

# East/West Circulation Alternatives Transportation Analysis

Kingston Terrace Master Plan  
King City, Oregon

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# 1 INTRODUCTION

## 1.1 Purpose of this Report

This report has been prepared to document existing and future (2040) transportation conditions to support the identification and evaluation of east/west circulation alternatives for the Kingston Terrace Master Plan area. The future conditions analysis includes both a baseline assessment drawing on analysis conducted for the City's Draft Transportation System Plan (TSP), and an assessment of the transportation implications of a range of alternatives.

## 1.2 Context of the Master Planning Effort

This report is built on information collected and analyzed for Draft King City *Transportation System Plan* (TSP) and the *Existing Multimodal Transportation Conditions* report for Kingston Terrace (July, 2021), as well as other planning efforts recently or currently underway that will influence multimodal access and circulation in the study area.

## 1.3 Study Area

The study area for evaluating future transportation conditions as part of the *King City Master Plan* (KCMP) is primarily focused on the area north of the Tualatin River, south of Beef Bend Road, east of Roy Rogers Road, and west of the existing city limits and the BPA utility corridor. The location of the KCMP study area is illustrated in **Figure 1**, along with the existing boundaries of King City.

## 1.4 How the Information in This Report Will be Used

The information presented in this report will be used as a basis for evaluating the effectiveness of east/west circulation alternatives in meeting the transportation system goals identified for Kingston Terrace. The evaluation presented in this report was conducted using factors specifically identified for that purpose. These factors are identified in Chapter 2. Ultimately, the results of the analysis covered in this report will be compiled into a multi-disciplinary Alternatives Analysis report leading to the identification of a preferred east/west circulation system.

## 1.5 Report Content and Organization

This report is organized into six chapters, the first of which is this Introduction. Chapter 2 presents and discusses the planning principles used in developing both factors that will guide the evaluation process and in defining a refined set of east/west circulation alternatives for the Kingston Terrace study area.

Chapter 3 provides a highlighted overview of the existing multimodal transportation system including streets, sidewalks, bicycle facilities, paths or trails, and transit service. Existing traffic volumes and operations at key intersections are identified. Existing travel times between a selected set of trip origins and destinations have also been determined.

Chapter 4 documents the 2040 future planned transportation system as identified in the Draft King City TSP with a focus on recommended improvements to the bicycle and pedestrian system, future traffic volumes and performance, travel time and other selected factors that were used in the evaluation

process. A more detailed outline of the regulatory context for providing street system connectivity is also included in this chapter.

Chapter 5 presents highlights of the development of East/West Circulation Alternatives for Kingston Terrace and a more in-depth discussion of the evaluation of these alternatives. This evaluation is intended to determine which alternatives would most successfully meet the city's goals for transportation system development in Kingston Terrace. This evaluation builds on the system identified in the TSP, and compares and contrasts the proposed alternatives using specific mobility factors as described in Chapter 2.

Chapter 6 summarizes the results of the analysis conducted and documented in Chapter 5, focusing first on identifying which alternatives would most successfully meet the city's goals for active transportation. The second part of this chapter presents a summary of findings related to the evaluation of vehicular mobility. Each alternative is ranked relative to each evaluation factor and an overall ranking is identified. The information in this chapter will be incorporated into the final Alternatives Analysis report.



Figure 1. Project Study Area



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## 2 PLANNING PRINCIPLES AND EVALUATION FACTORS

### 2.1 Planning Principles for East/West Corridor

The *URA 6D Beef Bend South Concept Plan* provided the basic structure for land use and a supportive transportation system. This plan is being further refined through a master planning process which will include identification of a multimodal network that accomplishes the following objectives:

- Provides a street network with a lot of connections to support bike/ped travel
- Works with existing topography and minimizes impacts to high value natural resources
- Supports in principle Concept Plan land uses and urban design structure which will offer a mix of housing types and neighborhoods that allows the city to achieve its vision for the future
- Integrates King City by providing at least one high quality route from one end of town to the other offering both connectivity and accessibility to all land uses
- Reduces Vehicle Miles of Travel and enhances sustainability
- Helps keep Beef Bend Road to a three-lane cross-section by spreading out east/west traffic over multiple alignments so that no one facility carries the full load.
- Provides a range of mode choices for residents and visitors
- Accommodate needs of public utilities, particularly gravity-fed sewer

### 2.2 Development of Evaluation Factors for Mobility

Building on the vision, goals, and objectives for the City’s transportation system as articulated in the Draft *Transportation System Plan (TSP)*, evaluation factors were identified to facilitate evaluation and ranking of east/west multimodal circulation alternatives based on how well the TSP vision could be realized. The TSP goals and objectives speak not only to transportation-related factors but also to ensuring that the transportation system operates in coordination with other community aspects such as land use and community livability, the built and natural environment, the local economy, and fiscal limitations.

Factors were chosen based on the likelihood that they would permit a differentiation among alternatives highlighting the choices and trade-offs that need to be made to arrive at a final decision on a preferred alignment(s). Factors have been developed for land use and community design, mobility, public utilities and services, natural resources, and cost/implementation considerations. This report specifically addresses an evaluation process based on the mobility factors and will largely consider “order of magnitude” effects of each alternative. Two categories of mobility factors were established with one set generally focused on bicycle and pedestrian mobility and the other generally focused on vehicular mobility.

#### 2.2.1 Bicycles, Pedestrians and Micro-mobility

These factors measure the effectiveness of alternatives on active transportation and sustainable/healthy outcomes, safety, performance, connectivity and accessibility related to a broad definition of active transportation modes (including micro-mobility choices), and fiscal responsibility. Specific factors include:

- Accommodation of bicycle and pedestrian system users to achieve sustainable and healthy outcomes
- Safety for bicycle and sidewalk users
- Connectivity and accessibility to significant destinations such as shopping, parks, schools, etc., as well as within neighborhoods
- Travel time comparisons between selected trip Origin and Destination (O-D) pairs, particularly for bicyclists and, to a lesser degree, pedestrians
- Ability to meet 330 foot bike/ped access spacing standards where feasible, or 530 foot spacing where 330 foot spacing is not feasible per Metro guidance, as well as block size goals and limits on long cul-de-sacs
- Supports providing a seamless connection to existing/planned infrastructure in existing King City and surrounding communities

## 2.2.2 Vehicular Mobility and Accessibility

These factors measure the effectiveness of alternatives on all vehicular users of the transportation system including autos, trucks, transit, school buses, and emergency vehicles with a specific emphasis on transportation safety and performance, broader community connectivity and accessibility, and fiscal responsibility. Specific factors include:

- Connectivity (accommodation of desired block size and spacing, as well as physical connections and directness of route)
- Levels of service/delays/volume-to-capacity ratios at key intersections
- Vehicular travel time comparisons between selected trip origin/destination (O-D) pairs (longer travel times would be indicative of greater VMT)
- Effect on Beef Bend Road 600-foot intersection spacing standards
- Limitations on long cul-de-sacs greater than 200 feet or serving less than 25 dwelling units (per City Code and Metro guidance)
- Transit supportive based on TSP goals and potential for future service
- Supports providing a seamless connection to existing/planned infrastructure in existing King City and surrounding communities

The analysis conducted for each of these factors is discussed in Chapter 5 and is summarized in terms of the overall quality of the connection provided for both active transportation and vehicular mobility and accessibility. Particular emphasis is placed on how well the alternative supports the system of street types consistent with the Concept Plan, the draft TSP and the evolving Master Plan.



## 3 EXISTING TRANSPORTATION CONDITIONS

This chapter has abstracted information from the Draft King City *Transportation System Plan* and the *Existing Multimodal Transportation Conditions* report for Kingston Terrace. Its purpose is to provide a basic understanding of the existing transportation system that currently serves Kingston Terrace. The chapter is structured for consistency with the evaluation factors that were used in assessing the trade-offs and benefits of various east/west circulation alternatives that will ultimately connect Kingston Terrace to the existing city. Included is a discussion of the existing multimodal transportation system, existing traffic volumes and system performance, and travel times between points of trip origin and destination.

### 3.1 Existing Multimodal Transportation System

#### 3.1.1 Physical Facilities

##### *Pedestrian Facilities*

**Figure 2** illustrates the existing King City pedestrian system which, in Kingston Terrace, is limited to a sidewalk along a portion of the north side of Beef Bend Road. Connections between Kingston Terrace and the existing city could be achieved at either Fischer Road or Capulet Lane.

##### *Bicycle Facilities*

**Figure 3** presents the current King City bicycle system which includes very limited facilities within the existing city and none in the vicinity of Kingston Terrace. Existing key facilities include Fischer Road, 131<sup>st</sup> Avenue and OR 99W.

#### 3.1.2 Performance of Multimodal Connections

##### *Pedestrian Facilities*

**Figure 4** shows the results of an analysis of the levels of traffic stress experienced by pedestrians using the existing multimodal transportation system in King City and Kingston Terrace. As shown, most city streets and rural roads experience a low level of stress for walkers due to the presence of existing paths or sidewalks or lower traffic volumes. Fischer Road, 137<sup>th</sup> Avenue, and 131<sup>st</sup> Avenue are experiencing a moderate degree of pedestrian stress, while the arterial streets in the study area are experiencing a high degree of stress including Beef Bend Road, Elsner Road, Roy Rogers Road, and OR 99W.

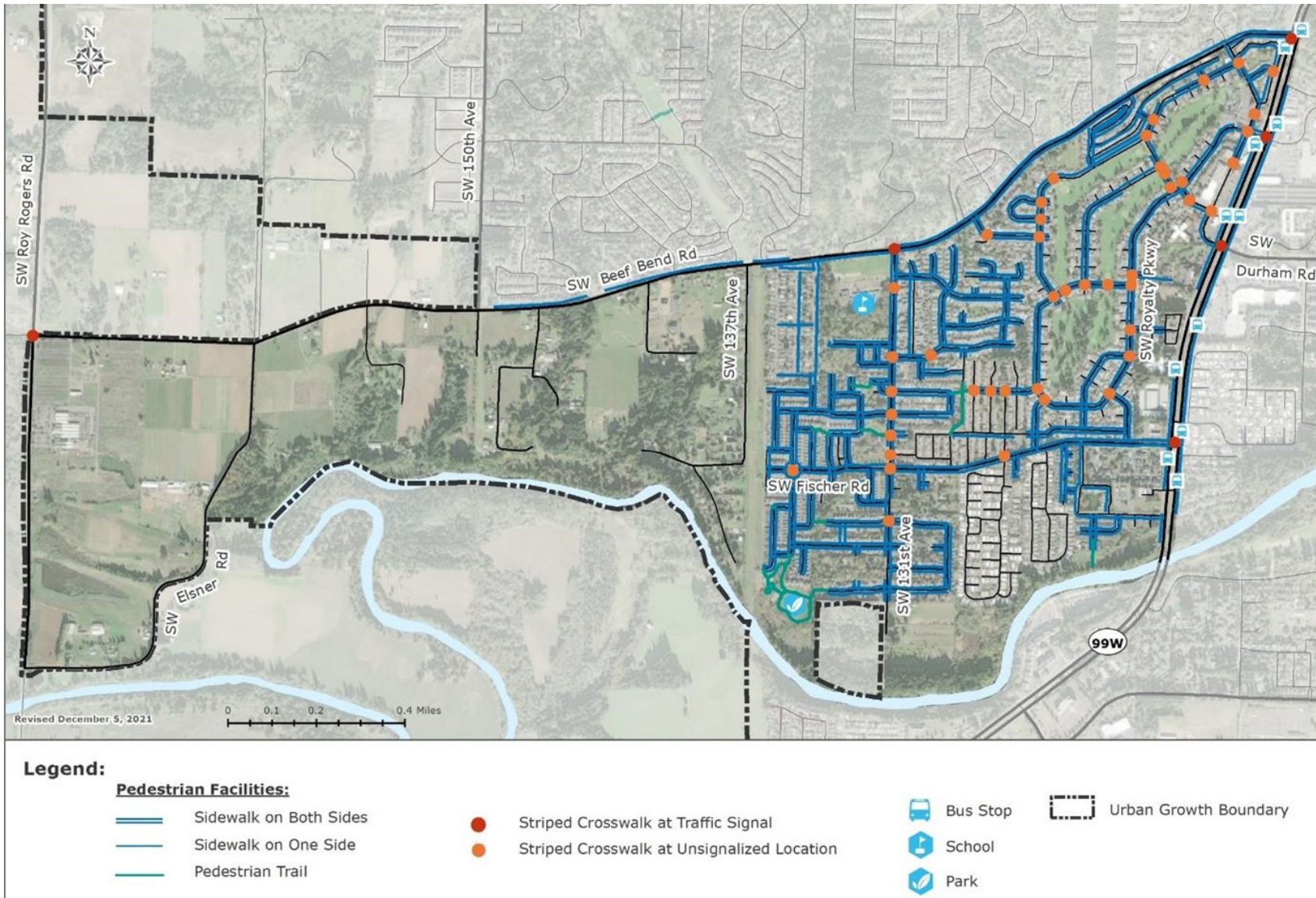
##### *Bicycle Facilities*

**Figure 5** illustrates the existing levels of traffic stress for bicyclists in King City and Kingston Terrace. The findings are the same as were identified for pedestrians, largely due to the lack of existing bicycle facilities.

##### *Active Transportation Gaps*

**Figure 6** presents gaps in the existing pedestrian and bicycle systems in King City, with a focus on Kingston Terrace. As shown in the figure, most of Kingston Terrace between Elsner and 137<sup>th</sup> Avenues lack either bicycle or pedestrian amenities. The figure also shows that part of the eastern portion of Kingston Terrace lies within a 15 minute bicycle ride of community amenities that lie within the existing city.

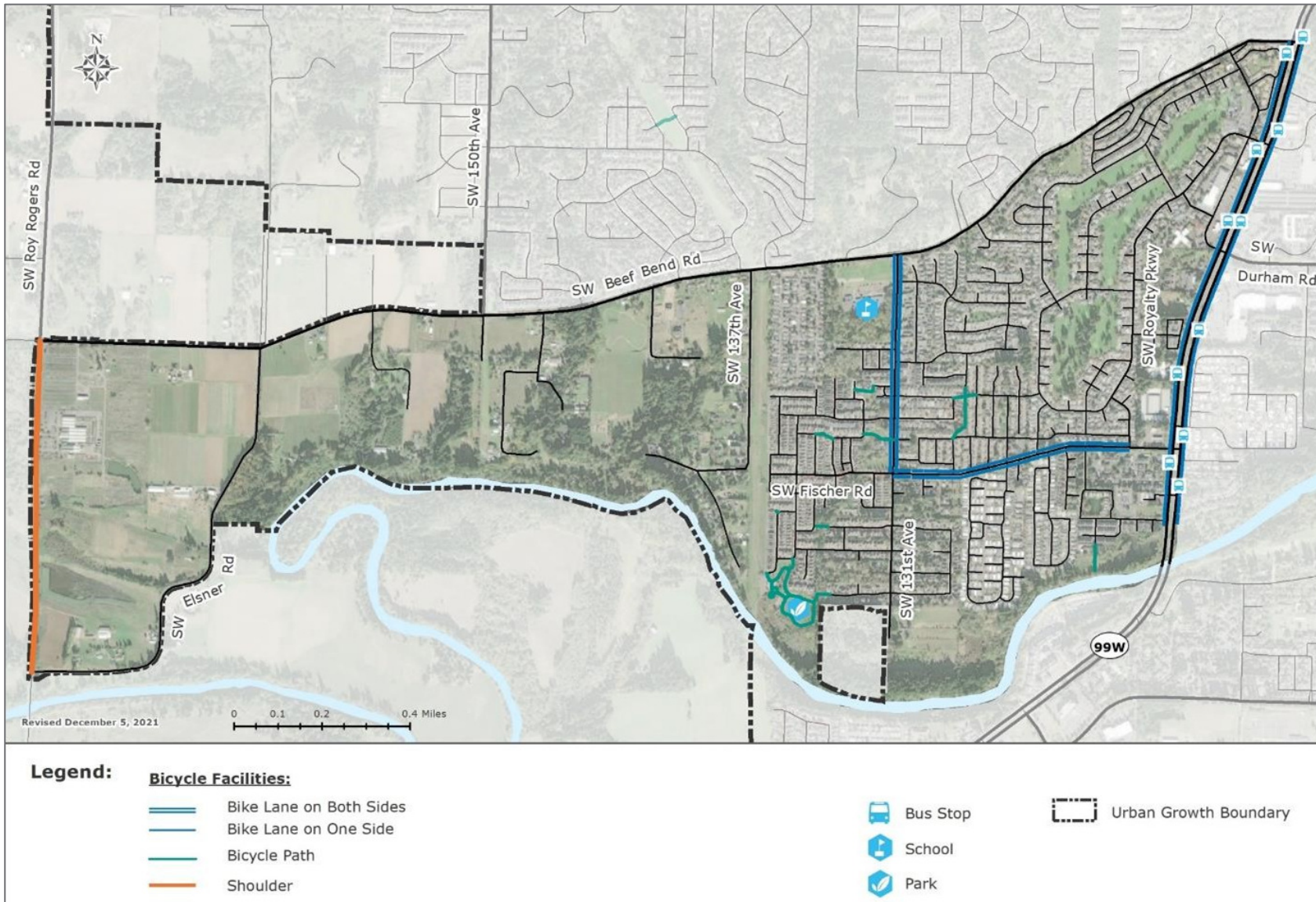
Figure 2. Existing Pedestrian Facilities



Source: Draft King City Transportation System Plan, December 2021



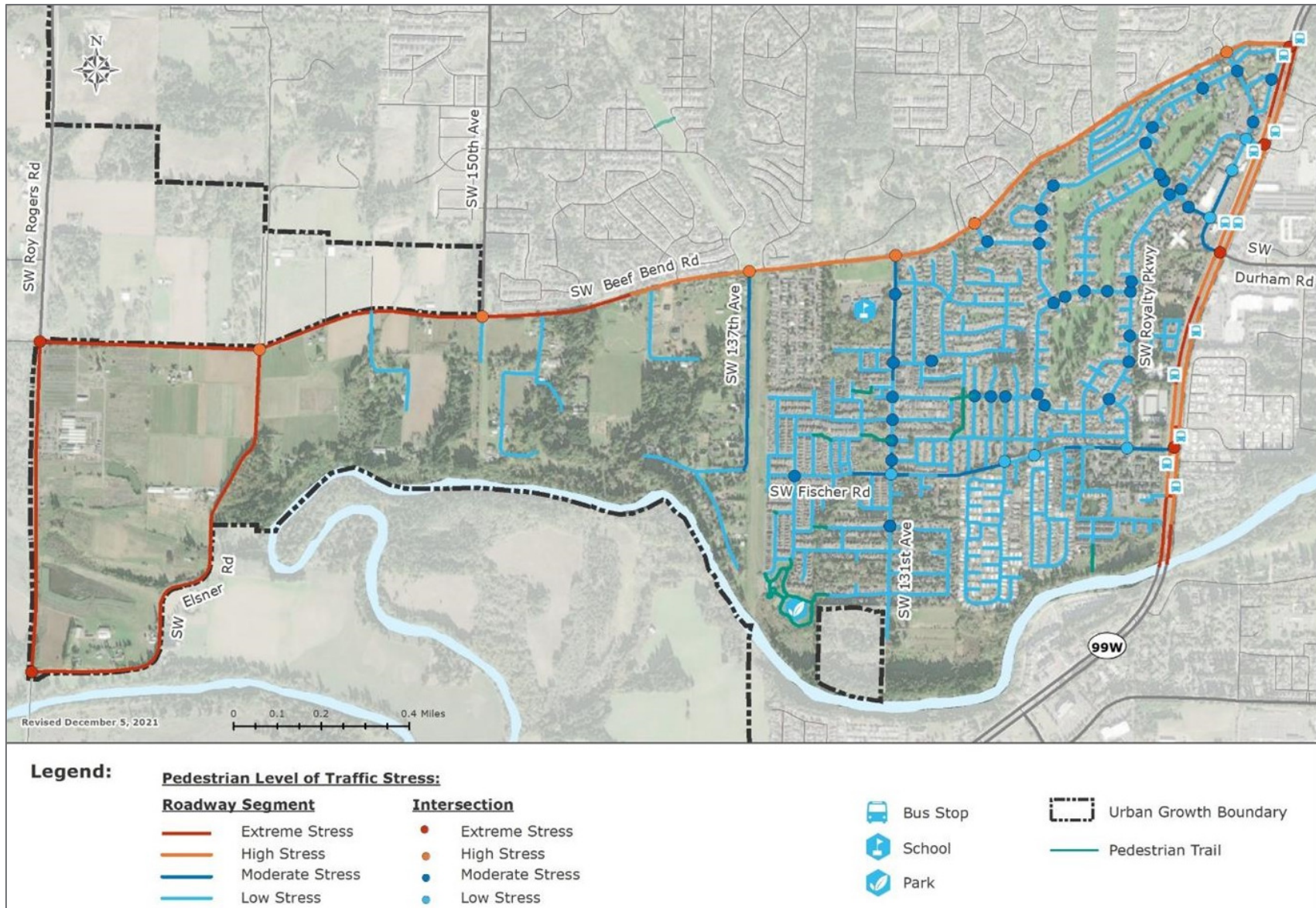
Figure 3. Existing Bicycle Facilities



Source: Draft King City Transportation System Plan, December 2021



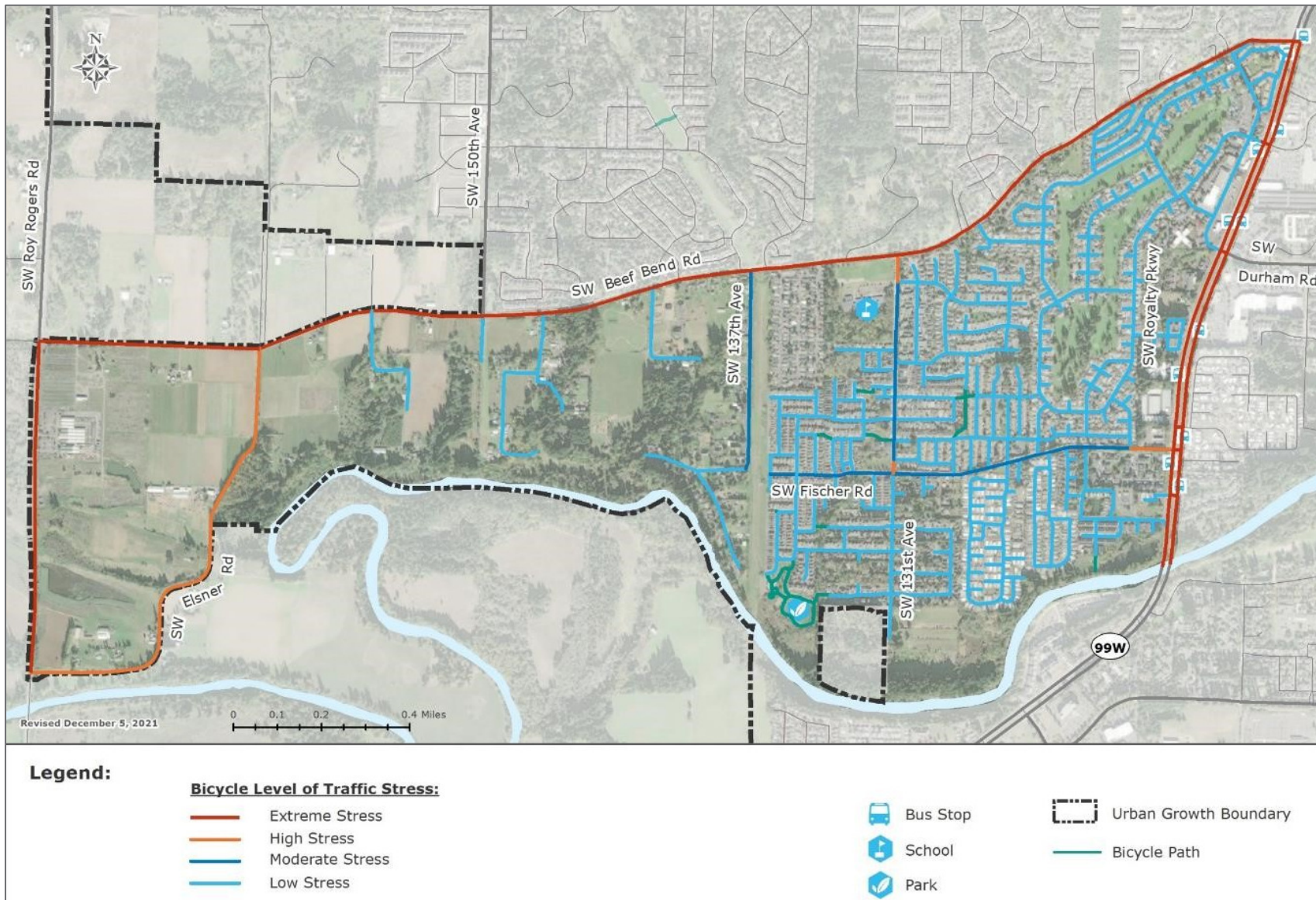
Figure 4. Pedestrian Levels of Traffic Stress



Source: Draft King City Transportation System Plan, December 2021

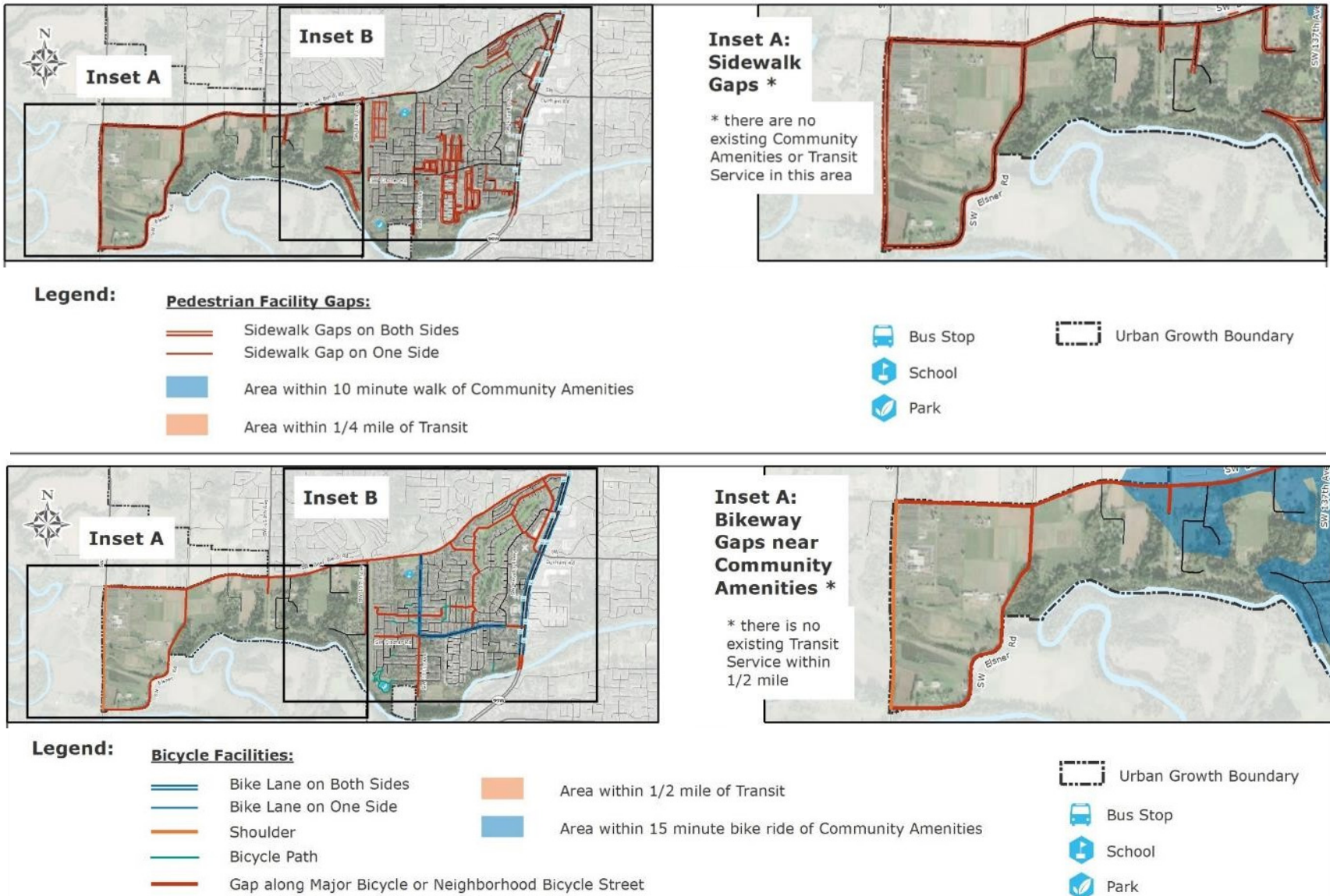


Figure 5. Bicycle Levels of Traffic Stress



Source: Draft King City Transportation System Plan, December 2021

Figure 6. Pedestrian and Bicycle System Gaps



Source: Draft King City Transportation System Plan, December 2021



## 3.2 2020 Traffic Volumes and Operations

### 3.2.1 Study Area Roadway Segments

Key roadway segments in the study area have been identified and were used in the assessment of traffic volume changes among various east/west circulation alternatives. 2020 existing PM peak hour volumes form the basis of future year (2040) travel forecasts and are included in this report for reference and comparison. Original data was taken from materials prepared by DKS for the City's Draft Transportation System Plan. This data was updated and modified to reflect changes in the various alignment alternatives and how they made connections to the remaining roadway system.

Data was provided at key locations including, but not limited to:

- Beef Bend Road west of 150<sup>th</sup> Avenue
- Beef Bend Road west of 137<sup>th</sup> Avenue
- Beef Bend Road between 137<sup>th</sup> and 131<sup>st</sup> Avenues
- Beef Bend Road west of OR 99W
- Fischer Road east of 131<sup>st</sup> Avenue
- Fischer Road west of OR 99W
- 131<sup>st</sup> Avenue south of Beef Bend Road

### 3.2.2 Study Area Intersections

The study area evaluated during development of the *Draft Transportation System Plan (TSP)* included fifteen key intersections located on streets surrounding the project area. A shorter list of six intersections has been excerpted from the TSP and included in this report. These volumes form the basis of the 2020 traffic operations analysis also included in the TSP. Intersection operations analysis were used to help determine potential impacts associated with east/west circulation alternatives. These intersections included:

- Beef Bend Road at 150<sup>th</sup> Avenue
- Beef Bend Road at 137<sup>th</sup> Avenue
- Beef Bend Road at 131<sup>st</sup> Avenue
- Fischer Road at 131<sup>st</sup> Avenue
- OR Highway 99W at Beef Bend Road
- OR Highway 99W at Fischer Road

Traffic control at these intersections is varied and include the following:

- Signal on Beef Bend Road at 131<sup>st</sup> Avenue
- Signals on OR 99W at Beef Bend Road and Fischer Road
- All way stop control on Beef Bend Road at 150<sup>th</sup> Avenue, and 131<sup>st</sup> Avenue at Fischer Road
- Two-way stop control at remaining study area intersections

### 3.2.3 Existing Traffic Performance Standards

State, local, and regional transportation plans require that all study area intersections must operate at or within adopted performance measures or mitigation in the form of roadway improvements may be necessary to support future growth. The intersection performance measures (or mobility targets) vary

by roadway jurisdiction including both ODOT and Washington County. King City does not yet have an adopted *Transportation System Plan* or mobility targets, but the standards included in the draft TSP have been used for this analysis.

### *ODOT Facilities*

Two intersections included in the study area are under the jurisdiction of ODOT. ODOT currently uses volume-to-capacity (v/c) ratio targets to assess traffic performance at intersections on state highway facilities. The mobility target for these intersections is identified in Table 7 of the *Oregon Highway Plan (OHP)*, Policy 1F as revised and adopted by the Oregon Transportation Commission through May of 2015. From Table 7, the mobility target identified along Highway 99W is an overall v/c ratio of 0.99.

### *Washington County Facilities*

Three of the study area intersections are under the jurisdiction of Washington County, all of which are located along Beef Bend Road. According to the *Draft Transportation System Plan*, Beef Bend Road is located in a regionally-designated Neighborhood and is subject to regional mobility targets. The current regional standards<sup>1</sup> require that a volume to capacity (v/c) ratio of 0.99 not be exceeded during the highest two consecutive hours of the day.

### *Draft King City Transportation System Plan*

One intersection in the study area, Fischer Road at 131st Avenue, is under the jurisdiction of King City. The Draft TSP includes new performance standards for motor vehicles specifying a maximum target v/c ratio of 0.99 on City streets and intersections during the highest one-hour period of the day<sup>2</sup>. At signalized, all-way stop, and roundabout controlled intersections, this standard is applied to the intersection. At two-way stop and yield controlled intersections, this standard is applied to all intersection approaches serving more than 20 vehicles during the peak hour. According to the TSP, mobility standards do not apply to approaches at stop-controlled intersections serving 20 vehicles or fewer during the peak hour<sup>3</sup>. This mobility standard allows more flexibility in the tension between larger intersection and street designs that are sometimes needed to accommodate peak vehicle demands, and the desire to maintain smaller designs that encourage slower vehicle speeds and tend to be more accommodating to pedestrian and bicycle users.

## 3.2.4 2020 Traffic Volumes

### *Roadway Segment Volumes*

**Figure 7** illustrates existing (2020) PM peak hour traffic volumes on the roadway system in the vicinity of Kingston Terrace. As shown in the figure, traffic volumes are highest along Roy Rogers Road, followed by Beef Bend Road. The segment of 131<sup>st</sup> Avenue between Beef Bend Road and Fisher Road, as well as

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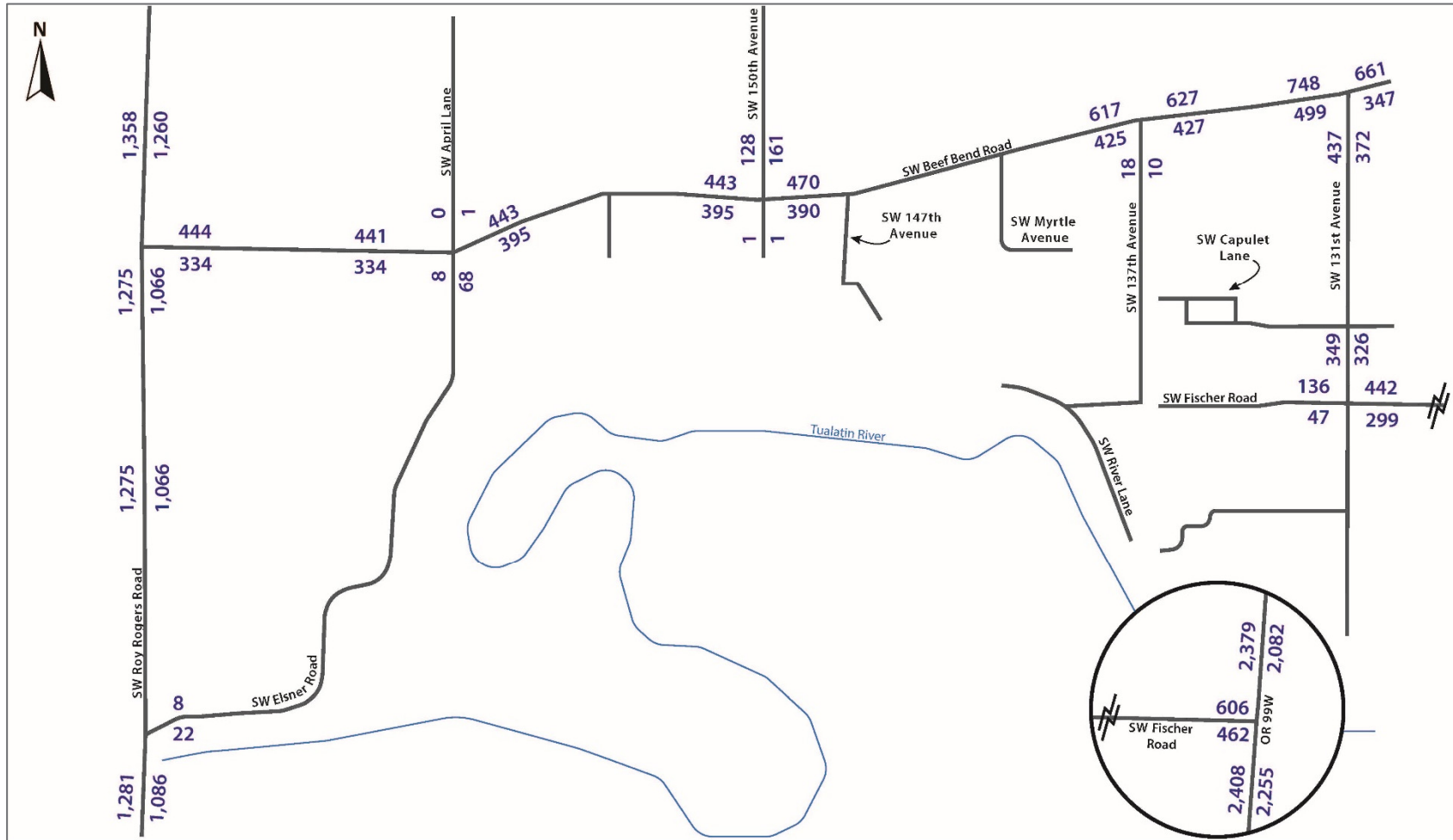
<sup>1</sup> Metro, *Regional Transportation Functional Plan*, Updated 2010, Table 3.08-2.

<sup>2</sup> The City v/c ratio performance standard is consistent with the Metro Regional Transportation Plan and Washington County targets that apply to SW Roy Rogers Road and SW Beef Bend Road.

<sup>3</sup> When a low number of vehicles approach a stop-controlled intersection (i.e., 20 or fewer), particularly at those with high volumes on the uncontrolled major street, long delays for vehicles often result during peak periods. This can cause the intersection to operate with a peak hour v/c ratio that exceeds the adopted intersection mobility standard and can necessitate the need to expand the intersection. Therefore, stop controlled approaches with a low volume of traffic are commonly excluded from agency mobility standards.



Figure 7. 2020 PM Peak Hour Traffic Volumes



Source: Draft King City Transportation System Plan, December 2021

Fischer Road from 131<sup>st</sup> Avenue to OR 99W carries a smaller but still significant level of existing peak hour traffic. The data presented in this figure was excerpted from Synchro traffic analysis data files prepared for the Draft King City TSP.

### Volumes at Key Intersections

Existing 2020 PM peak hour traffic volumes at study area intersections are included in Appendix A. This data was excerpted from the Draft King City TSP.

### 3.2.5 2020 Traffic Operational Analysis

Traffic analyses were conducted to identify any existing deficiencies within the study area for the 2020 PM peak hour. The acknowledged source for determining overall capacity for signalized and unsignalized intersections is the *Highway Capacity Manual (HCM)*. Consistent with the *ODOT Analysis Procedures Manual*, the 2010 HCM was used to obtain average delay, v/c ratios and level of service output for unsignalized intersections, as well as delay and levels of service for signalized intersections using the Synchro (Version 11) software package. The results of the 2020 PM peak hour intersection operations analysis are presented in **Table 1**. As indicated in this table, all intersections are currently operating within their identified mobility target with the exception of OR 99W at Fischer Road.

**Table 1. 2020 PM Peak Hour Intersection Operations**

Intersection	Traffic Control	Planned Jurisdiction	Mobility Target	PM Peak Hour		
				Volume/ Capacity	Avg Delay (sec.)	Level of Service
Beef Bend Road at 150 <sup>th</sup> Avenue	AWSC	County	v/c 0.99	0.72	19.8	C
Beef Bend Road at 137 <sup>th</sup> Avenue	TWSC	County	v/c 0.99	0.38/0.02	8.2/12.9	B
Beef Bend Road at 131 <sup>st</sup> Avenue	Signal	County	v/c 0.99	0.58	9.8	A
Fischer Road at 131 <sup>st</sup> Avenue	AWSC	City	v/c 0.99	0.65	16.6	C
Highway 99 at Beef Bend Road	Signal	ODOT	v/c 0.99	0.90	23.7	C
Highway 99W at Fischer Road	Signal	ODOT	v/c 0.99	<b>1.13</b>	<b>71.6</b>	<b>E</b>

Note 1: Performance results for the unsignalized intersections represent the worst movement.

Note 2: Analysis is based on 6th edition of the HCM except for volume/capacity ratios at signalized intersections which used 2000 HCM.

Note 3: ASWC means all-way stop control, TWSC means Two-way stop control.

Black boxes with white numbering indicates where the relevant mobility target would be exceeded.

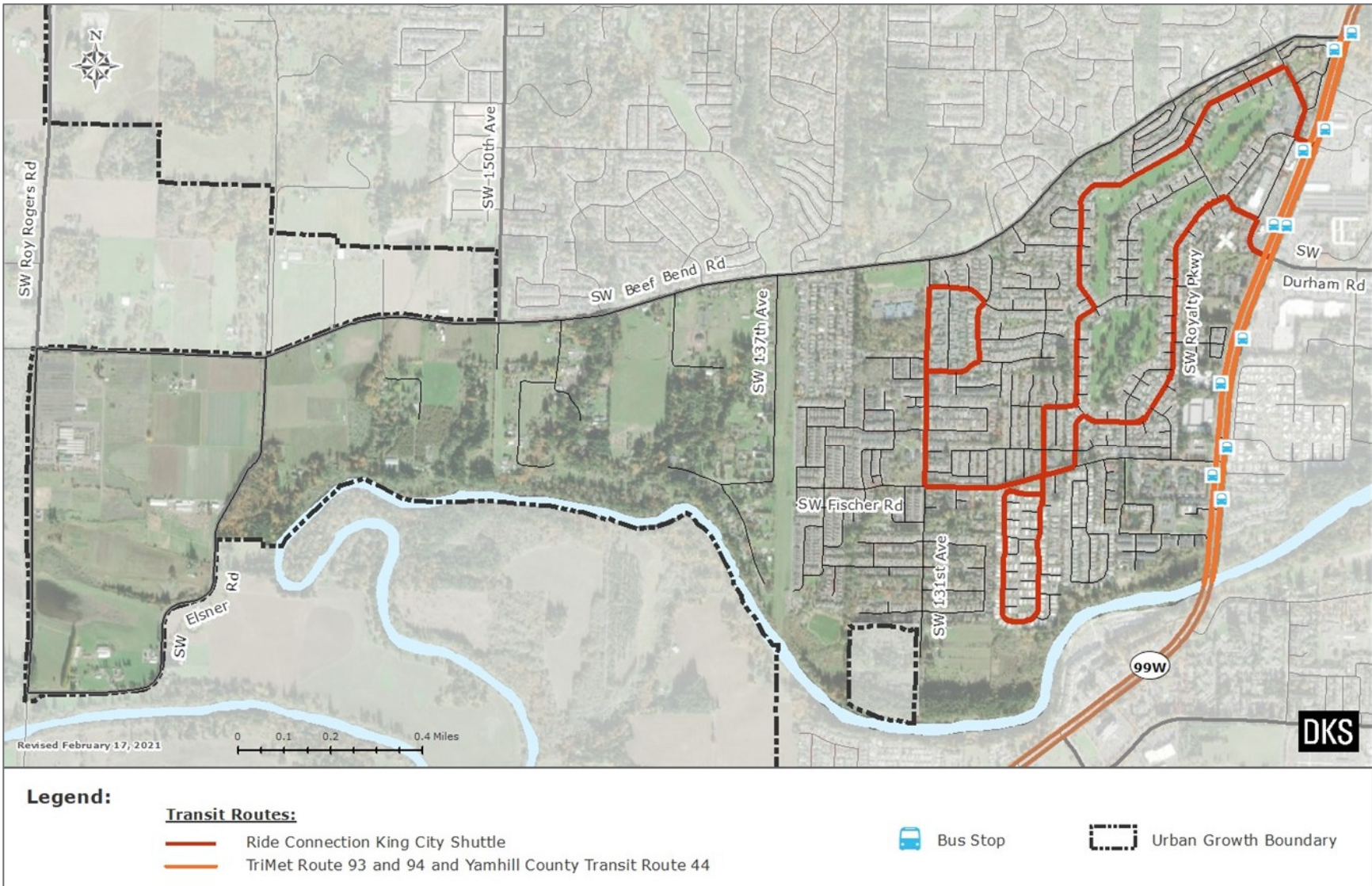
## 3.3 Travel Times

Travel time comparisons among the various alignment alternatives is used as a measure both of the ease of travel between various parts of King City and Kingston Terrace and as a surrogate for the effects of the alternatives on Vehicle Miles of Travel (VMT). The evaluation summaries between five selected points of trip origin and destination are illustrated in **Figure 12** in Chapter 4. **Table 3** in Chapter 4 presents the various travel times under existing conditions and under the future Base condition (comparable to the connection illustrated in the Draft King City TSP).

## 3.4 Existing Transit

**Figure 8** shows existing transit service in the vicinity of Kingston Terrace. Service is largely concentrated within the existing city limits and along OR 99W. As Kingston Terrace develops over time, there is a potential for expansion of transit into this area if a transit-supportive street system is developed. Service may also, ultimately, include Roy Rogers Road.

Figure 8. Existing Transit Service



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## 4 FUTURE (2040) BASELINE TRANSPORTATION CONDITIONS

The focus of this chapter is on documenting the expected future multimodal transportation system that will serve King City and Kingston Terrace. Guidance for development of this system, as well as needed improvements on the existing system are discussed in detail in the Draft King City *Transportation System Plan* (December 2021). This plan is not yet adopted but will be modified and ultimately adopted based on the outcome of the Kingston Terrace master planning process which will define a preferred east/west travel corridor or corridors that connects to the existing city.

Based on information contained in or developed for the TSP, baseline conditions data is being developed that can help guide and support the evaluation of east/west circulation alternatives. However, information described in this chapter pertains only to a planned or baseline system which was used as a starting point for evaluating the different transportation impacts and trade-offs of the various east/west alternatives. Information in this chapter will include what the draft TSP has to say about the mobility factors including elements that influence the evaluation and comparison of active transportation modes and vehicular modes. The evaluation of alternatives is discussed in Chapter 5.

### 4.1 Future Multimodal Connections

#### 4.1.1 Planned Pedestrian Facilities

**Figure 9** shows the planned backbone pedestrian system as articulated in the Draft TSP. It should be noted that route alignments and connections into the existing city are not yet clearly defined. The routing presented is a draft, subject to change.

#### 4.1.2 Planned Bicycle Facilities

**Figure 10** shows the planned backbone bicycle system as articulated in the Draft TSP. It should be noted that route alignments and connections into the existing city are not yet clearly defined. The routing presented is a draft, subject to change.

#### 4.1.3 Performance of Multimodal Connections

The multimodal connectivity suggested by Figures 9 and 10 is supportive of the Master Plan goal of providing high quality, low stress, and safer connections throughout Kingston Terrace to support the expanded use of active transportation modes. The backbone routes illustrated support the land use and network patterns identified in the Concept Plan which provide for diversified and convenient connections to most points of origin or destination within the community. These graphics will provide guidance to the refinement and evaluation of east/west circulation alternatives including the potential for multi-use paths, separate from vehicular routes.

### 4.2 Connectivity and Directness of Travel Route

Figures 9 and 10 illustrate a potential east/west corridor alignment between Roy Rogers Road and OR 99W as suggested by the TSP (shown in red and/or orange in the figures). This route is preliminary and subject to change but was used as the basis for analyzing future year traffic operations and developing a roadway improvement plan. This route provides good and direct connectivity for all parts of Kingston Terrace and would serve all travel modes including motor vehicles, transit, bicycle and pedestrian



Figure 9. TSP Pedestrian Route Designation

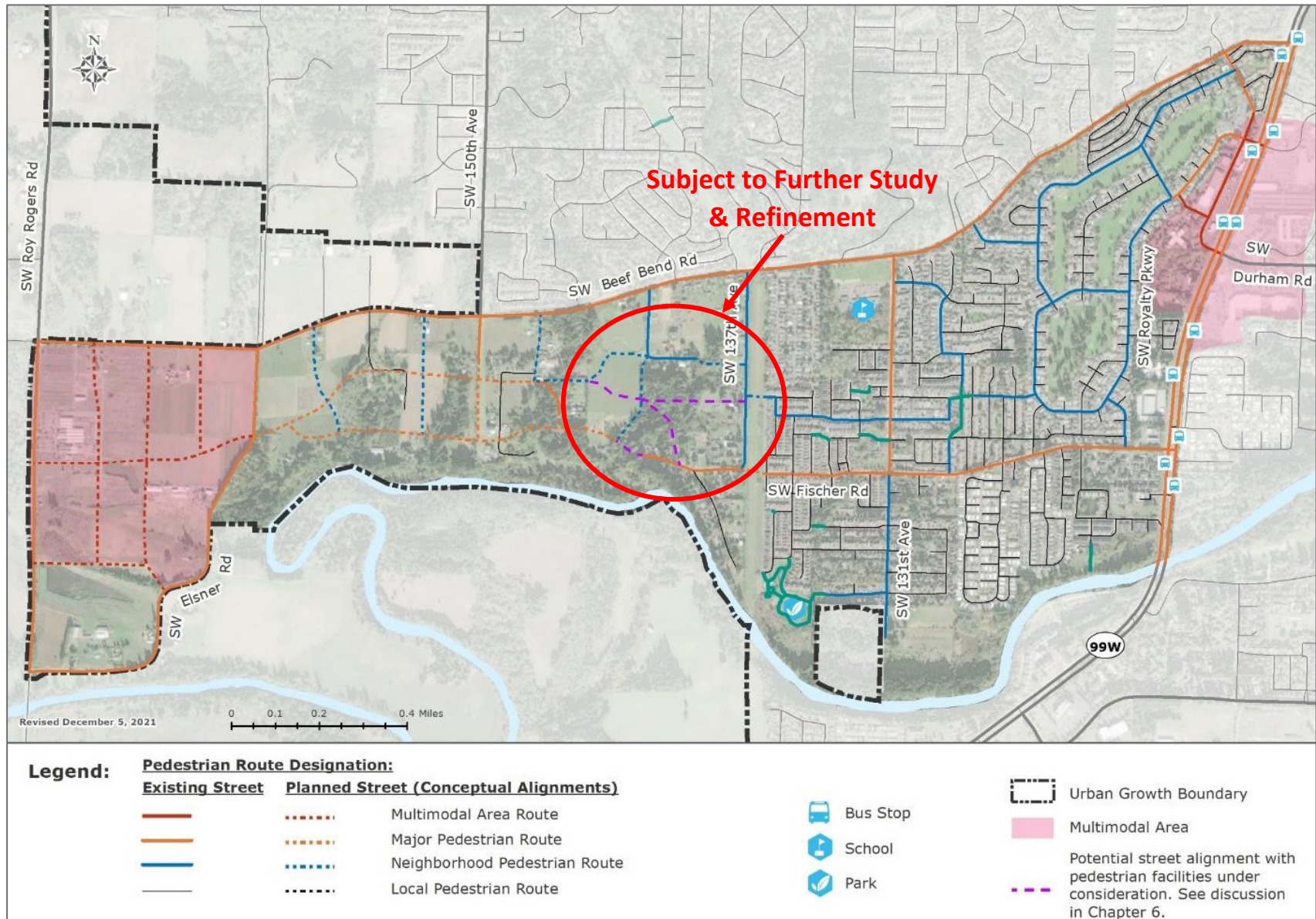
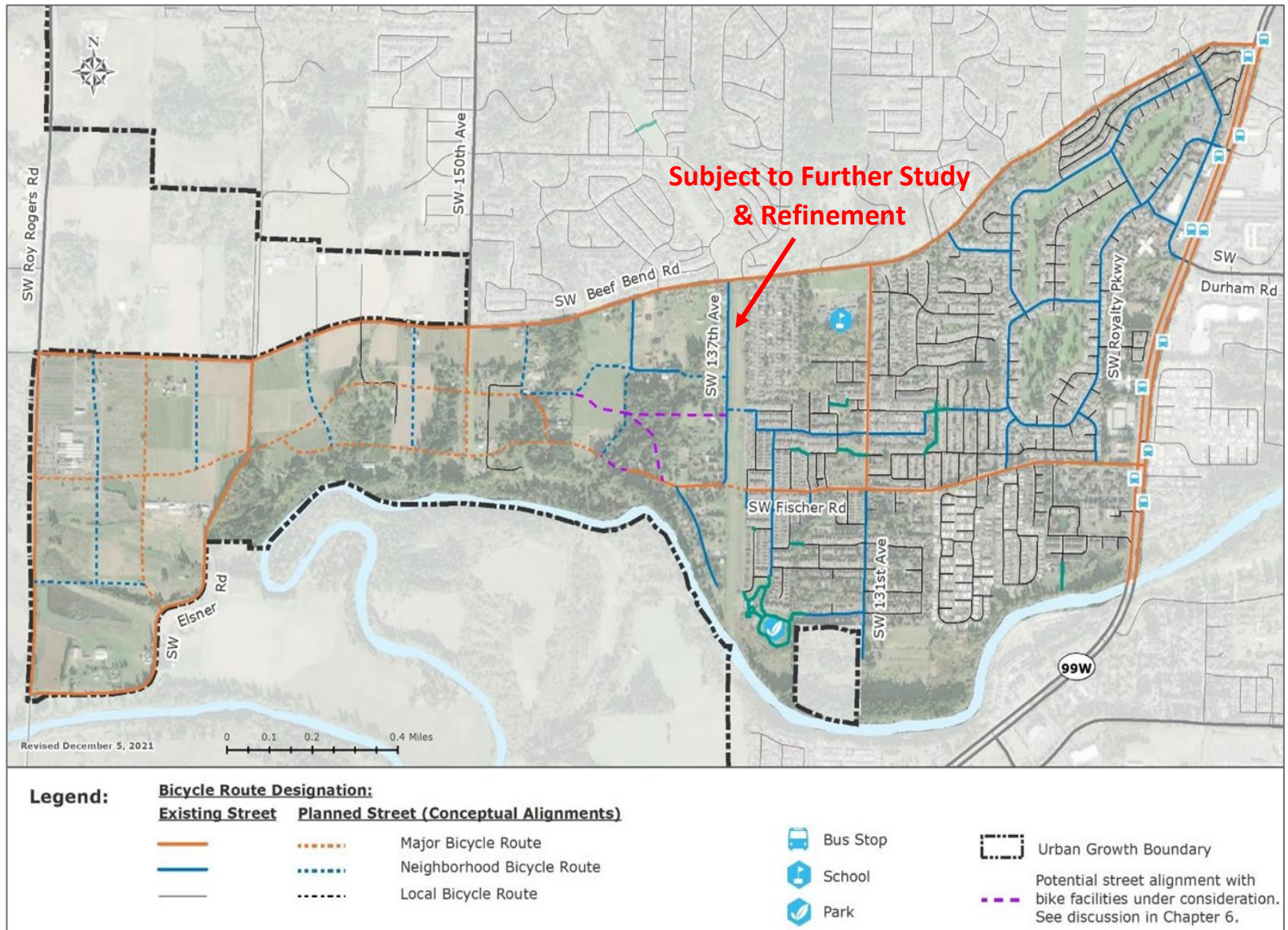




Figure 10. TSP Bicycle Route Designation



facilities, and school bus circulation. Other potential east/west connections were also identified in the figures connecting to Capulet Lane and a potential street connection further to the north. These connections may also provide connectivity for all travel modes or could be limited to active transportation travel.

## 4.3 2040 Baseline Traffic Volumes and Operations

### 4.3.1 2040 Baseline Roadway Segment Traffic Volumes

Future year traffic volumes were estimated for the TSP and are based on assumed land use and street network plans that are expected to be in place by the planning horizon year of 2040. **Figure 11** presents 2040 PM peak hourly roadway traffic volumes for the TSP's "Aspirational" system which is assumed to represent future baseline conditions for the evaluation of alternatives. The TSP uses the term "aspirational" to refer buildout of a preferred multimodal transportation network.

As is further discussed in Chapter 5, 2040 PM peak hour roadway traffic forecasts and turning movement projections at key intersections were developed for each east/west circulation alternative using the volumes in Figure 11 as a starting point. The modified volumes reflect the differences among alternatives in terms of connectivity, directness of travel, expected congestion and other factors. Future year volumes were used to conduct operational analysis of the alternatives for comparison with each other and with the network included in the TSP.

### 4.3.2 2040 Baseline Traffic Operational Analysis

**Table 2** presents future 2040 PM peak hourly traffic congestion at key intersections and along major roadway corridors in the study area. This information was excerpted from the draft TSP which describes in more detail the analysis assumptions and methods used to identify locations with expected future year congestion. Traffic operations analysis was conducted as part of the TSP to identify any future long-term (2040) PM peak hour intersection deficiencies which may require improvement.

Several intersections are expected to exceed their identified mobility target. These include:

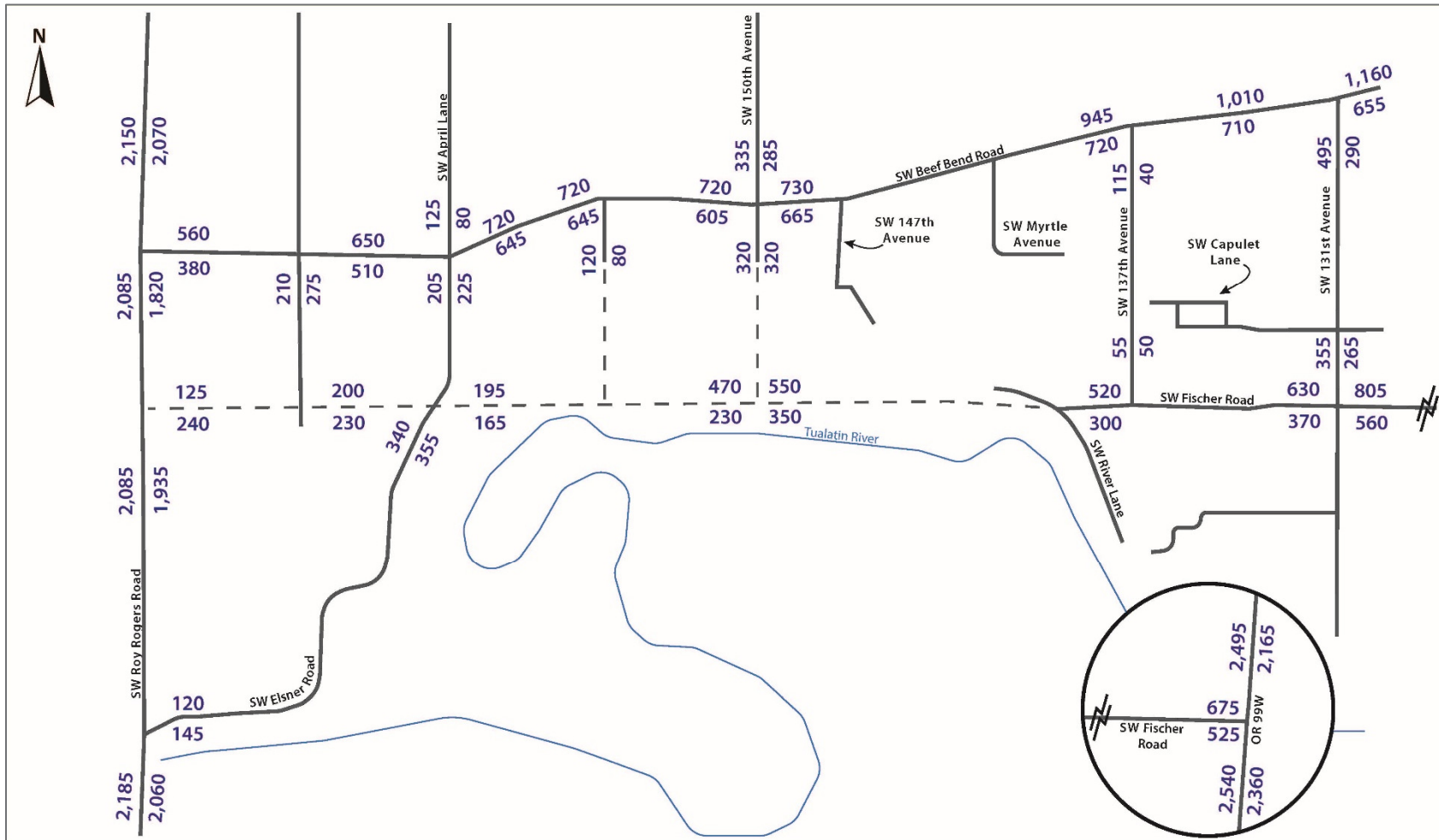
- *Fischer Road at 131<sup>st</sup> Avenue* – most approaches to this all-way stop-controlled intersection would operate acceptably but excessive delay would be experienced for the westbound leg which causes the entire intersection average to fail.
- *Highway 99W at Beef Bend Road and Fischer Road* – Each of these intersections is expected to exceed its mobility target of  $v/c = 0.99$ . At Beef Bend Road, excessive delay would also be experienced resulting in level of service F. Less actual vehicle delay would be experienced at Fischer Road and LOS C would be expected.

The analysis included in this table assumes that a direct roadway connection would be made between Kingston Terrace and the existing city as identified in the Draft TSP. The analysis summarized in Table 2 also assumes that various improvements as recommended in the TSP have been incorporated into the results. Recommended improvements include the following:

- *Beef Bend Road at 150<sup>th</sup> Avenue* – add a traffic signal, a northbound left turn lane and a southbound left turn lane
- *OR Highway 99 W at Fischer Road* – add a second eastbound right turn lane



Figure 11. 2040 PM Peak Hour TSP Traffic Volumes



Source: Draft King City Transportation System Plan, December 2021

**Table 2. 2040 PM Peak Hour TSP Intersection Operations<sup>1</sup>**

Intersection	Traffic Control	Mobility Target	PM Peak Hour		
			Volume/ Capacity	Avg Delay (sec.)	Level of Service
Beef Bend Road at 150 <sup>th</sup> Avenue	Signal	v/c 0.99	0.85	23.0	C
Beef Bend Road at 137 <sup>th</sup> Avenue	TWSC	v/c 0.99	0.13	17.5	C
Beef Bend Road at 131 <sup>st</sup> Avenue	Signal	v/c 0.99	0.73	11.5	B
Fischer Road at 131 <sup>st</sup> Avenue	AWSC	v/c 0.99	1.54	158.1	F
Highway 99W at Beef Bend Road	Signal	v/c 0.99	1.08	82.0	F
Highway 99W at Fischer Road	Signal	v/c 0.99	1.06	32.3	C

<sup>1</sup> Abstracted from Draft *Transportation System Plan* (December 2021), aspirational alternative analysis. The term “aspirational” was used in the TSP to refer to a condition with buildout of a preferred multimodal Kingston Terrace transportation network including a connection to existing city via Fischer Road and intersection improvements as needed.

Note 1: Performance results for the unsignalized intersections represent the worst movement.

Note 2: Analysis conducted based on 6th edition of the Highway Capacity Manual except for volume/capacity ratios at signalized intersections which used the critical V/C calculation method outlined in the ODOT Analysis Procedures Manual.

Note 3: ASWC means all-way stop control, TWSC means Two-way stop control.

Note 4: Analysis at the OR 99W/Fischer Road intersection was conducted using the 2000 HCM.

Note 5: For unsignalized intersections the volume/capacity ratio presented is for the worst movement. Delay and LOS are for the total intersection.

Black boxes with white numbering indicates where the relevant mobility target would be exceeded.

## 4.4 Travel Time Comparisons for the Base Case

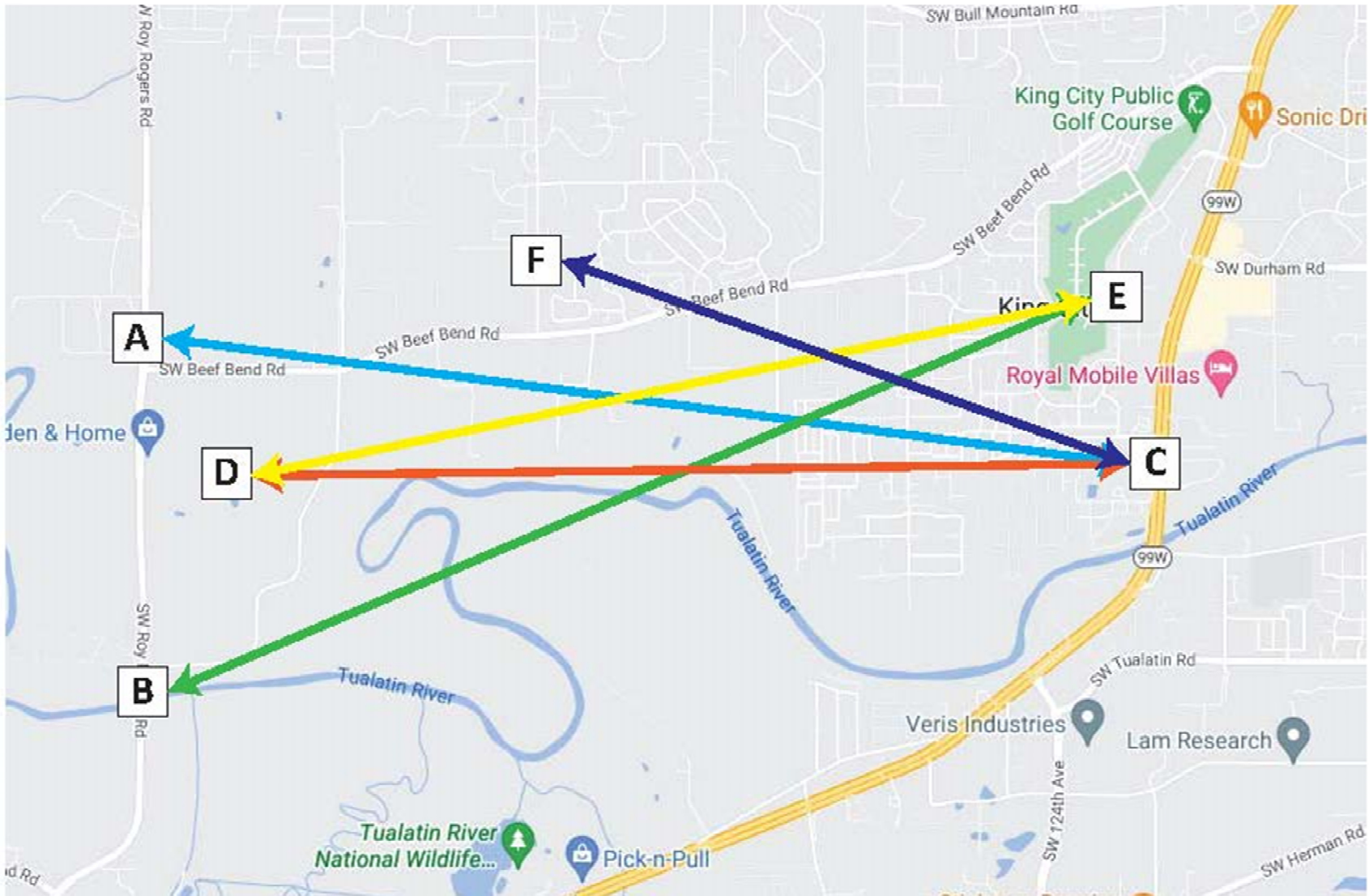
Travel time comparisons among the various alignment alternatives is used as a measure both of the ease of travel between various parts of King City and Kingston Terrace and as a surrogate for the effects of the alternatives on Vehicle Miles of Travel (VMT). This evaluation summarizes travel times between five selected points of trip origin and destination which are illustrated in **Figure 12**. All travel times are measured in the PM peak hour in the dominate PM peak hour direction which is westbound. Existing and expected intersection delays affecting the movement of traffic between the O/D pairs are also included in the travel time estimates. This includes calculated delays at the intersections of Beef Bend Road with Elsner Road, 150<sup>th</sup> Avenue, 137<sup>th</sup> Avenue, and 131<sup>st</sup> Avenue, as well as at the intersection of Fischer Road with 131<sup>st</sup> Avenue.

**Table 3** presents the various travel times under both existing conditions and the future Base condition (comparable to the collector street connection illustrated in the Draft King City TSP which would be most similar to Alternative 3 with a southerly alignment on the east end).

**Table 3. Travel Time Comparisons, Existing 2020 and Base Case 2040 (Per TSP)**

Origin-Destination Pairs	Travel Time in Minutes		
	2020	2040 Base	Difference
A to C (OR 99W/Fischer to Roy Rogers/Beef Bend)	7.81	6.90	(0.91)
F to C (OR 99W/Fischer to 150 <sup>th</sup> n/o Beef Bend)	6.19	5.41	(0.78)
B to E (Royal Parkway near golf course to Roy Rogers at Elsner)	6.72	7.70	+0.98
D to E (Royal Parkway near golf course to Elsner near Town Center)	6.27	7.08	+0.81
D to C (OR 99W/Fischer to Elsner near Town Center)	8.01	6.35	(1.66)

Figure 12. Origin-Destination Pairs for Travel Time Analysis



As noted in the table, the presence of a local collector street would improve travel time between 2020 and 2040 for several of the O/D pairs including from near the intersection of Fischer Road with OR 99W to both Roy Rogers Road and 150<sup>th</sup> Avenue north of Beef Bend Road. The connection between the intersection of Fischer Road at OR 99W and Elsner Road near the Kingston Terrace Town Center would also see improved travel times with the proposed Kingston Terrace collector street. Travel times are estimated to increase between Royalty Parkway in the vicinity of King James Place and destinations near the west end of Kingston Terrace. Travel times are expected to increase by 2040 due to increased traffic volumes along Beef Bend Road which would be the most likely route of this traffic between the Prince Albert Road intersection and the 137<sup>th</sup> Avenue intersection.

## 4.5 Future Transit

The Draft King City TSP identified opportunities for future transit service through Kingston Terrace, connecting it with the existing city, surrounding communities, and both existing transit (along the OR 99W corridor) and future transit service that could be offered along Roy Rogers Road. **Figure 13** was excerpted from the TSP and illustrates potential internal transit routing alignment options. It should be noted that while Figure 12 does not show a transit route on Roy Rogers Road, the potential for this service has been discussed when residential and employment densities are sufficiently high to provide a reasonable level of ridership. Having a well-connected internal street system is key to providing internal transit service to destinations within both Kingston Terrace and the larger community.

## 4.6 Master Plan Goals for Block Size/Spacing/Cul-de-Sacs

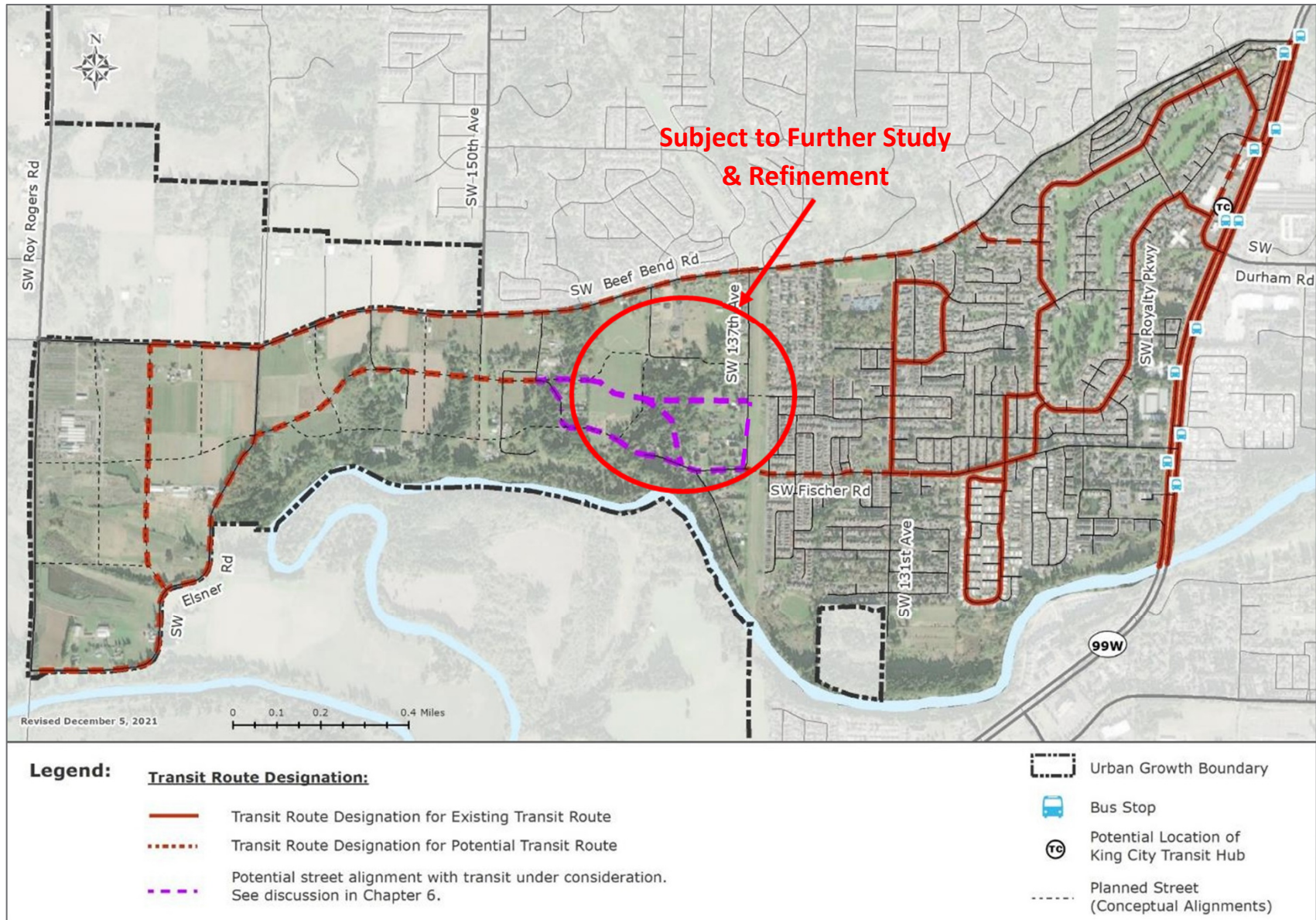
The basic or preferred TSP alternative, which represents the transportation system recommended for implementation in King City and Kingston Terrace in the TSP, assumed a series of connections throughout the study area. These connections were generally consistent with the Concept Plan and are used as the basis for analysis under this factor. Essential goals and regulatory requirements articulated in the Concept Plan and carried forward into the Master Plan emphasize connectivity of the street system and how well it could accommodate the desired block size and intersection spacing identified in the Concept Plan that intended to support good access and circulation for active transportation users.

- In its *Regional Transportation Functional Plan* Metro establishes a minimum block spacing of 530 feet in most cases, consistent with regional requirements. This requirement is also identified in the King City Municipal Code. This requirement is intended to ensure that a pedestrian or a bicyclist never has to travel more than 265 feet out of direction to access the next street.
- Washington County has established intersection spacing standards of 600 feet on arterials such as Beef Bend Road, but also allowing spacing of 330 feet for bicycle and pedestrian crossings where feasible. If 330 feet is not feasible connections at 530 feet consistent with Metro guidelines are established.
- Metro guidance and city code also limit the use of cul-de-sacs greater than 200 feet in length or serving fewer than 25 dwelling units. Revisions to the Oregon Administrative Rules (660-012-0810 (1)(c)) currently under consideration also speak to avoiding the development of local streets with dead ends.

Each alternative was assessed based on how well it is expected to meet these requirements.



Figure 13. TSP Transit Route Designation



## 4.7 Connectivity to Existing King City and Surrounding Communities

Both the Concept Plan and the Draft King City TSP identified an internal street system to serve development in Kingston Terrace. This street system connects the future developing areas of Kingston Terrace to each other, to the existing city, and to the surrounding communities and the regional transportation system. Each alignment alternative was evaluated to determine the extent to which the multimodal connectivity goals illustrated in these plans can be realized.

Connectivity goals address not only motor vehicle travel including autos, trucks, emergency vehicles, school buses and possibly future transit but also active or personal transportation modes. In this context, personal transportation can include not only bicycles and pedestrians, but may also include a range of small, low-speed micro-mobility devices such as powered standing scooters, electric-assist bicycles (e-bikes), powered seated scooters (scooter/mopeds), electric personal assistive mobility devices, personal delivery devices, and other small, lightweight, wheeled devices.

Connectivity requirements are clearly identified in several sections of the Oregon Administrative Rules (OAR 660-012) which implement State Planning Goal 12: Transportation (otherwise known as the Transportation Planning Rule or TPR). Pending amendments to the TPR are even more specific about intent including:

- OAR 660-012-0810:(1)(c) – *“Cities and counties must plan and design a complete and connected network of local streets.”*
- OAR 660-012-0810:(2) – *“Cities and counties must plan collector streets to provide access to property and collect and distribute traffic between local streets and arterials. Cities and counties must plan and design a collector street network that is complete and connected with local streets and arterials.”*

The OAR also stipulates that a local, adopted TSP or local street plan in the Portland Metropolitan Area must comply with Metro’s requirements for street connectivity as contained in Title 6, Section 3 of the *Urban Growth Management Functional Plan*.

The Metro *Urban Growth Management Functional Plan* (section 3.07.1120 Planning for Areas Added to the UGB) identifies requirements that comprehensive plans shall include *“A conceptual street plan that identifies internal street connections and connections to adjacent urban areas to improve local access and improve the integrity of the regional street system. For areas that allow residential or mixed-use development, the plan shall meet the standards for street connections in the Regional Transportation Functional Plan.”*

The Metro *Regional Transportation Functional Plan* identifies street design guidance for preparation of a conceptual plan map of all new streets in areas of more than five acres that allow for residential and mixed use development. *“The map shall identify street connections to adjacent areas to promote a logical, direct and connected system of streets and should demonstrate opportunities to extend and connect new streets to existing streets, provide direct public right-of-way routes and limit closed-end street designs consistent with subsection E”* (which speaks to block size and access spacing).<sup>4</sup>

Each alternative was evaluated based on the requirements identified above.

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<sup>4</sup> Metro Code, Chapter 3.08, Title 1: Transportation System Design, 3.08.110 Street System Design

## 5 FUTURE (2040) ANALYSIS OF CIRCULATION ALTERNATIVES

### 5.1 Development of Alternatives

The development of east/west circulation alignment alternatives involved a multi-step process that included:

- **Step 1:** Brainstorming and collecting a wide range of ideas about how multimodal connectivity could be achieved.
- **Step 2:** Initial screening of alternatives to develop a shortlist of reasonable alternatives that could achieve the goals and vision of the City for Kingston Terrace.
- **Step 3:** Evaluation of the remaining alternatives using the factors identified in Chapter 2.

The importance of having good east/west connections cannot be over-emphasized. The value that they bring includes:

- Integrating King City through quality circulation from one end of town to the other, offering connectivity and accessibility.
- Supporting proposed land uses and development in Kingston Terrace to achieve the vision.
- Reducing vehicle miles of travel (VMT) and enhancing community sustainability.
- Providing a range of mode choices for residents and visitors and offering opportunities for the quickest travel times by all modes.
- Supporting of potential future transit that touches the heart of the community.
- Supporting better emergency vehicle travel times.
- Spreading the traffic burden throughout the network.

### 5.2 Initial Screening of Alternatives

An initial screening of alternatives was conducted that built on the wide range and variety of east/west connections that have been suggested through both the Concept Plan development process and the early stages of the Master Plan. The initial screening was conducted prior to the preparation of this report, whose purpose is to document the more detailed screening of shortlisted alternatives based on the chosen mobility factors. Other reports have been prepared that address the other factors used in producing a more comprehensive assessment of the benefits, impacts and trade-offs of each shortlisted alternative.

The initial screening of alternatives involved a qualitative assessment of each option using high level factors drawn from the goals of the master planning process. These included determining how well an alternative met the following objectives:

- Consistency with Concept Plan principles (connectivity, multimodal, etc.)
- Multiple east/west alignments to spread out the traffic.
- Separation from Beef Bend Road so no one facility carries the full traffic load.
- Avoid high value natural resources.
- Accommodate needs of public utilities, particularly gravity-fed sewer.
- Identify range of alternatives for more in-depth analysis.

## 5.3 Identification of Shortlist of Reasonable Alternatives

Considering all of the community and stakeholder input on alternative east/west corridor alignment alternatives, the initial evaluation process identified a shortlist of alternatives to be considered for further, more detailed evaluation. This shortlist was identified based on the following guidance from initial evaluation including alternatives that:

- Generally supported the land use and transportation network patterns identified in the Concept Plan which are further evolving in the master planning process.
- Collectively provided the opportunity for redundant east/west corridors to spread out the traffic burden, offer alternative corridors for non-vehicular travel modes, and reduce complete reliance on Beef Bend Road for intra-city travel.
- Provided the basis for considering the effects of topography on east/west corridor alignments.
- Integrated with and supported infrastructure necessary to serve future urban development, particularly allowing for gravity-flow sanitary sewer.
- Integrated with and supported or enhanced the preservation of natural resources in Kingston Terrace.

**Figure 14** illustrates the shortlist of reasonable east/west circulation alternatives for which more detailed evaluation was conducted. It should be noted that the alignments illustrated in this figure are both generalized and preliminary. As the analysis process is conducted, alignment modifications may be made and some options may ultimately be rejected for all travel modes. There exists the potential that one or more of these preliminary alignment alternatives may be flagged solely for active transportation which could also include low-powered, low-speed micro-mobility modes as noted earlier in the report.

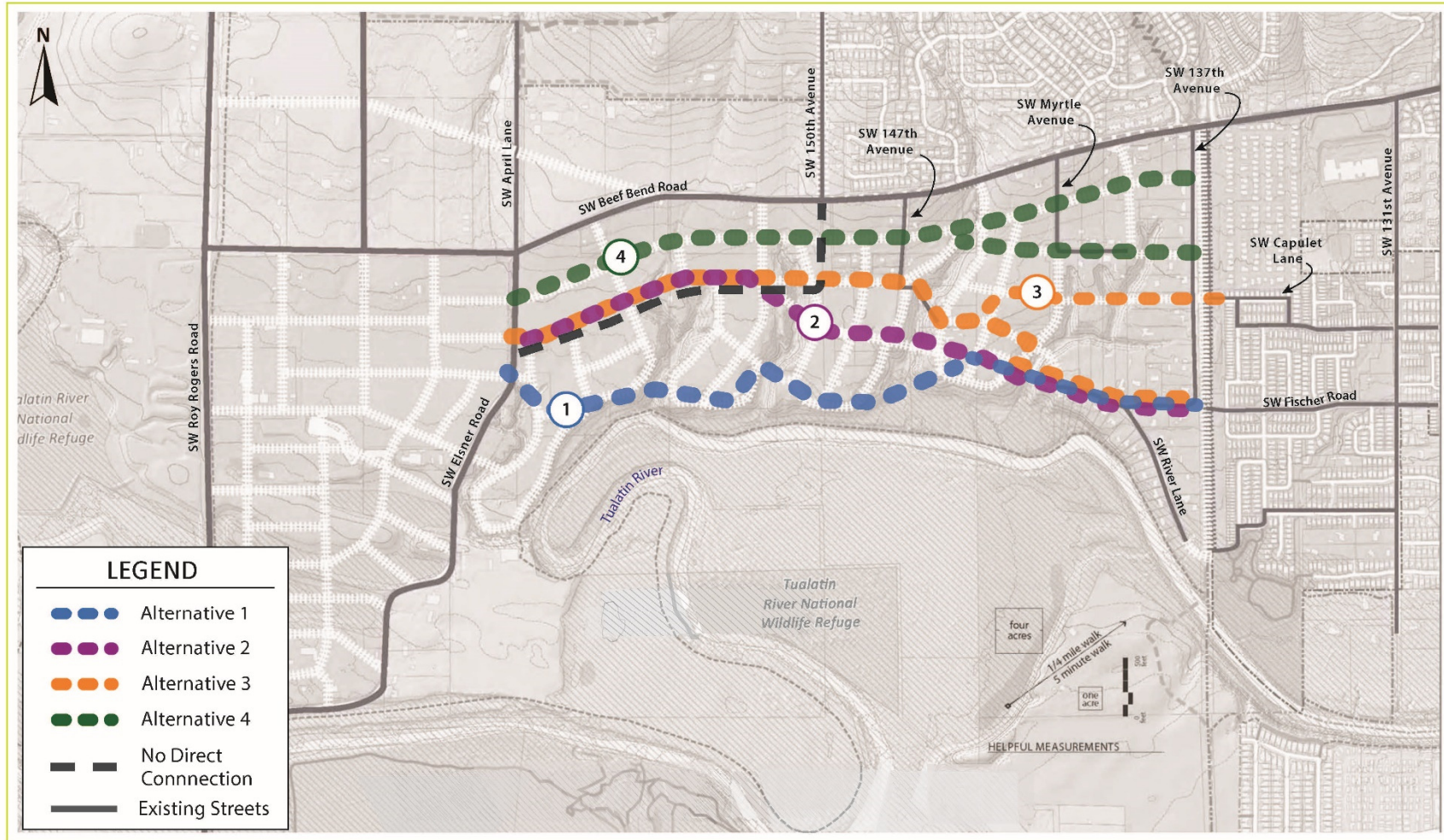
Additionally, it should also be noted that the precise alignment of the preferred circulation alternatives identified through more detailed planning may well be revised when actual land development and more detailed engineering occur at some point in the future.

The short-list of alternatives includes:

- **Alternative 1:** provides east/west collector street connectivity from Elsner Road near the southern end of the proposed Kingston Terrace Town Center to the existing western terminus of Fischer Road. This alternative would include numerous crossings of the existing north/south ravines in Kingston Terrace running along the southern edge of the study area, generally in proximity to the Tualatin River.
- **Alternative 2:** also provides east/west collector street connectivity from Elsner near the center of the proposed Kingston Terrace Town Center to the existing western terminus of Fischer Road. This alternative would include fewer crossings of Kingston Terrace Ravines running generally through the central portion of the study area.
- **Alternative 3:** also provides east/west collector street connectivity from Elsner Road near the center of the proposed Kingston Terrace Town Center to the existing western terminus of Fischer Road. This alternative would include fewer crossings of ravines in the study area, also generally running through the central portion of the study area.



Figure 14. East/West Circulation Alternatives



Kingston Terrace Master Plan  
King City, Oregon

- Alternative 4:** this east/west collector street connects Elsner Road near the northern edge of the proposed Kingston Terrace Town Center to 137<sup>th</sup> Avenue. This alternative would likely include little or no crossings of ravines in the study area and runs through the northern portion of the study area. Most of this alternative alignment would run parallel to and approximately 300 feet south of Beef Bend Road.

In addition to the shortlisted alternatives, traffic analysis has been conducted on a “No Direct Connection” scenario which would include a collector level street between Elsner Road and approximately 150<sup>th</sup> Avenue. East of 150<sup>th</sup> Avenue there would be no collector level facility and circulation would be provided by a system consisting only of local streets. A connection to the western end of Fischer Road would not be included. Based on roadway design guidelines identified in the City’s draft TSP, local streets would include sidewalks but not bicycle lanes.

## 5.4 Summary of Evaluation Process

### 5.4.1 Mobility Evaluation Factors

As noted in Chapter 2, the more detailed evaluation process is based on a list of factors that are expected to most clearly identify the differences among the shortlisted alternatives. As noted in that chapter, the evaluation process was based largely on qualitative, order-of-magnitude comparisons for which precise results are less important than differences among the alternatives. As appropriate, some quantitative data that is available at the level of detail proscribed by this analysis would also be provided for the comparisons.

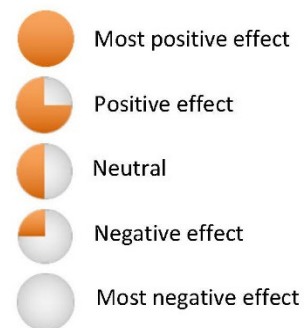
For the mobility assessment, key factors that were discussed in the remainder of this chapter are segregated into two categories including factors affecting the assessment of active transportation modes (including bicycles, pedestrians and micro-mobility modes) and vehicular modes as discussed in Chapter 2.

### 5.4.2 Application of Scoring Factors

Using each of the mobility factors, a summary of the key findings and conclusions for each alternative has been prepared and is documented in this chapter. The key findings of this analysis are presented in a summary table which is supported by a more detailed summary in matrix format that has been included in **Appendix B**. Based on the summary of both quantitative and qualitative data, each alternative was scored relative to each factor. Determination of rankings was based on quantitative analysis data where available. Otherwise, a qualitative assessment of the relative merits of each alternative for each factor was determined.

Circulation alternatives were evaluated for each factor based on five levels of impact as shown in the graphic.

In considering how best to rank a circulation alternative relative to a specific factor or among categories of factors it was important to consider how the alternatives compare with each other. Absolute numbers from a quantitative evaluation or the more general qualitative assessments are less important than the comparison among alternatives.



It will also be important in identifying a preferred alternative to recognize that there is no perfect solution – all alternatives will have positive benefits and negative impacts. Existing plans, policies and the regulatory context were considered in evaluating trade-offs among alternatives, as will the magnitude of identified adverse impacts and positive benefits. A balance among the factors should be sought so that no single category outweighs another but that they are considered on the basis of their merits. It will also be important to remember that the selected east/west circulation alternative will need to accommodate all travel modes and must support and integrate with the broader transportation network that will ultimately serve Kingston Terrace. Emphasis was on accommodating local circulation needs rather than regional through traffic. Scoring results for all alternatives and factors are presented in Chapter 6 in Table 19 and Table 20 for bicycle and pedestrian modes and in Table 21 and Table 22 for vehicular travel modes.

### 5.4.3 Assumptions for the Evaluation Process

Several assumptions were made during the course of the transportation analysis process which are documented below. These assumptions were applied uniformly across the evaluation process to ensure that the process would be as fair, transparent, and unbiased as possible. Assumptions include:

- The westerly point of origin for all alternatives would be at the intersection with Elsner Road in the vicinity of the proposed Kingston Terrace Town Center.
- Connections to the existing city would occur either via an extension of Fischer Road to 137<sup>th</sup> Avenue with connections to specific alternatives occurring from that point, or, in the case of the northerly alignment of Alternative 4, via Beef Bend Road.
- The same cross-section was assumed for all alternatives (2 travel lanes with on street parking, a landscaped buffer, sidewalks, and bicycle pathways on both sides of the street). It was assumed that bicycle lanes would be added to the west end of Fischer Road to provide for a continuous bicycle connection between the new collector road and the existing Fischer Road bicycle lanes. Sidewalks are already provided along this street section.
- The No Direct Connection scenario would not provide a collector level street system east of approximately 150<sup>th</sup> Avenue. While a multimodal pathway is assumed to be provided as part of an improved Beef Bend Road cross-section, the local streets would not include bicycle facilities (as consistent with the recommended street cross-section for this facility type in the King City Draft TSP).
- All alternatives were assumed to be posted for 25 mph speeds and designed to accommodate slow travel speeds using a variety of traffic calming strategies.
- The analysis assumes that Alternative 4 would only connect to 137<sup>th</sup> Avenue and that any further connections into the existing city would be via Beef Bend Road for the northern alignment or Fischer Road for the southern alignment. The cost of improvements to 137<sup>th</sup> Avenue was not included for these alignment alternatives to keep the comparisons relatively comparable but would be a necessary part of these alternatives should one of them be selected as the preferred alignment.
- For the analysis of bicycle travel it was assumed that the No Direction Connection scenario and Alternatives 4 (north and south) and 3 (north) would use the future Westside trail to make a

connection between the alignment alternative and the existing city. Connections from the trail into the city could occur either at Capulet Lane or Fischer Road.

- Block sizing and spacing was assumed to be comparable for all alternatives so this factor was not meaningful in comparing differences among alternatives.
- An original vehicular mobility factor that assessed whether the alternative provided at least one continuous connection into the existing city was determined to be actually a Yes/No assessment which did not identify qualitative differences among the alternatives. This factor was eliminated from further consideration.
- An original factor that broadly identified the quality of multimodal connectivity offered by an alternative was determined to more effectively summarize the overall evaluation results and has been used as such in this report.

## 5.5 Active Transportation Modes

This section focuses on the effectiveness of shortlisted alternatives on active transportation modes (including micro-mobility choices). The evaluation was conducted using the factors identified in Chapter 2 and summarized below as they related to sustainable/healthy outcomes, safety, performance, connectivity, and accessibility. Specific factors include:

- Accommodation of bicycle and pedestrian system for healthy outcomes
- Safety for bicycle and sidewalk users
- Connectivity to key destinations and directness of travel route
- Travel time comparisons between selected trip Origin and Destination (O-D) pairs, particularly for bicyclists
- Ability to meet spacing standards/block size goals and limits on long cul-de-sacs
- Supports providing a seamless connection to existing/planned infrastructure in existing King City and surrounding communities
- Overall ranking of alternatives that speaks broadly to all considerations that have been evaluated related to active transportation modes and represent an assessment of the overall multimodal quality of the connection.

Each of these factors is discussed in more detail in the sub-sections that follow. This analysis assumes that Alternative 4 would only connect to 137<sup>th</sup> Avenue and that any further connections into the existing city would be via Beef Bend Road for the northern alignment or Fischer Road for the southern alignment.

### 5.5.1 Accommodation of Bicycle and Pedestrian Systems

This section evaluates how well each of the alternatives can physically accommodate bicycle and pedestrian circulation systems. Analysis is based on a qualitative review of potential physical alignments to assess how each might reasonably meet TSP and master planning goals in accommodating both bicycle and pedestrian circulation. Analysis results are shown in **Table 4**.

As indicated in the table, there would be no substantive difference among the alternatives including the No Direct Connection scenario with respect to the pedestrian improvements that could be provided. By assuming a consistent cross-section for the alternatives, all would be built with sidewalks on both sides



of the street with landscaped buffers. Sidewalks would also be provided along all local streets which would be the only facility type built east of approximately 150<sup>th</sup> Avenue within Kingston Terrace. Based on the cross-sectional guidelines in the Draft King City TSP, local streets would not include bicycle facilities. This would limit the attractiveness of the Kingston Terrace circulation system for bicycle travel, particularly for longer distances.

**Table 4. Accommodation of Bicycle and Pedestrian Systems**

<b>Alternative</b>	<b>Pedestrian Systems</b>	<b>Bicycle Systems</b>
No Direct Connection e/o 150th	Sidewalks would be provided under all street design options.	No collector road east of 150 <sup>th</sup> which may include no or lesser quality bicycle facility.
Alternative 1	Sidewalks would be provided under all street design options.	Collector status would include some form of high quality bikeway.
Alternative 2	Sidewalks would be provided under all street design options.	Collector status would include some form of high quality bikeway.
Alternative 3	Sidewalks would be provided under all street design options.	Collector status would include some form of high quality bikeway.
Alternative 4	Sidewalks would be provided under all street design options.	Collector status would include some form of high quality bikeway.

### 5.5.2 Safety for Bicycle and Sidewalk Users

This analysis focuses on bicycle and pedestrian safety, primarily by identifying areas of potential risk that could limit the usefulness of the alignment to a broad range of users. Both the TSP and the Kingston Terrace Concept and Master Plans identify a goal of providing high quality, comfortable, and safe active transportation mobility for all users in King City. While relying on existing crash data and experience, each alternative has been qualitatively assessed to determine how well it achieves this goal. Analysis results are presented in **Table 5**.

**Table 5. Safety of Bicycle and Sidewalk Users**

<b>Alternative</b>	<b>Pedestrian Safety</b>	<b>Bicycle Safety</b>
No Direct Connection e/o 150th	Relies on local streets only within KT and is assumed to use 137 <sup>th</sup> or Westside Trail to connect with streets in existing King City such as via Capulet or Fischer.	Relies on local streets only within KT and is assumed to use 137 <sup>th</sup> or Westside Trail to connect with streets in existing King City such as via Capulet or Fischer. May not have bikeways on local streets.
Alternative 1	Lower stress, relatively safe connections would be available.	Lower stress, relatively safe connections would be available.
Alternative 2	Lower stress, relatively safe connections would be available.	Lower stress, relatively safe connections would be available.
Alternative 3	Lower stress, relatively safe connections would be available.	Lower stress, relatively safe connections would be available. If connected via Capulet may not have bikeways.
Alternative 4	Sidewalks to be provided, connection to existing city is assumed to use 137 <sup>th</sup> or Westside Trail to connect with streets in existing King City such as via Capulet or Fischer.	Bikeways to be provided, connection to existing city is assumed to use 137 <sup>th</sup> or Westside Trail to connect with streets in existing King City such as Capulet or Fischer. Likely no bikeways on local streets like Capulet but would be added to Fischer.

As indicated in Table 5, Alternatives 1, 2 and 3 would have similar characteristics including the provision of lower stress, relatively safe connections across the study area for optimal bicycle circulation. For Alternative 3 north the connection to the existing city via Capulet Lane would not have bicycle lanes and bicyclists would share street space with vehicles until they reach available facilities on 131<sup>st</sup> Avenue and/or Fischer Road. Alternative 4 would be similar to the other alternatives except that it would require use of 137<sup>th</sup> Avenue or the Westside Trail for connections into the city. The No Direct Connection scenario would rely on local streets east of 150<sup>th</sup> Avenue which would not have bicycle facilities. Alternately, bicycles could use the shared use pathway proposed for the south side of Beef Bend Road to 137<sup>th</sup> Avenue and then connect into the existing city via Capulet Lane or Fischer Road. However, this option would likely involve some out of direction travel to reach destinations within Kingston Terrace.

### 5.5.3 Connectivity and Directness of Travel Route to Key Destinations

This factor evaluates the extent to which each alternative provides a direct route for bicycle and pedestrian travel modes that connects Kingston Terrace internally within itself and the existing city for a variety of key destinations. Examples of key destinations include parks, schools, shopping facilities, employment centers, or entertainment venues. Analysis is qualitative and focused on identifying the differences among the alternatives. Analysis results are presented in **Table 6**.

**Table 6. Connectivity and Directness of Travel to Key Destinations for Active Transportation**

Alternative	Pedestrians	Bicycles
No Direct Connection e/o 150th	Likely the most circuitous as would largely rely on local connections or Beef Bend Road to get to the existing city.	Likely the most circuitous as would largely rely on local connections or Beef Bend Road to get to the existing city.
Alternative 1	Most direct connectivity across KT with link to town center and schools	Most direct connectivity across KT with link to town center and schools
Alternative 2	Most direct connectivity across KT with link to town center and schools	Most direct connectivity across KT with link to town center and schools
Alternative 3 - south	Similar to #1 and #2.	Similar to #1 and #2.
Alternative 3 - north	Less direct due to circuitous route via Capulet.	Less direct due to circuitous route via Capulet.
Alternative 4	More circuitous than #1, #2 or #3 to reach destinations in existing city.	More circuitous than #1, #2 or #3 to reach destinations in existing city.

As discussed in the table, there would be a lot of similarity between Alternatives 1, 2 and 3 south which generally provide the most direct connections to various destinations in the future Kingston Terrace and the existing city. These alternatives would align closer to the center of development, making it easier to reach more destinations within Kingston Terrace. Alternative 3 north and Alternative 4 would provide slightly more circuitous routing with the most circuitous routing being provided by the No Direct Connection scenario. This latter scenario would rely on local streets which would have sidewalks but no bicycle lanes or would require travel on Beef Bend Road on the perimeter of Kingston Terrace.

### 5.5.4 Bicycle Travel Time Comparisons

Based on the trip Origin-Destination (O-D) pairs identified in Figure 12, travel times by bicycle were identified for each alternative. For this analysis, it was assumed that bicycle travel speeds will average 15 mph regardless of the roadway used. This speed was identified through online bicycle planning resources as a good average including both beginning and very experienced riders. It was also assumed

that travel through key study area intersections would be affected by the expected delay at these locations relative to alignment alternatives and the expected traffic volumes that each will carry. It was further assumed that bicycles using any of the alternatives could use Fischer Road to reach the existing city, either directly or via the proposed Westside Trail segment in the BPA alignment. Results of the analysis are summarized for each O-D pair and each alternative in **Table 7**. The location of each point of trip origin or destination is illustrated in Figure 12 or described in Table 3.

**Table 7. Bicycle Travel Time Comparisons**

Alternative	Vehicle Travel Time (in minutes)				
	A-C	F-C	B-E	D-E	D-C
No Direct Connection e/o 150 <sup>th</sup>	11.88	8.68	14.60	11.84	11.80
Alternative 1	11.36	8.44	13.24	10.48	10.44
Alternative 2	10.88	8.00	13.60	10.84	10.80
Alternative 3 South	11.16	8.00	13.88	11.12	11.08
Alternative 3 North	11.80	8.60	14.52	11.76	11.72
Alternative 4 South	11.80	8.24	14.68	11.92	11.88
Alternative 4 North via Fischer	12.08	8.84	15.20	12.44	12.40
Alternative 4 North via Beef Bend	12.88	9.60	13.00	12.08	13.20

Note: Numbers highlighted in red show the longest travel times between each O/D pair.

As shown in the table, since assumed speeds are the same for all roads, the primary differentiating factor among the alternatives is distance traveled between each O/D pair. Routes that would have a direct connection via Fischer Road (Alternatives 1, 2 and 3 south) would generally require less travel time as these routes would typically be shorter. For trips to destinations north of Beef Bend Road (A on Roy Rogers Road and F on 150<sup>th</sup> Avenue), it was assumed that bicyclists would use the proposed multiuse path to be built on the south side of Beef Bend Road west of the BPA alignment where Metro is expected to build a regional trail (Westside Trail). The Westside Trail would then be used to access streets within the existing city via either Capulet Lane or Fischer Road.

In summary, travel times for Alternatives 1, 2 and 3 South which all connect to the existing city directly via Fischer Road are considered to be similar and would generally experience the lowest travel times. Alternative 3 North, Alternative 4 South and the No Direct Connection scenario would also experience generally similar travel times which would average slightly longer than the preceding three alternatives. Alternative 4 North would experience the longest travel times due to the location of this alternative relative to the select O/D pairs.

### 5.5.5 Ability to Meet Intersection Spacing Standards, Block Size Goals and Limitations on Long Cul-de-Sacs

Metro guidance, the draft King City TSP and the Kingston Terrace Concept and Master plans all specify intersection spacing standards, block size and a general limitation on cul-de-sacs (or closed loop systems) in excess of 200 feet. One of the primary intents of these standards is to minimize travel distances for pedestrians and bicyclists within Kingston Terrace, thus encouraging use of these travel modes in lieu of motorized vehicles. The extent to which each alternative alignment can support these policies was assessed on a qualitative and comparative basis and the results are summarized in **Table 8**.

**Table 8. Spacing Standards Affecting Active Transportation**

<b>Alternative</b>	<b>Intersection Spacing</b>	<b>Block Sizes</b>	<b>Cul-de-Sacs</b>
No Direct Connection e/o 150 <sup>th</sup>	Standards could be met.	Standards could be met.	Vulnerable to cul-de-sacs unless local street system is built to provide connectivity across ravines.
Alternative 1	Standards could be met.	Standards could be met.	Minimizes any cul-de-sacs with the most ravine crossings.
Alternative 2	Standards could be met.	Standards could be met.	Guarantees more east/west connectivity across ravines
Alternative 3	Standards could be met.	Standards could be met.	Guarantees more east/west connectivity across ravines
Alternative 4	Standards could be met.	Standards could be met.	Vulnerable to cul-de-sacs unless local street system is built to provide connectivity across ravines.

All of the alternatives and the No Direct Connection scenario were assumed to be built in conformity to the intersection spacing and block size standards. Thus, the primary difference among alternatives relative to the listed design standards would focus on how well an alternative could achieve goals to limit the length of roadway cul-de-sacs. The presence of cul-de-sacs would result in out-of-direction travel and the lengthening trips by all travel modes and, likely, increased Vehicle Miles of Travel.

Due to its proposed alignment and the frequency of ravine crossings, Alternative 1 is expected to be the most successful in minimizing the need for cul-de-sacs. Given their general alignment within Kingston Terrace and the presence of several ravine crossings that guarantee more east/west connectivity, Alternatives 2 and 3 (both alignments) are expected to limit the need for any roadway cul-de-sacs but may not completely eliminate it. Due to their locations at or near the northern perimeter of Kingston Terrace, Alternative 4 and the No Direct Connection scenario are vulnerable to creating a roadway system with long cul-de-sacs unless local street crossings of one or more ravines are included in the Master Plan. Generally, it was concluded that these two options would provide the poorest performance relative to the cul-de-sac limitation.

### 5.5.6 Seamless Connections to Surrounding Communities

This factor provides a qualitative measure of the ability of an alternative to provide seamless connections for bicycles and pedestrians between Kingston Terrace and the street system in surrounding communities, particularly Tigard's River Terrace. Of particular importance would be the provision of frequent, high quality connections across Beef Bend Road, consistent with County policy. Results of this assessment are summarized in **Table 9**.

This factor has a more regional focus than the others considered in the foregoing analysis. The evaluation assumes that the alternatives which include a collector road system (both for crossing Kingston Terrace and for accessing either Beef Bend or Roy Rogers Roads would provide the best level of connectivity. This includes Alternatives 1 through 4, but Alternative 1 was considered to be less successful in providing a seamless connection due to its location the furthest away from River Terrace and other destinations largely to the north. The No Direct Connection scenario was considered to be the worst at achieving this evaluation factor as it would rely largely on a local street system east of 150<sup>th</sup>



Avenue which may not be permitted to provide direct access onto or across Beef Bend Road. Washington County policies limit access to/from arterial roads such as Beef Bend Road to collector streets located a minimum of 600 feet apart.

**Table 9. Seamless Connections for Active Transportation**

<b>Alternative</b>	<b>Surrounding Communities</b>
No Direct Connection e/o 150 <sup>th</sup>	Would rely on local streets which may not have bikeways to reach Beef Bend Road crossings.
Alternative 1	Would have designated bikeways to reach Beef Bend Road connections, but forces collector level traffic the farthest south. However, would provide best opportunity for connections to proposed Tualatin Riverside trail.
Alternative 2	Would have designated bikeways to reach Beef Bend Road connections.
Alternative 3	Would have designated bikeways to reach Beef Bend Road connections.
Alternative 4	Would have designated bikeways to reach Beef Bend Road connections.

## 5.6 Vehicular Transportation Modes

These factors measure the effectiveness of alternatives on all vehicular users of the transportation system including autos, trucks, transit, school buses, and emergency vehicles with a specific emphasis on transportation safety and performance, broader community connectivity and accessibility, and fiscal responsibility. Specific factors include:

- Connectivity and potential for out-of-direction travel
- Levels of service/delays/volume-to-capacity ratios at key intersections
- Travel times between selected O-D pairs and potential Vehicle Miles of Travel (VMT) effects. Longer travel times would be indicative of greater VMT.
- Effect on Beef Bend Road intersection spacing standards
- Limitations on long cul-de-sacs greater than 200 feet or serving less than 25 dwelling units
- Transit supportive based on TSP goals and potential for future service
- Supports providing a seamless connection to existing/planned infrastructure in existing King City and surrounding communities
- Overall ranking of alternatives that speaks broadly to all considerations that have been evaluated related to autos, trucks, transit, school buses, emergency vehicles and represent an assessment of the overall multimodal quality of the connection.

### 5.6.1 Connectivity and Directness of Travel Route

This factor evaluates the extent to which each alternative provides a direct route that connects Kingston Terrace internally within itself and to the existing city for vehicular travel modes including passenger cars, trucks, transit, emergency vehicles, and school buses. Analysis is qualitative and focused on identifying the differences among the alternatives. Analysis results are presented in **Table 10**.

**Table 10. Vehicular Connectivity and Directness of Travel**

<b>Alternative</b>	<b>Motor Vehicles</b>	<b>School Buses</b>	<b>Emergency Vehicles</b>
No Direct Connection e/o 150 <sup>th</sup>	Poorest connection to existing city, relies on Beef Bend & local streets built to lower standards than an internal collector	Could reach all destinations but would depend on local streets east of 150 <sup>th</sup> and may require a more circuitous pick-up/drop-off route. Likely no bike connections.	No redundancy in east/west city connections across King City. Only have Beef Bend Road.
Alternative 1	Peripheral route to center of development but offers complete east/west connection	Farther from center of development, may require more walking or circuitous routing.	Offers reasonable redundancy to Beef Bend Road
Alternative 2	Offers complete east/west connection	Central to development, may have better options for pick-up and drop-off.	Offers reasonable redundancy to Beef Bend Road
Alternative 3	Offers complete east/west connection	Central to development, may have better options for pick-up and drop-off.	Offers reasonable redundancy to Beef Bend Road
Alternative 4	Less direct connection to existing city. Also peripheral to center of development.	Farther from center of development, may require more walking or circuitous bus routing.	More circuitous connection between east and west of city but does offer redundancy if Beef Bend Road is not available.

As noted in Table 10 all Alternatives and the No Direct Connection scenario provide some connectivity between Kingston Terrace and the existing city. Due to its location on the northern edge of Kingston Terrace, Alternative 4 provides connectivity but it is less direct, serves a smaller portion of the study area, and/or has slower travel speeds than the other options. Potentially of greater significance is the east/west roadway system redundancy provided by Alternatives 1 through 4 which is not offered by the No Direct Connection scenario. This finding could be significant should there be heavy traffic on Beef Bend Road or a crash that blocks the street, particularly for emergency vehicles.

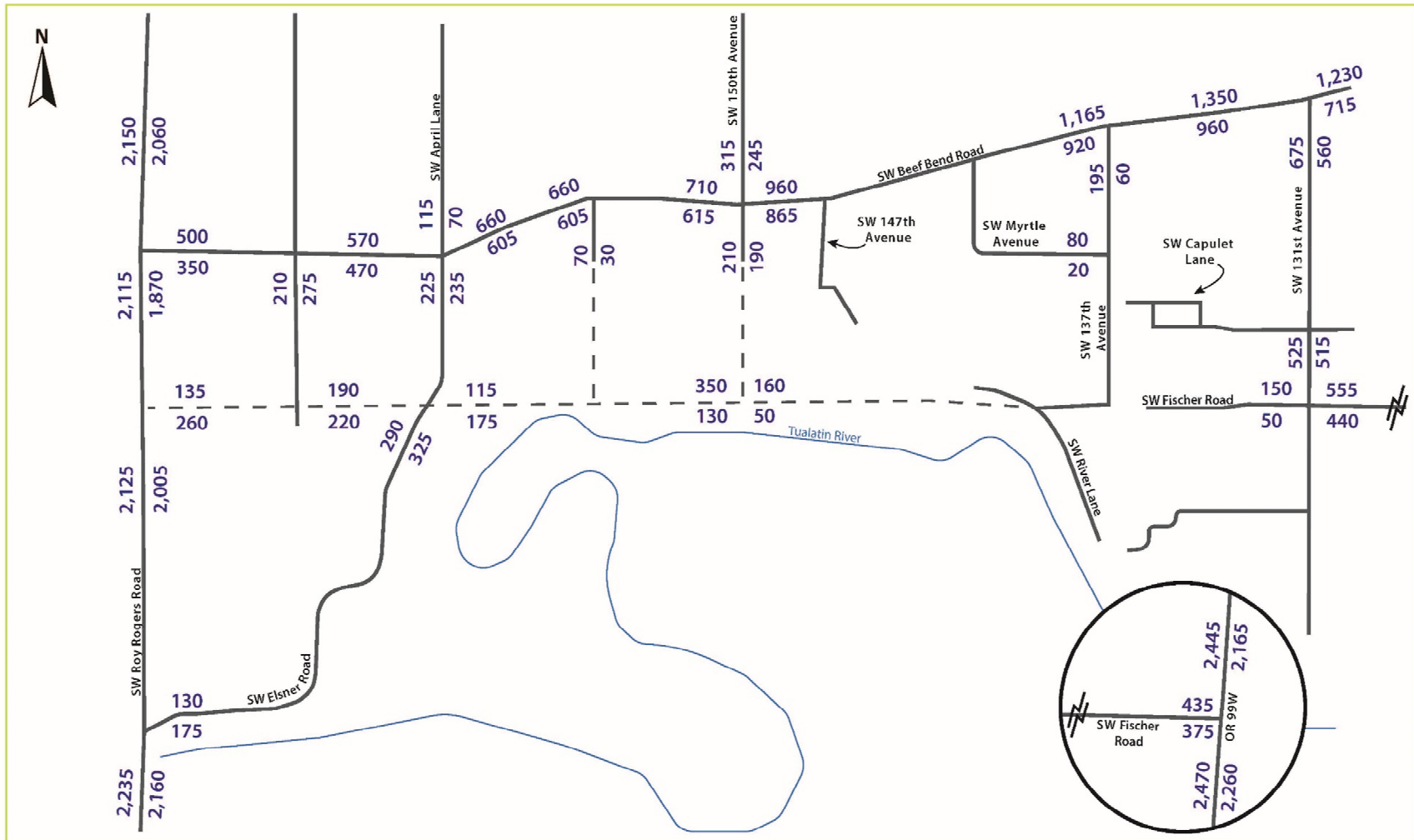
### 5.6.2 2040 Alternative Traffic Volumes and Operations

This factor was assessed using quantitative traffic volume estimates for each alternative coupled with operations analysis that identifies the expected 2040 PM peak hour performance of the alternative at key study area intersections. The results of analysis for each alternative are presented below.

#### *No Direct Connection*

Projected traffic volumes for this alternative are presented in **Figure 15**. The results of the 2040 PM peak hour intersection operations analysis are presented in **Table 11**. As indicated in this table, all intersections are expected to operate within their identified mobility target with the exception of the intersection of OR 99W with Beef Bend Road. Traffic operations at this location would be worse than any other circulation system alternative due to the higher volume of traffic that is expected to use this intersection. Unlike the Alternatives, operations at OR 99W/Fischer Road are expected to operate

Figure 15. 2040 PM Peak Hour Traffic Volumes for Alternative with No Direct Connection



Kingston Terrace Master Plan  
King City, Oregon

acceptably due to the lower traffic volumes from Kingston Terrace that would be attracted to this intersection.

The intersection of Fischer Road with 131<sup>st</sup> Avenue was evaluated with its existing all-way stop control as was assumed in the Draft King City TSP. With stop control, the intersection is expected to just meet its mobility target but would experience excessive delays and operate at Level of Service F. Installation of a traffic signal was considered at this location, and the results of that analysis show a significant improvement in traffic operations. Inclusion of a traffic signal at this location could be considered as potential mitigation for traffic impacts associated with Kingston Terrace development due to the expected pattern of traffic that involves heavy southbound left turns and heavy westbound right turns as traffic moves between OR 99W and Beef Bend Road.

It should be noted that the intersection of Beef Bend Road at 150<sup>th</sup> Avenue would also have the worst expected traffic operations of any alternative and is close to exceeding its target mobility standard.

**Table 11. 2040 PM Peak Hour Intersection Operations for No Direct Connection<sup>1</sup>**

Intersection	Traffic Control	Mobility Target	PM Peak Hour		
			Volume/Capacity	Avg Delay (sec.)	Level of Service
Beef Bend Road at 150 <sup>th</sup> Avenue	Signal	v/c 0.99	0.97	29.4	C
Beef Bend Road at 137 <sup>th</sup> Avenue	Stop Sign	v/c 0.99	0.25	24.4	C
Beef Bend Road at 131 <sup>st</sup> Avenue	Signal	v/c 0.99	0.91	22.6	C
Fischer Road at 131 <sup>st</sup> Avenue	AWSC	v/c 0.99	0.99	53.0	F
	Signal	v/c 0.99	0.87	19.7	B
Highway 99W at Beef Bend Road	Signal	v/c 0.99	1.14	81.7	F
Highway 99W at Fischer Road	Signal	v/c 0.99	0.89	13.3	B

1 Modified from traffic volumes and analysis in the Draft *Transportation System Plan* (December 2021), aspirational alternative analysis. The term “aspirational” was used in the TSP to refer to a condition with buildout of a preferred multimodal Kingston Terrace transportation network that includes a connection to existing city via Fischer Road and intersection improvements as needed.

Note 1: Performance results for the unsignalized intersections represent the worst movement.

Note 2: Analysis conducted based on 6th edition of the Highway Capacity Manual except for volume/capacity ratios at signalized intersections which used the critical V/C calculation method outlined in the ODOT Analysis Procedures Manual.

Note 3: ASWC means all-way stop control, TWSC means Two-way stop control.

Note 4: Analysis at the OR 99w/Fischer Road intersection was conducted using the 2000 HCM.

Note 5: For unsignalized intersections the volume/capacity ratio presented is for the worst movement. Delay and LOS are for the total intersection.

Black boxes with white numbering indicates where the relevant mobility target would be exceeded.

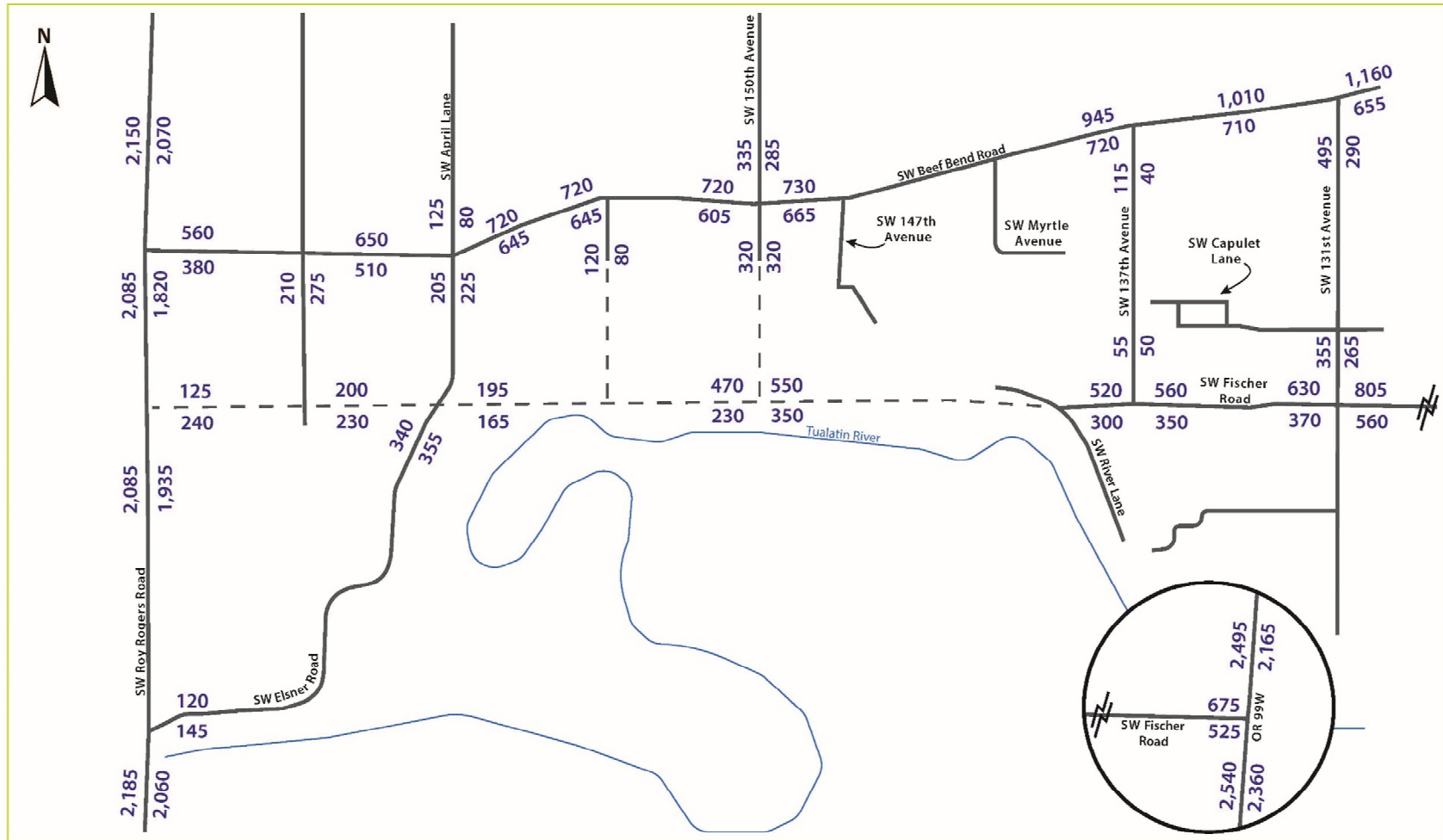
### Alternatives 1, 2 and 3 South

Projected traffic volumes for these alternatives were extracted from the Draft King City TSP and are presented in **Figure 16**. Due to their layout in relation to the intersections chosen for operations analysis, the differences between 2040 PM peak hour projections with Alternatives 1, 2 and 3 South are expected to be nominal. Therefore, traffic operations analysis for each of these alternatives has been combined into a single table.

Results of the 2040 PM peak hour intersection operations analysis were also extracted from the Draft King City TSP and are presented in **Table 12**. As indicated in this table, all intersections would operate within their identified mobility target with the exceptions of Fischer Road at 131<sup>st</sup> Avenue and OR 99W



Figure 16. 2040 PM Peak Hour Traffic Volumes for Alternatives 1, 2 and 3 South (TSP)



Source: Draft King City Transportation System Plan, December 2021

at Fischer Road and Beef Bend Road. Installation of a traffic signal at Fischer Road at 131<sup>st</sup> Avenue would result in operations very similar to what was shown in Table 11 for the No Direct Connection scenario. Even through traffic volumes with these alternatives would be higher at this location, the major traffic movements would be east and westbound throughs that would operate more efficiently than the turning movements which dominate traffic patterns today and in the future with the No Direct Connection scenario.

For all intersections along Beef Bend Road, these alternatives would provide better future year traffic operations due to the lower traffic volumes that would be expected in comparison with the No Direct Connection scenario. While the intersection of OR 99W at Beef Bend Road is still expected to exceed its mobility target, the projected volume/capacity ratio would be substantially improved over conditions with the No Direct Connection scenario. No further improvement to this intersection was recommended in the TSP.

The intersection of Fischer Road at OR 99W assumes the addition of a second eastbound right turn lane in the Draft King City TSP with the resulting traffic operations performance. No further recommendations were identified in the TSP. Any further mitigation at this location could be considered as part of a corridor-wide strategy.

**Table 12. 2040 PM Peak Hour Intersection Operations for Alternatives 1, 2 and 3 South<sup>1</sup>**

Intersection	Traffic Control	Mobility Target	PM Peak Hour		
			Volume/Capacity	Avg Delay (sec.)	Level of Service
Beef Bend Road at 150 <sup>th</sup> Avenue	Signal	v/c 0.99	0.85	23.0	C
Beef Bend Road at 137 <sup>th</sup> Avenue	Stop Sign	v/c 0.99	0.13	17.5	C
Beef Bend Road at 131 <sup>st</sup> Avenue	Signal	v/c 0.99	0.73	11.5	B
Fischer Road at 131 <sup>st</sup> Avenue	AWSC	v/c 0.99	1.54	158.1	F
	Signal	v/c 0.99	0.86	17.2	B
Highway 99W at Beef Bend Road	Signal	v/c 0.99	1.08	82.0	F
Highway 99W at Fischer Road	Signal	v/c 0.99	1.06	32.3	C

1 Modified from traffic volumes and analysis in the Draft *Transportation System Plan* (December 2021), aspirational alternative analysis. The term “aspirational” was used in the TSP to refer to a condition with buildout of a preferred multimodal Kingston Terrace transportation network that includes a connection to existing city via Fischer Road and intersection improvements as needed.

Note 2: Analysis conducted based on 6th edition of the Highway Capacity Manual except for volume/capacity ratios at signalized intersections which used the critical V/C calculation method outlined in the ODOT Analysis Procedures Manual.

Note 3: ASWC means all-way stop control, TWSC means Two-way stop control.

Note 4: Analysis at the OR 99W/Fischer Road intersection was conducted using the 2000 HCM.

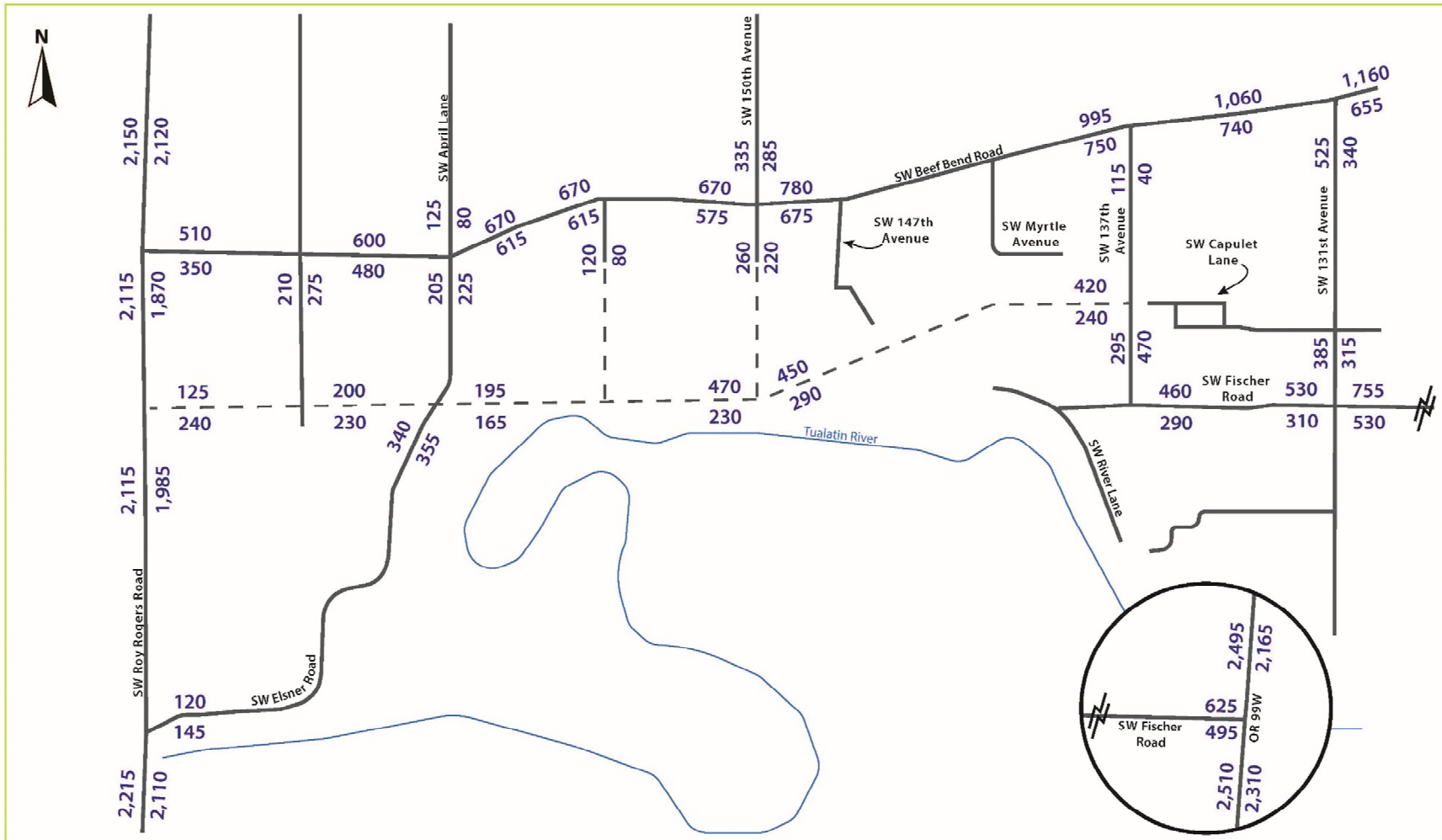
Note 5: For unsignalized intersections the volume/capacity ratio presented is for the worst movement. Delay and LOS are for the total intersection.

Black boxes with white numbering indicates where the relevant mobility target would be exceeded.

### Alternatives 3 North and 4

Projected traffic volumes for these alternatives are presented in **Figure 17**. These volumes were developed by modifying the projections in the Draft King City TSP (and shown in Figure 16) consistent with the alignment and connectivity provided by these alternatives. Any differences among the alternatives were considered to be nominal, thus a single set of projections was used for the analysis in this section.

Figure 17. 2040 PM Peak Hour Traffic Volumes for Alternatives 3 North and 4



The results of the 2040 PM peak hour intersection operations analysis are shown in **Table 13**. As indicated in this table, all intersections are expected to operate within their identified mobility target with the exceptions of OR 99W at Fischer Road and Beef Bend Road and Fischer Road at 131<sup>st</sup> Avenue. It should be noted that all intersections along Beef Bend Road would operate better with these alternatives than with the No Direct Connection scenario. A signal is recommended for installation at the intersection of Fischer Road with 131<sup>st</sup> Avenue.

**Table 13. 2040 PM Peak Hour Intersection Operations for Alternatives 3 North and 4<sup>1</sup>**

Intersection	Traffic Control	Mobility Target	PM Peak Hour		
			Volume/Capacity	Avg Delay (sec.)	Level of Service
Beef Bend Road at 150 <sup>th</sup> Avenue	Signal	v/c 0.99	0.88	23.3	C
Beef Bend Road at 137 <sup>th</sup> Avenue	Stop Sign	v/c 0.99	0.13	18.2	C
Beef Bend Road at 131 <sup>st</sup> Avenue	Signal	v/c 0.99	0.75	12.9	B
Fischer Road at 131 <sup>st</sup> Avenue	AWCS	v/c 0.99	1.43	129.2	B
	Signal	v/c 0.99	0.85	17.9	B
Highway 99W at Beef Bend Road	Signal	v/c 0.99	1.08	82.0	F
Highway 99W at Fischer Road	Signal	v/c 0.99	1.03	26.2	C

1 Modified from traffic volumes and analysis in the Draft *Transportation System Plan* (December 2021), aspirational alternative analysis. The term “aspirational” was used in the TSP to refer to a condition with buildout of a preferred multimodal Kingston Terrace transportation network that includes a connection to existing city via Fischer Road and intersection improvements as needed.

Note 2: Analysis conducted based on 6th edition of the Highway Capacity Manual except for volume/capacity ratios at signalized intersections which used the critical V/C calculation method outlined in the ODOT Analysis Procedures Manual.

Note 3: ASWC means all-way stop control, TWSC means Two-way stop control.

Note 4: Analysis at the OR 99W/Fischer Road intersection was conducted using the 2000 HCM.

Note 5: For unsignalized intersections the volume/capacity ratio presented is for the worst movement. Delay and LOS are for the total intersection.

Black boxes with white numbering indicates where the relevant mobility target would be exceeded.

### 5.6.3 Travel Time Comparisons

Based on the trip Origin-Destination (O-D) pairs identified in Figure 12, travel times by auto have been identified for each alternative. For this analysis, it was assumed that speeds along Beef Bend Road would be 35 mph as the area will be more fully developed than today, while speeds along the various east/west roadway alignments would be 25 mph. For all other roads, existing posted speed limits were assumed. It was also assumed that travel through key study area intersections would affect the total travel time between the different O-D pairs. The intersections included in the travel time calculations are the intersections of Beef Bend Road with Elsner Road, 150<sup>th</sup> Avenue, 137<sup>th</sup> Avenue and 131<sup>st</sup> Avenue, as well as the intersection of Fischer Road with 131<sup>st</sup> Avenue. Analysis results are summarized for each O-D pair and each alternative in **Table 14**. The location of each point of trip origin or destination are illustrated in Figure 12 or described in Table 3.

In most instances, the alignments with connections via Fischer Road would provide a faster travel route between various O/D pairs than alignments that rely on Beef Bend Road. For example, travel to locations in existing King City such as near the intersection of Fischer Road with OR 99W (location C) are better served by Alternatives, 1,2 and 3 than via Alternative 4 or the No Direct Connection scenario. There are slight travel time differences between routes that lead directly to Fischer Road and those that require travel along 137<sup>th</sup> Avenue or via Capulet Lane.



**Table 14. Vehicle Travel Time Comparisons**

Alternative	Vehicle Travel Time (in minutes)				
	A-C	F-C	B-E	D-E	D-C
No Direct Connection e/o 150 <sup>th</sup>	7.81	6.19	6.72	6.27	8.01
Alternative 1	7.02	5.68	7.31	6.69	5.96
Alternative 2	6.73	5.41	7.53	6.91	6.18
Alternative 3 South	6.90	5.41	7.70	7.08	6.35
Alternative 3 North	7.26	5.78	8.08	7.46	6.73
Alternative 4 South	7.26	5.57	8.10	7.56	6.83
Alternative 4 North via Fischer	7.43	5.93	8.49	7.87	7.14
Alternative 4 North via Beef Bend	8.46	6.93	5.89	5.27	8.17

Note: Numbers highlighted in red show the longest travel times between each O/D pair.

Beef Bend Road would have a higher travel speed and a more direct connection to the northern portion of the existing city from the Kingston Terrace Town Center and Roy Rogers Road than any of the alignment alternatives. This is due to the higher travel speed along Beef Bend Road and the availability of direct Beef Bend Road access via Prince Albert Road. However, the No Direct Connection scenario is generally slower for destinations nearer to the heart of Kingston Terrace or the center of the existing city. Alternative 4 is expected to have the slowest travel times for the O-D pairs analyzed.

It should be noted that not only are these findings significant from the standpoint of driver convenience, they may also be significant in terms of Vehicle Miles Traveled (VMT) for vehicles with an origin or destination in Kingston Terrace. VMT is an important regional indicator of transportation system efficiency.

#### 5.6.4 Effect on Beef Bend Road Intersection Spacing Standards

This factor assesses how well each alternative can meet the intersection spacing standards included in the Washington County Community Development Code for a minor arterial street such as Beef Bend Road. Analysis was intended to be comparative among the alternatives to determine which one could potentially best meet the 600-spacing requirement consistent with the general land use and transportation system development pattern identified in the Concept Plan and current Master Plan work efforts. Analysis results are presented in **Table 15**.

**Table 15. Effects on Beef Bend Road Access**

Alternative	Consistency with Spacing Standards
No Direct Connection e/o 150 <sup>th</sup>	Standards could be met west of 150 <sup>th</sup> but will require collector street designation to access Beef Bend Road east of 150 <sup>th</sup> .
Alternative 1	Standards could be met.
Alternative 2	Standards could be met.
Alternative 3	Standards could be met.
Alternative 4	Standards could be met.

The evaluation assumes that alternatives which include a collector road system (both for crossing Kingston Terrace and for accessing either Beef Bend or Roy Rogers Roads) would provide the best level of connectivity. This includes Alternatives 1 through 4, but Alternative 1 was considered to be less successful in providing a seamless connection due to its location the furthest away from River Terrace and other destinations largely to the north. The No Direct Connection scenario would rely largely on a

local street system east of 150<sup>th</sup> Avenue which may not be permitted to provide direct access onto or across Beef Bend Road resulting in some potential out-of-direction travel. Washington County policies limit access to/from arterial roads such as Beef Bend Road to collector streets located a minimum of 600 feet apart.

Review of opportunities for Beef Bend Road access indicates that, while there would be some difference among the alternatives, the differences are not considered to be significant, provided that collector level street connections could be provided to Beef Bend Road.

### 5.6.5 Transit Supportive

Based on potential future TriMet transit service options as presented in the Draft TSP, the various alternatives are compared to identify how well each might accommodate this service. Analysis is qualitative but reflects an understanding of how TriMet makes future service decisions – acknowledging that both increased development densities and the directness and overall accessibility provided by the transportation system will be critical to service decisions. Analysis results are shown in **Table 16**.

**Table 16. Transit Supportive**

<b>Alternative</b>	<b>Accommodate Future Internal Regional Transit Service</b>
No Direct Connection e/o 150 <sup>th</sup>	Likely no internal TriMet service to KT except perhaps to town center
Alternative 1	Provides through connections for TriMet service to KT Town Center but peripheral to development
Alternative 2	Provides through connections for TriMet from existing city to KT Town Center
Alternative 3	Southern alignment provides through connections for TriMet from existing city to KT Town Center. Northern alignment likely too circuitous.
Alternative 4	Too circuitous, likely rely on Beef Bend Road for TriMet service

As indicated in the table, it is expected that Alternatives 2 and 3 will provide the greatest potential for attracting TriMet transit service through Kingston Terrace. Alternatives 1 and 4 may be too circuitous and are located farther from the center of development to provide a good opportunity for internal King City transit service by TriMet. While TriMet service could be provided along Beef Bend Road to connect with the future Town Center and other development expected along Roy Rogers Road to the north, service to the bulk of Kingston Terrace residents would be less readily accessible.

### 5.6.6 Ability to Meet Standards for Limitations on Cul-de-Sacs.

Metro guidance, the draft King City TSP and the Kingston Terrace Concept and Master plans all specify intersection spacing standards, block size and a general limitation on cul-de-sacs (or other closed loop systems) in excess of 200 feet or serving less than 25 dwellings. The extent to which each alternative alignment can support these policies was qualitatively assessed and is summarized in **Table 17**.

The effect of each alternative on limiting the potential for cul-de-sac development is similar to that discussed in section 5.5.5 for active transportation. Alternative 1 is expected to be the most successful in minimizing the need for cul-de-sacs due to the investment assumed in bridges and ravine crossings that are part of this alternative. Alternatives 2 and 3 (both alignments) are expected to limit the need for any roadway cul-de-sacs but may not completely eliminate it. Due to their locations at or near the northern perimeter of Kingston Terrace, Alternative 4 and the No Direct Connection scenario are vulnerable to creating a roadway system with long cul-de-sacs unless local street crossings of one or

more ravines are included in the Master Plan. Generally, it was concluded that these two options would provide the poorest performance relative to the cul-de-sac limitation.

**Table 17. Support for Limiting Cul-de-Sacs**

<b>Alternative</b>	<b>Limiting Cul-de-Sacs or Closed Loop Systems</b>
No Direct Connection e/o 150 <sup>th</sup>	Vulnerable to cul-de-sacs unless local street system is built to provide connectivity across ravines.
Alternative 1	Minimizes any cul-de-sacs with the most ravine crossings.
Alternative 2	Guarantees more east/west connectivity across ravines
Alternative 3	Guarantees more east/west connectivity across ravines
Alternative 4	Vulnerable to cul-de-sacs unless local street system is built to provide connectivity across ravines.

### 5.6.7 Provides at Least One Continuous Connection

This factor assesses the effectiveness of the various alternatives in providing a reasonably direct and continuous connection to serve Kingston Terrace, connecting future residential areas with both the existing city and the proposed Kingston Terrace town center. The quality of connections to surrounding communities is also considered. This street would function as a designated collector funneling traffic between local streets and regional arterial streets such as Beef Bend Road and Roy Rogers Road. This evaluation is qualitative and addresses all modes including motor vehicles, transit, freight, emergency vehicles and school bus circulation. Analysis results are shown in **Table 18**.

As indicated in the table, all of the proposed collector street alternatives would provide good opportunities for providing a continuous connection through the Kingston Terrace development. Alternatives 1 and 4 might be less successful in that they push the connection to the periphery of development reducing its effectiveness. The No Direct Connection scenario would rely on local street connections east of 150<sup>th</sup> Avenue and would likely result in an under-design of facilities to accommodate the collector-level traffic that may be attracted to one or more of these streets.

**Table 18. Continuous Connection**

<b>Alternative</b>	<b>Existing King City</b>	<b>Surrounding Communities</b>
No Direct Connection e/o 150 <sup>th</sup>	Continuous connection provided only west of 150 <sup>th</sup> , would rely on local streets to the east. There may be issues with connections to Beef Bend Road due to County policy of limited arterial access to collectors.	Would rely on local streets to reach Beef Bend Road crossings. System not designed to funnel traffic from local streets to the arterial.
Alternative 1	Provides connection	Forces collector level traffic the farthest south.
Alternative 2	Provides connection	Would provide good opportunities for connections.
Alternative 3	Provides connection	Would provide good opportunities for connections.
Alternative 4	Provides connection	Would provide good opportunities for connections but proximity to Beef Bend Road would limit the ability of this facility to function as a collector street.

## 5.7 Beef Bend Road Improvement Needs

To augment the assessment of the evaluation factors identified for the comparison of alternatives, a few other transportation issues have been raised for consideration. In particular, Washington County staff have identified the need to address how the development of Kingston Terrace may affect the potential need for improvements along Beef Bend Road. For purposes of this report, this question has two components which have been evaluated in the course of the East/West Alternatives Analysis Study:

- How do the projected traffic volumes along a three-lane Beef Bend Road compare to other similar roadways in Washington County and how might this affect the need for a five-lane widening?
- What key intersection improvements might be needed to accommodate expected traffic volumes near the intersection with 137<sup>th</sup> Avenue?

### 5.7.1 Beef Bend Road Widening

To better understand how traffic volume growth along Beef Bend Road may trigger the need for future widening of this street, a comparison was made between the 2040 Average Daily Traffic (ADT) projections for Beef Bend Road with existing daily traffic experience on Durham Road which includes both three and five-lane cross-sections in the immediate project vicinity. These segments of Durham Road are highly congested with existing volumes on the three-lane segment approaching the practical capacity of that facility. Thus, it provides a good comparable for evaluating the potential need for widening along Beef Bend Road.

Analysis was based on 2040 PM peak hour forecasts for two scenarios as illustrated in Figures 16 and 15 of this report. Figure 16 shows projections for Alternatives 1, 2 and 3 South, while Figure 15 shows projections with the No Direct Connection scenario. The PM peak hour forecasts were adjusted to reflect ADT based on k factors derived from the current experience of Durham Road.

As illustrated in **Table 19**, daily traffic forecasts with Alternatives 1, 2 or 3 South for eastern portions of Beef Bend Road are expected to be busy but within the capacity of the existing and/or improved three-lane roadway cross-section for the area between OR 99W and 150<sup>th</sup> Avenue. Expected volumes would be similar to or slightly higher than those that currently exist along Durham Road to the east of Summerfield Drive. Traffic volumes west of 150<sup>th</sup> Avenue are expected to be lower than to the east and are not addressed in this daily traffic analysis. These alternatives have the advantage of offering at least one additional east/west connection between Kingston Terrace and the existing city to provide redundancy for expected traffic levels.

Table 19 also shows that projected 2040 daily traffic volumes along Beef Bend Road with the No Direct Connection scenario would be substantively higher than with the other alternatives. Projected volumes would range from approximately 24,000 ADT to nearly 29,000 ADT depending on location which would be higher than existing volumes on Durham Road immediately east of OR 99 W which currently has a five-lane cross-section. It is anticipated that, with this level of traffic, improvement of Beef Bend Road to a five-lane cross-section would be necessary. This improvement would have substantial right of way and property acquisition impacts.



Table 19. Comparison of 2040 Projected Average Daily Traffic (ADT) Volumes

Street/Location	Cross-Section	Existing ADT	2040 Estimated ADT with Fischer Connection	2040 Estimated ADT with No Direct Connection
Durham Road (OR 99W to Summerfield Drive) <sup>1</sup>	5-lane	24,000	NA	NA
Durham Road (Summerfield Drive to 113 <sup>th</sup> Avenue)	3-lane	20,000	NA	NA
Durham Road (113 <sup>th</sup> Avenue to 108 <sup>th</sup> Avenue)	3-lane	18,400	NA	NA
Beef Bend Road (150 <sup>th</sup> Avenue to 147 <sup>th</sup> Avenue)	3-lane	5,100	17,400	22,800
Beef Bend Road (Myrtle Avenue to 137 <sup>th</sup> Avenue)	3-lane	5,100	20,800	26,100
Beef Bend Road (137 <sup>th</sup> Avenue to 131 <sup>st</sup> Avenue)	3-lane	5,100	21,500	28,900
Beef Bend Road (131 <sup>st</sup> Avenue to Prince Albert Street)	3-lane	8,700	22,700	24,300
Beef Bend Road (116 <sup>th</sup> Avenue to OR 99W)	3-lane	10,000	21,100	22,800

1 Durham Road has tighter intersection spacing than most places on Beef Bend Road, but east of 147<sup>th</sup> where intersection spacing is tighter is also the location with the highest expected volumes and where we see the need for the wider road.

Existing ADT data source:

<https://tigard.maps.arcgis.com/apps/Viewer/index.html?appid=58ef584e8e8f476e91c9210072ae04f7>

## 5.7.2 Beef Bend Road Improvements in Vicinity of 137<sup>th</sup> Avenue

At the request of Washington County staff, analysis has been conducted of future traffic operations at the three intersections on Beef Bend Road in the vicinity of 137<sup>th</sup> Avenue. From west to east, these intersections include Colyer Way, 137<sup>th</sup> Avenue, and Peachtree Drive. Both Colyer Way and Peachtree Drive serve existing urban residential development on the north side of Beef Bend Road, while 137<sup>th</sup> Avenue serves the rural area in future Kingston Terrace on the south. As measured from westernmost centerline to the easternmost centerline, the three intersections are a total of only 300 feet apart. Current traffic volumes along Beef Bend Road and on 137<sup>th</sup> Avenue are low, and traffic at the three intersections generally functions acceptably. However, this will not be the case in the future. Planning level consideration has been given to potential improvements that will either tie operations at these intersections together or will allow them to operate separately in a more efficient manner.

Analysis was based on 2040 PM peak hour volumes for the No Direct Connection scenario which is expected to experience the highest traffic volumes on Beef Bend Road of any scenario. As no traffic count data was available for the intersections of Beef Bend Road with Colyer Way or Peachtree Drive, these volumes were estimated based on the development intensity of the areas served by these roads and a review of the turning movement patterns at Beef Bend Road/150<sup>th</sup> Avenue. Side street left-turning volumes at 137<sup>th</sup> Avenue are expected to be low, similar to today, while left-turning volumes from Colyer Way and Peachtree Drive are expected to be proportionally higher. In the 2040 PM peak hour, traffic operations for a Baseline or No Build condition are expected to be good at 137<sup>th</sup> Avenue due to

the low level of left-turning traffic. However, due to the higher expected levels of left-turning traffic at Colyer Way and Peachtree Drive (i.e., heading to OR 99W), it is expected that these intersections would substantially exceed the county standard of  $V/C = 0.99$ , potentially by as much as double.

To address these expected problems, the following preliminary alternatives were identified and initial operations analysis was conducted for each.

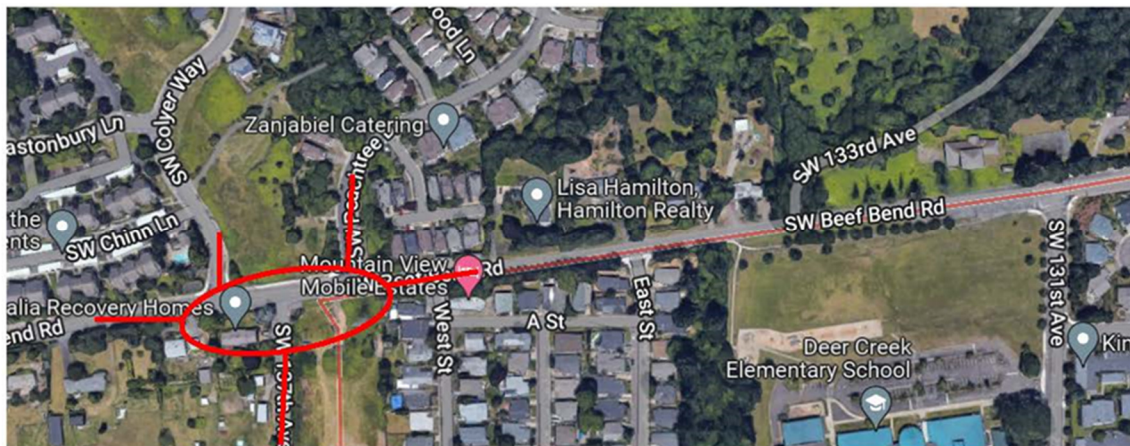
### *Improvement Alternatives*

Three improvement alternatives were identified including:

- Five-legged roundabout connecting all three side street approach legs as well as two legs on Beef Bend Road in an oval-shaped roundabout.
- Four-legged roundabout including Colyer Way, 137<sup>th</sup> Avenue and the two legs on Beef Bend Road. Relocate Peachtree Drive to connect to Colyer Way north of Beef Bend Road.
- Realign 137<sup>th</sup> Avenue to align with Colyer Way and relocate Peachtree Drive to connect to Colyer Way north of Beef Bend Road. Install traffic signal at the intersection with Beef Bend Road.

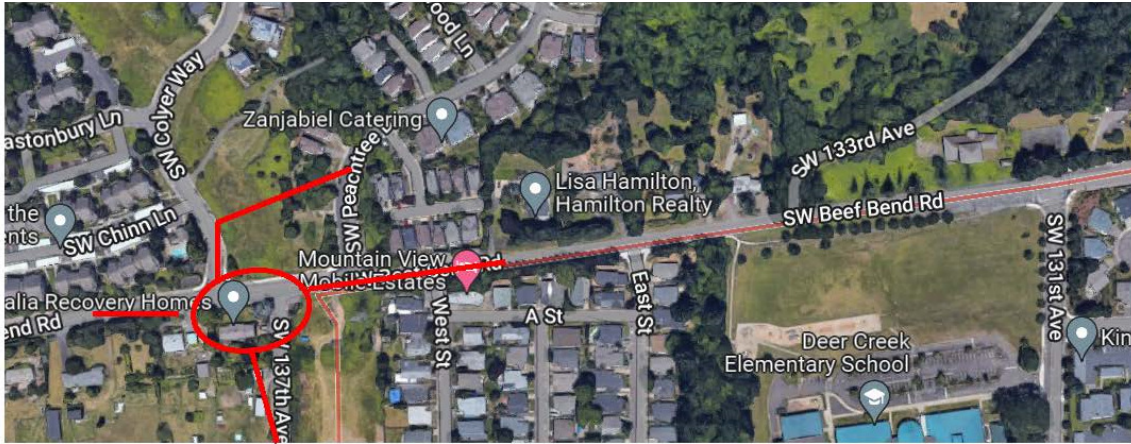
### Five-Legged Roundabout

This alternative is shown in the figure below. Analysis of the alternative revealed that it would barely meet County operational standard of  $V/C = 0.99$  in the 2040 PM peak hour. The worst movement (westbound through) at the intersection is estimated to be 0.98 with about 1,400 vehicles in a single approach lane. Estimated westbound queue back from this intersection would be greater than 1,000 feet.



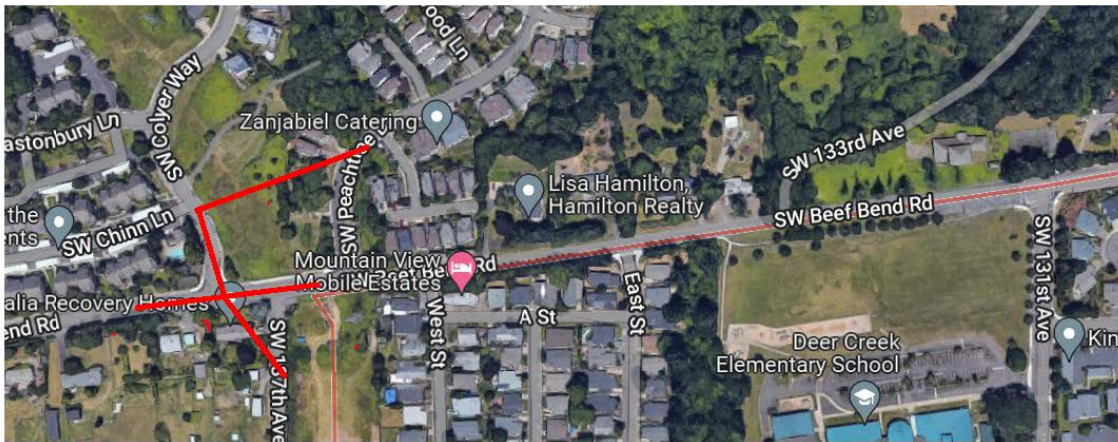
### Four-Legged Roundabout

This alternative is illustrated in the figure below. Analysis of the alternative indicated that it would be unlikely to meet the County operational standard of  $V/C = 0.99$  in the 2040 PM peak hour. The worst movement (westbound through) at the intersection is estimated to be  $V/C = 1.11$  with a queue of approximately 2,200 feet.



### Realign 137th Avenue and Peachtree Drive with Signal

This alternative is illustrated in the figure below. Analysis of the alternative revealed that it would successfully meet County operational standard of  $V/C = 0.99$  in the 2040 PM peak hour. The worst movement (westbound through/right) at the intersection is estimated to have a  $v/c$  ratio of 1.00 but the overall intersection is estimated to have a  $v/c$  ratio of 0.96 (using quick output from HCM 2000). This scenario would meet the County’s standard.



## 5.8 Fischer Road Improvement Needs

**Table 20** presents a summary of 2040 Average Daily Traffic projections on three of the approach legs for the intersection of Fischer Road with 131<sup>st</sup> Avenue. These projections were prepared for both the Alternative 1, 2 and/or 3 South scenarios or the No Direct Connection scenario and compares the projections with existing daily volumes. ADT estimates were based on the PM peak hour projections prepared as part of the Alternatives Analysis and rely on a K factor reflecting the relationship between daily and peak hourly counts as observed on Fischer Road near OR 99W.

As indicated in the table, Fischer Road is currently estimated to carry about 7,000 daily vehicles east of the intersection with 131<sup>st</sup> Avenue, and about 6,400 vehicles on 131<sup>st</sup> Avenue north of Fischer Road. Existing traffic patterns on these two streets include a relatively heavy movement between Fischer and 131<sup>st</sup> Avenue to/from the north. This movement includes motorists making a cut-through maneuver



from Beef Bend Road to/from OR 99W south of Fischer Road as this pathway is shorter and quicker than using the intersection of Beef Bend Road with OR 99W. Existing daily traffic volumes on Fischer Road west of 131<sup>st</sup> Avenue average about 1,800 vehicles.

As further illustrated in the table, traffic volumes are expected to increase on either Fischer Road or 131<sup>st</sup> Avenue with the two Kingston Terrace east/west alignment alternatives, with an approximate 4,000 daily vehicle difference between the two scenarios on either Fischer Road or 131<sup>st</sup> Avenue. While the expected increases are significant, they are anticipated to affect the intersection of Fischer Road with 131<sup>st</sup> Avenue regardless of scenario. It is recommended that this intersection be signalized as signal warrants are expected to be met.

**Table 20. Comparison of Fischer Road Volumes**

<b>Location</b>	<b>2021 ADT</b>	<b>2040 ADT with Alternatives 1, 2 or 3 South (with Fischer Connection)</b>	<b>2040 ADT with No Direct Connection (No Fischer Connection)</b>
Fischer Road east of 131 <sup>st</sup> Avenue	7,000	12,900	8,900
131 <sup>st</sup> Avenue north of Fischer Road	6,400	5,800	9,800
Fischer Road west of 131 <sup>st</sup> Avenue	1,800	8,600	1,900

The east/west alignment alternatives that include a direct connection to Fischer Road would see a substantial increase in daily traffic along the segment of Fischer Road to the west of 131<sup>st</sup> Avenue, growing from approximately 2,000 ADT to over 8,000 ADT.

Fischer between 131<sup>st</sup> and 137<sup>th</sup> Avenues has a 61-foot wide right of way and a 36-foot curb-to-curb width which includes on-street parking. There are very few driveways along this street segment and relatively few intersecting streets. Analysis conducted of the existing roundabout at 136<sup>th</sup> Avenue indicates that it is expected to continue to operate acceptably with this traffic growth. Consideration will need to be given to the provision of bicycle facilities through this corridor which could be developed as a bike lane couplet placing westbound bicyclists on Fischer Road (and restricting on-street parking to one side of the street) and eastbound bicyclists on King Lear Way (a parallel street to the south) where such an opportunity is available. Complete removal of on-street parking could occur between King Lear Way and 131<sup>st</sup> Avenue because the parking demand and usage is much lower than further west. Pedestrian crossings could continue to be provided at the intersections of Fischer Road with 136<sup>th</sup> Avenue and King Lear Way/134<sup>th</sup> Terrace.



## 6 SUMMARY OF CONCLUSIONS

This chapter summarizes analysis conducted of the transportation system effects for each Kingston Terrace circulation alternative. As described in Chapter 5, Section 5.4, the analysis process considers all the evaluation factors and ranks alternatives by how well they meet the intent of each. A graduated ranking system has been applied for each evaluation factor ranging from most positive effect through neutral to most negative effect. Most evaluation is qualitative based on professional engineering judgment and a full consideration of the likely effects of each alternative. For these evaluation factors, order-of-magnitude effects of one alternative relative to another are the most important outcome. Some evaluation factors (such as travel times or operational performance) are quantitative and alternatives are ranked based of the results.

### 6.1 Analysis Results for Active Transportation

Scoring results for all alternatives and factors related to bicycle and pedestrian mobility are presented in **Table 19**. The summary text presented in **Table 20** is intended to provide a short explanation of the considerations behind the ranking shown in Table 19.

**Table 21. Comparative Ranking Active Transportation Mobility Factors**

Impact Categories/Criteria	No Direct Connection	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4
Accommodation of bicycle/ped system for healthy outcomes					
Safety for bicycle & pedestrians users					
Connectivity to key destinations					
Travel time comparisons for bikes					
Ability to meet limit on cul-de-sacs					
Supports providing a seamless connection to existing/planned infrastructure in surrounding communities					
OVERALL RANKING					

As noted in the table, Alternatives 1 and 2 would have the highest overall ranking purely from a transportation system perspective. This would be followed by Alternative 3, then Alternative 4, and lastly by the No Direct Connection scenario. Further discussion of these rankings and the rationale behind them is presented in this section.

**Table 22. Summary of Key Findings from Evaluation of Active Transportation Mobility**

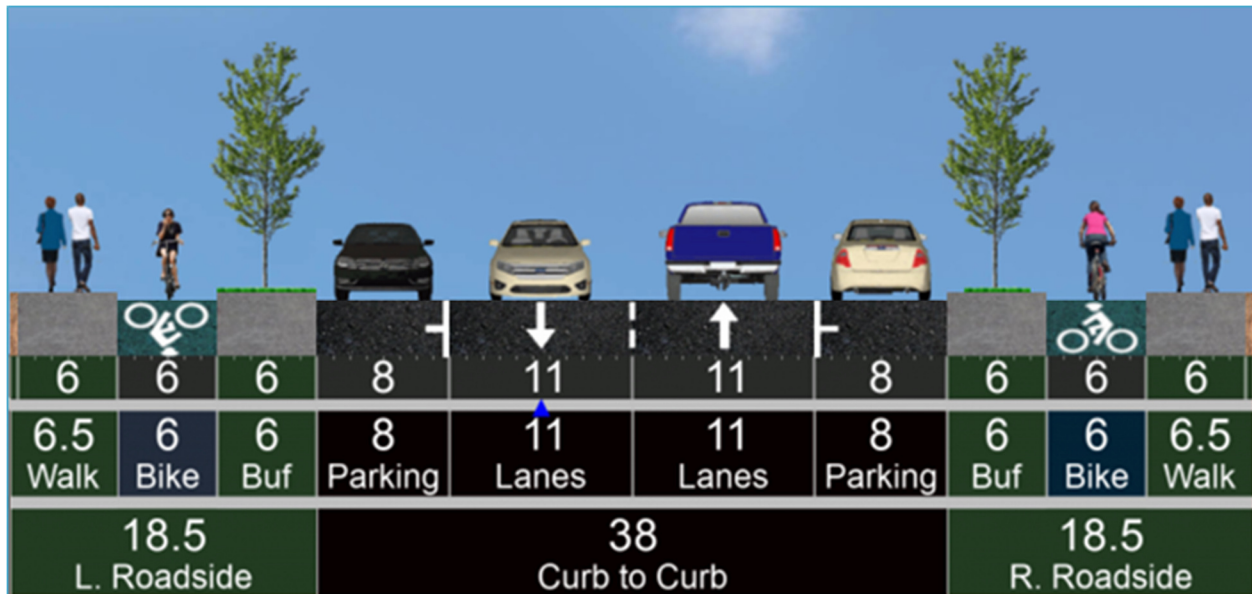
<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Accommodation of bicycle/ped system for healthy outcomes	<i>No difference for pedestrians. Reliance on local streets east of 150<sup>th</sup> which may include no or lesser quality bicycle facilities.</i>	<i>Collector status would include some form of high quality bikeway.</i>	<i>Collector status would include some form of high quality bikeway.</i>	<i>Collector status would include some form of high quality bikeway. No substantive difference between North or South alignments.</i>	<i>Collector status would include some form of high quality bikeway. No substantive difference between North or South alignments.</i>
Safety for bicycle & pedestrians users	<i>Relies largely on local streets within KT and is assumed to use 137<sup>th</sup> or Westside Trail to connect with streets in existing King City such as via Capulet or Fischer. May not have bikeways on local streets.</i>	<i>Lower stress, relatively safe connections would be available.</i>	<i>Lower stress, relatively safe connections would be available.</i>	<i>Lower stress, relatively safe connections would be available.</i>	<i>Sidewalks and bikeways to be provided, connection to existing city is assumed to use 137<sup>th</sup> or Westside Trail to connect with streets in existing King City such as Capulet or Fischer. Likely no bikeways on local streets like Capulet but would be added to Fischer and King Lear as a couplet. No substantive difference between North or South alignments.</i>
Connectivity and directness of travel to key destinations	<i>Likely the most circuitous as would largely rely on local connections or Beef Bend Road to get to the existing city.</i>	<i>Most direct connectivity across Kingston Terrace with link to town center, parks/trails, and schools</i>	<i>Most direct connectivity across Kingston Terrace with link to town center, parks/trails, and schools</i>	<i>South alignment is similar to #1 and #2. North alignment is less direct due to circuitous routing.</i>	<i>More circuitous than #1, #2 or #3 to reach destinations in existing city. No substantive difference between north &amp; south alignments.</i>
Travel time comparisons, particularly for bikes	<i>Would have a longer travel time than other alternatives due to distance. Analysis assumes that most</i>	<i>Would generally experience the lowest travel times connecting to more</i>	<i>Would generally experience the lowest travel times connecting to more</i>	<i>Southern alignment would generally experience the lowest travel times connecting to more</i>	<i>Would have a slightly longer travel time than other alternatives due to distance. No substantive</i>

	<i>bicyclists would use the facilities on Beef Bend to 137<sup>th</sup> and then travel south to connect to existing streets.</i>	<i>destinations in the existing city.</i>	<i>destinations in the existing city.</i>	<i>destinations in the existing city. Northern alignment would have a slightly longer travel time due to distance.</i>	<i>difference between South and North alignments.</i>
<i>Ability to meet intersection spacing/block size standards and limit on cul-de-sacs</i>	<i>No substantive differences related to spacing or block sizing. Vulnerable to cul-de-sacs unless local street system is built to provide connectivity across ravines.</i>	<i>Minimizes any cul-de-sacs with the most ravine crossings.</i>	<i>Guarantees more east/west connectivity across ravines</i>	<i>Guarantees more east/west connectivity across ravines. No substantive difference between South and North alignments.</i>	<i>Vulnerable to cul-de-sacs unless local street system is built to provide connectivity across ravines. No substantive difference between South and North alignments.</i>
<i>Supports providing a seamless connection to existing/planned infrastructure in surrounding communities</i>	<i>Would rely on local streets which may not have bikeways to reach Beef Bend Road crossings.</i>	<i>Would have designated bikeways to reach Beef Bend Road connections, but forces collector level traffic the farthest south. Provides good connection to potential Tualatin Riverside trail.</i>	<i>Would have designated bikeways to reach Beef Bend Road connections.</i>	<i>Would have designated bikeways to reach Beef Bend Road connections. No substantive difference between South and North alignments.</i>	<i>Would have designated bikeways to reach Beef Bend Road connections. No substantive difference between South and North alignments.</i>

### 6.1.1 Alternatives 1 and 2

What makes Alternatives 1 and 2 strong from a transportation perspective are the inclusion of high quality bicycle and pedestrian facilities as part of the basic design cross-section for the roadway. The proposed collector street cross-section is illustrated in **Figure 18** and was abstracted from the Draft King City TSP. Inclusion of these facilities would result in a lower level of stress and safer travel for active transportation users. Alternatives 1 and 2 would provide the most direct connections linking residents of Kingston Terrace to the town center, parks, trails, and schools, resulting in the lowest expected travel times across the newly developing community. These alternatives would minimize the potential for development of long-cul-de-sacs contrary to city and regional policy and would facilitate connections to neighboring communities via Beef Bend Road. Block size and spacing assumed to be the same for all alternatives.

**Figure 18. Typical City Collector, Neighborhood Route, and Local Street Cross-section Major Pedestrian, Major Bicycle and Transit Route Designation**



### 6.1.2 Alternatives 3 and 4

Alternatives 3 and 4 (including both northern and southern sub-alignments of both) would also provide high quality bicycle and pedestrian facilities as illustrated in Figure 19. The southern alignment of Alternative 3 would have similar findings as Alternatives 1 and 2 in terms of creating a low stress and safer active transportation environment, would have similar travel times, and would generally provide good east/west connectivity across the ravines with a lower probability of creating long cul-de-sacs. The northern alignment of Alternative 3 would have slightly longer travel times and may result in a more circuitous trip between destinations in Kingston Terrace and the existing city. This Alternative would also facilitate connections to neighboring communities via Beef Bend Road.

It is assumed that bicyclists and pedestrians using Alternative 4 would rely on either active transportation facilities along 137<sup>th</sup> Avenue or on the future Westside Trail when completed by Metro to connect with destinations in the existing city. Connections could be made either via an extension of



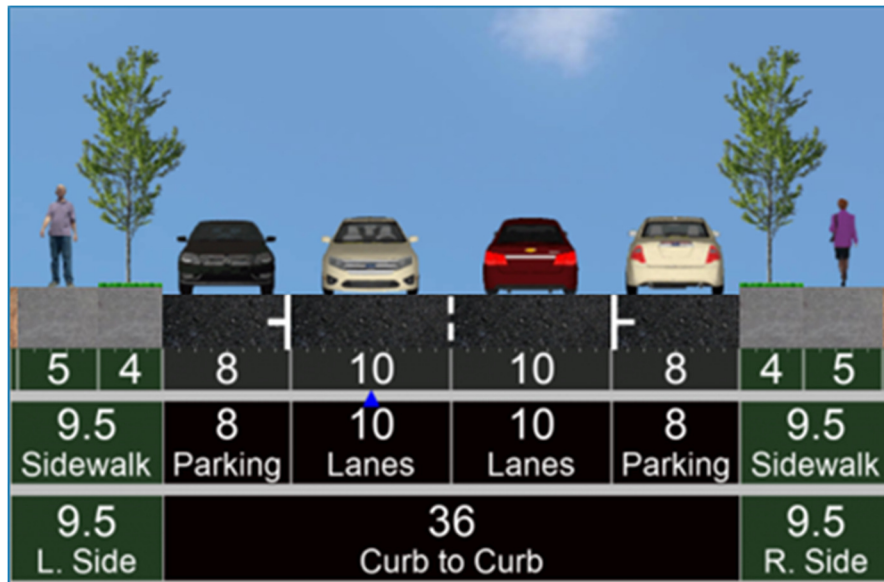
Capulet Lane or an extension of Fischer Road. Unlike Alternatives 1, 2 and 3 South, a direct connection via Fischer Road would not be provided.

Alternative 4 would likely be more circuitous than the alternatives that connect direction with Fischer Road and would generally have longest travel times between the selected trip origins and destinations evaluated in this report. The alternative would be vulnerable to creating long cul-de-sacs unless some local street connectivity is built across some of the existing ravines to provide better internal circulation within Kingston Terrace. The block size and spacing for this alternative is assumed to be similar to the other alternatives.

### 6.1.3 No Direct Connection Scenario

On a comparative basis the No Direct Connection scenario would rank the lowest of the options considered. It would rely entirely on a local-street system east of 150<sup>th</sup> Avenue, and based on the cross-section abstracted from the Draft King City TSP and shown in **Figure 19**, it would have no separated bicycle facilities. While traffic speeds and volumes could be lower on local streets than on a collector, the lack of such facilities may result in a more stressful cycling environment if certain local streets actually end up functioning as collectors. Traffic will typically find its preferred path through an area, and some of the local street system may provide logical connections across Kingston Terrace to connect the 150<sup>th</sup> Avenue corridor (and any collector streets to the west) with the existing city.

**Figure 19. Typical City Local Street Cross-section with Local Pedestrian and Local Bicycle Route Designation**



This scenario would likely result in the most circuitous routing through the study area with longer travel times for nearly all destinations studied. The exception would be portions of the existing city that lie close to Beef Bend Road, which result in a shorter travel path than the other circulation alternatives due to higher speeds on Beef Bend Road. The alternative would be vulnerable to creating long cul-de-sacs unless some local street connectivity is built across some of the existing ravines to provide better internal circulation within Kingston Terrace. The block size and spacing for this alternative is assumed to be similar to the other alternatives. This alternative would rely on an improved 137<sup>th</sup> Avenue or the

Westside Trail to connect the proposed Beef Bend Road active transportation improvements along Kingston Terrace frontage with the existing city via either Capulet Lane or Fischer Road extensions.

#### 6.1.4 Summary of Rankings

This section presents summary conclusions and ranks the expected effect of each alternative on active transportation travel within Kingston Terrace, existing King City, and surrounding areas. As noted in the beginning of this report, the factors included in this evaluation were considered to be the most significant in identifying differences among the alternatives and would provide a sound basis for ranking the alternatives relative to each other for their effectiveness in meeting community goals for a high quality pedestrian and bicycle circulation system.

##### *Alternatives 1 and 2*

As indicated in Table 19, Alternatives 1 and 2 are expected to rank equally high among the alternatives for their effectiveness in providing a high quality, safe, comfortable, and attractive active transportation system. Not only do these alternatives provide for both bicycle and pedestrian travel within the recommended collector street cross-section, they also provide direct connectivity and generally the shortest travel times between destination within Kingston Terrace and to the existing city. Additionally, they would limit the development of long cul-de-sacs which hinder the achievement of good pedestrian and bicycle circulation through potentially extensive out-of-direction travel.

##### *Alternative 3*

Alternative 3 is ranked in second place among the alternatives (after 1 and 2 which are tied for first place). Generally, the southern alignment of Alternative 3 would be similar to Alternative 2, while the northern alignment would provide a slightly more circuitous connection to the existing city and would involve slightly longer travel times.

##### *Alternative 4*

Alternative 4 is ranked third in comparison to the other alternatives with longer travel times, more circuitous connectivity to the existing city (even a connection via Capulet Lane, pedestrian and bicycle travel would be constrained by the lack of through east/west streets in the existing city and would likely need to use Fischer Road or a winding local street system to reach destinations east of the golf course. Due to its location approximately 300 to 600 feet from Beef Bend Road (depending on alignment and location), this alternative is vulnerable to development of long cul-de-sacs to serve development which results in a significant adverse impact on the use of active transportation to reach non-neighborhood destinations.

##### *No Direct Connection Scenario*

The No Direct Connection scenario is ranked last when considering its effectiveness in meeting community goals for active transportation. It would have no separated bicycle facilities which may result in a more stressful cycling environment. Its connectivity to the existing city is circuitous and it would likely have the worst impact on limiting the potential for the development of long cul-de-sacs. Typically active transportation travel times would be among the longest with this alternative except for the northern part of the existing city which could be reached from Beef Bend Road. However, this would

require that bicyclists use the existing narrow and winding street system which lacks bicycle facilities and carries higher speed traffic.

## 6.2 Analysis Results for Vehicular Mobility

Scoring results for all alternatives and factors related to vehicular mobility are presented in **Table 21**. The summary text presented in **Table 22** is intended to provide a short explanation of the considerations behind the ranking shown in Table 21.

As noted in the table, Alternatives 2 and 3 would have the highest overall ranking purely from a transportation system perspective. This would be followed by Alternative 1, then Alternative 4, and lastly by the No Direct Connection scenario. Further discussion of these rankings and the rationale behind them is presented in this section.

**Table 23. Comparative Ranking of Vehicular Mobility Factors**

Impact Categories/Criteria	No Direct Connector	Alternative 1	Alternative 2	Alternative 3 (S/N)	Alternative 4
Connectivity & potential for out of direction travel					
Level of service/delays at key intersections					
Travel times/VMT effects					
Beef Bend Road spacing standards					
Transit supportive (primarily regional but some local)					
Ability to meet standards to limit cul-de-sacs					
Provides at least one continuous connection through the study area for all travel modes					
OVERALL RANKING					

### 6.2.1 Alternatives 2 and 3

Alternatives 2 and 3 ranked the highest from the perspective of vehicular mobility for a number of reasons. They both offer a complete east/west connection which is located far enough from Beef Bend Road to offer a reasonable and effective alternative for moving traffic through Kingston Terrace including providing redundancy for east/west travel in emergency situations if Beef Bend Road is

**Table 24. Summary of Key Findings from Evaluation of Vehicle Mobility**

<b>Evaluation Factors</b>	<b>No Direct Connection</b>	<b>Alternative 1</b>	<b>Alternative 2</b>	<b>Alternative 3</b>	<b>Alternative 4</b>
Connectivity & potential for out of direction travel	<i>Poorest connection to existing city, relies on Beef Bend &amp; local streets built to lower standards than an internal collector. School bus routing may be more circuitous. No redundancy to Beef Bend Road in east/west connections across King City.</i>	<i>Peripheral route to center of development but offers complete east/west connection. May require more walking or circuitous school bus routing. Offers reasonable redundancy to Beef Bend Road.</i>	<i>Offers complete east/west connection. Central to development so may have better options for school bus pick-up and drop-off. Offers reasonable redundancy to Beef Bend Road.</i>	<i>Offers complete east/west connection. Central to development so may have better options for school bus pick-up and drop-off. Offers reasonable redundancy to Beef Bend Road. No substantive difference between North and South alignments.</i>	<i>Less direct connection to existing city. Also peripheral to center of development so may require more circuitous school bus routing or walking. Offers redundancy to Beef Bend Road but not in a way that serves the bulk of future development. No substantive difference between North and South alignments.</i>
Level of service/delays at key intersections	<i>All intersections would operate worse than the alignment alternatives except at OR 99W/Fischer which would operate substantively better.</i>	<i>All intersections would operate better than No Connection except OR 99W/Fischer. Some differences are substantial</i>	<i>All intersections would operate better than No Connection except OR 99W/Fischer. Some differences are substantial</i>	<i>All intersections would operate better than No Connection except OR 99W/Fischer. Some differences are substantial. No substantive difference between North and South alignments.</i>	<i>All intersections would operate better than No Connection except OR 99W/Fischer. Some differences are substantial. No substantive difference between North and South alignments.</i>
Travel times/VMT effects	<i>Slower travel times for most destination except for northern part of the city which would be fastest via Beef Bend Road.</i>	<i>Most destinations are well served. Travel times to the northern part of the city would be slower.</i>	<i>Most destinations are well served. Travel times to the northern part of the city would be slower.</i>	<i>Most destinations are well served. Travel times to the northern part of the city would be slower. No substantive difference between North and South alignments.</i>	<i>Expected to have the slowest travel times if connections into the city are made via Fischer Road. Only destinations in the north part of the city might be quicker but not as fast as the No Direct Connection scenario. No substantive difference between</i>



					<i>North and South alignments.</i>
<i>Beef Bend Road spacing standards</i>	<i>Standards could be met west of 150<sup>th</sup> but will require collector street designation to access Beef Bend Road east of 150<sup>th</sup>.</i>	<i>Standards could be met.</i>	<i>Standards could be met.</i>	<i>Standards could be met.</i>	<i>Standards could be met.</i>
<i>Transit supportive</i>	<i>Likely no internal TriMet service to Kingston Terrace except perhaps to town center</i>	<i>Provides through connections for TriMet service to Kingston Terrace Town Center but peripheral to development</i>	<i>Provides through connections for TriMet from existing city to Kingston Terrace Town Center</i>	<i>Southern alignment provides through connections for TriMet from existing city to Kingston Terrace Town Center. Northern alignment likely too circuitous.</i>	<i>Too circuitous, likely rely on Beef Bend Road for TriMet service. No substantive difference between North and South alignments.</i>
<i>Ability to meet standards to limit cul-de-sacs</i>	<i>Vulnerable to cul-de-sacs unless local street system is built to provide connectivity across ravines.</i>	<i>Minimizes any cul-de-sacs with the most ravine crossings.</i>	<i>Guarantees more east/west connectivity across ravines</i>	<i>Guarantees more east/west connectivity across ravines</i>	<i>Vulnerable to cul-de-sacs unless local street system is built to provide connectivity across ravines. No substantive difference between North and South alignments.</i>
<i>Provides at least one continuous connection through the study area for all travel modes</i>	<i>Connected only west of 150<sup>th</sup>, would rely on local streets to the east. There may be issues with connections to Beef Bend Road due to County policy of limited arterial access to collectors.</i>	<i>Provides a connection to existing King City. Forces collector level traffic the farthest south.</i>	<i>Provides good opportunities for connections to existing King City.</i>	<i>Provides good opportunities for connections to existing King City. The South alignment provides a more direct connection than the North alignment.</i>	<i>Provides good opportunities for connections to existing King City but proximity to Beef Bend Road would limit its effectiveness as a collector street. No substantive difference between North and South alignments.</i>

unavailable. They are both located central to expected development so they may be more effective in providing direct service to multiple destinations within the study area, and may have better options for school bus pick-up and drop-off. All study area intersections would operate better with these alternatives than the No Direct Connection scenario, except at the intersection of OR 99W with Fischer Road, and would operate similarly with the other circulation alternatives. Travel times to most destinations studied would be better than either Alternative 4 or the No Direct Connection scenario, except for the northern part of the existing city. Alternative 2 and the southern alignment of Alternative 3 would provide through connections that could be attractive for TriMet service from the existing city to the Kingston Terrace Town Center. Would likely have minimal effect on development of long cul-de-sacs and provide good connections to existing King City.

### 6.2.2 Alternative 1

This alternative is peripheral to the center of development but offers a complete east/west connection. It may require more walking or be more circuitous for school buses, emergency or delivery vehicles or general traffic, pushing them onto more local streets. However, it would offer redundancy to travel on Beef Bend Road in an emergency. All study area intersections would operate better with this alternative than the No Direct Connection scenario, except at the intersection of OR 99W with Fischer Road, and would operate similarly with the other circulation alternatives. Travel times to most destinations studied would be better than either Alternative 4 or the No Direct Connection scenario, except for the northern part of the existing city. This alternative could provide an attractive corridor for TriMet service but would be less compelling than Alternatives 2 or 3 South due to its location on the periphery of development. Would minimize the likelihood of development of long cul-de-sacs and provide good connections to existing King City.

### 6.2.3 Alternative 4

This alternative is also peripheral to the center of development in Kingston Terrace and may require more circuitous routing of school buses, deliveries, emergency vehicles and general traffic to connect with the existing city. This alternative offers redundancy to travel on Beef Bend Road but not in a way that serves the bulk of future development. All study area intersections would operate better with this alternative than the No Direct Connection scenario, except at the intersection of OR 99W with Fischer Road. This alternative is expected to have the slowest travel times of any alternative. This alternative is likely too close to Beef Bend Road and too circuitous to be attractive to TriMet for future transit service. The alternative is vulnerable to the development of long cul-de-sacs unless the local street system is built to provide some connectivity across the one or more of the ravines. The alternative provides a good opportunity for general connectivity to the existing city but its close proximity to Beef Bend Road would limit its effectiveness as a collector street.

### 6.2.4 No Direct Connection Scenario

The No Direct Connection scenario would provide the poorest connection to the existing city in that it relies on either Beef Bend Road or a series of local streets. These local streets would not be designed to accommodate the function of collecting and distributing traffic between neighborhoods and commercial land uses which is expected to occur regardless of street designation. This scenario would likely require more circuitous routing of school buses, deliveries, emergency vehicles and general traffic to connect with the existing city. All study area intersections would operate worse with this scenario, except at the

intersection of OR 99W with Fischer Road. The diversion of traffic away from Fischer Road would adversely affect intersections along Beef Bend Road but would reduce expected future traffic volumes on Fischer Road. This scenario would likely see slower travel times than the other alternatives except for trips destined to the northern part of the city. The alternative would be vulnerable to the development of long cul-de-sacs unless local street connectivity were provided across one or more ravines. While TriMet service could be attracted to Beef Bend Road, it would limit service opportunities to the edge of the developed area rather than its core, except perhaps in the Town Center.

### 6.2.5 Summary of Rankings

This section presents summary conclusions and ranks the expected effect of each alternative on vehicular mobility within Kingston Terrace, existing King City, and surrounding areas. As noted in the beginning of this report, the factors included in this evaluation were considered to be the most significant in identifying differences among the alternatives and would provide a sound basis for ranking the alternatives relative to each other for their effectiveness in meeting community goals for a high quality circulation system.

#### *Alternatives 2 and 3*

As indicated in Table 21, Alternatives 2 and 3 are expected to rank equally high among the alternatives for their effectiveness in providing a high quality, safe, comfortable, and attractive multimodal transportation system. These alternatives provide direct connectivity and generally the shortest travel times between destination within Kingston Terrace and to the existing city. Additionally, they would be supportive of future TriMet transit service into the heart of Kingston Terrace, and would limit the development of long cul-de-sacs which hinder the achievement of good circulation through potentially extensive out-of-direction travel.

#### *Alternative 1*

Alternative 1 bears many of the same characteristics as Alternatives 2 and 3 and is highly ranked because of this. Where alternative 1 is less effective in meeting community goals for a high quality transportation system lies in its location near the southern periphery of Kingston Terrace. The alternative offers a complete east/west connection but may require more walking or circuitous school bus routing to reach the center of development. Additionally, it would likely be less attractive for future TriMet service given the lower densities and fewer destinations that it would directly serve.

#### *Alternative 4*

Alternative 4 would be substantively less effective in meeting transportation goals than alternatives 1, 2 or 3. It has a less direct connection to the existing city and is generally peripheral to the center of development which may require more driving, walking, or biking to reach destinations. Its proximity to Beef Bend Road would limit its effectiveness as a collector street. This alternative is expected to have the slowest travel times of any alternative and would likely not be attractive for future TriMet transit service. This alternative may lead to the development of long cul-de-sacs unless local street connectivity across some ravines is built.

### *No Direct Connection Scenario*

From a transportation perspective the No Direct Connection scenario is the least affective option in achieving the city's goals for a well-connected, high quality transportation system to serve the developing areas of Kingston Terrace. There would be no redundancy provided for Beef Bend Road in the event of an emergency and the lack of a collector facility may push through traffic onto local streets that have not been designed to accommodate it. This alternative would have slower travel times than Alternatives 1, 2 and 3 except for the northern edge of the existing city where access would be fastest via Beef Bend Road. There would likely be no TriMet transit service provided to internal Kingston Terrace destinations except perhaps to the Town Center. This alternative is very vulnerable to the development of cul-de-sacs due to the lack of solid east/west connections across any of the ravines.



# Appendix A

## Traffic Operations Analysis Worksheets

