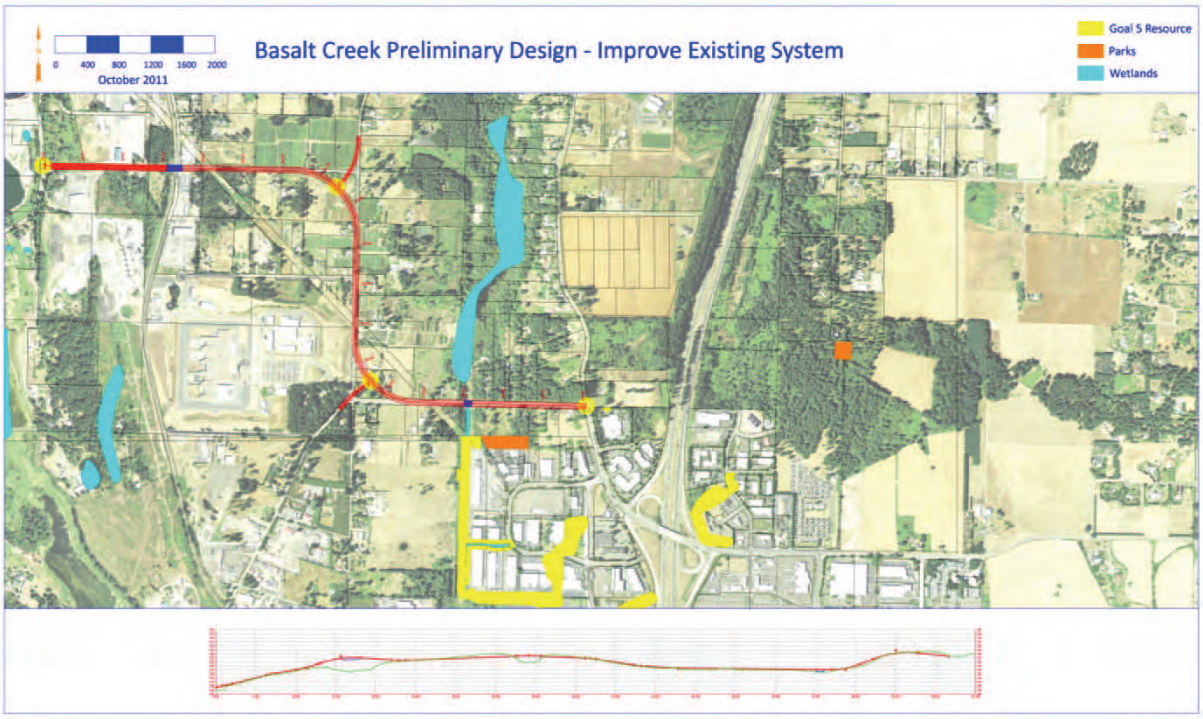


Figure 18 Improve Existing concept with Overcrossing to Parkway Center option

The Improve Existing concept creates 45 mph curves at the existing Tonquin Road/Grahams Ferry Road and Grahams Ferry Road/Day Road intersections. Grahams Ferry Road to the north and south of this main east-west corridor is realigned to "T" into the corridor at the curves.

The Improve Existing concept also accommodates a future overcrossing of I-5 on the Day Road alignment, with options for connection to Elligsen Road at either Parkway Center Drive or Canyon Creek Road. Also, this concept is compatible with a future split diamond interchange improvement on I-5, with collector-distributor roads connecting between the Day Road extension and Elligsen Road.

Diagonal Alignment

This concept adds a new diagonally aligned facility between the Tonquin Road/Grahams Ferry Road intersection and Boones Ferry Road. This creates a future connection from the Southwest 124th Avenue extension to the I-5 interchange that is provided by a 5-lane Tonquin Road to the north, the new 5-lane diagonal facility, and a 5-lane Boones Ferry Road south of the diagonal facility. Figure 19 shows a preliminary alignment for this concept.

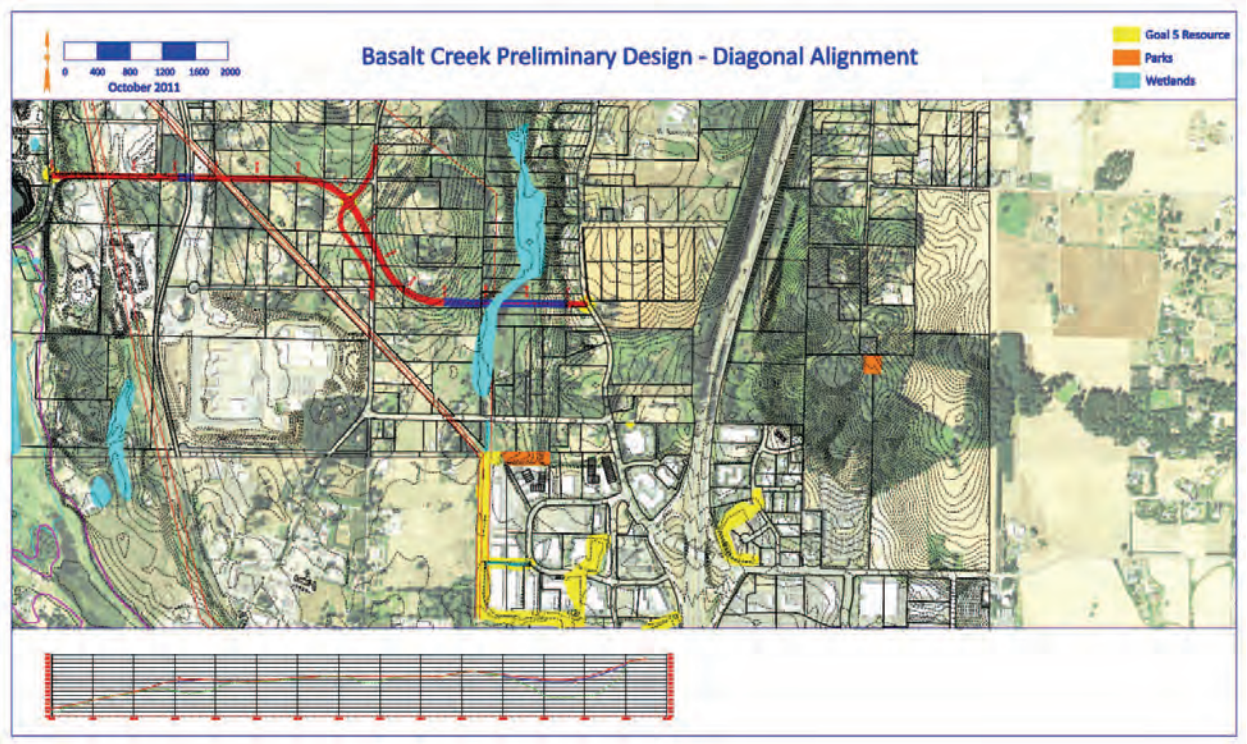


Figure 19: Diagonal Alignment concept

The Diagonal Alignment includes an overcrossing of the wetland between Grahams Ferry Road and Boones Ferry Road. Also, a realignment of Grahams Ferry Road is needed in order to provide a geometrically viable intersection where it meets the diagonal facility.

The Diagonal Alignment concept accommodates a future overcrossing of I-5 on a diagonal alignment, with options for connecting to Elligsen Road at either Parkway Center Drive or Canyon Creek Road. Like the Improve Existing concept, the Diagonal Alignment is compatible with a future split diamond interchange improvement on I-5, with collector-distributor roads connecting between the Diagonal Alignment extension and Elligsen Road.

East-West Alignment

The East-West Alignment concept adds a new 5-lane east-west facility all the way from the 124th Avenue extension to Boones Ferry Road and widens Boones Ferry Road to five lanes between the new facility and Day Road. Tonquin Road is retained as a future three-lane facility. Figure 20 shows a preliminary alignment for this concept.

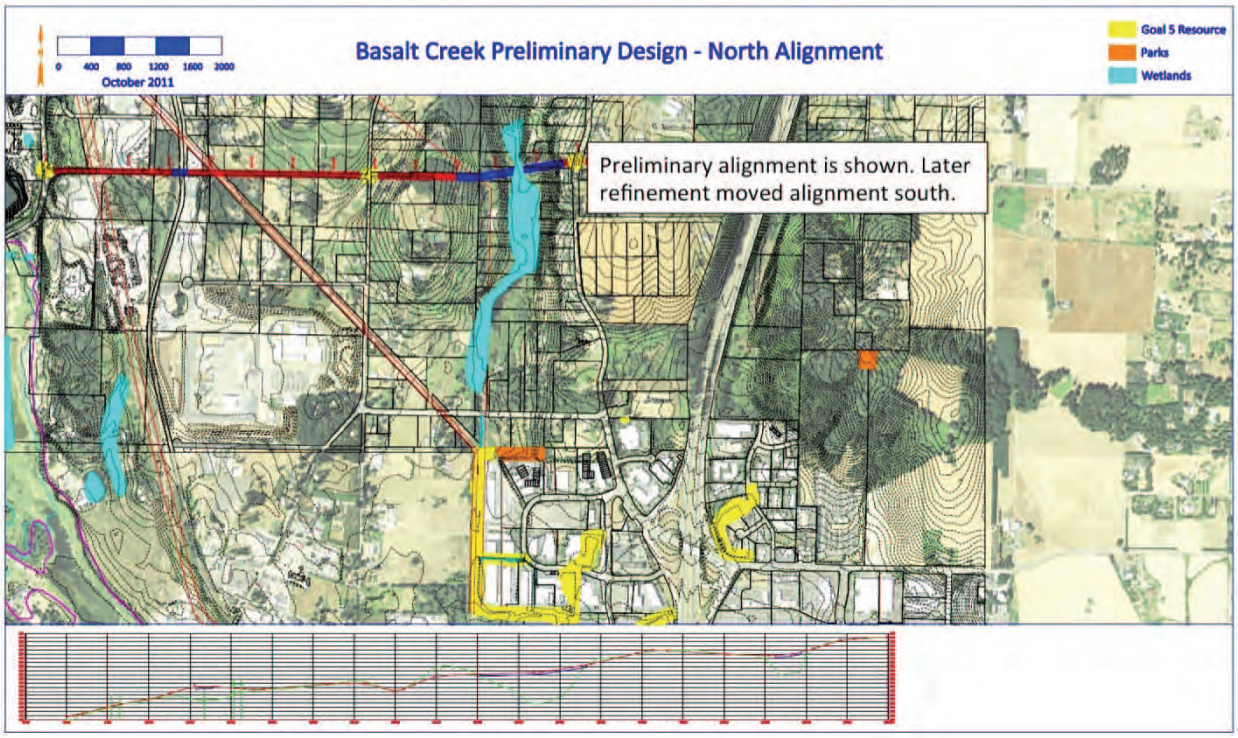


Figure 20: East-West Alignment concept

Like the Diagonal Alignment concept, the East-West Alignment provides a new crossing of the wetland between Grahams Ferry Road and Boones Ferry Road. Preliminary sketches and engineering work have focused on an alignment that runs north of Tonquin Road, but the concept of the East-West Alignment is also valid on the south side of Tonquin Road.

The East-West Alignment concept allows for the most options for interfacing with I-5. It retains the same Day Road overcrossing or future split diamond interchange as the Improve Existing option. Also, this alignment concept supports an additional I-5 overcrossing, which extends the east-west arterial alignment over I-5. In preliminary drawings, this overcrossing landed on the east side of I-5 at the Frobase Road alignment. Future concepts, described later in the report, place the East-West facility and overcrossing farther south.

Corridor Capacity and Interim Year Performance

In order to narrow alternatives for further study, preliminary traffic analysis was performed on the three roadway framework concepts. At this stage, traffic performance was assessed for:

- 2030 with growth only inside the existing UGB
- 2035 with growth only inside the existing UGB
- 2035 with full RTP growth, including urban reserves

These years and land use scenarios were selected to assess the adequacy of the concepts through the planning horizon year and determine which I-5 treatments would be needed to support the concepts in future years. The following sections document the preliminary traffic analysis that was presented to the multi-agency group.

Improve Existing

The Improve Existing concept begins to experience traffic congestion near the I-5/Elligsen Road interchange in 2030 and corridor-wide congestion in 2035. Figures 21 through 24 show this concept's performance over the analysis years.

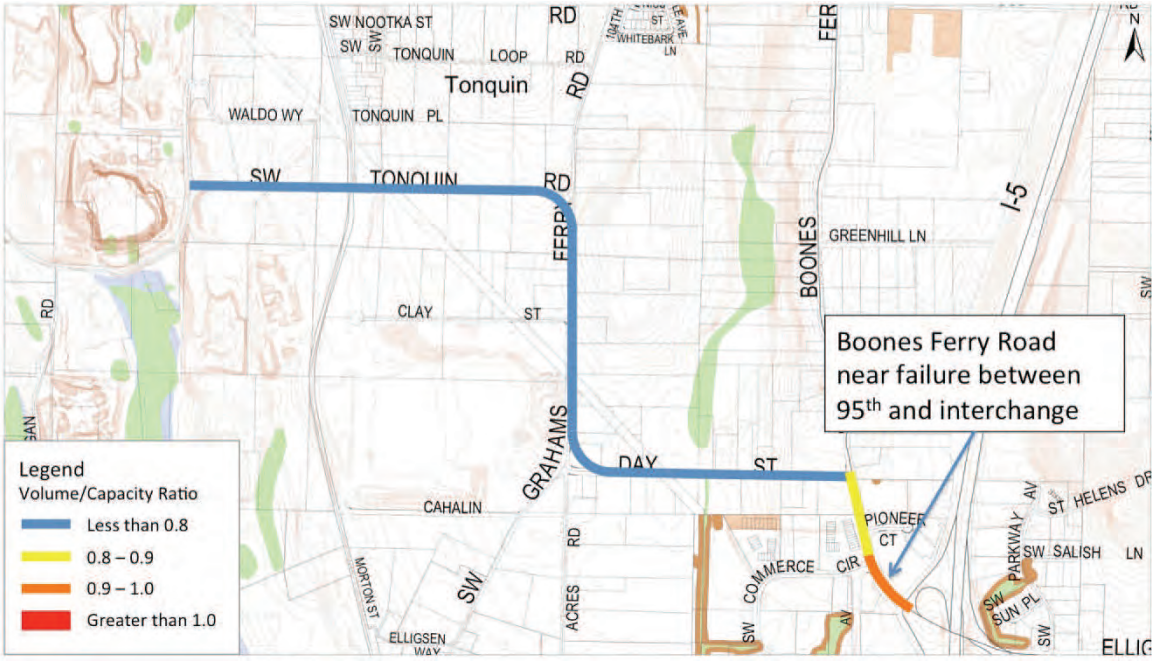


Figure 21: Improve Existing concept, 2030 PM Peak corridor-level performance

With 2030 growth, the five-lane corridor performs well all the way to the Boones Ferry Road/Day Road intersection, but operations in the intersection area near the I-5 southbound ramps begin to approach failure.

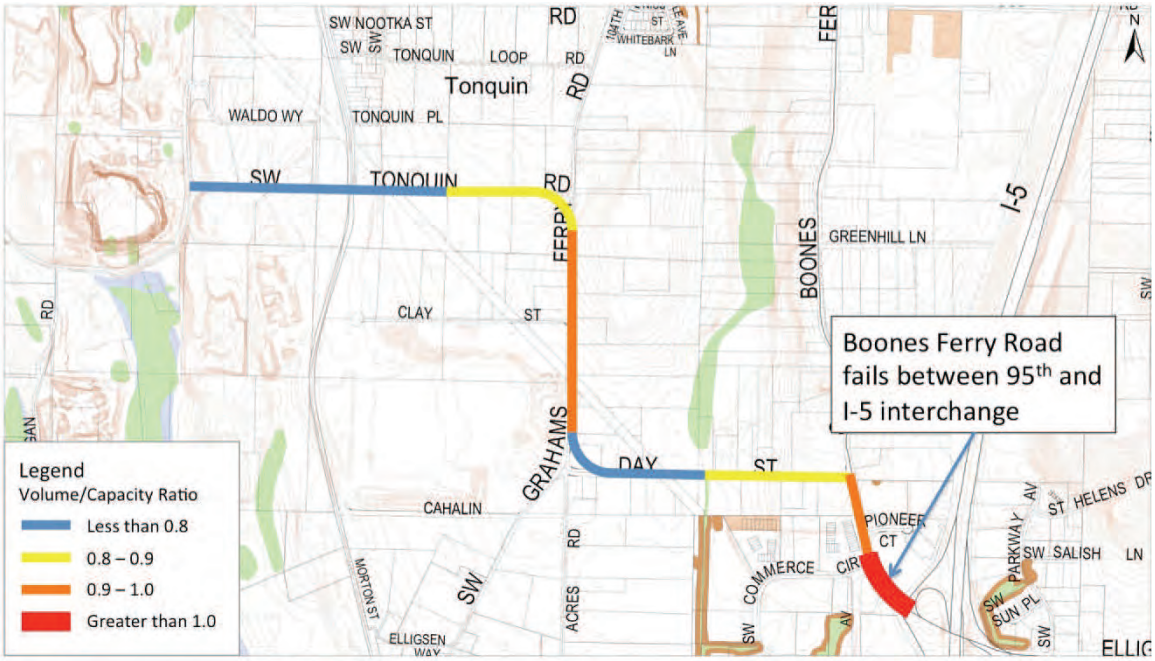


Figure 22: Improve Existing concept, 2035 (UGB) PM Peak corridor-level performance

In the 2035 scenario with growth inside the UGB only, operations get worse along the five-lane corridor, and the corridor V/C ratio exceeds 1.0 near the interchange even assuming additional I-5 southbound ramp capacity. To test if acceptable operations could be achieved with the Improve Existing concept under the 2035 UGB scenario, the Day Road overcrossing was added as shown in Figure 23.

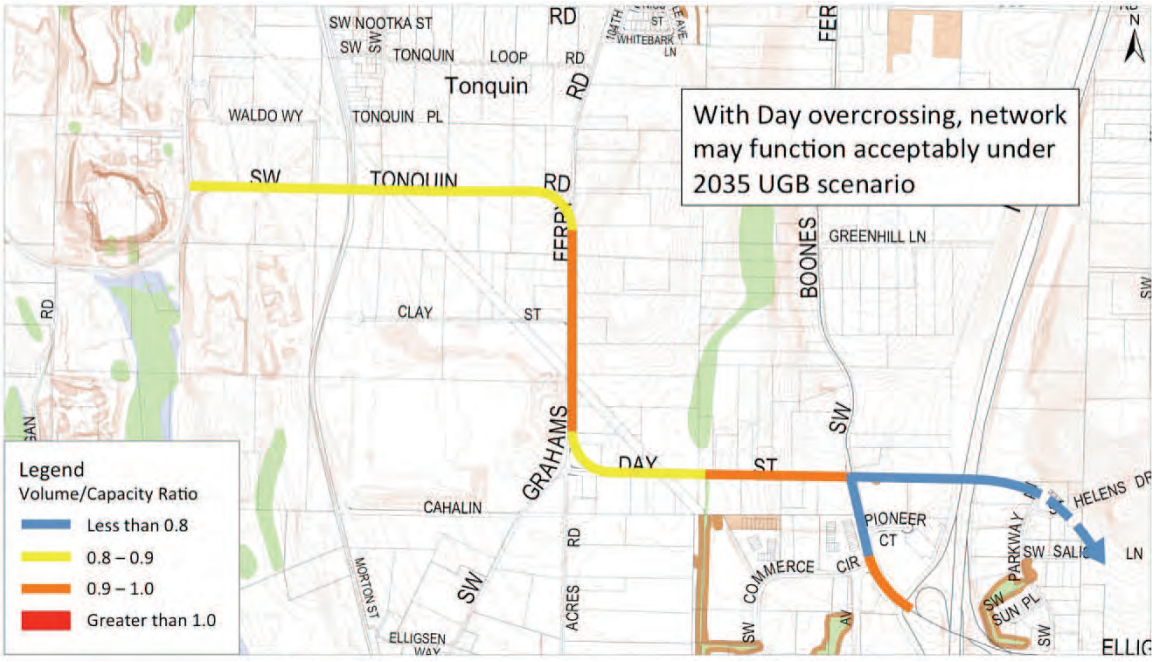


Figure 23: Improve Existing concept with Day Overcrossing, 2035 (UGB) PM Peak corridor-level performance

Adding the Day Road overcrossing to the Improve Existing concept improves performance around the I-5 interchange, allowing the network to perform adequately under the 2035 UGB scenario. Figure 24 shows how this same set of improvements performs under 2035 RTP conditions, which assume growth in urban reserves.

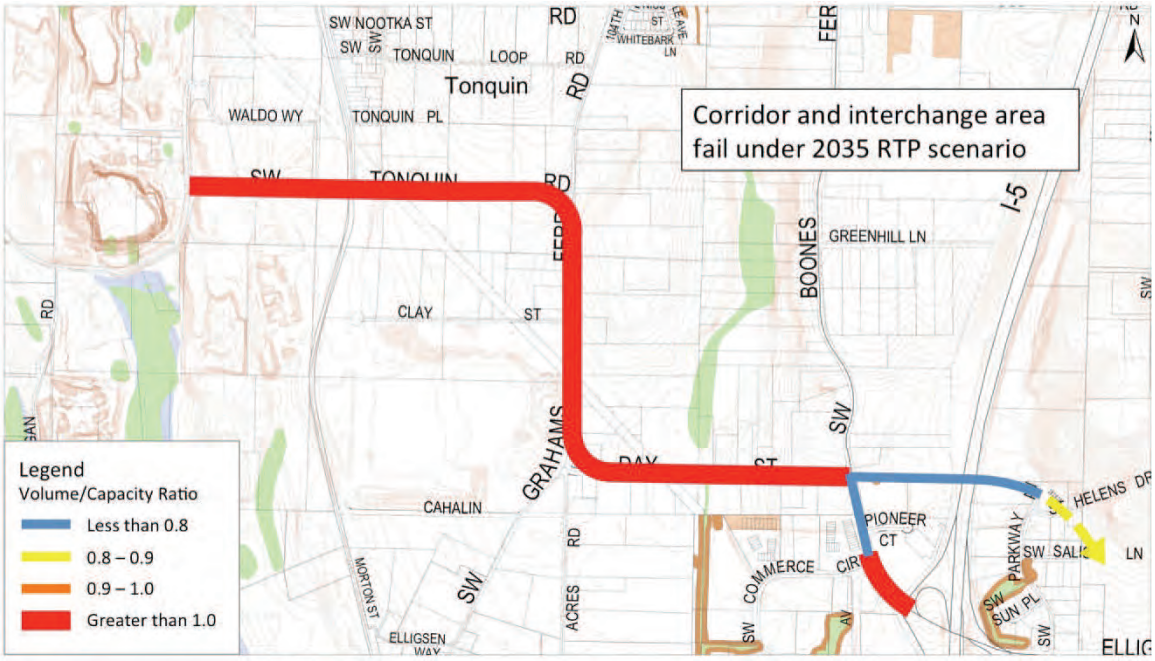


Figure 24: Improve Existing concept with Day Overcrossing, 2035 (RTP) PM peak corridor-level performance

The growth in vehicle trips related to RTP land use assumptions causes failure, not only at the I-5 interchange but along the entire five-lane corridor. Further interchange improvements, such as a split diamond, were not considered in this analysis since the five-lane corridor from the 124th Avenue extension to the interchange area is clearly insufficient to accommodate future needs regardless of interchange capacity.

Improve Existing concept removed from further consideration

Given the analysis above, the multi-agency group agreed to remove the Improve Existing concept from further consideration. Although no further technical analysis was performed on this concept, results from this screening-level assessment are included in the evaluation matrix in Chapter 4 to provide a comparison among alternatives.

Diagonal Alignment

The Diagonal Alignment concept functions acceptably under the 2030 scenario, requires interchange improvements to meet capacity needs in the 2035 UGB scenario, and appears to

perform inadequately under 2035 RTP land use conditions. Figures 25 through 28 show this concept's performance over the 2035 UGB and RTP analysis years.

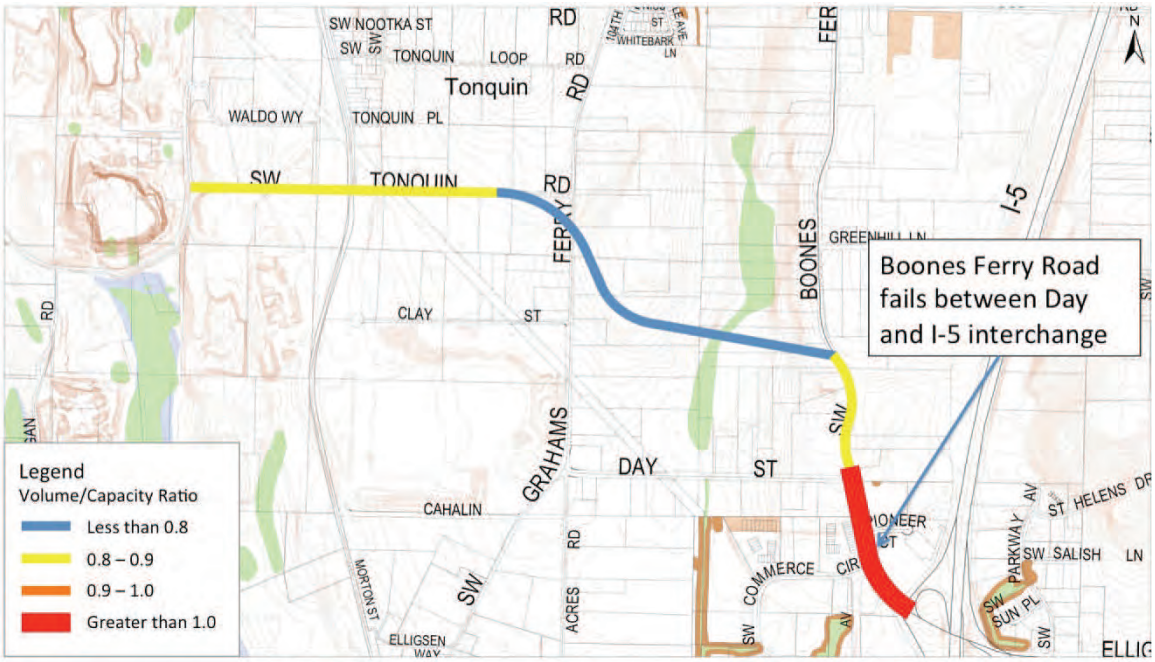


Figure 25: Diagonal Alignment concept, 2035 (UGB) PM Peak corridor-level performance

As with the Improve Existing concept, the Diagonal Alignment functions acceptably under the 2030 scenario, but under 2035 UGB conditions the interchange area fails, even with increased capacity at the I-5 southbound ramp terminal. To test if acceptable operations could be achieved with this concept under the 2035 UGB scenario, a diagonally aligned overcrossing was added as shown in Figure 26.

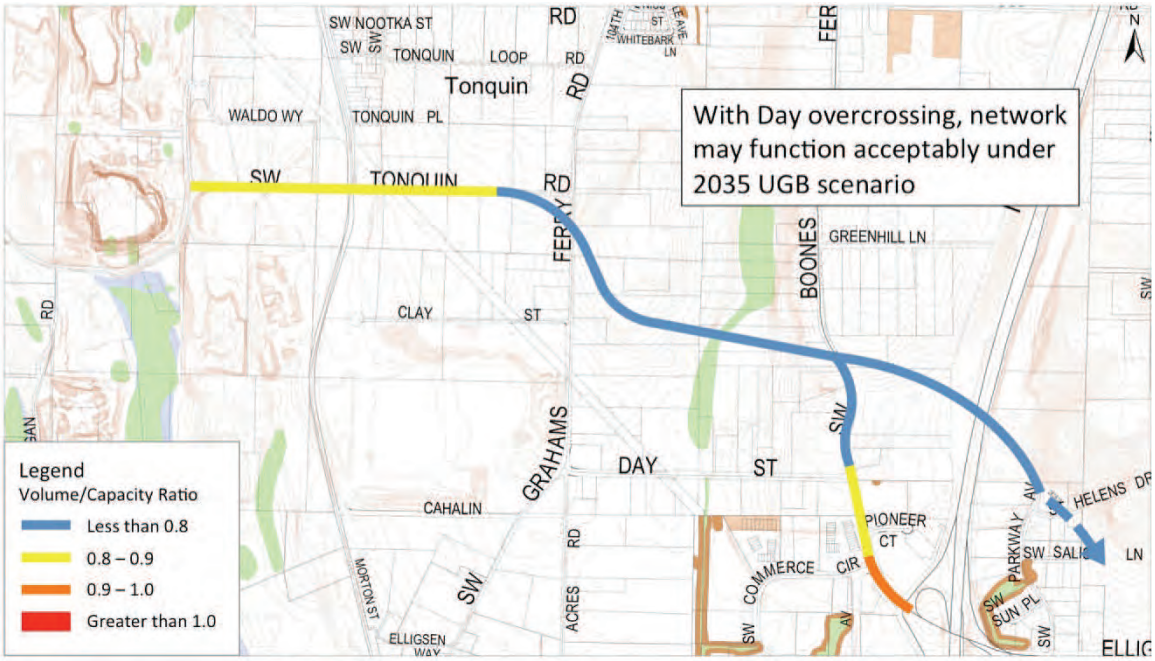


Figure 26: Diagonal Alignment concept with overcrossing, 2035 (UGB) PM Peak corridor-level performance

Adding the Day Road overcrossing to the Diagonal Alignment concept improves performance around the interchange, allowing the entire network to perform acceptably under the 2035 UGB growth scenario. Figure 27 shows how this same set of improvements performs under 2035 RTP land use conditions, which assume growth in urban reserves.

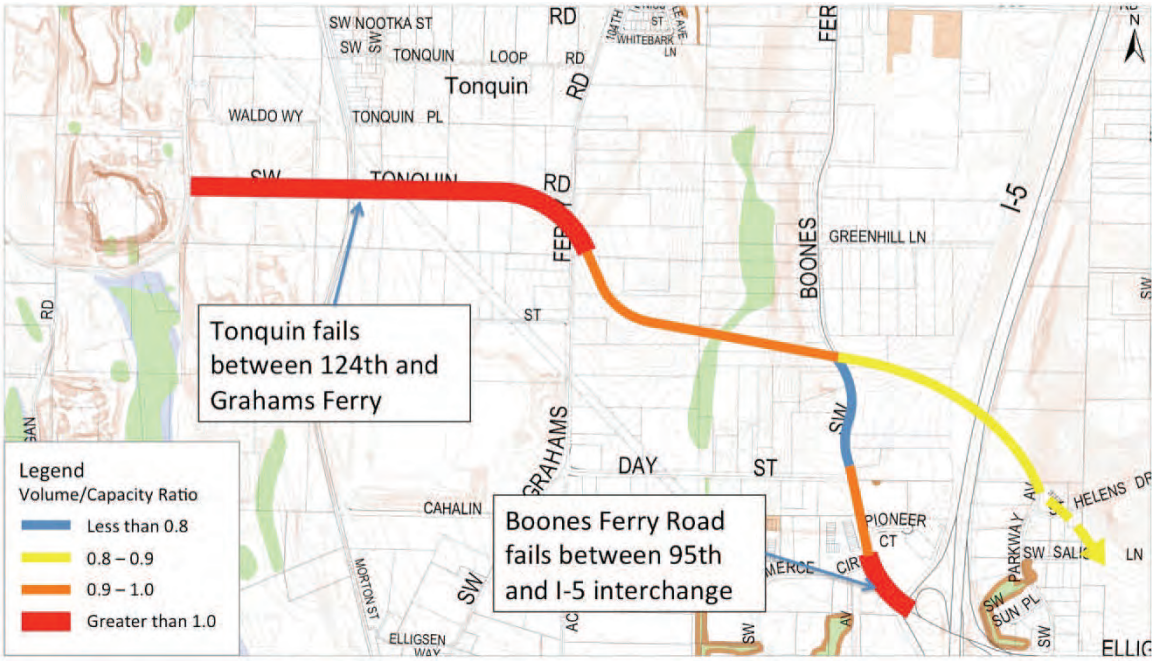


Figure 27: Diagonal Alignment concept with overcrossing, 2035 (RTP) PM Peak corridor-level performance

The growth in vehicle trips related to RTP land use assumptions causes failure on the 5-lane Tonquin Road segment of the corridor under this concept, as well as in the interchange area. An additional 2035 RTP scenario was analyzed to see if adding a split diamond interchange would improve this concept's operation, with results shown in Figure 28.

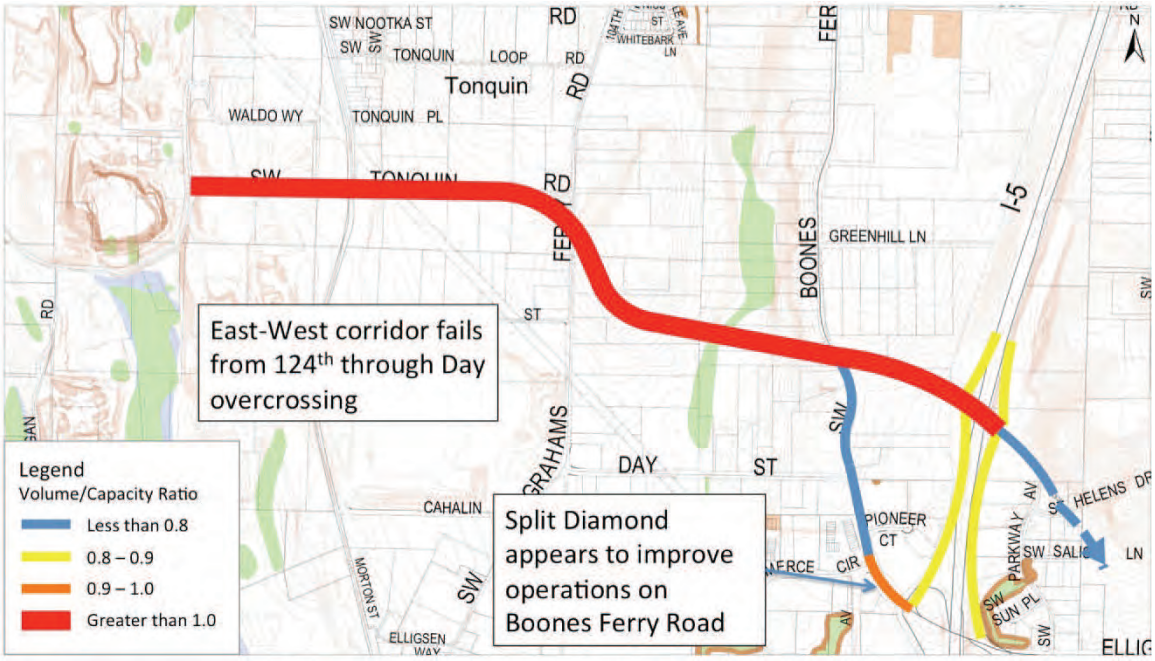


Figure 28: Diagonal Alignment concept with split diamond, 2035 (RTP) PM Peak corridor-level performance

Introduction of the split diamond interchange improves operations on Boones Ferry Road where it approaches the I-5 southbound ramp terminal, but creates operational issues at the north end of the split diamond. The entire east-west corridor, from the Southwest 124th Avenue extension to the interchange, operates over capacity.

Despite this preliminary traffic assessment, the multi-agency group wished to retain this option for more detailed engineering and traffic analysis, which is provided in Chapter 4 of this report.

East-West Alignment

The East-West Alignment concept functions acceptably under the 2030 scenario, requires a new overcrossing at I-5 to meet capacity needs in the 2035 UGB scenario, and requires a second overcrossing at I-5 in order to function adequately under 2035 RTP land use conditions. Figures 29 through 33 show this concept's performance over the analysis years. For this level of analysis, the East-West Alignment was assumed to be along Tonquin Place. **The more detailed analysis provided in Chapter 4 of this report places this alignment south of Tonquin Road, roughly aligned with Greenhill Road.**

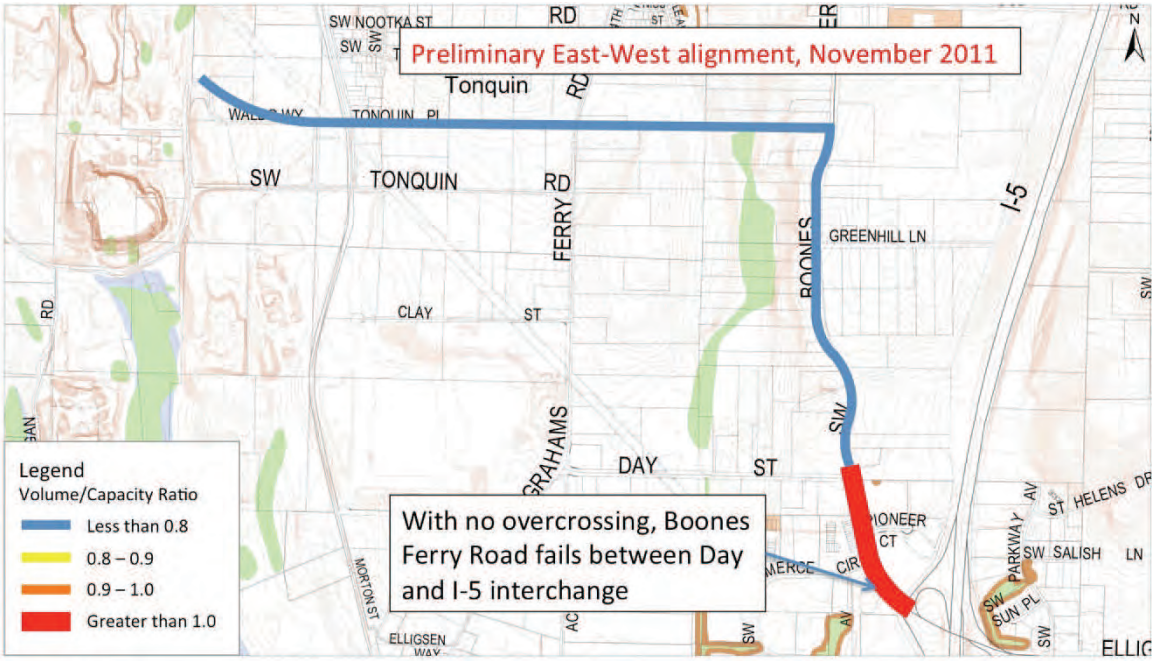


Figure 29: East-West Alignment concept, 2035 (UGB) PM Peak corridor-level performance

Like the other two concepts, the East-West Alignment functions acceptably under the 2030 scenario, but under 2035 UGB conditions the interchange area fails, despite the assumption of increased capacity at the I-5 southbound ramp terminal. This indicates that a major improvement to the interchange is needed in the 2035 UGB scenario, so a new overcrossing on the Day Road alignment was added as shown in Figure 30.

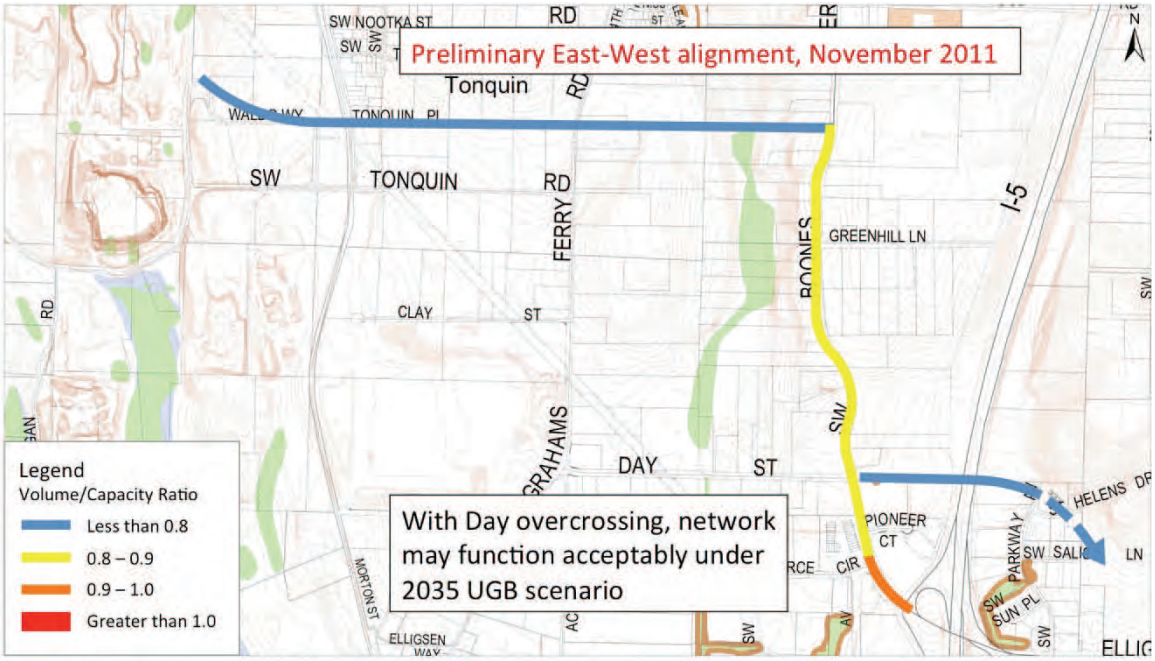


Figure 30: East-West Alignment concept with Day overcrossing, 2035 (UGB) PM Peak corridor-level performance

Addition of the Day Road overcrossing improves performance around the interchange, allowing the entire network to perform acceptably under the 2035 UGB growth scenario. Figure 31 shows how this same set of improvements performs under 2035 RTP land use conditions, which assume growth in urban reserves.

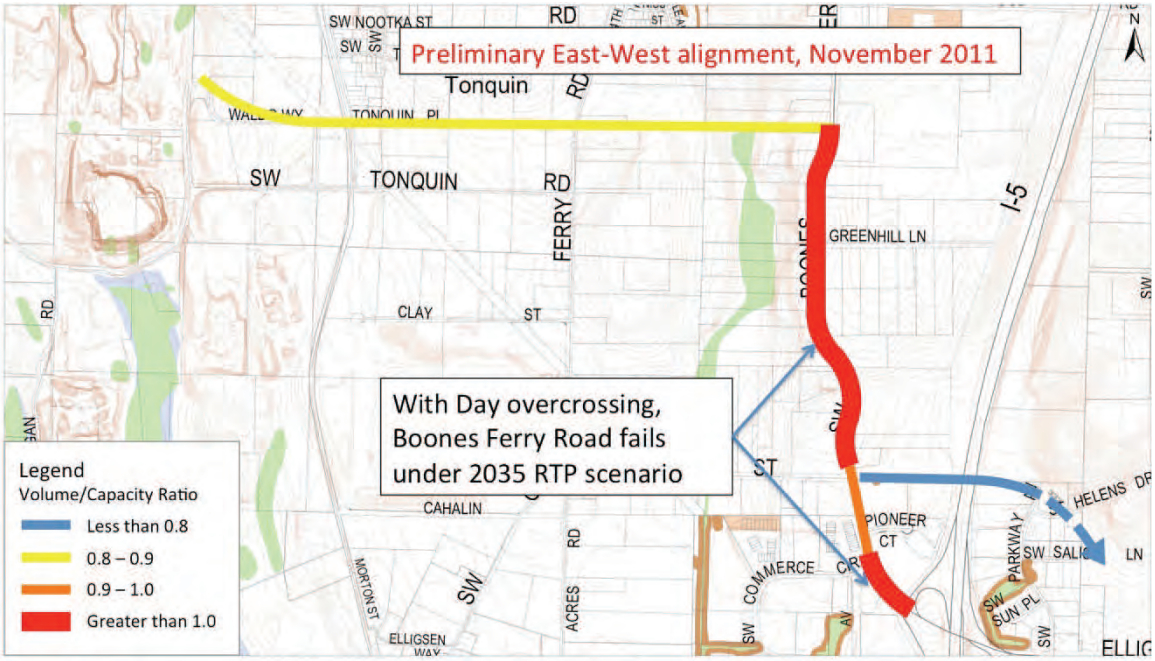


Figure 31: East-West Alignment concept with Day overcrossing, 2035 (RTP) PM Peak corridor-level performance

The east-west corridor performs adequately under 2035 RTP land use assumptions, but the growth in vehicle trips causes failure on the 5-lane Boones Ferry Road segment between the east-west arterial and Day Road as well as near the interchange. An additional 2035 RTP scenario was analyzed to see if adding an I-5 overcrossing on the East-West Alignment would improve this concept's operation, with results shown in Figure 32.

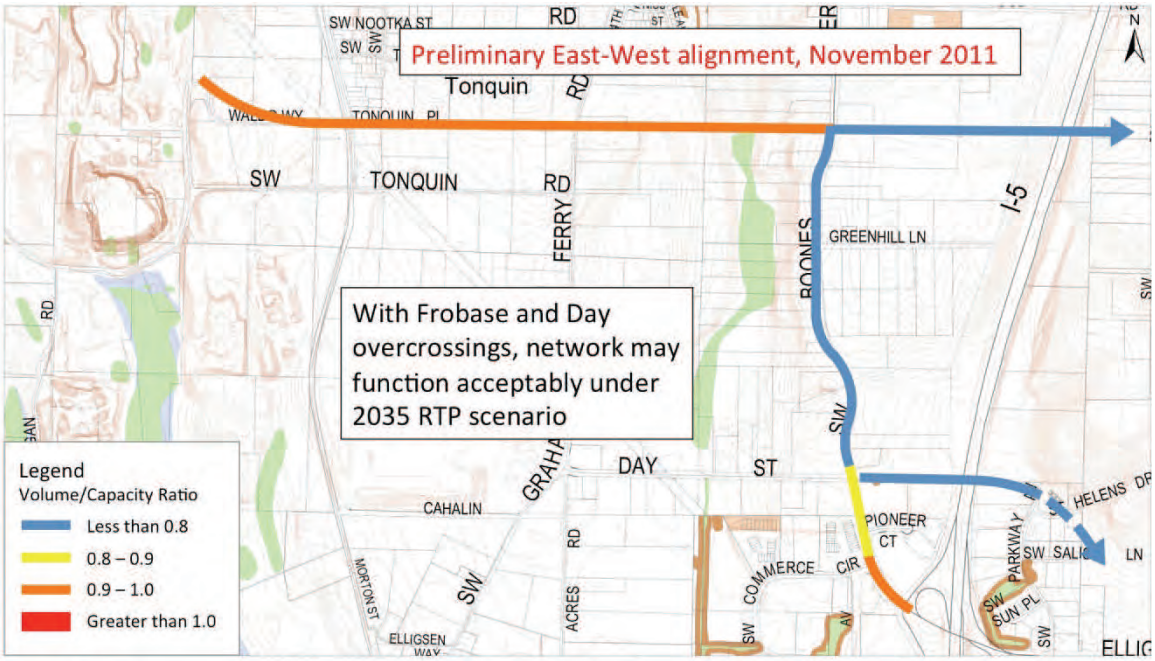


Figure 32: East-West Alignment concept with two overcrossings, 2035 (RTP) PM Peak corridor-level performance

The second overcrossing, shown above on the alignment of the east-west facility, provides a new connection for vehicles not destined for I-5 by pulling traffic away from the interchange area. This relieves congestion on Boones Ferry Road south of the new east-west facility and around the interchange. Note that both the Day Road and East-West overcrossings are needed to provide acceptable traffic performance.

An additional scenario for the East-West Alignment was analyzed with the two overcrossing improvements and a split diamond interchange. While the East-West concept appears to function acceptably without the split diamond, it is expected that the increased traffic from a future Southern Arterial connection to Highway 99W may necessitate further improvements beyond 2035. This scenario does not include any increased demand or further connections on the roadway network (besides the split diamond); it is provided in order to compare operations with and without a split diamond under identical conditions. Corridor performance under the split diamond option is shown in Figure 33.

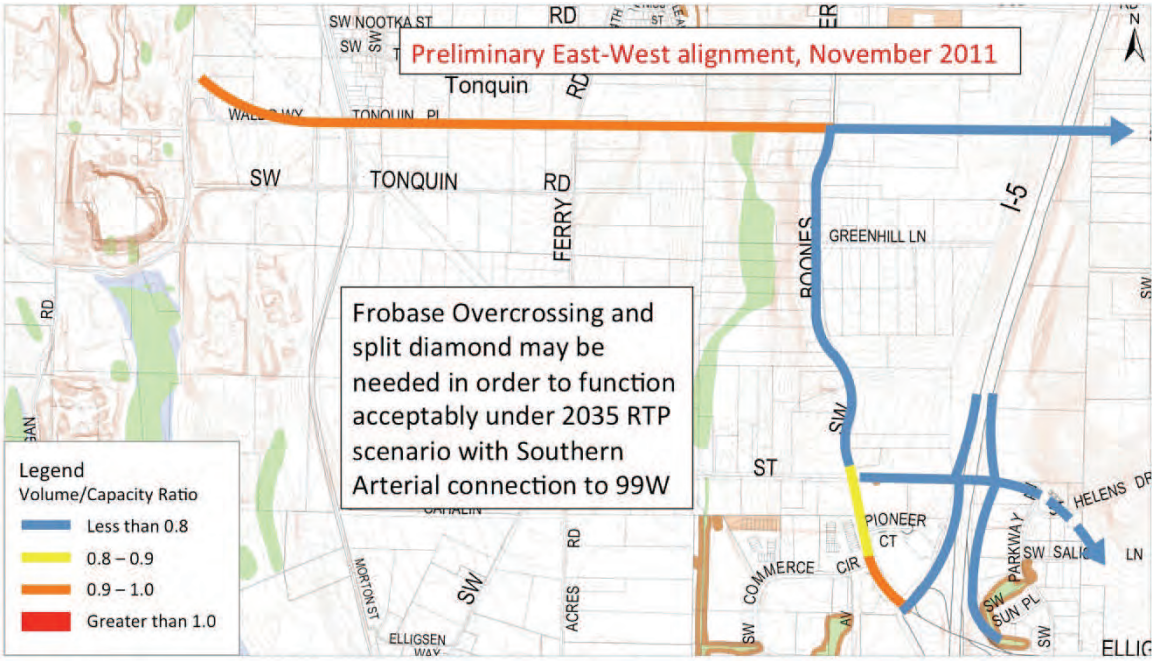


Figure 33: East-West Alignment concept with overcrossings and split diamond, 2035 (RTP) PM Peak hour corridor-level performance

At this level of analysis, the addition of a split diamond interchange has no substantial impact on network operations. The multi-agency group recommended carrying the East-West Alignment concept into further engineering and traffic assessment, which is provided in Chapter 4 of this report.

Chapter 4: Alternatives Evaluation

This chapter documents the evaluation of the two network concepts carried forward from alternatives development, including phasing years and I-5 interface concepts. Improve Existing was not carried forward as the multi-agency group felt that its poor traffic performance in 2035 was a fatal flaw. The two remaining concepts, the Diagonal Alignment and the East-West Alignment, were evaluated in the following areas:

- **Traffic Analysis.** At this phase of evaluation, the road network was analyzed at an intersection level to inform interim year phasing considerations and to better assess each alternative's ability to accommodate traffic demands in 2035.
- **Cost and Design Considerations.** This section presents refined cost estimates for the two alignment alternatives and the related I-5 interface options and describes environmental, topographical, and right-of-way issues considered as part of refining roadway alignments.
- **Travel Patterns.** The multi-agency group was also interested in considering impacts to freight movement, impacts to other transportation facilities near the Basalt Creek area, and the origins and destinations of vehicles using a new facility.
- **Public Involvement and Policy Considerations.** This section documents public involvement efforts and potential policy considerations to guide continued development of the roadway network, concept planning, and other land use considerations.

In addition, the project's Technical Working Group elected to add a third concept, the Diagonal Hybrid, to this phase of evaluation. A table summarizing the evaluation of these concepts is provided at the end of this chapter.

Traffic Analysis

Intersection level analysis was performed for the Diagonal Alignment and East-West Alignment concepts for interim and horizon years at both the corridor and intersection level. This is a more detailed analysis than the preliminary corridor-level analysis used to screen concepts in the alternatives development phase (see Chapter 3). The intersection-level analysis presents a clearer picture of operations in future years and provides guidance for project phasing and interim year intersection improvements such as additional turn lanes.

Intersection Operations

This analysis employs the methodology from the 2000 Highway Capacity Manual to estimate levels of service (LOS), average vehicle delays, and V/C ratios in order to evaluate operations at intersections.

An intersection's LOS is similar to a "report card" rating, based on average vehicle delay. LOS A, B, and C indicate conditions where vehicles can move freely. LOS D and E are progressively worse. For signalized intersections, LOS F represents conditions where the average delay for all vehicles through the intersection exceeds 80 seconds per vehicle, and it is generally correlated to long queues and delays. Under this operating condition, delay is highly variable, and it is difficult to estimate average delay accurately because congestion often extends into and is affected by adjacent intersections.

An intersection's V/C ratio takes into account the total volume entering an intersection and compares it to the overall capacity at that intersection to determine a ratio on a scale of 0.0 to 1.0. As the V/C ratio comes closer to 1.0, the intersection becomes more congested and has longer queues and higher delay. As stated in Chapter 2, study area roadways are under the jurisdiction of Washington County and ODOT, and both agencies use V/C ratio as their performance standard. All intersection performance documented below is compared to the standard of the relevant jurisdiction.

ODOT V/C standards for interchange ramp terminals (0.85 for existing terminals, 0.75 for new or reconstructed terminals) are lower than standards for other signalized intersections. For the phasing considerations in the analysis below, it is assumed that, in interim years, only the projects needed to bring ramp terminal operations under 1.00 V/C are part of phasing. This means that coordination with ODOT on V/C design exceptions would be needed as improvements are made.

Existing Conditions

PM peak hour traffic counts were collected at key intersections in the study area, and operations of these intersections were analyzed and compared to Washington County and ODOT mobility standards. Table 7 shows the results of this analysis for existing conditions.

Table 7: 2010 PM Peak Hour Intersection Operations

Intersection	V/C Standard	V/C	LOS	Delay (sec.)
I-5 Northbound/Elligsen Road	0.85	0.55	A	6.4
I-5 Southbound/Elligsen Road	0.85	0.60	C	27.8
Boones Ferry Road/Commerce Circle	0.99	0.84	C	29.5
Boones Ferry Road/Day Road	0.99	0.64	C	30.1
Grahams Ferry Road/Day Road	0.99	0.55	B	19.8
Grahams Ferry Road/Tonquin Road*	0.99	0.44	B	14.6
Waldo Way/Tonquin Road*	0.99	0.03	B	14.0

Source: 2010 traffic counts, 2012 DKS Associates traffic analysis
* Unsignalized intersection: V/C, LOS, and delay are for critical movement approach

All study area intersections meet performance standards under existing conditions. The intersection of Boones Ferry Road and Commerce Circle is the closest to approaching the mobility standard, but it still operates adequately.

Year 2020 Conditions

All concepts evaluated in this chapter require the same interim phasing by 2020. Projects added to the 2010 network to create the 2020 network are:

- 124th Avenue extension: new 3-lane facility between Tualatin-Sherwood Road and Tonquin Road
- Tonquin Road: widen to 3-lane facility between 124th Avenue extension and Grahams Ferry Road
- Grahams Ferry Road: widen to 3-lane facility between Tonquin Road and Day Road
- Boones Ferry Road: widen to 3-lane facility between Norwood Road and Day Road
- Boones Ferry Road/95th Avenue/Commerce Circle turn lane improvements
- New signalized intersections at 124th Avenue extension/Tonquin Road and Grahams Ferry Road/Tonquin Road

Figure 34 shows the performance of the network in 2020, including V/C ratios for links as well as at each signalized intersection.

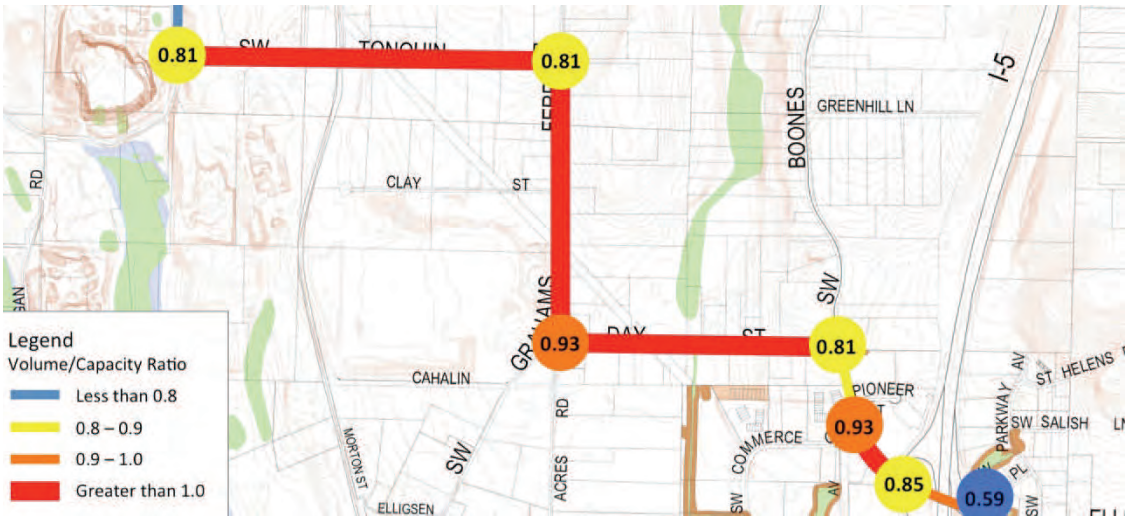


Figure 34: 2020 PM Peak Hour network traffic performance (phase applicable to both Diagonal and East-West)

In 2020, three roads – Tonquin Road, Grahams Ferry Road, and Day Road – form a three-lane corridor from the 124th Avenue extension to Boones Ferry Road, and provide access to I-5 at the Elligsen Road interchange. These three roads operate over capacity on a corridor basis, with volumes in the peak direction (toward I-5) exceeding the capacity typically seen on a three-lane arterial. However, all intersections on the network function under capacity. Operations of key intersections within the study area were analyzed and compared to County and ODOT mobility standards. Table 8 shows the results of this analysis for 2020.

Table 8: 2020 PM Peak Hour Intersection Operations

Intersection	V/C Standard	V/C	LOS	Delay (sec.)
I-5 Northbound/Elligsen Road	0.85	0.59	A	8.8
I-5 Southbound/Elligsen Road	0.85	0.85	D	35.1
Boones Ferry Road/95th Avenue	0.99	0.93	C	30.8
Boones Ferry Road/Day Road	0.99	0.81	C	22.4
Grahams Ferry Road/Day Road	0.99	0.93	D	37.7
Grahams Ferry Road/Tonquin Road	0.99	0.81	B	16.5
124th Avenue/Tonquin Road	0.99	0.81	B	17.5

Source: DKS Associates, 2012

The improvements included for phasing in 2020 are the minimum needed for the network to operate adequately. The intersections of I-5 southbound/Elligsen Road, Boones Ferry Road/95th Avenue, and Grahams Ferry Road/Day Road are near the mobility standard under this 2020 scenario, indicating the need for improvements by 2030. The following two sections present the phasing considerations and operational analysis for the Diagonal Alignment and East-West Alignment concepts. For the Diagonal Hybrid concept, evaluation considered improvements for

the full 2035 RTP growth scenario only, and did not look at phasing improvements for interim years.

Diagonal Alignment

For the Diagonal Alignment, the following improvements are needed beyond what is in the 2020 network for future interim and horizon years:

- 2030
  - 124th Avenue extension: widen to 5-lane facility between Tualatin-Sherwood Road and Tonquin Road
  - Tonquin Road: widen to 5-lane facility between 124th Avenue extension and Grahams Ferry Road
  - New diagonally aligned 5-lane facility between Grahams Ferry Road and Boones Ferry Road
  - Boones Ferry Road: widen to 5-lane facility between diagonal facility and Day Road
  - Kinsman Road extension: 3-lane facility between Ridder Road and Day Road
  - Day Road: widen to 5-lane facility between Kinsman Road and Boones Ferry Road
  - Boones Ferry Road/95th Avenue access control[10]
  - Additional turn pocket on I-5 southbound off-ramp where it intersects with Elligsen Road
- 2035 UGB Growth
  - New 4-lane overcrossing of I-5 connecting the new diagonal facility from Boones Ferry Road on the west side of the interchange to Elligsen Road on the east side of the interchange
- 2035 RTP Growth
  - Conversion of I-5/Elligsen Road interchange to split diamond using the diagonal overcrossing

Note that the split diamond improvement in the 2035 RTP scenario only adds significant benefits if combined with additional network capacity, such as widening the diagonal corridor to seven lanes and making major upgrades to intersections (e.g., potential grade-separated intersection forms). Figures 35 through 37 show the performance of the network for the interim and horizon years, including V/C ratios at each signalized intersection.

[10] For access control, the evaluation in this report initially assumed right-in/right-out access only at the Boones Ferry Road/95th Avenue intersection. Additional analysis showed that closing the minor east leg of the intersection and allowing all other movements would provide similar operational benefits. The decision on specific type of access control is deferred to concept planning or the Wilsonville TSP Update. For more information, see the section on access control for the Boones Ferry Road/95th Avenue intersection later in this chapter.

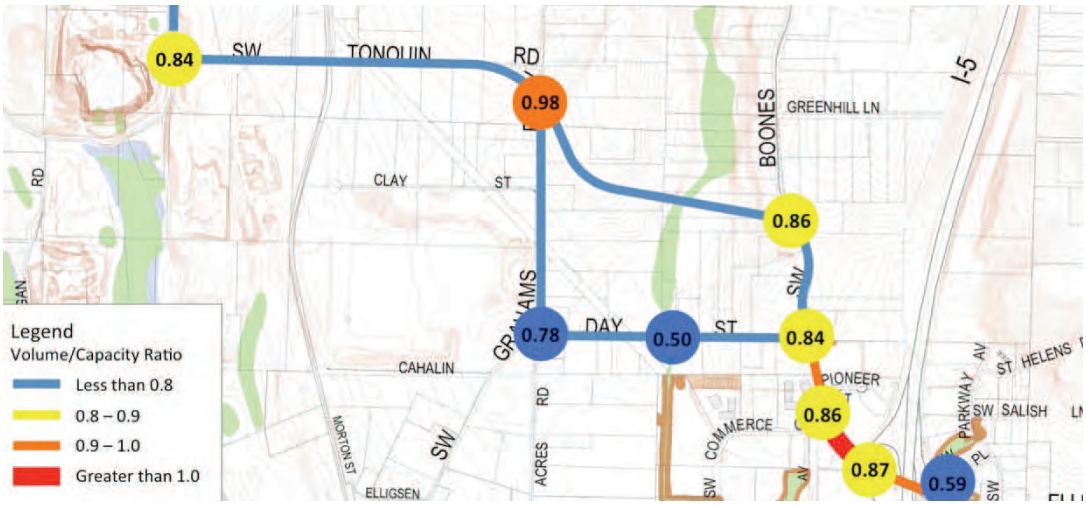


Figure 35: 2030 PM Peak Hour Network Operations, Diagonal Alignment

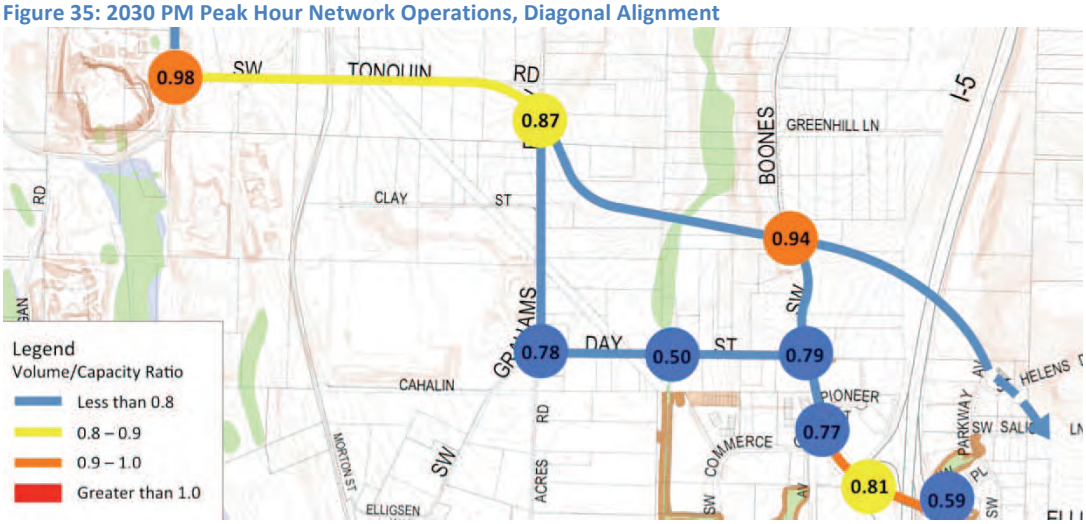


Figure 36: 2035 (UGB) PM Peak Hour Network Operations, Diagonal Alignment

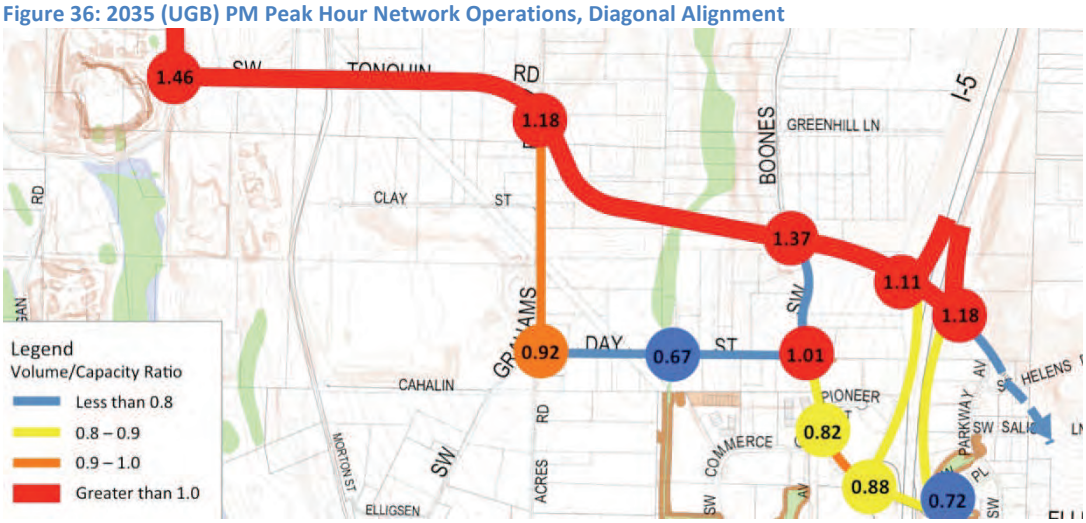


Figure 37: 2035 (RTP) PM Peak Hour Network Operations, Diagonal Alignment

Table 9 provides more detail on the operational analysis for 2030 and the two 2035 land use scenarios, including LOS and delay. Also, the relevant V/C standard for each intersection is given in order to assess the network's ability to meet mobility policy.

Table 9: Diagonal Alignment Future Year PM Peak Hour Operations

		2030			2035 UGB Growth			2035 RTP Growth		
Intersection	V/C Standard	V/C	LOS	Delay (sec)	V/C	LOS	Delay (sec)	V/C	LOS	Delay (sec)
I-5 Northbound/ Elligsen Road	0.85	0.59	B	12.7	0.66	B	10.2	0.72	B	19.2
I-5 Southbound/ Elligsen Road	0.85	**0.87**	C	32.1	0.76	C	29.2	**0.88**	C	25.2
I-5 Northbound/ Diagonal Arterial	0.75	-	-	-	-	-	-	**1.18**	E	77.3
I-5 Southbound/ Diagonal Arterial	0.75	-	-	-	-	-	-	**1.11**	E	71.4
Boones Ferry Road/ 95th Avenue	0.99	0.86	B	19.2	0.77	C	20.1	0.82	B	19.7
Boones Ferry Road/ Day Road	0.99	0.84	C	27.6	0.79	C	25.1	**1.01**	D	53.3
Boones Ferry Road/ Diagonal Arterial	0.99	0.86	C	23.4	0.94	D	51.5	**1.37**	F	145.2
Kinsman Road/ Day Road	0.99	0.50	B	17.1	0.52	A	6.8	0.67	C	20.7
Grahams Ferry Road/Day Road	0.99	0.78	C	23.8	0.83	C	32.6	0.92	D	42.8
Grahams Ferry Road/Tonquin Road	0.99	0.98	E	56.6	0.94	D	46.3	**1.18**	F	116.3
124th Avenue/ Tonquin Road	0.99	0.84	B	17.4	0.98	C	34.5	**1.46**	F	151.7

Source: DKS Associates, 2012
Bold V/C ratios exceed mobility standard

- The primary improvement for 2030 is the diagonal roadway between Grahams Ferry Road and Boones Ferry Road. This improvement reduces traffic volumes at the Grahams Ferry/Day intersection, which is near failure in 2020.
- Operations at Boones Ferry/95th Avenue are maintained at an acceptable level by introducing access control, simplifying signal operations, and providing adequate green time for 2030 demand.
- With turn lane improvements only, the V/C ratio at the I-5 southbound ramp terminal exceeds the mobility standard, but is still below 0.90.

Under 2035 UGB conditions, with turn lane improvements to the existing interchange only, the I-5 southbound ramp terminal fails. With the addition of the Diagonal overcrossing, vehicles traveling across I-5 are pulled away from the ramp terminals, allowing this intersection to meet ODOT's mobility standard. Other intersections on the network, such as 124th Avenue/Tonquin Road and Boones Ferry Road/Diagonal Arterial are close to capacity under 2035 UGB conditions.

Under 2035 RTP conditions, with a split diamond interchange and substantial capacity improvements at multiple intersections, analysis confirms that the Diagonal Alignment concept does not accommodate demand. In particular, the Tonquin Road/Diagonal Arterial corridor fails at all five signalized intersections in the study area.

East-West Alignment

For the East-West Alignment, the following improvements are needed beyond what is in the 2020 network for future interim and horizon years:

- 2030
  - 124th Avenue extension: widen to 5-lane facility between Tualatin-Sherwood Road and East-West facility
  - New east-west aligned 5-lane facility, south of Tonquin Road, between 124th Avenue extension and Boones Ferry Road
  - Boones Ferry Road: widen to 5-lane facility between east-west facility and Day Road
  - Kinsman Road extension: 3-lane facility between Ridder Road and Day Road
  - Day Road: widen to 5-lane facility between Kinsman Road and Boones Ferry Road
  - Boones Ferry Road/95th Avenue access control[11]
  - Additional turn pocket on I-5 southbound off-ramp where it intersects with Elligsen Road
- 2035 UGB Growth
  - New 4-lane overcrossing of I-5 on Day Road alignment from Boones Ferry Road on the west side of the interchange to Elligsen Road on the east side of the interchange
- 2035 RTP Growth
  - New 4-lane overcrossing of I-5 on east-west facility from Boones Ferry Road on the west side of I-5 to the area of Frobase Road on the east

Figures 38 through 40 show the performance of the network for the interim and horizon years, including V/C ratios at each signalized intersection.

[11] For access control, the evaluation in this report initially assumed right-in/right-out access only at the Boones Ferry Road/95th Avenue intersection. Additional analysis showed that closing the minor east leg of the intersection and allowing all other movements would provide similar operational benefits. The decision on specific type of access control is deferred to concept planning or the Wilsonville TSP Update. For more information, see the section on access control for the Boones Ferry Road/95th Avenue intersection later in this chapter.

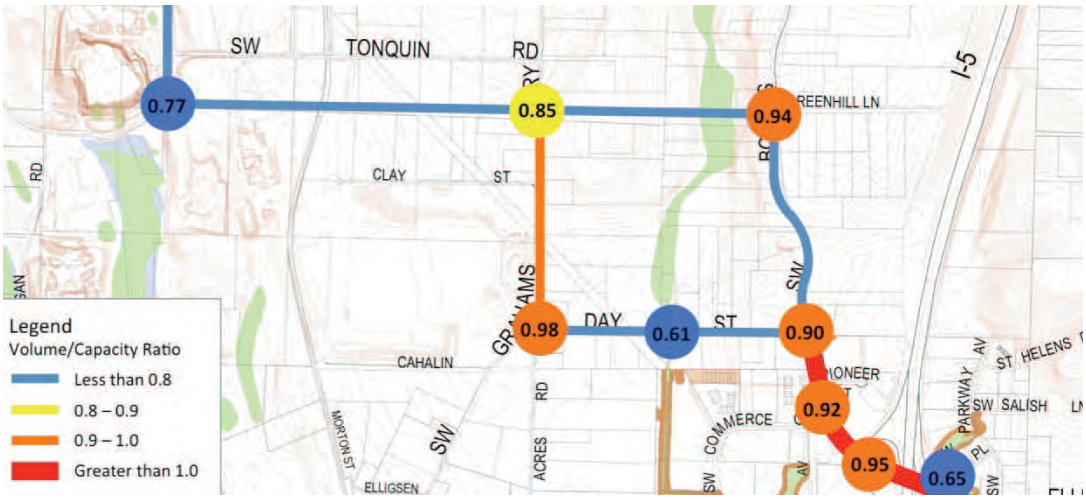


Figure 38: 2030 PM Peak Hour Network Operations, East-West Alignment

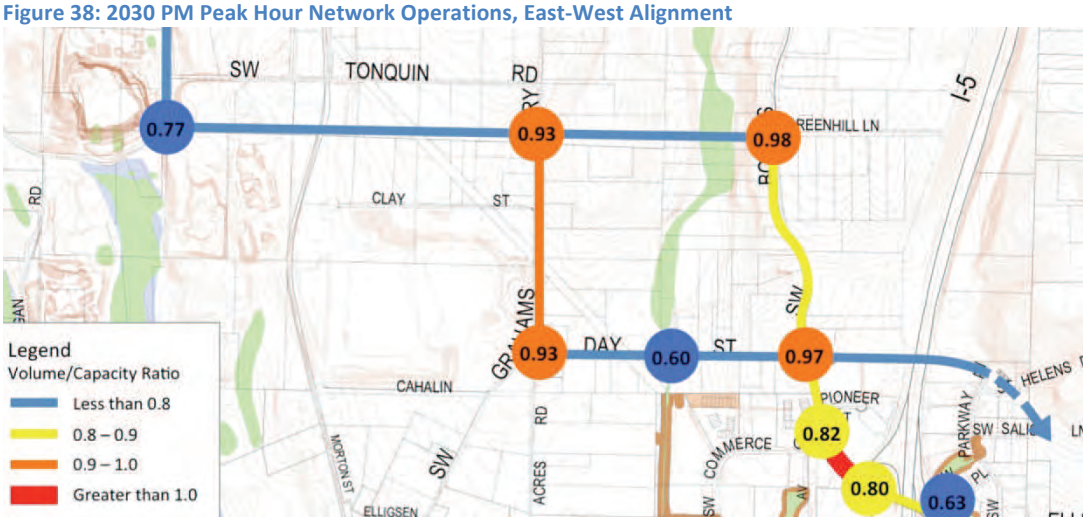


Figure 39: 2035 (UGB) PM Peak Hour Network Operations, East-West Alignment

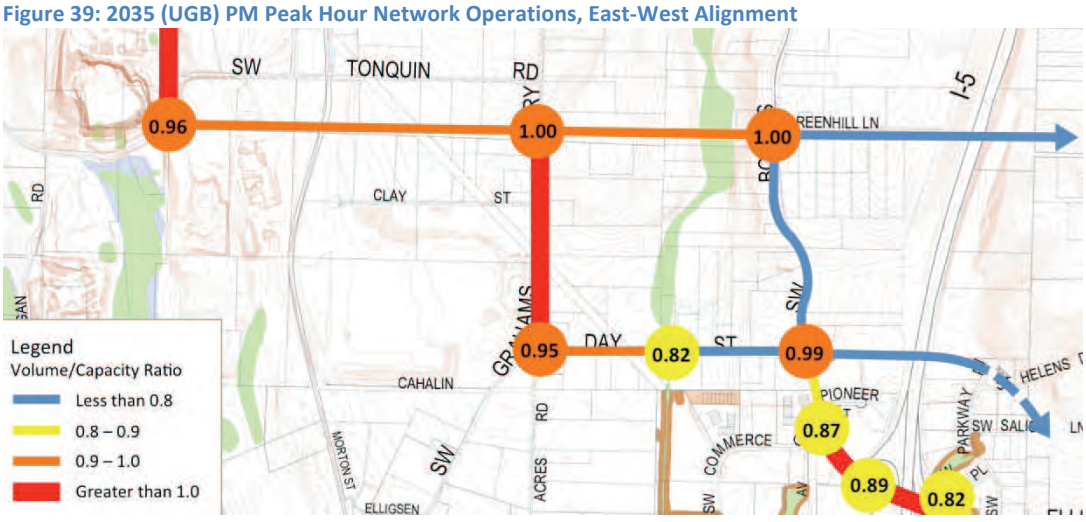


Figure 40: 2035 (RTP) PM Peak Hour Network Operations, East-West Alignment

Table 10 provides more detail on the operational analysis for 2030 and the two 2035 land use scenarios, including LOS and delay. Also, the relevant V/C standard for each intersection is given in order to assess the network's ability to meet mobility policy.

Table 10: East-West Alignment Future Year PM Peak Hour Operations

		2030			2035 UGB Growth			2035 RTP Growth		
Intersection	V/C Standard	V/C	LOS	Delay (sec)	V/C	LOS	Delay (sec)	V/C	LOS	Delay (sec)
I-5 Northbound/ Elligsen Road	0.85	0.65	B	12.4	0.63	B	11.9	0.82	B	12.1
I-5 Southbound/ Elligsen Road	0.85	**0.95**	C	28.6	0.80	C	23.2	**0.89**	C	27.7
Boones Ferry Road/ 95th Avenue	0.99	0.92	C	23.9	0.82	B	14.8	0.87	C	20.1
Boones Ferry Road/ Day Road	0.99	0.90	C	30.8	0.97	E	73.0	0.99	E	55.7
Boones Ferry Road/ East-West Arterial	0.99	0.94	D	37.9	0.98	D	45.1	**1.00**	E	63.3
Kinsman Road/ Day Road	0.99	0.61	B	19.9	0.60	C	20.1	0.82	C	28.7
Grahams Ferry Road/Day Road	0.99	0.98	D	44.6	0.93	D	37.7	0.95	D	36.7
Grahams Ferry Road/East-West Art.	0.99	0.85	D	52.4	0.93	E	57.5	**1.00**	E	64.1
124th Avenue/ East-West Arterial	0.99	0.77	C	27.1	0.77	C	27.5	0.96	D	45.8

Source: DKS Associates, 2012
Bold V/C ratios exceed mobility standard

2030 phasing for the East-West concept is similar to the phasing for the Diagonal concept, and it provides similar benefits. One major difference is that 2030 phasing for the East-West concept includes a new facility between the 124th Avenue extension and Grahams Ferry Road. The addition of this facility provides more east-west throughput in the study area, which increases volumes at the I-5/Elligsen Road interchange. As a result, the V/C ratio at the I-5 southbound ramp terminal in 2030 is higher than in the Diagonal concept, but still below 1.0.

In the 2035 UGB scenario the Day overcrossing is included, providing relief to the interchange ramp terminals similar to the Diagonal overcrossing improvement in its 2035 UGB scenario. Several intersections on this network approach capacity, particularly on Boones Ferry Road. This suggests the need for additional connectivity to reduce reliance on this north-south facility.

The 2035 RTP scenario includes an additional overcrossing on the east-west arterial alignment, connecting farther east to Stafford Road. This overcrossing improves network operations by

providing a way for vehicles to cross I-5 without traveling on Boones Ferry Road. The network operates near or at capacity under 2035 RTP conditions, particularly on the east-west facility itself, but performs significantly better than the Diagonal concept.

Diagonal Hybrid Alignment

Because one of the clear traffic advantages of the East-West concept is the inclusion of two facilities (Tonquin Road and the new East-West arterial) west of Grahams Ferry Road, public response indicated that a modified diagonal concept that included a second facility west of Grahams Ferry should be evaluated as well. The TWG requested evaluation of this concept, known as the Diagonal Hybrid, which is similar to the original Diagonal concept, but also integrates elements of the East West concept. Key differences from the original Diagonal concept include:

- A five-lane east-west facility is added between the SW 124th Avenue extension and Grahams Ferry Road, on the same alignment as the new facility in the East-West concept.
- Widening of Tonquin Road between SW 124th Avenue and Grahams Ferry Road is reduced, resulting in a three-lane facility.
- For the long term (2035 RTP scenario), the diagonally-aligned overcrossing connecting to Elligsen Road is included rather than a split diamond interchange.

The Diagonal Hybrid was evaluated under 2035 RTP conditions to provide a direct comparison to the Diagonal and East-West traffic performance under the same growth assumptions. Figure 41 shows corridor and intersection performance under 2035 RTP conditions, and Table 11 shows more detailed intersection analysis for this concept, compared to the East-West.

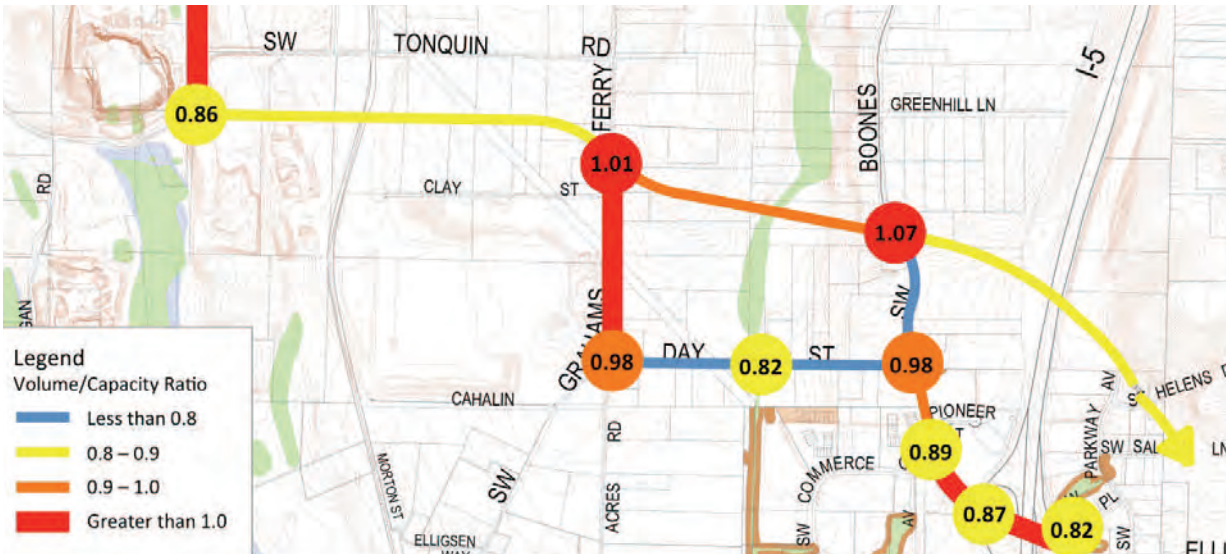


Figure 41: 2035 (RTP) PM Peak Hour Network Operations, Diagonal Hybrid

Table 11: Diagonal Hybrid Alignment comparison: 2035 RTP PM Peak Hour Operations

Intersection	V/C Standard	East-West			Diagonal Hybrid		
		V/C	LOS	Delay (sec)	V/C	LOS	Delay (sec)
I-5 Northbound/Elligsen Road	0.85	0.82	B	12.1	0.82	B	10.5
I-5 Southbound/Elligsen Road	0.85	**0.89**	C	27.7	**0.87**	C	31.6
Boones Ferry Road/95th Avenue	0.99	0.87	C	20.1	0.89	C	25.8
Boones Ferry Road/Day Road	0.99	0.99	E	55.7	0.98	D	44.5
Boones Ferry Road/East-West Arterial	0.99	**1.00**	E	63.3	**-**	-	-
Boones Ferry Road/Diagonal Arterial	0.99	**-**	-	-	**1.07**	E	60.5
Kinsman Road/Day Road	0.99	0.82	C	28.7	0.82	B	16.1
Grahams Ferry Road/Day Road	0.99	0.95	D	36.7	0.98	D	48.9
Grahams Ferry Road/East-West Arterial	0.99	**1.00**	E	64.1	**1.01**	E	55.2
124th Avenue/ East-West Arterial	0.99	0.96	D	45.8	0.86	D	38.1

Source: DKS Associates, 2012
Bold V/C ratios exceed mobility standard

The Diagonal Hybrid performs comparably to the East-West concept at most intersections, except for two that exceed capacity: Grahams Ferry Road/East-West Arterial (1.01 v/c) and Boones Ferry Road/Diagonal Arterial (1.07 v/c). Both of these are intersections along the main diagonal alignment, which carries more through traffic than the east-west alignment does in the East-West concept. Traffic is heavier on the diagonal arterial because it connects to the single overcrossing in that concept, while traffic in the East-West concept has the option of a second overcrossing accessed from Day Road. In particular, this concept focuses high traffic volumes on the Boones Ferry Road/Diagonal Arterial intersection, exceeding capacity even with double-left and double-right turn lanes assumed in the analysis.

The interchange ramp terminal intersections perform similarly in both concepts, as the Boones Ferry Road/Diagonal Arterial intersection acts as a bottleneck limiting traffic to and from the interchange. Note that the diagonal crossing of the wetlands is longer than an east-west crossing, adding significant cost (over $10 million) to the concept.

Additional Considerations for East-West Alternative

Split Diamond Interchange

For the 2035 RTP growth scenario, an additional phasing option was analyzed. This option includes all of the elements from the 2035 RTP growth scenario shown above, but also integrates the Day Road overcrossing into a new split diamond interchange. Table 12 compares operations with the split diamond to operations without under 2035 RTP conditions.

Table 12: East-West Alignment with Split Diamond Interchange comparison: 2035 RTP PM Peak Hour Operations

Intersection	V/C Standard	Without Split Diamond			With Split Diamond		
		V/C	LOS	Delay (sec)	V/C	LOS	Delay (sec)
I-5 Northbound/Elligsen Road	0.85	0.82	B	12.1	0.84	C	22.2
I-5 Southbound/Elligsen Road	0.85	**0.89**	C	27.7	**0.89**	B	14.8
I-5 Northbound/Day Road	0.75	-	-	-	**0.93**	D	43.6
I-5 Southbound/Day Road	0.75	-	-	-	**0.83**	C	25.2
Boones Ferry Road/95th Avenue	0.99	0.87	C	20.1	0.88	C	24.5
Boones Ferry Road/Day Road	0.99	0.99	E	55.7	0.98	D	54.2
Boones Ferry Road/East-West Arterial	0.99	**1.00**	E	63.3	**1.00**	E	63.8
Kinsman Road/Day Road	0.99	0.82	C	28.7	0.84	C	23.5
Grahams Ferry Road/Day Road	0.99	0.95	D	36.7	0.98	D	45.9
Grahams Ferry Road/East-West Arterial	0.99	**1.00**	E	64.1	0.99	E	65.7
124th Avenue/ East-West Arterial	0.99	0.96	D	45.8	0.94	D	45.7

Source: DKS Associates, 2012
Bold V/C ratios exceed mobility standard

Under identical land use and origin-destination assumptions, these two networks operate very similarly. The intersections nearest to capacity are still the ones on the east-west arterial, and operations at the existing I-5 northbound and southbound ramp terminals are similar. The addition of the split diamond does not improve on the performance of the 2035 RTP concept with two overcrossings, as it does not address the system's most congested intersections (on the east-west arterial and Boones Ferry Road). Longer term planning for the Southern Arterial concept from the I-5/99W Connector Study may consider additional capacity improvements on the east-west arterial and grade separation at key intersections. With these capacity improvements on the network, the split diamond option may warrant further study. Note that a split diamond interchange is a level of improvement that would trigger higher Federal Highway Administration scrutiny, and that ODOT would require an interchange area management plan (IAMP) before this type of improvement would be funded.

Additional evaluation was performed for an alternative split diamond with an elongated configuration, using the East-West overcrossing (rather than the Day overcrossing) as the northern terminus. This configuration also did not provide better operations than the two-overcrossing alternative in 2035, and did not eliminate the need for the Day overcrossing. As a result, the elongated split diamond configuration is not recommended at this time. However, future development of this concept should not be precluded, and any I-5 overcrossing in the

vicinity of Day Road should be designed with room under the overcrossing for collector-distributor roads.

Access Control at the Boones Ferry Road/95th Avenue Intersection

While the operational analysis for this report assumed right-in/right-out access control for the Boones Ferry Road/95th Avenue intersection, further evaluation showed that closing the minor east leg of the intersection and allowing all other movements would provide similar operational benefits. The decision on specific type of access control is deferred to concept planning or the Wilsonville TSP Update. However, the "T" intersection option, allowing full access on the west leg while closing the minor east leg, appeared to be the preferred option for access management among the multi-agency group.

Phasing Order of Overcrossings

Interim scenario analysis of the East-West Alignment concept assumed that the Day Road overcrossing would be built before the East-West-aligned overcrossing. This is due to the Transportation Planning Rule requirements for new facilities sited on rural lands that do not serve local functions.[12] However, the multi-agency group was interested in comparing how the transportation network performed under 2035 UGB conditions with the east-west overcrossing built first rather than the Day overcrossing. Figure 42 shows performance of these two overcrossing phasing options.

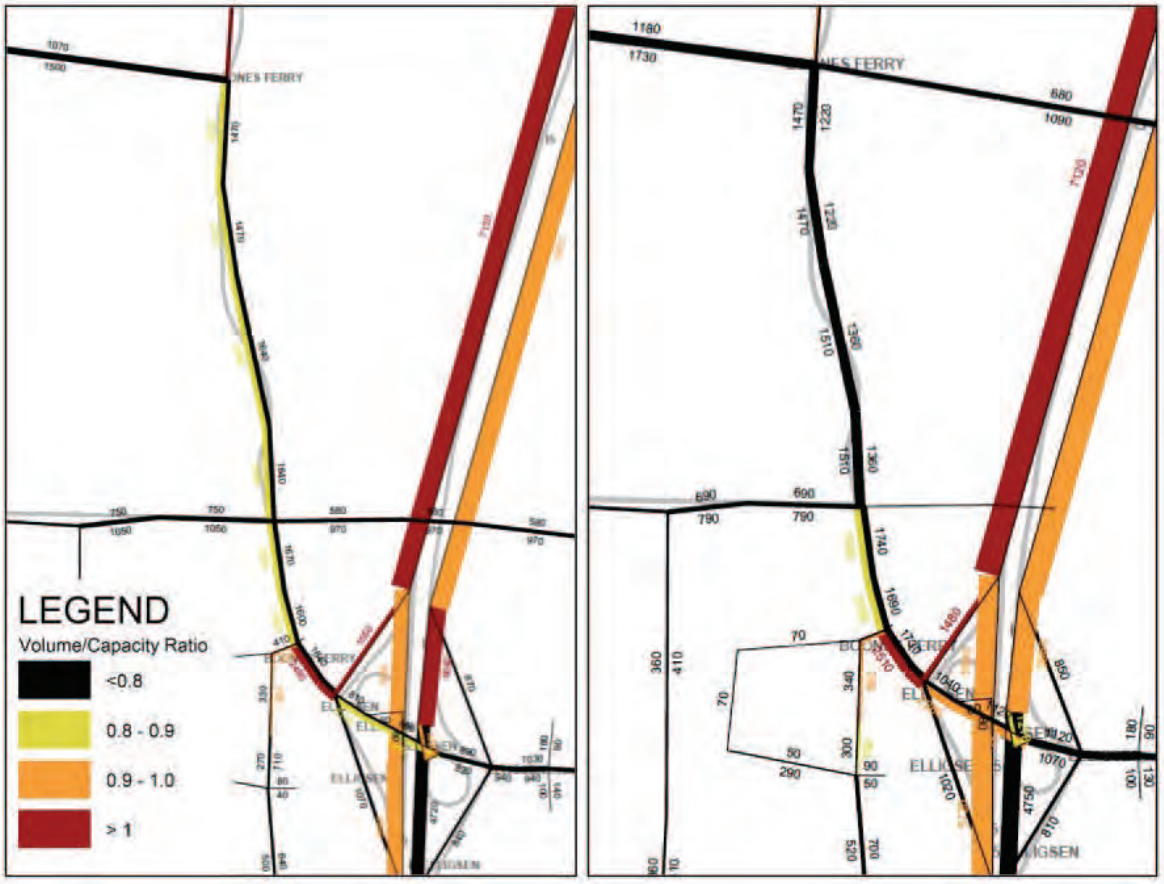


Figure 42: Impact of Day Overcrossing (left) and East-West Overcrossing (right) 2035 UGB PM Peak (full plots included in appendix)

The two overcrossings provide similar overall operation in terms of link V/C ratio, but there are differences in the way vehicles use the interchange itself. Table 13 compares the raw 2035 UGB model volumes for the new scenarios on roadway links in the interchange area.

[12] Transportation Planning Rule, Oregon Administrative Rules 660-012-0070

Table 13: PM Peak Hour Model Volume Comparison for Overcrossings

Roadway/Direction	Volume with Day Overcrossing	Volume with East-West Overcrossing	Change in Volume with East-West Overcrossing
Boones Ferry Road Eastbound approaching I-5 Southbound	2,490	2,510	+20
Boones Ferry Road Westbound approaching 95th Avenue	1,640	1,730	+90
Elligsen Road eastbound approaching I-5 Northbound	2,140	2,280	+140
Elligsen Road westbound approaching I-5 Southbound	890	1,120	+230
I-5 Southbound off-ramp	1,550	1,480	-70
I-5 Southbound on-ramps (combined)	1,150	1,100	-50
I-5 Northbound off-ramp	840	810	-30
I-5 Northbound on-ramps (combined)	2,190	2,060	-130

Source: DKS Associates, 2012

The volume of vehicles moving through the interchange on Elligsen Road/Boones Ferry Road is higher with the East-West overcrossing, particularly westbound, while the I-5 ramp volumes are lower. This suggests that the East-West overcrossing is not quite as effective as the Day Overcrossing in providing an attractive alternate route for vehicles traveling from one side of I-5 to the other. These through vehicles take up more of the interchange's capacity and reduce the number of vehicles willing to use the interchange area to get on or off I-5. However, either option on its own would provide significant capacity benefit to the interchange area compared to having no overcrossing.

Costs and Design Considerations

The Diagonal and East-West Alignment concepts contain several common projects that are either identical or very similar between the two networks. Some projects, such as the 124th Avenue extension and the Kinsman Road extension, are planned projects that feed into the area and were assumed for all concepts developed. Other projects, such as the main arterial route, are specific to the two concepts carried forward for further assessment. Table 14 shows costs for the projects that are common to the Diagonal and East-West alignments and also compares them to RTP projects that are similar or overlapping. Note that some overlapping RTP projects, such as the Grahams Ferry Road widening, are significantly different in scope.

Table 14: Network Improvement Costs (projects common or similar between both alternatives)

Basalt Creek Improvement	Cost (2012 millions)	Project for Diagonal?	Project for East-West?	Comparable RTP Project	Cost (2007 millions)
Grahams Ferry Road (Tonquin to Day): 3 lanes	$5.4	x	x	10588 (Wash. Co.) - Grahams Ferry Road (Helenius to county line): 3 lanes	$28.0
Day Road (Kinsman to Boones Ferry): 5 lanes	$5.8	x	x	11243 (Wash. Co.) - Day Road (Grahams Ferry to Boones Ferry): reconstruct to accommodate trucks	$3.2
Boones Ferry/Commerce/95th intersection improvements	$2.5 (RTP cost)	x	x	10852 (Wilsonville) - Boones Ferry/Commerce/95th intersection improvements	$2.5
Tonquin Road (124th extension to Grahams Ferry): 5 lanes	$17.2	x		10590 (Wash. Co.) - Tonquin Road (Oregon to Grahams Ferry): 3 lanes	$28.4
Boones Ferry Road (Diagonal to Day): 5 lanes	$0.8[a]	x		*10732 (Tualatin) – Boones Ferry Road (Norwood to Day): 5 lanes* [b]	*$40.1*
Tonquin Road (124th extension to Grahams Ferry): 3 lanes	$10.5		x	10590 (Wash. Co.) - Tonquin Road (Oregon to Grahams Ferry): 3 lanes	$28.4
Boones Ferry Road (East-West to Day): 5 lanes	$1.1[a]		x	*10732 (Tualatin) – Boones Ferry Road (Norwood to Day): 5 lanes* [b]	*$40.1*
TOTAL Diagonal		**$31.7**		**TOTAL RTP**	**$62.1**
TOTAL East-West			**$25.3**		

Source: Quincy Engineering, 2012, Metro 2035 Regional Transportation Plan, 2010

[a] Cost assumes one-sided widening of already-constructed three-lane Boones Ferry Road

[b] *RTP Project 10732 is on the State RTP project list, but not the Federal Financially Constrained*

All of the projects shown for the Diagonal concept are also part of the Diagonal Hybrid. More detailed design work and cost estimates, shown in the following sections, were completed for the Diagonal Alignment and East-West Alignment arterial concepts, and applied to the Diagonal Hybrid as well.

Diagonal Alignment

This alignment crosses the Basalt Creek area's most significant wetland area, the Seely Ditch, at a location that requires an approximately 1,500-foot-long structure. This large structure would create substantial project risk, as the soil type and slope stability vary to the north and south along the ditch, and finding a viable location may be difficult. Table 15 shows a detailed cost estimate for the diagonal facility from Grahams Ferry Road to Boones Ferry Road. The estimate

for the Tonquin Road piece of this corridor is included as well, in order to provide a reasonable comparison between the alignment concepts. Note that while no site visit was made to the bridge location, it is likely that an additional $1 million would be needed to raise the existing power lines, as in the East-West concept.

Table 15: Diagonal Arterial Costs

Improvement	Cost (millions)
New Five-Lane Roadway (Grahams Ferry to Boones Ferry)	$5.0
Basalt Creek Bridge and Abutments	$21.1
Traffic Signals	$0.7
50% E&C	$13.4
Right-of-Way	$2.8
TOTAL (Grahams Ferry Road to Boones Ferry Road)	**$42.9**
Tonquin Road (124th extension to Grahams Ferry): 5 lanes	$17.2
CORRIDOR TOTAL (124th extension to Boones Ferry Road	**$60.1**
Comparable RTP Project: 11340 (Wash. Co.) – Southern Arterial (99W to I-5): 4-5 lanes [a]	***$40.0***

Source: Quincy Engineering, 2012

[a] *RTP Project 11340 is on the State RTP project list, but not the Federal Financially Constrained. Half of the budget is assumed to account for construction east of 124th Avenue.*

Table 15 also shows the cost of the comparable Southern Arterial project from the RTP. Project 11340, which widens the Southern Arterial to 4-5 lanes, has an estimated cost of $80 million. The comparison assumes that half of this cost occurs east of 124th Avenue.

Additional Diagonal Hybrid Improvements

In addition to all improvements associated with the Diagonal concept, the Diagonal Hybrid includes a new 5-lane east-west facility between the 124th Avenue extension and Grahams Ferry Road, but keeps Tonquin Road at three lanes. Table 16 shows the net additional costs for the Diagonal Hybrid over and above the Diagonal concept.

Table 16: Additional Cost for Diagonal Hybrid

Improvement	Cost (millions)
Five-Lane East-West Roadway	$8.5
Railroad Crossing Bridge and Abutments	$1.7
Traffic Signals	$0.7
50% E&C	$5.4
Right-of-Way	$9.9
TOTAL	**$26.2**
Tonquin Road (Change from 5-lane to 3-lane)	($6.8)
TOTAL NET CHANGE FROM DIAGONAL	**$19.4**

Source: Quincy Engineering, 2012

East-West Alignment

At the direction of the multi-agency group, field visits and a detailed topographical analysis were performed to find an optimal East-West alignment balancing cuts and fills and minimizing risks and costs associated with crossing the Seely Ditch. The resulting alignment and 600-foot crossing location, shown in Figure 43, will have some wetland impact, although the extent won't be known until further project refinement. Costs for this facility from the 124th Avenue extension to Boones Ferry Road are shown in Table 17.

Table 17: East-West Arterial Costs

Improvement	Cost (millions)
Five-Lane Roadway	$12.2
Railroad Crossing Bridge and Abutments	$1.7
Basalt Creek Bridge and Abutments	$9.8
Retaining Walls	$5.0
Traffic Signals	$1.0
50% E&C	$14.8
Right-of-Way	$12.4
Power Line Raising	$1.0
TOTAL	**$57.9**
Comparable RTP Project: 11340 (Wash. Co.) – Southern Arterial (99W to I-5): 4-5 lanes [a]	***$40.0***

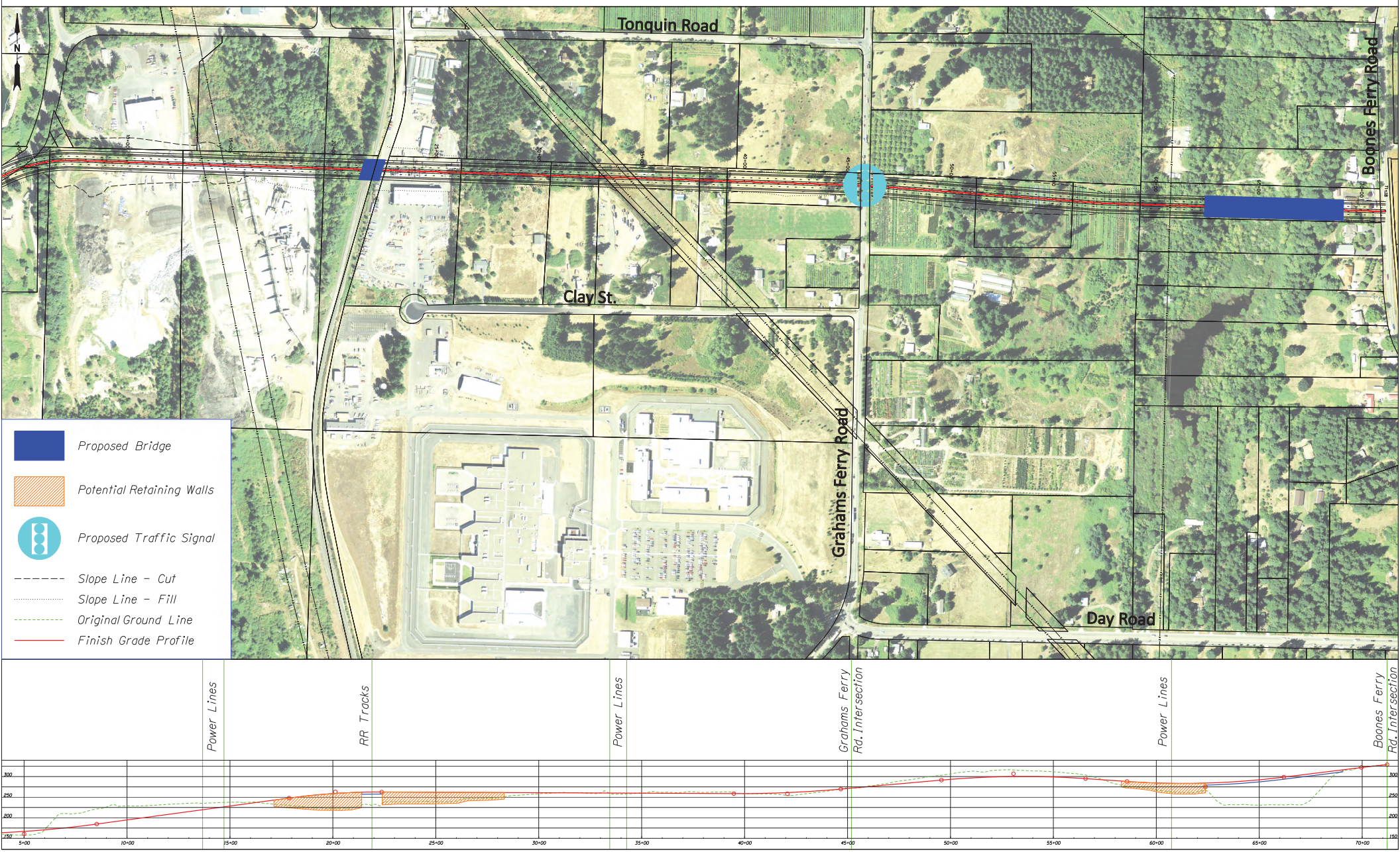
Source: Quincy Engineering, 2012

[a] *RTP Project 11340 is on the State RTP project list, but not the Federal Financially Constrained. Half of the budget is assumed to account for construction east of 124th Avenue.*

For comparison purposes, Table 17 makes the same assumption about RTP project 11340 as Table 14 did.

Basalt Creek Preliminary Design - East-West Connector

January 2012



In order to determine the optimal east-west alignment through the area, and across the Seely Ditch, project engineers used high quality topographical information (LIDAR data from the National Oceanic and Atmospheric Administration). This data helped find not only the narrowest channel for a crossing, but the one with steep enough slopes to accommodate bridge abutments. This location on the ditch, roughly aligned with Greenhill Road to the east, is considered the "sweet spot" because it minimizes bridge length and provides excellent slopes for the bridge structure.

Figure 44: The "sweet spot," looking out over Seely Ditch

After determining this optimal alignment based on topographical data, project staff conducted a field visit to review key locations, and in the sweet spot in particular. Staff visually confirmed a natural rock outcropping that had been identified from the data and also observed older, undisturbed rock at the location, indicating site stability.

Figure 45: Power lines close overhead at sweet spot crossing

While field reconnaissance confirmed a viable location for a relatively short crossing, it also revealed potential issues with power lines that would likely need to be raised to accommodate the new structure. While this adds some risk to the project, preliminary research indicates that 20-foot extensions can be added to the two towers for a total of $700,000 to $1,000,000. This cost has been included in the total project cost for the East-West concept, and it is likely an element of any Diagonal concept cost as well.

The East-West roadway would have less impact on access from developable lands than the Diagonal concept. Parcels currently having access onto Tonquin Road would be able to maintain access, as Tonquin Road would not become a high-capacity facility. Also, most of the roadway alignment would run along the back lines of existing lots, keeping developable parcels largely intact.

Overcrossings

At the request of some members of the project's multi-agency Technical Working Group, project staff performed additional design work to further assess the feasibility of overcrossing options in the vicinity of Day Road, using the more detailed LIDAR topographical data to balance cuts and fills and assess property impacts. Alignments for a Day Road extension over I-5

to Elligsen Road were refined with the goal of avoiding structures and minimizing construction costs and risks. Figures 46 and 47 show these two overcrossing options.

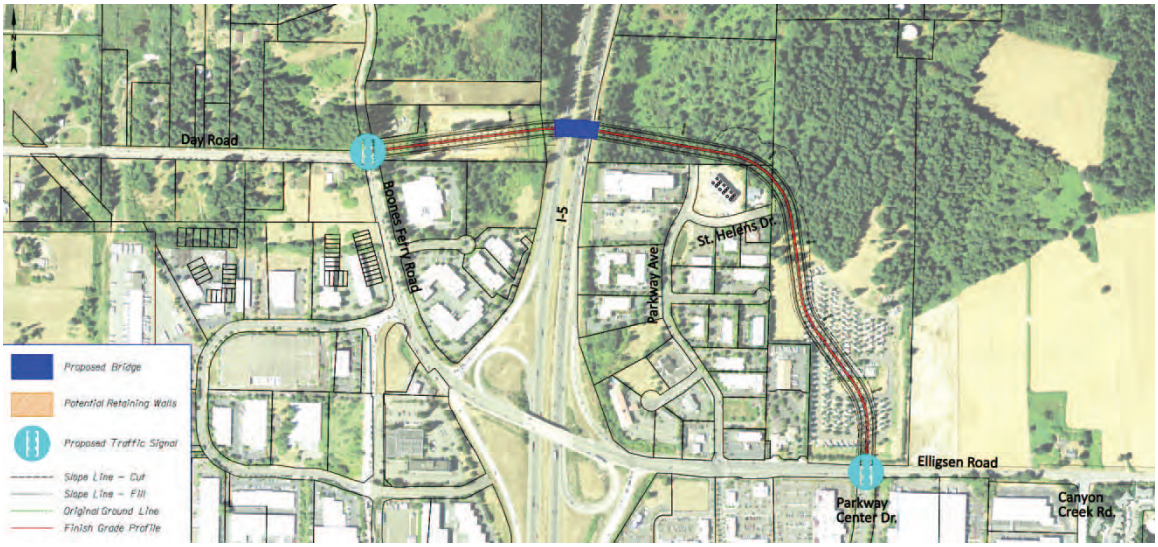


Figure 46: Day overcrossing with Parkway Center alignment

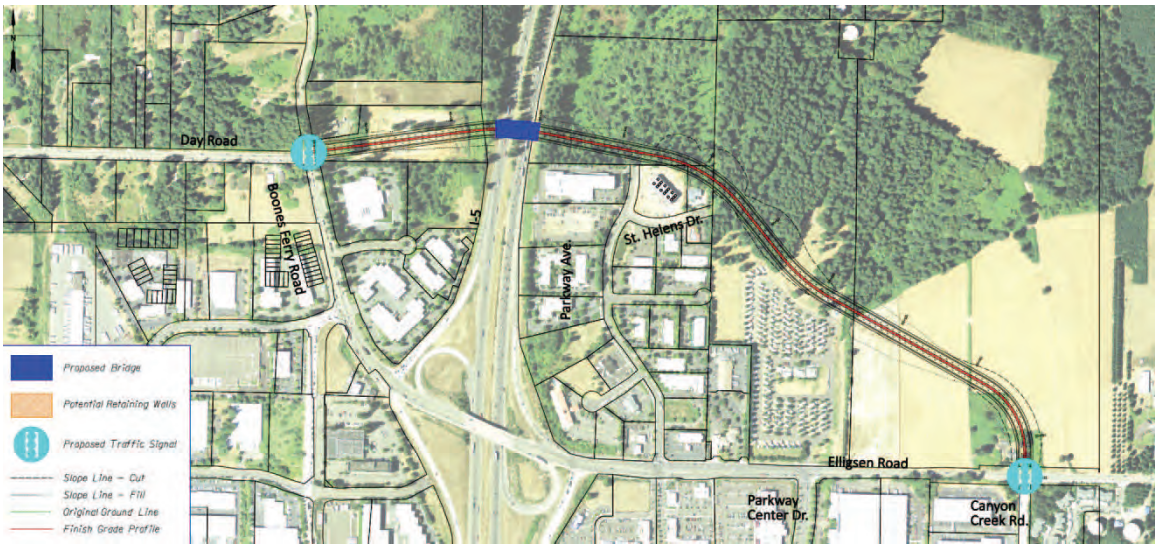


Figure 47: Day overcrossing with Canyon Creek alignment

For both options, the alignment on the west side of I-5 angles to the north slightly in order to land at a place on the east side that avoids existing structures on the north end of Parkway Avenue. The west-side alignment cuts irregularly through lots on the north side of the Day Road alignment. The alignment on the east side of the interchange impacts parcels along St. Helens Drive, but does not appear to require building acquisitions.

An area of particular concern to participating agencies is the roadway segment just east of I-5 that is constrained by a steep hillside on the north and east and by established businesses on the south. While project staff has found a feasible alignment here, it involves important impacts and risk factors. These include proximity to City of Tualatin and City of Wilsonville water facilities to the north and noise impacts to businesses to the south caused by new traffic and a potentially amplifying rocky hillside.

More detailed alignments for an overcrossing on the East-West alignment (i.e., towards Frobase) were not prepared as part of this effort, as additional coordination with Metro and Clackamas County would be needed in order to confirm an appropriate alignment through current rural areas. Costs for the overcrossing options are shown in Table 18.

Table 18: Overcrossing Option Costs

Improvement	Overcrossing to Parkway Ctr ($ millions)	Overcrossing to Canyon Crk ($ millions)	Overcrossing to Stafford Rd ($ millions)
Five-Lane Roadway	$8.7	$10.3	$15.2
I-5 Crossing Bridge and Abutments	$4.0	$4.0	$2.9
Retaining Walls	$4.9	$8.2	$0.4
Traffic Signals	$0.7	$0.7	$0.7
50% E&C	$9.1	$11.6	$9.6
Right-of-Way [a]	$6.4	$9.5	$9.2
TOTAL	**$33.7**	**$44.1**	**$38.0**
Comparable RTP Project: 11342 (Wash. Co.) – Southern Arterial/I-5 Interface	***$50.0***		

Source: Quincy Engineering, 2012

[a] Refined right-of-way costs to be provided by City of Wilsonville

[a] *RTP Project 11342 is on the State RTP project list, but not the Federal Financially Constrained.*

124th Avenue Extension/East-West Facility Intersection

Under the East-West Alignment concept, more detailed phasing and design work are needed to determine how the new 124th Avenue extension intersects with Tonquin Road and the east west facility in different interim years. Figure 48 and Figure 49 show how improvements could be phased through 2030, with different options available in the longer term. Longer term treatments for this area depend on whether 124th Avenue is eventually realigned to the west, and whether a Southern Arterial is connected to the East-West corridor.

Cost estimates have not been done for the longer-term improvements. The combination of the 2020 improvement, which realigns Tonquin Road slightly, and the 2030 improvement, which

curves the East-West arterial to align with 124th, may result in a full right of way take for an existing industrial parcel, which could cost $3-4 million.

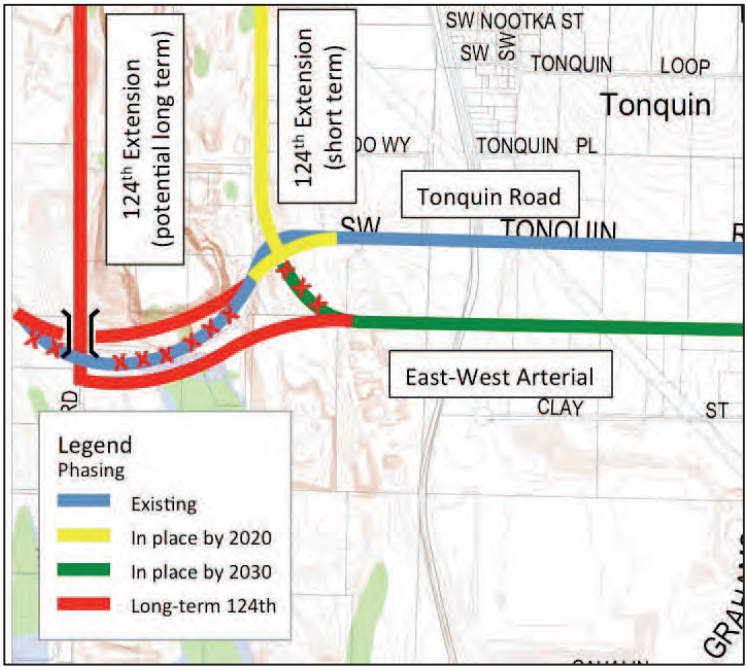


Figure 48: Phasing option for 124th Extension/East-West Arterial Intersection area (grade separation in long-term)

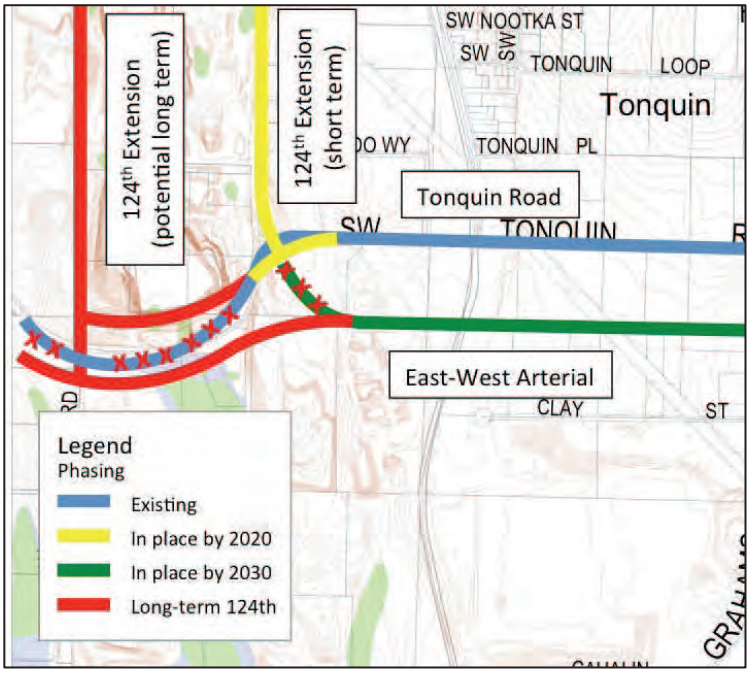


Figure 49: Phasing option for 124th Extension/East-West Arterial Intersection area (at-grade intersections)

Improve Existing Interchange

Although new overcrossings are needed by 2035, improving the interchange in its existing configuration is an important part of phasing. Analysis showed that in the 2030 interim year, an additional lane is needed at the I-5 southbound off-ramp in order to provide double right turns. The cost of this improvement, which occurs only at the upper end of the ramp near the Elligsen Road intersection, is estimated at $500,000.

Travel Pattern Evaluation

This section summarizes additional issues regarding the types of vehicles using facilities in the network alternatives, origins, and destinations of traffic using the facilities and the impacts to the surrounding street network created by potential changes in the Basalt Creek area.

Freight

At the outset of this process, the multi-agency group made it clear that freight travel patterns would be an important measure for evaluating network alternatives. Metro's regional travel demand model, which accounts for truck trips separately from passenger car trips, was used to estimate truck percentages on key facilities on both the Diagonal and East-West concepts under 2035 RTP conditions. Both alternatives were analyzed without a split diamond interchange, in order to provide a useful comparison of freight activity around the interchange.

A comparison of the results is shown in Figure 50, below, and in Table 19.

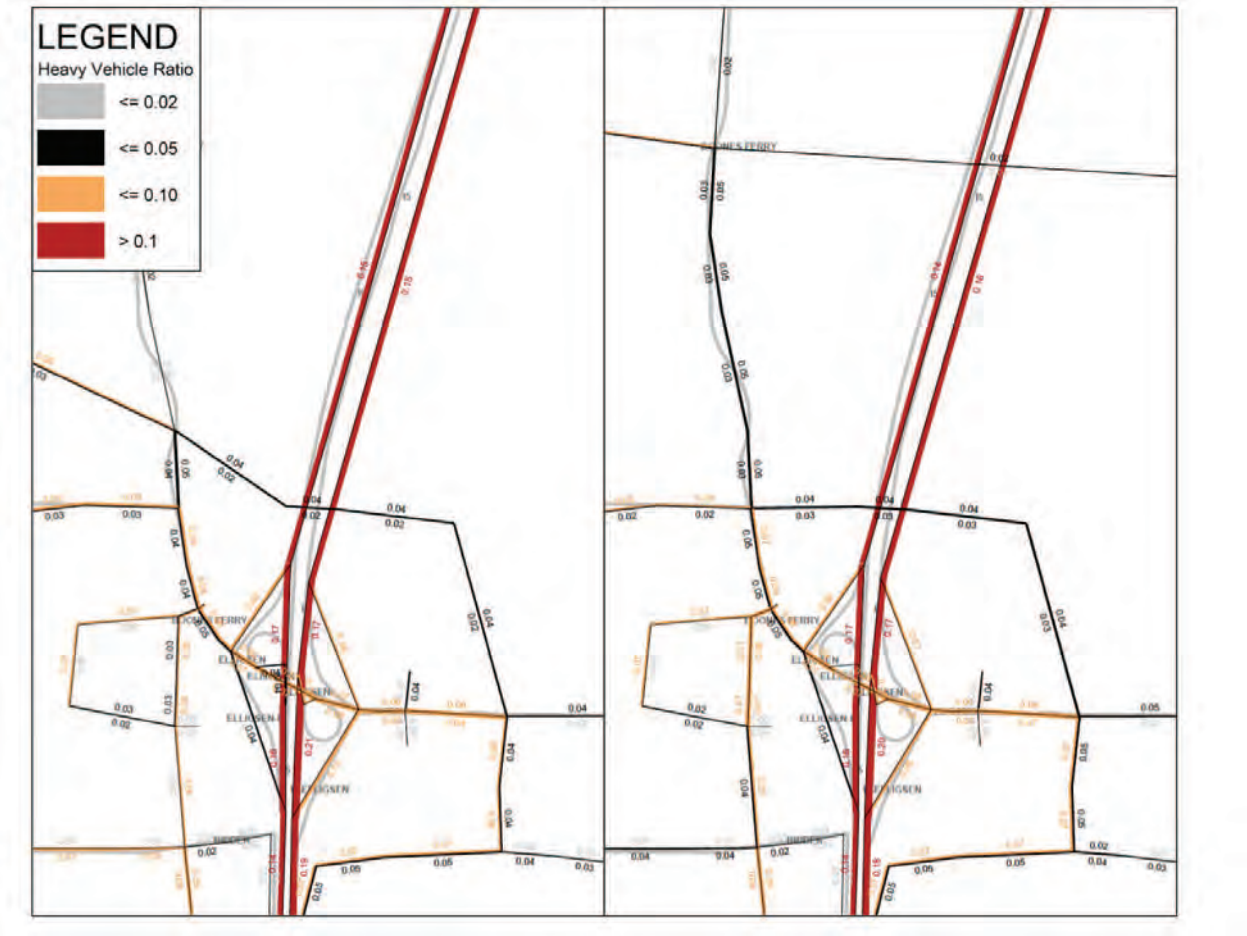


Figure 50: Truck percentages under Diagonal concept (left) and East-West concept (right) 2035 RTP PM peak (full plots included in appendix)

Table 19: Comparison of Truck Activity

Roadway Link	WB/NB Truck	EB/SB Truck	WB/NB Truck	EB/SB Truck
	Diagonal		East-West	
East-West Alignment (Grahams Ferry to Boones Ferry)	-	-	5%	3%
Diagonal Alignment (Grahams Ferry to Boones Ferry)	6%	3%	-	-
Boones Ferry Road (95th to I-5 Southbound)	8%	5%	8%	5%
East-West Overcrossing	-	-	2%	1%
Day Overcrossing		-	4%	3%
Diagonal Overcrossing	2%	4%	-	-

Source: DKS Associates, 2012

This analysis found little difference in truck patterns between the two concepts. Both the Diagonal and the East-West have similarly high truck percentages on Boones Ferry Road and Elligsen Road at the interchange, and a lower percentage (2-4%) of trucks on the overcrossing just to the north.

Origin and Destination Analysis

During this process, participating agencies were interested in where users of a new east-west facility would be coming from and going to. Figures 51 and 52 plot the paths of vehicles using the segment of the new facility between Grahams Ferry Road and Boones Ferry Road, for both the Diagonal and the East West concepts, under the 2035 RTP scenario. Generally the plots show that, in the PM peak hour, the most common origin and destination facilities for users under each concept are, in rank order:

Diagonal Concept	East-West Concept
1. I-5 South	1. I-5 South
2. Southwest 124th Avenue	2. Stafford Road
3. Tonquin Road	3. Southwest 124th Avenue
4. I-205 (via I-5 north)	4. Tualatin-Sherwood Road
5. Tualatin-Sherwood Road	5. Tonquin Road

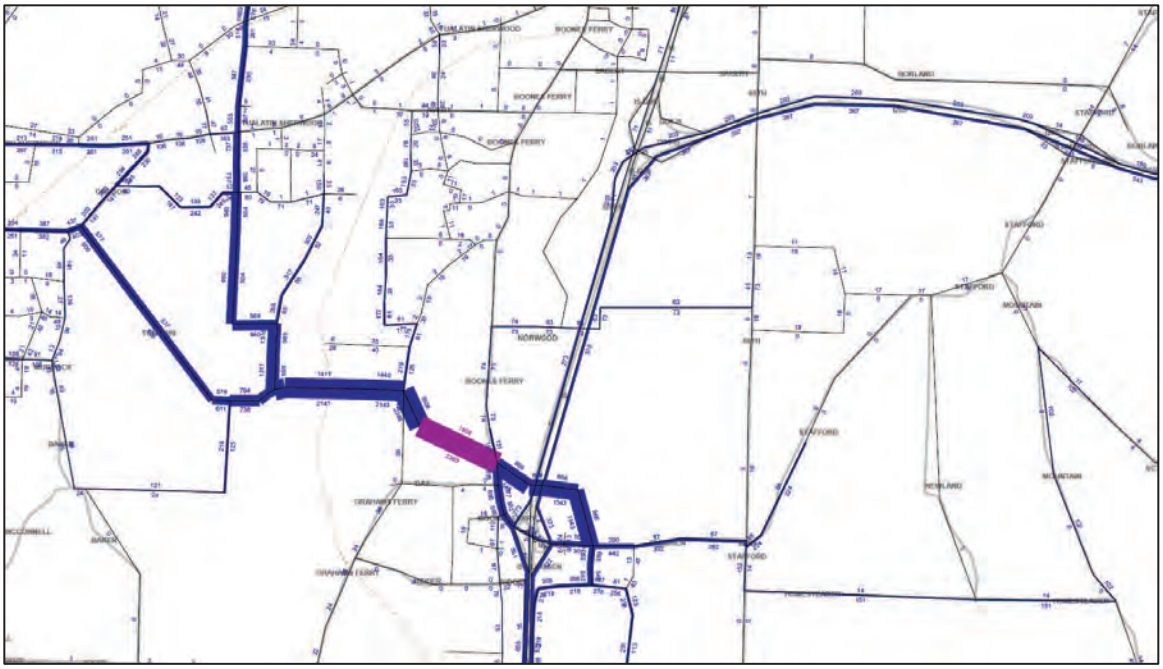


Figure 51: Travel paths of Diagonal facility users (2035 RTP PM Peak) (full plots included in appendix)

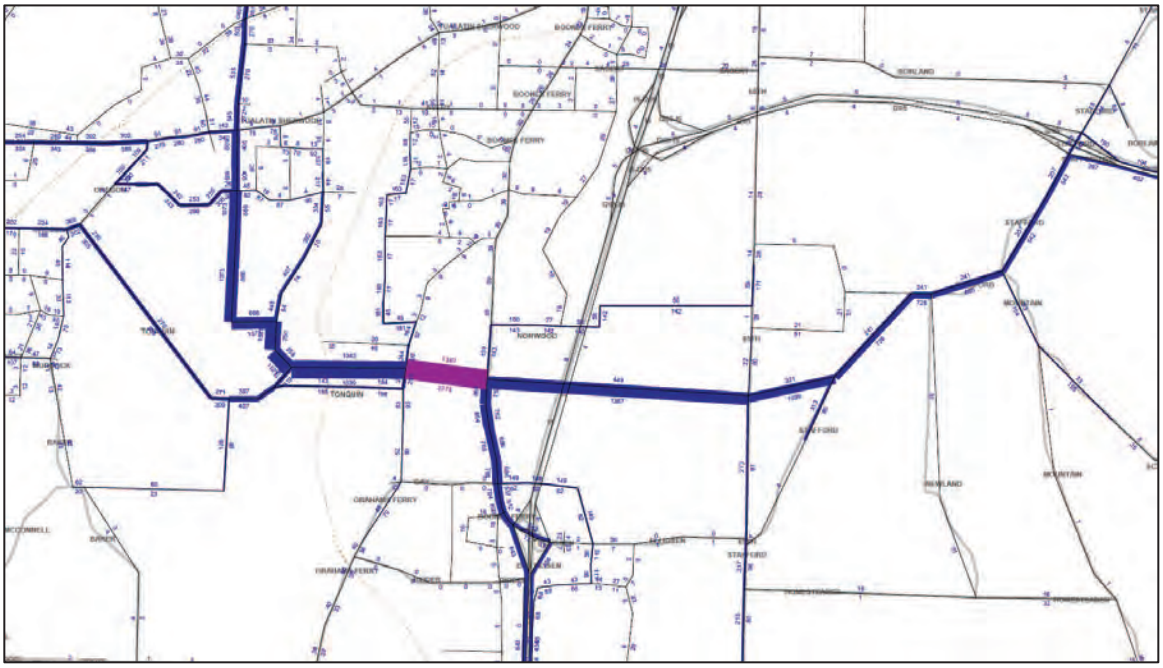


Figure 52: Travel paths of East-West facility users (2035 RTP PM Peak) (full plots included in appendix)

This analysis highlights a key difference between the Diagonal and East-West concepts. Under the Diagonal concept, of the nearly 4,000 vehicles using the facility between Grahams Ferry

Road and Boones Ferry Road, the heart of the Basalt Creek area, about 650 vehicles are either coming from or going to I-5 North at the Elligsen Road interchange. Under the East-West concept, this number is less than 20. This is an effect of the east-west overcrossing, which provides a new route for vehicles coming from or going to I-205. In the model, vehicles traveling on the new facility do not generally come from or go to I-5 north beyond the I-205 interchange, as there are more attractive interchanges (primarily Tualatin-Sherwood Road) for these trips.

Surrounding System Impacts

Another question raised by this process was the effect of changes to the network on existing facilities. In particular, any changes that might divert or induce traffic in ways that impact neighborhoods could be cause for concern. The Metro travel demand model was used to compare traffic volumes on the roadway network under the East-West 2035 RTP scenario and the adopted financially constrained RTP scenario. The key differences between these two networks are the inclusion of new projects in the East-West concept:

- The East-West facility between the 124th Avenue extension and Stafford Road
- The Day Road overcrossing connecting to Elligsen Road
- The widening of Boones Ferry Road between the East-West facility and Day Road

The following figures show model volume difference plots for the PM peak hour for the East-West concept. Red bands indicate where volumes are higher in the east-west network than in the financially constrained network, and green bands show where volumes are lower.

Figure 53: Traffic Impact to south Tualatin (2035 PM peak hour, East-West network vs. RTP financially constrained base)

Figure 53 centers on south Tualatin, with the I-5/Tualatin-Sherwood Road interchange in the upper right. With the East-West alternative in place, traffic is reduced on nearly all roads.

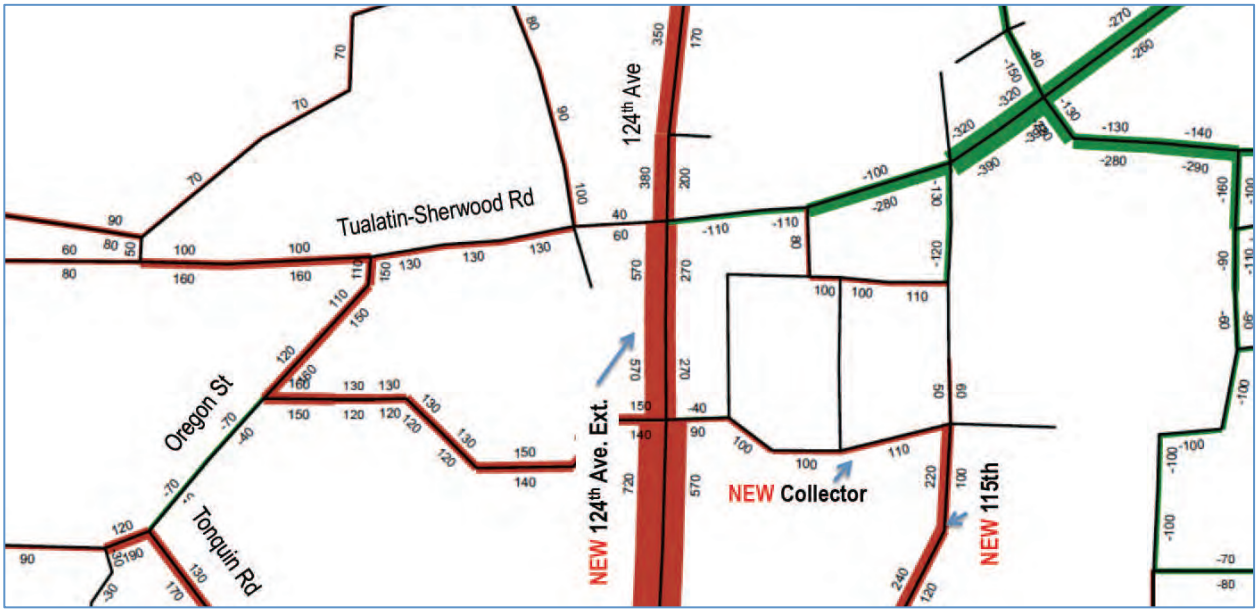


Figure 54: Traffic impact to southwest Tualatin (2035 PM peak hour, East-West network vs. RTP financially constrained base)

Figure 54 centers on the SW 124th/Tualatin-Sherwood Road intersection, and shows traffic growth on 124th and to the west and south, but less traffic to the east.

Figure 55: Traffic impact to north Wilsonville (2035 PM peak hour, East-West network vs. RTP financially constrained base)

Figure 55 centers on the I-5/Elligsen Road interchange. With the East-West alternative in place, including I-5 overcrossings aligned with Day Road and the East-West arterial, traffic patterns change significantly. At the interchange, the new overcrossings allow non-freeway traffic to bypass the ramp terminals, so while freeway ramp use increases, traffic on Elligsen Road decreases. Volumes west of the interchange are generally lower, with traffic diverting to the north and east rather that using Grahams Ferry Road and Day Road.

The volume difference analysis shows that, under the East-West concept, new and/or improved facilities in the study area tend to draw volumes off existing facilities, reducing the burden on neighborhood roads and facilities in the immediate vicinity of the interchange. Roadways showing an increase in volume over adopted RTP conditions are those that connect directly into the new capacity. These include 124th Avenue, Tonquin Road, and Parkway Center Drive. Elligsen Road sees an increase in traffic under the Diagonal concept, and a decrease under the East-West.

Boones Ferry Road

Area stakeholders expressed particular interest in how the East-West concept could affect traffic volumes on Boones Ferry Road. Using the same model volume differences as were discussed in the previous section, Figure 56 shows the change to total weekday PM peak hour volume on different segments of Boones Ferry Road. South of the east-west facility, volumes increase on Boones Ferry Road, because the facility creates a new, higher-capacity connection to the I-5/Elligsen Road interchange. North of the east-west facility, volumes are reduced, because traffic may now use the 124th Avenue/East-West connection to access the interchange (and future overcrossing) rather than using Boones Ferry Road all the way from Tualatin-Sherwood Road.

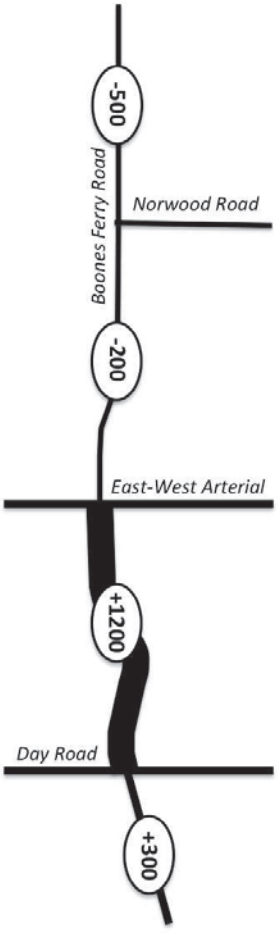


Figure 56: Future traffic volume changes on Boones Ferry Road due to East-West concept (weekday PM peak hour)

Public Input

Because this planning effort is a refinement of previously adopted plans, the public involvement and outreach has been focused to gather feedback on the concepts for a major transportation network through the Basalt Creek planning area. Future public involvement during the concept planning process will allow opportunity for input on land use and local transportation in this area.

Figure 57: Open House to present Basalt Creek concepts to the public

As part of this process, the public was provided with information on the process and concepts being explored through two broad mailings, a website sharing the concepts, and two open houses that attracted about 80 participants per event. Public stakeholders were also able to attend the Policy Advisory Group meetings held in November 2011 and April 2012, and the Tualatin and Wilsonville Councils received briefings open to the public. Project team members also visited Tualatin Citizen Involvement Organization 5 in January 2012, shared information at several meetings related to the Boones Ferry Road Improvement Project, and staffed information stations at both Tualatin and Wilsonville Transportation System Plan open houses.

The following briefly summarizes recurring public input from discussion with staff at public meetings, written comment forms from meetings, letters, emails, and phone calls. This is not a record of all individual comment forms or each meeting summary.

Public Comment Themes:

Impacts to existing residences – Many residential neighbors from SW Boones Ferry Road and the southern residential developments in Tualatin have attended meetings and provided input. Several residents expressed concern about how they believe the new roadway might affect livability (increased traffic and noise, environment, etc.) and property values for individual homes or neighborhoods. Several preferred a concept that used the existing roads or a desire to see any new arterial as far south from the existing neighborhoods as possible. Several neighbors wanted to learn more about specific right-of-way impacts.

Impacts to existing industrial lands or other businesses – Businesses, specifically in the Tonquin Industrial area and around the existing I-5 interchange in North Wilsonville, have concerns about their ability for continued access and successful operations in the future. This is related to both transportation access and compatibility of changing land uses (future concept

planning) in the area. A few business representatives that have attended meetings (County and Wilsonville properties) have been interested in how any of the road alignments might specifically affect the current use of properties or ability to develop their properties in the future.

Traffic operations – Many people have asked specific questions about how I-5 and the interchange affect the traffic in the area, how any new roadways affect operations on I-5, and where the traffic is coming from and going to. There has been some general concern that this may shift areas of congestion and a result would increase traffic in residential neighborhoods. Overall, most public stakeholders agree that the current infrastructure would not meet future travel demands and they support transportation improvements. Many have expressed support for the concept that best meets long term transportation needs for the area.

Timing/Phasing – Many meeting attendees have had questions about the timing or phasing of any future projects. Some were related to right-of-way needs and when individual property owners may be affected. Others wanted to know when future land uses would be identified through the concept planning process; they felt the use of their property or ability to sell was being stalled or affected current property values. Others wanted to know when changes to the area may affect their current use, such as rural residential areas or rural businesses (nurseries, etc). Others were interested in development potential in the area.

Long-term focus –Many have asked about the relationship to the I-5/99W Connector and questioned whether this road would link to Sherwood (99W). While this planning effort will need to allow for future development of the Southern Arterial that was identified through that study and included in regional plans, this effort is not intended to identify a specific future extension alignment to the west. There is also much interest in the future land uses in the area; stakeholders have been told that this discussion will occur during concept planning for the Basalt Creek area.

Policy and Land Use Considerations

Although this report provides a wide range of traffic, design, and cost information on which to move forward with a recommended transportation network, several key issues will need further consideration. The cities of Tualatin and Wilsonville will begin concept planning with the recommendations from the report as a framework, but further refinements and continued coordination are needed.

- **City Limits:** New city limits for Tualatin and Wilsonville will be established as part of the concept planning process. Where this boundary is drawn in relation to planned transportation improvements, particularly the primary east-west facility, will

substantially affect the level of urban services each city may need to provide in the Basalt Creek area.

- **Lot lines and developable parcels:**
    - **East-West Concept:** Design work on the East-West concept places much of the alignment on back lot lines in order to minimize impacts and maintain existing access onto Tonquin Road and other facilities. Further work on a more precise alignment will be needed to determine whether the facility runs to the north or south of the line, or on the line itself.
    - **Diagonal Concept:** The use of Tonquin Road as a high capacity five-lane facility will severely limit the available access from developable lands, and the Diagonal Alignment between Grahams Ferry Road and Boones Ferry Road is likely to cut through parcels in a way that divides them inefficiently.
- **Regional Trail System:** Right of way purchases should consider the needs of the future Tonquin Trail and its connections to the larger regional system, particularly along the east-west corridor. This includes a potential multi-use path on a future east-west I-5 overcrossing.
- **Stormwater:** More refined design work will be needed to determine where stormwater will run off of new/improved facilities, and how it will be conveyed and treated.
- **Access to the Planning Area:** More detailed assessment of minor transportation facilities will be needed during concept planning in order to ensure good access to the network from developable parcels.
- **East-West alignment overcrossing option:** Further coordination with Metro and Clackamas County will be needed to better understand the policy and process requirements for an I-5 overcrossing into the currently rural Stafford area.

Evaluation Summary

A summary of the evaluation provided in this memo for all network and I-5 interface alternatives is included in the following pages, in Table 20. A table showing costs for all project elements of the Diagonal and East-West concepts is shown in Table 21.

Table 20: Basalt Creek Transportation Refinement Plan Evaluation Summary

	Framework Concepts (124th to Boones Ferry Road)				I-5 Interchange Connection/Overcrossing Options			
	New East-West Arterial Connection		New Diagonal Arterial Connection	Improve Existing Road Network	Improve Existing Interchange	Overcrossing (Day/Diagonal to Elligsen)	Overcrossing (to Frobase/Stafford)	Split Diamond Interchange
Cost • Per element/phase	**TOTAL $139M** • East-West 5-lane $58M • Tonquin 3-lane $11M • BFR 3-lane $11M • BFR 5-ln (E-W to Day) $1M • GFR 3-lane $5M • Day 5-lane (Kinsman-BFR) $6M • BFR/Commerce $3M • 124th Extension $34M • Kinsman Extension $10M	**TOTAL $149M** • Hybrid 5-lane $69M • Tonquin 3-lane $11M • BFR 3-lane $11M • BFR 5-ln (E-W to Day) $1M • GFR 3-lane $5M • Day 5-lane (Kinsman-BFR) $6M • BFR/Commerce $3M • 124th Extension $34M • Kinsman Extension $10M	**TOTAL $130M** • Diagonal 5-lane $43M • Tonquin 5-lane $17M • BFR 3-lane $11M • BFR 5-ln (Diag to Day) $1M • GFR 3-lane $5M • Day 5-lane (Kinsman-BFR) $6M • BFR/Commerce $3M • 124th Extension $34M • Kinsman Extension $10M	**TOTAL $82M** • Tonquin 5-lane $17M • GFR 5-lane $8M • Day 5-lane $10M • BFR/Commerce $3M • 124th Extension $34M • Kinsman Extension $10M	**TOTAL $500K** • I-5 SB/Elligsen Int. Imp. $500K	**TOTAL $34-44M** • To Parkway Center $34M • To Canyon Creek $44M	**TOTAL $38M** • Overcrossing and extension to 82nd $17M • Extension from 82nd to Stafford $21M	**TOTAL $48M**
Ability to phase based on need and development	+ • Can build new connection from Grahams Ferry to Boones Ferry as Phase I, then extend over I-5 in later phase when Urban Reserves develop • Allows existing corridors to build out as standard county facilities with a newer, higher capacity corridor to come later • Compatible with all interchange and overcrossing concepts	+ • Can phase components that connect to I-5 (e.g., overcrossing or split diamond at Elligsen), but does not provide a new connection to Urban Reserves east of I-5 • Compatible with overcrossing near the interchange or split diamond concept, not an overcrossing to Frobase	+ • Can phase components that connect to I-5 (e.g., overcrossing or split diamond at Elligsen), but does not provide a new connection to Urban Reserves east of I-5 • Requires Tonquin to be built as high capacity 5-lane roadway (plus) instead of county standard arterial • Compatible with overcrossing near the interchange or split diamond concept, not an overcrossing to Frobase	+ • Can be phased between 3-lane and 5-lane corridors	+ • Compatible with each framework concept and with other interchange improvement options	+ • Can be phased as needed with any of the Framework alternatives	✓ • Can be phased with the East-West concept only	- • Can only be phased after a Day or Diagonal overcrossing is constructed
Supports development (provides access)/Impacts to existing uses/future development opportunities?	+ • East-West arterial alignment is along back lines of existing lots, allowing existing roads (such as Tonquin) to continue to provide access function • Allows extension of an arterial grid into Urban Reserve areas	✓ • Diagonal would likely bisect developable properties, and not align well with existing lot lines	✓ • Between 124th and Grahams Ferry Road, access to Tonquin will be limited in order to provide high capacity 5-lane facility • Diagonal would likely bisect developable properties, and not align well with existing lot lines	- • Converting Tonquin/GFR/BFR to high capacity 5-lane would reduce accesses available for developable parcels • 45 mph curves at current Tonquin/Grahams Ferry Road and Day/Grahams Ferry Road intersections may substantially impact developable parcels	+ • Future access control (right-in/right-out) at Boones Ferry Road/95th/Commerce impacts access to businesses	✓ • May provide new access point for Parkway area • Impacts to RV park under Parkway Center option • Impacts to parcels between Boones Ferry and I-5 in order to provide alignment that avoids structures and minimizes impacts to existing uses on east side of I-5	+ • Allows more flexibility in local network (including extending an arterial grid into Urban Reserve areas) • Potential impacts to lots around Greenhill east of Boones Ferry • If connecting to Frobase, this is currently a local road, would need to change to arterial to 65th Ave.	✓ • It is anticipated that inclusion of retaining walls would allow collector-distributor roads to be constructed within existing ODOT right-of-way
Environmental Impact	- • 600 foot wetland crossing at Seely Ditch	-- 1500 foot wetland crossing at Seely Ditch	-- • 1500 foot wetland crossing at Seely Ditch	+ • Minimal impacts	+ • Minimal impacts	+ • No impacts to wetland or Title 3 areas • Potential noise impacts on east side of interchange where alignment skirts development and hillside	+ • No impacts to wetland or Title 3 areas	✓ • Potential impacts in northeast quadrant of existing interchange

+ Performs Well ✓ Performs adequately - Does not perform well -- Performs poorly

Table 20: Basalt Creek Transportation Refinement Plan Evaluation Summary

	Framework Concepts (124th to Boones Ferry Road)				I-5 Interchange Connection/Overcrossing Options			
	New East-West Arterial Connection		**New Diagonal Arterial Connection**	**Improve Existing Road Network**	**Improve Existing Interchange**	**Overcrossing (Day/Diagonal to Elligsen)**	**Overcrossing (to Frobase/Stafford)**	**Split Diamond Interchange**
Consistency with RTP	+ • Alignment may be used as part of a future Southern Arterial concept	+ Alignment may be used as part of a future Southern Arterial concept	+ • Alignment may be used as part of a future Southern Arterial concept	✓ • Alignment insufficient for future Southern Arterial concept	+	+	✓	✓
Traffic operations	+ • Accommodates improvements (two overcrossings) that will keep network from exceeding capacity under 2035 RTP conditions	- • Would require additional overcrossing to last beyond 2035 UGB scenario	- • Would require additional capacity between 124th and Grahams Ferry to go beyond 2035 UGB scenario • Would require additional overcrossing to last beyond 2035 UGB	-- • Provides adequate capacity through the 2035 UGB Scenario only • Likely to require removal of access to existing uses • Most severe impacts on existing traffic during construction	+ • Insufficient for 2035 operations, but important for phasing	+ • Needed to provide adequate capacity in 2035 UGB scenario	+ • Needed to provide adequate capacity in 2035 RTP scenario	- • Additional system improvements needed (east-west capacity, grade separated intersections) for split diamond to have benefits
Confidence in viability (constructability)	+ • Engineering has found a viable location for the bridge crossing over Seely Ditch; high confidence in constructability • Power line corridor at ditch will need to be raised	✓ • More difficult crossing of Seely Ditch due to larger wetland area, structural needs for bridge; creates higher risk	✓ • More difficult crossing of Seely Ditch due to larger wetland area, structural needs for bridge; creates higher risk	+ • Lower risk due to use of existing facilities	+ • Lower risk due to use of existing facilities	✓ • Rocky hillside and proximity to City water facilities increase risk	+ • Low engineering risk factors, but connecting into area outside of UGB will require coordination with Metro, Clackamas County	- • Need for ODOT and FHWA coordination and difficulty of obtaining a design exception increase risk
Works with upgrades to existing interchange?	With upgrades, existing interchange functions though 2030 UGB	With upgrades, existing interchange functions though 2030 UGB	With upgrades, existing interchange functions though 2030 UGB	With upgrades, existing interchange functions though 2030 UGB				
Works with new overcrossing connection to Elligsen (east side of I-5)?	With overcrossing to Elligsen, system functions through 2035 UGB	With overcrossing to Elligsen, system functions through 2035 UGB	With overcrossing to Elligsen, system functions through 2035 UGB	With overcrossing to Elligsen, system functions through 2035 UGB				
Works with split diamond interchange?	Yes	Yes	Yes	Yes				
Worthy of refinement and evaluation?	Yes		Yes	No	Yes	Yes	Yes	Yes

+ Performs Well ✓ Performs adequately - Does not perform well -- Performs poorly

Table 21: Cost Estimates for Diagonal and East-West Alignment Alternatives (by interim year the added capacity is needed)

Improvement	Diagonal Alt Cost ($M)	Diag. Hybrid Alt Cost ($M)	East-West Alt Cost ($M)	Previously Planned?*
2020				
3-lane 124th Avenue Extension [a]	$20.0	$20.0	$20.0	Federal RTP
Improve Tonquin Road to 3 lanes (124th Avenue Extension to Grahams Ferry Road) [b]	$10.5	$10.5	$10.5	Federal RTP
Improve Grahams Ferry Road to 3 lanes (Tonquin to Day) [b]	$5.4	$5.4	$5.4	Federal RTP
Improve Boones Ferry Road to 3 lanes (Norwood Road to Day Road) [a]	$10.8	$10.8	$10.8	In design
Boones Ferry Road/Commerce Circle/95th Avenue Intersection Improvements [c]	$2.5	$2.5	$2.5	Federal RTP
Construct Tonquin Trail **	-	-	-	Federal RTP
TOTAL 2020	**$49.2**	**$49.2**	**$49.2**	***$49.2***
2030				
Improve 124th Avenue Extension to 5 lanes [a]	$14.0	$14.0	$14.0	Federal RTP
5-lane East-West facility (124th Avenue Ext to Boones Ferry Rd) [b]	N/A	N/A	$57.9	State RTP
Improve Tonquin Road to 5 lanes (124th Avenue to Grahams Ferry) [b]	$6.7	N/A	N/A	State RTP
5-lane Diagonal facility (Grahams Ferry Road to Boones Ferry Road) [b]	$42.9	N/A	N/A	State RTP
5-lane Hybrid facility (124th Avenue Ext to Boones Ferry Road) [b]	N/A	$69.1	N/A	State RTP
5-lane Boones Ferry Road (new facility to Day Road) [b]	$0.8	$0.8	$1.1***	State RTP
5-lane Day Road (Kinsman Extension to Boones Ferry Road) [b]	$5.8	$5.8	$5.8	Similar to RTP project
3-lane Kinsman Road Extension [c]	$10.4	$10.4	$10.4	Federal RTP
Boones Ferry Road/Commerce Circle/95th Avenue Access Control	minimal	minimal	minimal	No
TOTAL 2030	**$80.6**	**$100.1**	**$89.2**	***$156.2***
2035 UGB				
5-lane Overcrossing of I-5 (Day Road/Boones Ferry Road intersection to Elligsen Road) [b]	$33.7-$44.1	$33.7-$44.1	$33.7-$44.1	State RTP
TOTAL 2035 UGB	**$33.7-$44.1**	**$33.7-$44.1**	**$33.7-$44.1**	***$50.0***
2035 RTP				
5-lane Overcrossing of I-5 (East-West facility/Boones Ferry Road intersection to Stafford Road) [b]	N/A	N/A	$38.0	State RTP
TOTAL 2035 RTP	**$0**	**$0**	**$38.0**	**$0**
GRAND TOTAL	**$165-$175**	**$185-195**	**$210-220**	***$250***

Source of cost estimates: [a] Washington County, [b] Quincy Engineering, [c] 2035 Regional Transportation Plan

* Totals for each interim year in this column, as well as grand total, represent total dollar amount either allocated in the RTP or committed for projects already in development. See Chapter 4 for more information on RTP comparison projects.

** Tonquin Trail costs are being estimated outside of this transportation refinement plan process.

*** Boones Ferry Road improvement costs are higher for the East-West because the segment south to Day Road is longest in this concept.

Appendix

A Aerial Maps, Contour Maps, and Roadway Designs

B Cost Estimates

C Travel Demand Model Plots

D Synchro 2000 Highway Capacity Manual Reports