

Westside Trail Master Plan

PLAN REPORT NO. 2—TRAIL CORRIDOR ANALYSIS



November 2012



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EXECUTIVE SUMMARY

Summary Table: WTMP Trail Segment Option Key Features

Option		Length	Cost	Treatment	Function	Special Features
Segment 1: Tualatin River crossing to SW Beef Bend Road						
River crossing		330' plus ramp	\$2,823,700	Bridge	River crossing	<ul style="list-style-type: none"> • 200' north ramp
5% slope (BPA – PGE)	1	0.76 mi	\$1,527,600	10' paved	Multimodal	<ul style="list-style-type: none"> • Wetland crossing • Possible property acquisition
Segment 2: SW Beef Bend Road to Tigard city limits						
5% slope (in-corridor)	2A	2.0 mi	\$3,907,500 + \$538,500 bridge	10' paved	Multimodal	<ul style="list-style-type: none"> • 60 switchbacks • 200' gully bridge • Probable property acquisition
8% slope (in-corridor)	2B	1.5 mi	\$2,721,400 + \$172,500 bridge	10' paved	Limited multimodal	<ul style="list-style-type: none"> • 26 switchbacks • 100' gully bridge • Probable property acquisition
5% – 8% slope (in-corridor, steps)	2C	1.46 mi	\$2,656,700 + \$52,500 bridge	10' paved	Primarily ped-only	<ul style="list-style-type: none"> • 25 switchbacks • 40' gully bridge • Step section • Probable property acquisition
8% slope (requires private property)	2D	TBD	TBD	10' paved	Gully crossing option	<ul style="list-style-type: none"> • Property acquisition required • Outside of corridor • Stream crossing

Option		Length	Cost	Treatment	Function	Special Features
Colyer – 141st (on-street)		1.01 mi	\$5,000	On-street	Probable interim solution	<ul style="list-style-type: none"> • Bypasses steeper in-corridor section • May allow in-corridor sections to be soft surface
Midblock crossing (SW Beef Bend)		N/A	\$426,250	Flashing beacon	Road crossing	
Midblock crossing (SW Bull Mountain)		N/A	\$426,250	Flashing beacon	Road crossing	
Segment 3: Tigard city limits to SW Barrows Road						
5% or 8% slope (in-corridor – Tigard to Mistletoe)		5% 0.17 mi	\$325,500	10' paved	Multimodal	<ul style="list-style-type: none"> • 9 switchbacks
		8% 0.12 mi	\$201,500	10' paved	Multimodal	<ul style="list-style-type: none"> • 2-3 switchbacks
5% or 8% slope (in-corridor – Mistletoe to Creekshire)		N/A	N/A	N/A	N/A	<ul style="list-style-type: none"> • This option fatally flawed (see Segment 3: Tigard city limits to SW Barrows Road narrative)
On-street (Nahcotta to Creekshire)		0.5 mi	\$5,000	On-street	ADA	<ul style="list-style-type: none"> • Option in 2 sections separated by paved cross corridor trail connector


Option		Length	Cost	Treatment	Function	Special Features
5% slope (cross corridor – Nahcotta to Creekshire connector)		0.09 mi	\$151,900	10' paved	Multimodal	<ul style="list-style-type: none"> • Crosses power corridor east-west • Connects Nahcotta and Creekshire on-street sections
Hillshire Woods (soft surface)		0.62 mi	\$378,600	Soft surface	Ped-only alternative	<ul style="list-style-type: none"> • Stream crossing • Option in two sections separated by paved cross-corridor trail connector
5% or 8% slope (in-corridor-Creekshire-to Barrows)		5% 0.43 mi	\$782,750	10' paved	Multimodal	<ul style="list-style-type: none"> • 7 switchbacks
		8% 0.39 mi	\$645,500	10' paved	Multimodal	<ul style="list-style-type: none"> • 2 switchbacks
Segments 4.11, 4.12 and 4.13 (south portion): MAX line crossing to Nike open space						
New MAX crossing (BPA)		N/A	N/A	N/A	N/A	<ul style="list-style-type: none"> • This option fatally flawed (see Segment 4.12 narrative)
Existing MAX crossing (SW 153rd Drive)		N/A	\$5,000			<ul style="list-style-type: none"> • Uses existing 153rd Drive MAX crossing • Uses NW Jenkins intersection crossing • Uses Nike street-edge trail or on-street bike/ped facilities

Option		Length	Cost	Treatment	Function	Special Features
Connector (Segment 4.11 MAX corridor)		0.10 mi	\$170,800	10' paved	Multimodal	<ul style="list-style-type: none"> • New trail section parallel to MAX line • Part of Crescent Connector Trail
Connector (SW Jenkins)		260'	\$52,000	10' paved	Multimodal	<ul style="list-style-type: none"> • New street-edge trail
Connector (Segment 4.13)		0.09 mi	\$151,900	10' paved	Multimodal	<ul style="list-style-type: none"> • Short connector to Nike trail
Segment 4.14: SW Walker Road to US 26						
5% slope (all BPA)		0.86 mi	\$591,600	10' paved	Multimodal	<ul style="list-style-type: none"> • 2 switchbacks
Midblock crossing (SW Walker)		N/A	\$600,000	Signal	Road crossing	
Segments 4.15 and 4.16: US 26 to NW Oak Hills Drive						
US 26 crossing (bridge)		230' plus ramps	\$3,274,000	Bridge	US 26 crossing	<ul style="list-style-type: none"> • Switchback (north) and straight (south) approach ramps • Power pole relocations • Possible wetland impacts


Option		Length	Cost	Treatment	Function	Special Features
US 26 crossing (tunnel)		250' plus ramps	\$5.0M +	Tunnel	US 26 crossing	<ul style="list-style-type: none"> • Requires boring • Subgrade approach ramps • Highway reconstruction impacts • Power pole relocations • Wetland impacts
5% slope (all BPA)	4F	0.65 mi	\$591,600	10' paved	Multimodal	<ul style="list-style-type: none"> • 7 switchbacks (4.16) • 2 wetland and stream crossings (4.16)
Pioneer – Science Park (On-street, interim solution)	4G	1.79 mi	\$1,019,100	On-street	US 26 crossing	<ul style="list-style-type: none"> • Uses Segments 4.14 and 4.15 • New sidewalks needed
Midblock crossing (NW Cornell)		N/A	\$600,000	Signal	Road crossing	
Segment 4.17: NW Oak Hills Drive to West Union Road						
5% slope (all BPA)	4H	0.49 mi	\$857,300	10' paved	Multimodal	<ul style="list-style-type: none"> • Widens existing trail • 8 switchbacks
Segment 4.18.1 (south portion): West Union Road to NW Kaiser Road						
5% slope (BPA – private open space)	4I	0.25 mi	\$416,800	10' paved	Multimodal	<ul style="list-style-type: none"> • Minor acquisition at north end

Option	Length	Cost	Treatment	Function	Special Features
Midblock crossing (West Union)	N/A	\$426,250	Flashing beacon	Road crossing	
Midblock crossing (NW Kaiser)	N/A	\$426,250	Flashing beacon	Road crossing	



Segment 4.18.3: Rock Creek Greenway to NW Springville Road





5% slope (all BPA)		0.43 mi	\$1,173,750	10' paved	Multimodal	<ul style="list-style-type: none"> • Wetland and stream crossing • Major meander to avoid power towers
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Segment 4.19: North of NW Springville Road

5% slope (BPA – along county line)		0.69 mi	\$1,130,000	10' paved	Multimodal	<ul style="list-style-type: none"> • Integrate into North Bethany trails
Midblock crossing (NW Springville)		N/A	\$387,500	Flashing beacon, no refuge island	Road crossing	<ul style="list-style-type: none"> • Possible phased build

Segments 4.20 to 5: Rock Creek Greenway to NW Skyline Boulevard

Connector (to Bethany Terrace Trail)		520'	\$160,150	10' paved	Multimodal	<ul style="list-style-type: none"> • Common to all Segment 4.20-5 options • Requires private property acquisition
5% slope (West section)		0.71 mi	\$1,165,000	10' paved	Multimodal	<ul style="list-style-type: none"> • Requires private property acquisition

Option		Length	Cost	Treatment	Function	Special Features
8% slope (West section)		0.59 mi	\$1,051,900	10' paved	Multimodal	<ul style="list-style-type: none"> Approximately follows power lines
8% slope (East section)		0.90 mi	\$1,505,000	10' paved	Multimodal	<ul style="list-style-type: none"> Requires private property acquisition Stream crossing
On-street (Springville – Saltzman)		1.63 mi	\$3,612,500	On-street paved shoulders	ADA	<ul style="list-style-type: none"> New 4' paved shoulders <i>both sides</i> Possible road ROW widening
Soft surface (Springville – Saltzman)		1.39 mi	\$1,128,200	Soft surface	Mountain bike and ped	<ul style="list-style-type: none"> 5 stream crossings Switchbacks needed Highly variable slopes Requires private property acquisition
Midblock crossing (NW Skyline)		N/A	\$387,500	Flashing beacon, no refuge island	Road crossing	<ul style="list-style-type: none"> Possible phased build

Summary Table: WTMP Trail Segment Option Descriptions

Option	Description
Segment 1: Tualatin River crossing to SW Beef Bend Road	
River crossing (bridge)	A right angle river crossing with a total 330-foot three-span bridge and a 200-foot-long north side approach ramp.
5% slope (BPA - PGE)	This trail option begins at the foot of the north bank approach ramp of the bridge option. The alignment meanders between BPA wood power poles and PGE lattice towers. This alignment accommodates equestrian use along the west edge of the BPA-owned corridor. The trail could also meander between BPA power poles and areas just east of PGE towers. The use of meanders may require easements across privately owned land underneath PGE power lines. Grades of 5% or less are achieved throughout. A 270-foot-wide wetland will be crossed by a boardwalk. Overall length is 0.76 mile.
Segment 2: SW Beef Bend Road to Tigard city limits	
5% slope (in-corridor)	5% grades can be achieved along the power corridor using extensive switchbacks, but the resulting density of paving, retaining walls, etc., would be very costly and greatly limit visual and wildlife habitat values. A 5% trail slope simply cannot be achieved in and out of the gully at midsection of this segment where the southeast bank drops 25 feet vertically in 40 feet horizontally. A 200-foot-long multimodal bridge would maintain accessible grades across the top of the bank. The overall length of this in-corridor option is 2.0 miles with up to approximately 60 switchbacks.
8% slope (in-corridor)	At an average 8% grade, it possible to develop this segment for both pedestrian and bicycle traffic using climbing turns and fewer switchbacks. Some retaining walls would still be required, but longitudinal slope would vary with the slope of hillside. By using switchbacks <i>within the power corridor</i> into the gully, an approximately 100-foot-long bridge could span a lower elevation crossing. The overall length of this in-corridor option is 1.5 miles with up to approximately 26 switchbacks.
5% – 8% slope (in-corridor, steps)	Combining varying trail slopes and using steps in the steepest areas of Segment 2, particularly in crossing the gully, effectively bars bicycle use, but could improve pedestrian functionality compared to the two other in-corridor options. Using steps down the southeast bank of the gully could reduce any needed bridge span to approximately 40 feet. The overall length of this in-corridor option is 1.46 miles with up to approximately 25 switchbacks and at least one step section.

Option	Description
8% slope (requires private property)	A final option for an 8% gully crossing involves the use of private property to the west and outside of the power corridor. A series of switchbacks and a short (less than 40-feet) bridge could be developed to enter the gully and cross the stream. This option is subject to a significant private property easement or purchase. Actual trail alignments, number of switchbacks and landings, and bridge location will be subject to further analysis if acquisition prospects are deemed favorable. The current mapped solution (see Figure 5) is highly conceptual.
Colyer – 141st (on-street)	SW Colyer Way and SW 141st Avenue are Washington County neighborhood routes. This on-street section would function as a trail bypass avoiding the steepest in-corridor sections immediately north of SW Beef Bend Road. It could also be used in concert with a soft-surface trail within the corridor. This option is from the intersection of SW Colyer Way and SW Glastonbury Lane to the intersection of SW 14th Avenue and SW Eagles View Lane. The length of this on-street option is 1.01 miles.
Segment 3: Tigard city limits to SW Barrows Road	
5% or 8% slope (in-corridor, Tigard city limits to Mistletoe)	At 5% and 8% grades, it is possible to develop this section of Segment 3 for both pedestrian and bicycle traffic using climbing turns and switchbacks. Total overall length of this option at 5% is 0.17 mile with approximately 9 switchbacks. Length at 8% is 0.12 mile with approximately 2-3 switchbacks.
5% or 8% slope (in-corridor, Mistletoe to Creekshire)	Very steep slopes and cross slopes between SW Mistletoe Drive and SW Creekshire Drive makes 5% multimodal trail grades impossible to maintain without a series of extremely sharp switchbacks using retaining walls. The adverse impacts greatly exceed even those in comparable Segment 2 options. The result would be a virtual paving over of the corridor in some sections. Achieving 8% slopes would require fewer switchbacks but are still considerable. <i>Therefore, the use of the power corridor for a trail in this section of Segment 3 is fatally flawed.</i>
On-street (Nahcotta to Creekshire)	This on-street route will have to be interconnected by a new trail section across the power corridor from the vicinity of SW Catalina Drive to the south end of SW Creekshire Drive. This option starts at SW Mistletoe Drive and ends where SW Creekshire Drive crosses over the power corridor. All streets used are either local or neighborhood classified routes. The on-street portions are 0.5 mile long and the new connecting trail section is 0.09 mile long. This option will have to be designated or constructed along with the Hillshire Woods soft-surface trail described below to provide for both bicycle and pedestrian accessibility.

Option	Description
Hillshire Woods (soft surface)	This soft-surface trail starts and ends within the power corridor and is routed through Tigard’s Hillshire Woods Park starting just north of SW Mistletoe Drive. The option is in two sections with an intervening hard-surface section (see preceding Nahcotta-Creekshire description). The first soft-surface section starts at SW Mistletoe Drive and connects to the new hard-surface trail section at the south end of SW Creekshire Drive. A second section of soft-surface trail is within the power corridor between the hard-surface section and the point where SW Creekshire Drive crosses the corridor. Total length of both soft-surface sections is 0.62 mile.
5% or 8% slope (Creekshire to Barrows)	At 5% and 8% grades, it is possible to develop this section of Segment 3 for both pedestrian and bicycle traffic using climbing turns and switchbacks. Some retaining walls would still be required, but longitudinal slope would vary with the slope of the hillside. Total overall length of this option at 5% is 0.43 mile with up to approximately 7 switchbacks. Length at 8% is 0.39 miles with up to approximately 2 switchbacks.
Segments 4.12 and 4.13 (south portion): MAX line crossing to Nike open space	
New MAX crossing (BPA corridor)	<p>This option connects to the developed Westside Trail section in Segment 4.11, and requires a new controlled crossing of the MAX Blue Line. The trail would then follow the power corridor between a PGE maintenance yard and power substation for about a third of the segment, cross two industrial service roads, and continue down the power corridor. A bridge and boardwalk would be needed to span the Cedar Mill Creek wetlands, and a new midblock crossing would be required at SW Jenkins Road. The total overall length of this option is 0.30 mile.</p> <p><i>This option is “fatally flawed.”</i> TriMet has indicated that a new MAX crossing would <i>not</i> be allowed so close to the existing SW 153rd Drive crossing. Washington County will <i>not</i> permit a midblock crossing of SW Jenkins Road so close to the signalized intersection with SW 153rd Drive.</p>

Option	Description
Existing MAX crossing (SW 153rd Drive)	<p>This option connects the existing end of the Westside Trail in Segment 4.11 to SW 153rd Drive via a new trail section along the south edge of the MAX right-of-way. This new trail section is 0.10 mile long and would functionally become part of the Crescent Connection Trail THPRD is planning to parallel the MAX line. After crossing the MAX line at SW 153rd Drive, the trail could either use the existing sidewalks and bicycle lanes along the east side of SW 153rd Road all the way to SW Jenkins Road and/or use a new street-edge trail recently built on adjacent privately owned vacant land to the east.</p> <p>Both the SW 153rd Drive street-edge and on-street solutions cross NW Jenkins Road at the existing signalized intersection and connect back to the power corridor up SW Jenkins Road via a new 260-foot-long street-edge multimodal trail along the north side. A 10-foot-wide multimodal trail would then turn north up the power corridor for 0.09 mile to connect to the end of an existing trail.</p>
Segment 4.14: SW Walker Road to US 26	
5% slope (all BPA)	The proposed trail alignment is illustrated down the center of BPA property, between power poles. Meanders could be added to improve the trail experience and to connect to future trail access points. The overall length of this option is 0.86 mile.
Segments 4.15 and 4.16: US 26 to NW Oak Hills Drive	
US 26 crossing (bridge)	The primary issue with a new pedestrian/bicycle bridge over US 26 is relocating electrical transmission and distribution poles and lines, both north-south and east-west.
US 26 crossing (tunnel)	Tunnel solutions are more expensive than bridge solutions, and raise major issues with respect to safety, wetlands, natural gas line relocation, and US 26 operations.
5% slope (all BPA)	The power corridor alignment provides the most direct route for a multimodal trail but requires a new US 26 crossing to work. The total length of Segment 4.15 from the end of the north bridge approach ramp to NW Cornell Road is 0.25 mile. Segment 4.16 from NW Cornell Road to NW Oak Hills Drive is 0.40 mile long.

Option	Description
On-street (Pioneer to Science Park – <i>interim</i> crossing solution)	This on-street option crosses US 26 at the SW Murray Boulevard interchange and returns to the power corridor without having to use any sections of NW Cornell Road. The option is intended as an interim solution until a new US 26 crossing is constructed. NW Pioneer Road has sections without sidewalks. NW 139th Avenue and NW Millcreek Drive have no sidewalks. The total length of this option from NW Pioneer Road to the return to the corridor down NW Science Park Drive and then within the corridor to the crossing of NW Cornell Road is 1.79 miles.
Segment 4.17: NW Oak Hills Drive to West Union Road	
5% slope (all BPA)	The proposed trail alignment is illustrated down the center of BPA property, between power poles. Meanders could be added to improve the trail experience. One short section immediately north of NW Oak Hills Drive would require approximately 8 switchbacks to maintain 5% slope. Total overall length of this option is 0.49 mile.
Segment 4.18.1 (south portion): West Union Road to NW Kaiser Road	
5% slope (all BPA)	The proposed trail alignment is illustrated down the center of the BPA-owned corridor, between power poles. Meanders could be added to improve the trail experience and to connect to future trail access points. The final approach of the trail to NW Kaiser Road would have to cross a small privately-owned vacant property to connect with the planned south end terminus of the Westside Trail section (Segment 4.18.2) scheduled for construction by THPRD in 2014. Total overall length of this option is 0.25 mile.
Segment 4.18.3: Rock Creek Greenway to NW Springville Road	
5% slope (all BPA)	The proposed trail alignment is illustrated down the center of the BPA-owned corridor, between power poles. One wetland/stream will have to be crossed. One significant meander is required to skirt an intersection of north-south and east-west power poles within the corridor. Other meanders could be added to improve the trail experience and to connect to any future trail access points. The total overall length of this option is 0.43 mile.

Option	Description
Segment 4.19: North of NW Springville Road	
5% slope (BPA – along county line)	The proposed trail alignment is illustrated down the center of the BPA-owned corridor, between power poles. This conceptual option should be fully integrated with trails and pathways planned for developing North Bethany neighborhoods to the west. Total overall length of this option down the BPA centerline is 0.69 mile.
Segments 4.20 to 5: Rock Creek Greenway to NW Skyline Boulevard	
Connector (to Bethany Terrace Trail)	This connector is common to all trail options for Segments 4.20 to 5. This 520-foot-long extension of the Bethany Terrace Trail has a 5% slope and is multimodal.
West section 5% slope (Multimodal paved surface)	This option extends north and east from the Bethany Terrace Trail extension through a wide cleared area between woodlands. This option then turns south to the same terminus as the west section 8% slope option. Total length is 0.71 mile.
West section 8% slope (multimodal paved surface)	This alternative extends due east from the end of the extended Bethany Terrace Trail primarily under or near to BPA power lines. This option provides an average 8% to 10% slope paved alternative along a different route but with the same terminus as the west section 5% slope option. Total length is 0.59 mile.
East section 8% slope (multimodal paved surface to Springville)	This alternative starts at the same point as the end of the west section 5% and 8% slope options summarized above. Through a series of approximately 4 to 5 wide switchbacks, this route first crosses and then parallels Bannister Creek then climbs to connection with NW Springville Road and the soft-surface route summarized below. Total length is 0.90 mile.
On-street (Springville - Skyline)	This on-street option follows NW Springville Road and NW Skyline Boulevard and enters Forest Park. The total length is 1.63 miles. NW Springville Road and NW Skyline Boulevard do not have sidewalk or bike lane improvements. This option primarily accommodates road bikes with the addition of widened paved shoulders on both sides of the roads.
Soft surface (Springville – Saltzman)	This soft-surface trail section will be designed for pedestrians, mountain bikes and equestrians and meander through the steep and wooded areas of Portland's West Hills to NW Saltzman Road. Approximately 5 minor stream crossings are involved. The total length for this option is 1.39 miles including a 900-foot-long stretch of NW Saltzman Road. NW Saltzman Road does not have sidewalk improvements.

BACKGROUND

The full Westside Trail Master Plan (WTMP) trail segments subject to this WTMP Trail Corridor Analysis are Segments 1 through 3, 4.12, 4.14 through 4.17, 4.18.3, 4.19, 4.21, and 5. Portions of Segments 4.11, 4.13 and 4.18.1 are also included in the WTMP study area. See Figure 1 which shows the overall trail corridor study area, trail segments by jurisdiction (city, county, parks district), and the location of the specific numbered trail segments subject to WTMP corridor analysis. The trail segment naming and numbering cited in this report is based on a system developed by the Tualatin Hills Parks and Recreation District (THPRD).

Trail segments between SW Barrows Road (4.01) and the Tualatin Hills Nature Park (4.11) are either constructed or scheduled for construction in 2012–2013. Most of Segments 4.13 and 4.17 include built trail sections that are privately developed and maintained (Nike and the Oak Hills Home Owners Association). The portion of Segment 4.18.1 that crosses Bronson Creek north of NW Kaiser Road and all of Segment 4.18.2 will be developed by THPRD in mid-2014, and Segments 4.20 and 4.22 are already developed and also under the jurisdiction of THPRD.

The eventual Westside Trail route east of NW Skyline Boulevard through Forest Park (Segment 6) will be subject to separate discussions between Metro and Portland Parks and Recreation. The trail connection east of Forest Park along US 30 (St. Helens Road) and the Willamette Greenway to the St. Johns Bridge will be subject to separate discussions between Metro, the City of Portland, and the Oregon Department of Transportation (ODOT).

METHODOLOGY

The information developed in the WTMP Existing Conditions phase (WTMP Report No. 1) of this project provided the essential background to this trail corridor analysis. The geographic information system (GIS) and mapping data developed in the Existing Conditions phase, and preliminary property ownership information developed by Metro with the assistance of project partners (primarily Bonneville Power Administration [BPA] and Portland General Electric [PGE]), was used extensively. Additional technical input to this WTMP trail corridor analysis was provided by THPRD, the Oregon Department of Transportation (ODOT), TriMet, BPA, Washington County, Multnomah County, and the cities of Tigard and Hillsboro.

Illustrated trail alignment options are conceptual. Options are based on data derived from the above noted sources and were subject to very limited field visits. Conceptual alignments and crossings have not been subjected to final design or engineering. The concepts are planning level only, but the amount of detail provided is greater than is generally provided at the master plan level. This detail provides more precise trail lengths and more exact estimates of needed special structures such as bridges, stream crossings, steps, midblock road crossings, switchbacks, retaining walls, and trail landings. The detail also facilitates the identification of probable utility relocations. This enhanced detail will provide the eventual trail builders and

operators with a well-defined set of trail options, impacts, and costs on which to base final design and engineering.

TRAIL ALIGNMENT ASSUMPTIONS

The key parameters guiding trail alignment options are listed below:

- Establish a conceptual alignment with 5 percent slopes or less meeting Americans with Disabilities Act (ADA) requirements.
- Stay within the 100-foot-wide BPA-owned power corridor (except for those portions of Segments 4.19, 4.21, and 5 for which there is no BPA-owned corridor).
- For other segments where 5 percent slopes cannot be achieved exclusively within the BPA-owned power corridor, use easement areas under PGE power towers and lines.
- If 5 percent slopes still cannot be achieved within the BPA-PGE power corridor, use abutting public or private open spaces.
- If 5 percent slopes still cannot be achieved within the BPA-PGE-open space corridor, or result in extended sections of sharp switchbacks, retaining walls, or extensive cut and fill, use average 8 percent slope trail sections.
- Where multimodal bicycle-pedestrian options meeting ADA requirements still cannot be achieved within the BPA-PGE-open space corridor, use split-mode solutions with on-street bicycle and/or pedestrian-only alternatives and/or facilities such as short bridges or steps.

Additional considerations include:

- Where pedestrian-only soft-surface solutions are indicated, use trail development standards that accommodate both pedestrians and mountain bicycle users.
- Use Washington County midblock crossing standards for all but two major street crossings (NW Springville Road and NW Skyline Boulevard in Multnomah County and City of Portland respectively). Washington County standards generally do not allow midblock crossings within 300 feet of existing signalized intersections.

CONCEPTUAL COST ASSUMPTIONS

Unit costs were used to develop conceptual trail construction cost estimates. The lengths of the trail segments and sections and the number of special features (such as switchbacks and midblock crossings) are based on the conceptual trail routes illustrated in this report's segment-by-segment trail corridor analysis maps. Trail unit costs were primarily developed based on preliminary THPRD information derived from the three Westside Trail construction projects that were bid in mid-2012. Unit cost data was also derived from similar trail construction projects in the Portland metropolitan region and elsewhere, and from other sources such as Washington County and ODOT. Unit cost assumptions are:

- The standard trail cross section is a 10-foot-wide asphalt-paved trail with 2-foot-wide gravel surface shoulders on each side. This standard is consistent with present THPRD practice. In areas with higher usage a 12-foot-wide trail surface may be considered. Easement or right-of-way acquisition costs are not included.
- Where sidewalks are absent along existing on-street sections, the standard is a retrofitted 5-foot-wide concrete paved sidewalk with curbs and conventional storm drainage on one side of the street. Easement or right-of-way acquisition costs are not included.
- Existing pedestrian and bicycle treatments along the on-street options illustrated in this report can be highly variable. Treatments range from concrete or asphalt sidewalks with curbs, to slightly meandering asphalt surfaced pathways set back from the street. Width can also vary greatly and the treatment changes in some cases almost block-to-block reflecting the different standards in the eras in which certain streets and surrounding neighborhoods were developed. Bike lanes can also be intermittent and narrow. Accordingly, on-street options selected as part of the Westside Trail system may require upgrades to current pedestrian and bicycle infrastructure. Such upgrade costs were not estimated.
- Soft-surface pedestrian and mountain bike trail sections are assumed to be 5 feet wide with a surface treatment supporting these types of traffic.
- Trail sections with two or more switchbacks in a concentrated sequence were estimated separately and added to the basic trail estimates. These switchback unit costs account for factors such as retaining walls, landings, and cut and fill.
- Wetland areas are crossed by elevated boardwalks consistent with current THPRD standards. All wetland areas identified and mapped in the WTMP Existing Conditions phase are given the same wetland crossing treatment irrespective of underlying wetland quality. Costs vary only by length.
- Concrete steps with bike tire gutters are indicated selectively in the most steeply sloped sections of Segments 2 and 3 to improve bike and ADA accessibility and reduce overall trail grades. Each short step section is assumed at \$7,000 cast in place with rails, plus permitting and engineering.
- Low level bridges are assumed across all the minor streams identified and crossed by the conceptual trail alignments. The most such crossings are in Segment 5. The number and siting of these crossings may vary with final design and engineering. Costing assumes \$23,000 per bridge, plus permitting and engineering.
- Cost estimates for collector and arterial street midblock crossing treatments are based on the recommended treatment described segment by segment in this corridor analysis report. Costs were modeled from recent bid costs for such crossings in Washington County. The primary factor distinguishing midblock crossing solutions is whether a flashing beacon or pedestrian activated signal is used. Costing assumes \$275,000 construction cost for the beacon solution and \$350,000 with pedestrian-activated

signals, plus permitting and engineering. All solutions include a center lane refuge island, unless otherwise noted. All midblock crossings treatments using flashing beacons could be upgraded at the time of construction to signals if road improvements and traffic volumes so dictate.

- Costs for the midblock crossings of NW Springville Road (rural collector) and NW Skyline Boulevard (local service traffic street) were adjusted for a treatment including flashing beacons but not refuge islands. The construction cost estimate for these midblock solutions is \$250,000, plus permitting and engineering. Refuge islands would improve safety but the current and future cross sections of these roadways may not be sufficiently wide to accommodate islands.
- A flat amount of \$5,000 for each local or neighborhood route midblock crossing is included in overall segment cost estimates. The standard used is high visibility marked pavement crossings and warning signage.
- A flat amount of \$5,000 is allocated for bicycle route pavement markings and warning signing along on-street options without bike lanes.

Unique attributes or requirements necessitated the development of specific conceptual cost estimates for some trail sections and/or structures:

- For Segment 1, a Tualatin River bridge option is described.
- Segment 2 crosses a 40-foot-deep gully with a very steep southerly slope. Four different bridge length options connecting four different trail approaches to and/or into the gully are identified. The bridge construction costs were estimated based on information by a bridge contractor familiar with THPRD standards. Permitting and engineering were added to these amounts.
- For Segment 4.16, two US 26 crossing options are described: a bridge and a tunnel. Costs include approach ramps. Costs of relocating transmission power lines and poles are also included.
- For Segment 5, the on-street Springville – Skyline option assumes new 4-foot-wide asphalt paved shoulders on both sides of these roads. The per-linear-foot estimate was based on 2009 costing information provided by Multnomah County and more recent engineer’s estimates for similar structures along Portland’s Capitol Highway, with a factor added for retaining walls that may be needed along many stretches of these roadways. Easement or right-of-way acquisition costs are not included.

Other conceptual cost assumptions include:

- Costs associated with design and engineering, permitting, and construction management were estimated as a percentage of construction costs.
 - Preliminary engineering and permitting 25 percent
 - Construction engineering 15 percent
 - Construction contingency 15 percent

The construction contingency percentage was adjusted to 30 percent for the Tualatin River and US 26 bridges.

- Easement and property acquisition costs are not included in the conceptual cost estimates. These costs may be estimated and added as an outcome of WTMP Task 6: Implementation Strategy right-of-way acquisition report.

All the foregoing factors are added together as applicable for each of the trail segment options described in this report and the total costs are listed under the key features table included for each segment under the Conceptual Cost Estimates section for each segment.

MAP LEGENDS

The segment maps in this report should always be reviewed in concert with the associated segment narrative to assure a full understanding of the options being considered, including issues such as slope, ADA compliance, trail surface, and mode split.

Segment-by-segment maps are included illustrating each trail option. In the title block of each segment map the segment name and number are shown, and a segment corridor length is cited. This segment length is the “as the crow flies” length of the segment’s trail corridor as defined by the segment boundaries established by the system developed by THPRD. This corridor length is included to provide the viewer with a context as to the scale of each segment. Segment boundaries are not uniformly spaced. Segments are primarily divided along roadways or other major features and in some cases by jurisdictional boundaries. The actual length of trail segment options described and illustrated in this report may vary greatly from the as the crow flies length because of the presence of meanders, switchbacks, and other factors.

Although some trail type titles refer to a single slope percentage, in practice the slopes within any given option may vary. The alignments shown strive to achieve the flattest slope whenever possible not to exceed the titled percentages.

In the interest of simplicity, generally five types of trail alignment lines are shown and titled on the maps:

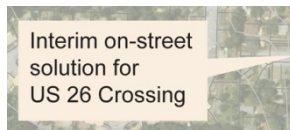
- Up to 5 percent slope, multimodal (5 percent)
- Up to 8 percent slope, multimodal (8 percent)
- 5 percent to 8 percent slope, with steps (5 percent – 8 percent steps)
- On-street
- Soft surface

Some alignment options are more complex than can be represented by a single line and a short title. Particularly in the more complex segments – Segments 2, 3, 4.21, and 5 – there are multiple trail options and iterations possible. Each trail option is cross referenced by a uniform trail identification icon that appears in the corridor analysis summaries and narrative, as well

as on segment maps. The numeral on the icon refers to the segment and the letter refers to a specific option.



In addition, some unique trail options attributes or challenges are annotated directly on the segment maps as shown below.



Various special trail features that occur repeated are also represented on the segment maps by other symbols.

- Wetland crossings. In addition, documented wetlands are shown as part of the underlying base information on each segment map.
- Minor stream crossings
- Steps
- Collector and arterial midblock crossings, plus the midblock crossing of NW Skyline Boulevard. Local streets and neighborhood route midblock crossings are not marked by symbols on the segment maps, but are reasonably obvious on the maps and are named in the narrative sections of this report.

As with the represented trail alignment options, the narrative sections of this report associated with the illustrated special feature should always be referenced for details.

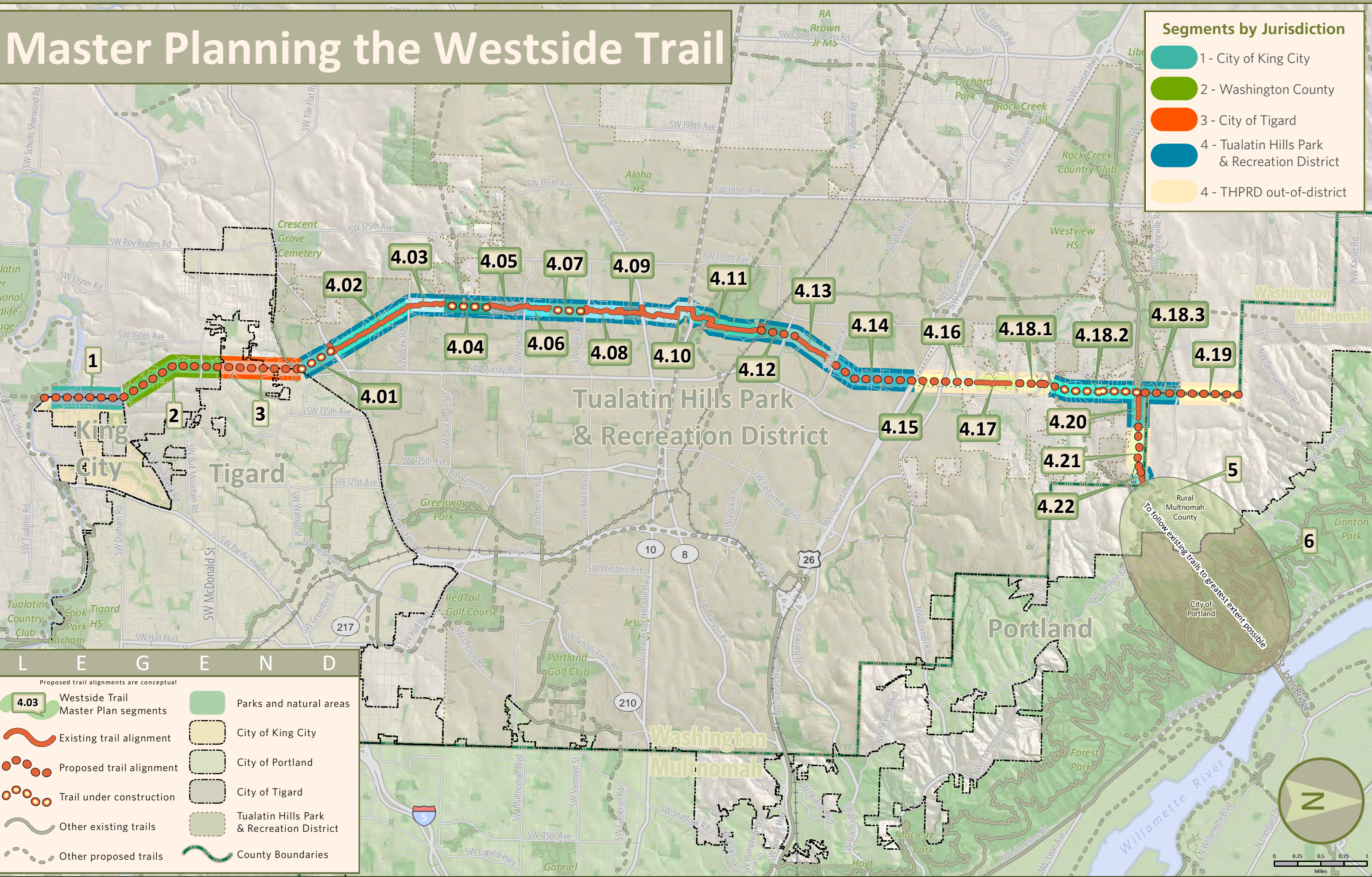
LIMITATIONS

As discussed under the preceding Methodology and Conceptual Cost Assumptions sections of the report, all trail alignment options were primarily developed based on existing information (GIS, aerial and topographic data, etc.) and very limited site visits. All illustrated or described trail alignments, standards, permitting, structures, and other features are subject to change based on final design and engineering, and the standards and regulatory requirements in place at the time of constructions. Cost estimates are based on available comparable data as of late 2012, and may vary at the time of construction.

Master Planning the Westside Trail

Segments by Jurisdiction

- 1 - City of King City
- 2 - Washington County
- 3 - City of Tigard
- 4 - Tualatin Hills Park & Recreation District
- 4 - THPRD out-of-district



SEGMENT DESCRIPTIONS

Segment 1: Tualatin River crossing to SW Beef Bend Road

Tualatin River crossing

Several bridge alignment options for crossing the Tualatin River and connecting to the Tonquin Trail were initially examined. A bridge option down the middle of the power corridor and straight across the river would result in by far the longest span, create potential conflicts with wetlands and power transmission lines and poles, and cross through the environmental cleanup area on the south bank of the river. Accordingly, this option was not further investigated. A bridge option avoiding the contaminated south bank of the river by crossing at an approximate 30 degree angle was also investigated and a schematic plan was developed. This 385-foot-long option uses a 200-foot-long approach ramp on the north side. A right angle bridge crossing option also can connect to the conceptual Tonquin Trail trailhead and is only 330 feet long with the same 200-foot-long approach ramp on the north side. This third option is illustrated on the trail alignment segment map (Figure 2) and in a more detailed schematic drawing (Figure 3).

Bridge structure

The illustrated bridge option crosses the river at a right angle, landing near the conceptual trail alignment trailhead shown in the Tonquin Trail Master Plan. This results in a three span bridge structure with a total length of 330 feet including a 100-foot south span, a main span length of 190 feet over the river, and a 40-foot span on the north end. Columns supporting the main span are sited on the south and north banks outside of the active flowing river channel. The wooded slope on the south bank would provide an at-grade landing for the bridge's south bank approach span, while the north bank span of the bridge would require an additional 200-foot-long sloped approach ramp to bring the trail down to the Segment 1 corridor grade.

Allowing for a 100-year flood elevation and required structure depth for the main span the bridge deck is at 133-foot elevation. For cost estimation purposes, the bridge deck was assumed to be 18 feet wide with a combination concrete steel tube rail on each side leaving an interior width of 16 feet. The minimum design load for pedestrian bridges is 85 pounds per square foot for pedestrians and 10,000 pounds for maintenance vehicles. Bridge types could be steel or concrete. For estimating purposes a steel box girder was used for the main span and the approach spans were assumed to be precast concrete. Bridge aesthetics were not considered at this master planning level.

Any bridge crossing the Tualatin River will also need to consider the following issues with respect to design and construction:

- The lowest portion of the bridge will need to be above the 100-year flood plain.
- Design will need to conform to ODOT's Bridge Design and Drafting Manual (BDDM) and the American Association of State Highway and Transportation Officials (AASHTO) Guide Specifications for the Design of Pedestrian Bridges.

- Construction near and within the Tualatin River will require extensive permitting and consultation with a wide range of federal, state, regional, and local agencies.

South Approach

A retained fill wall ramp structure was initially considered for the south approach but was deemed unsuitable when taking into account the existing wooded slope. Instead an approach bridge span is used that aligns at-grade with the proposed Tonquin Trail. Using an approach span at this location also better maintains wildlife access adjacent to the river bank as compared to a ramp.

North approach

With an estimated grade difference of 10 feet, the run-out approach ramp length required to meet a 5 percent ADA design (without landings) is 200 feet. Local distribution power poles running along the north bank of the river may require relocation to accommodate the north approach structure. For cost estimation purposes the approach ramp was assumed to be built using mechanically stabilized earth retaining walls which are typically the most cost effective and easily constructed.

Trail options

1 There are no significant impediments or fatal flaws that constrain trail development within the Segment 1 power corridor. A paved multimodal trail of 5 percent slope or less is possible along the entire segment within the BPA-owned 100-foot-wide section of the corridor. Siting the trail slightly farther east and at least partly under PGE power lines would allow greater separation from equestrian uses near to SW 137th Avenue. (Public input on this trail segment frequently cited the extensive use of the corridor by equestrians.) This easterly iteration would require easement or private property acquisitions under PGE lines. The City of King City and two homeowners associations own the property under the PGE towers and power lines.

Gentle meanders could be used to enhance the trail experience and to better link to any future access points and trailheads. Meanders could also be used to minimize impacts to the small emergent wetland in the corridor near SW Macbeth Drive.

The total overall length of this dual option is 0.76 mile including a 270-foot wetland crossing, but excluding the Tualatin River bridge north bank approach ramp.

Comparative evaluation


Tualatin River crossing

Not applicable.

Trail options

The two trail iterations described above are substantially identical in all crucial respects, except for potential easement or property acquisition costs. The BPA - PGE alternative could marginally improve user experience by using more gentle meanders, create somewhat larger continuous areas for habitat and wildlife, and provide some additional flexibility for equestrian uses, and connections to adjacent streets in King City. The only significant difference from the all-BPA alternative would be the costs associated with easements or private property acquisitions under the PGE power lines. Acquisition costs are not included in the conceptual cost estimates.

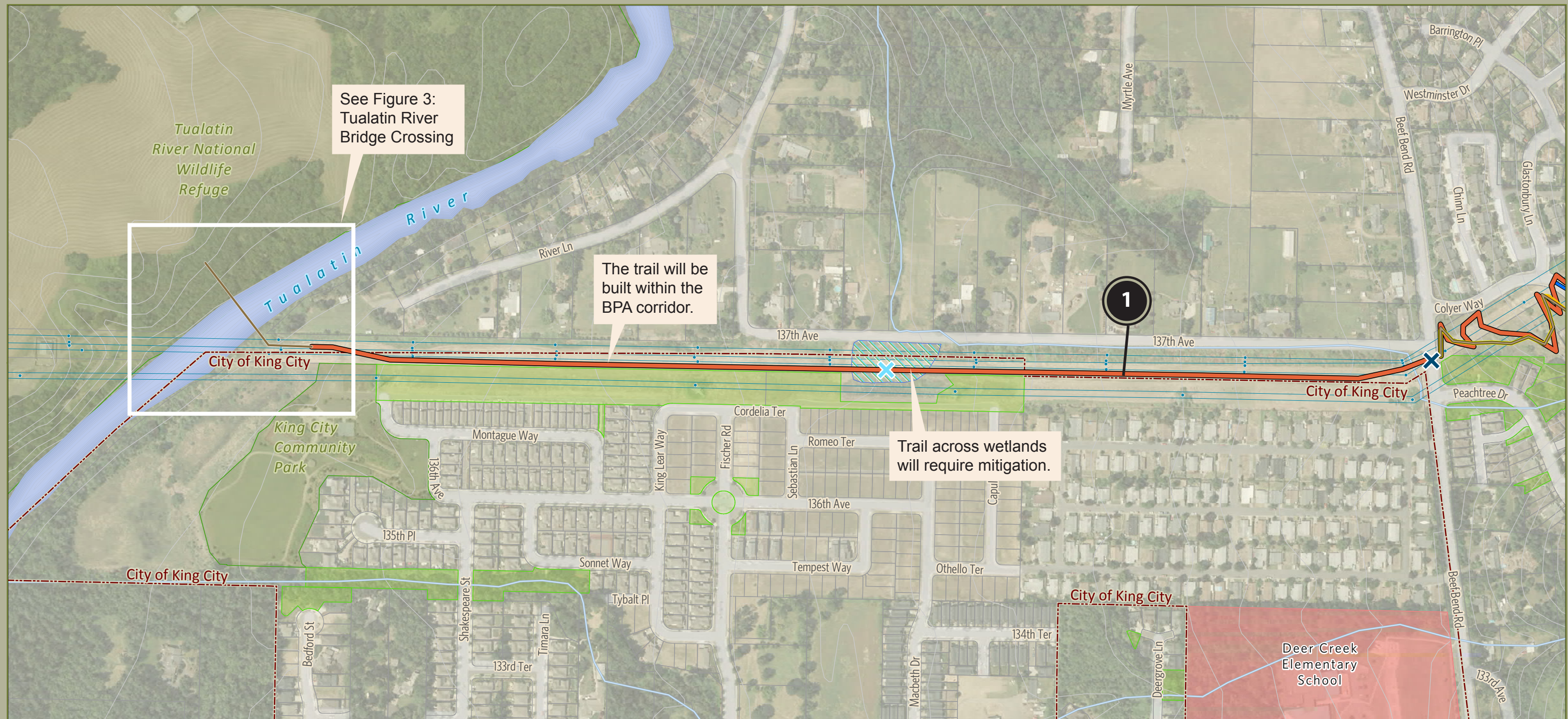
Table 1: Segment 1 key features

Option		Length	Cost	Treatment	Function	Special Features
Segment 1: Tualatin River crossing to SW Beef Bend Road						
River crossing		330' plus ramp	\$2,823,700	Bridge	River crossing	• 200' north ramp
5% slope (BPA - PGE)		0.76 mile	\$1,527,600	10' paved	Multimodal	• Wetland crossing • Possible property acquisition

Westside Trail Master Plan

Figure 2

Segment 1
Tualatin River to Beef Bend Rd
Segment Corridor = 0.85 Miles



Westside Trail Alternatives

- Up to 5% slope, multimodal
- 5% - 8% slope, with steps
- Up to 8% slope, multimodal
- Soft surface
- On-street

Bridge

- Steps
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings

Other Existing Trails

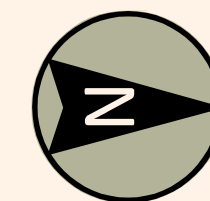
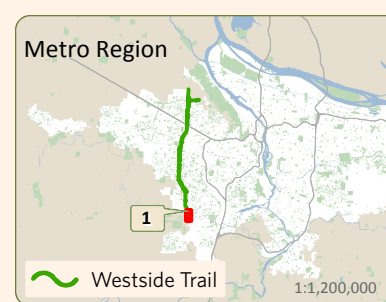
- School sites
- Parks and natural areas
 - Privately owned
 - Publicly owned
 - Wetlands

Taxlots

- Powerline Towers
- Powerlines
- Streams
- 10 foot contours

City Boundaries

- County Boundaries
- Tualatin Hills Park & Rec District Boundary
- Segment option number



All illustrated alignments subject to change based on final design, permitting, and engineering.

Westside Trail Master Plan

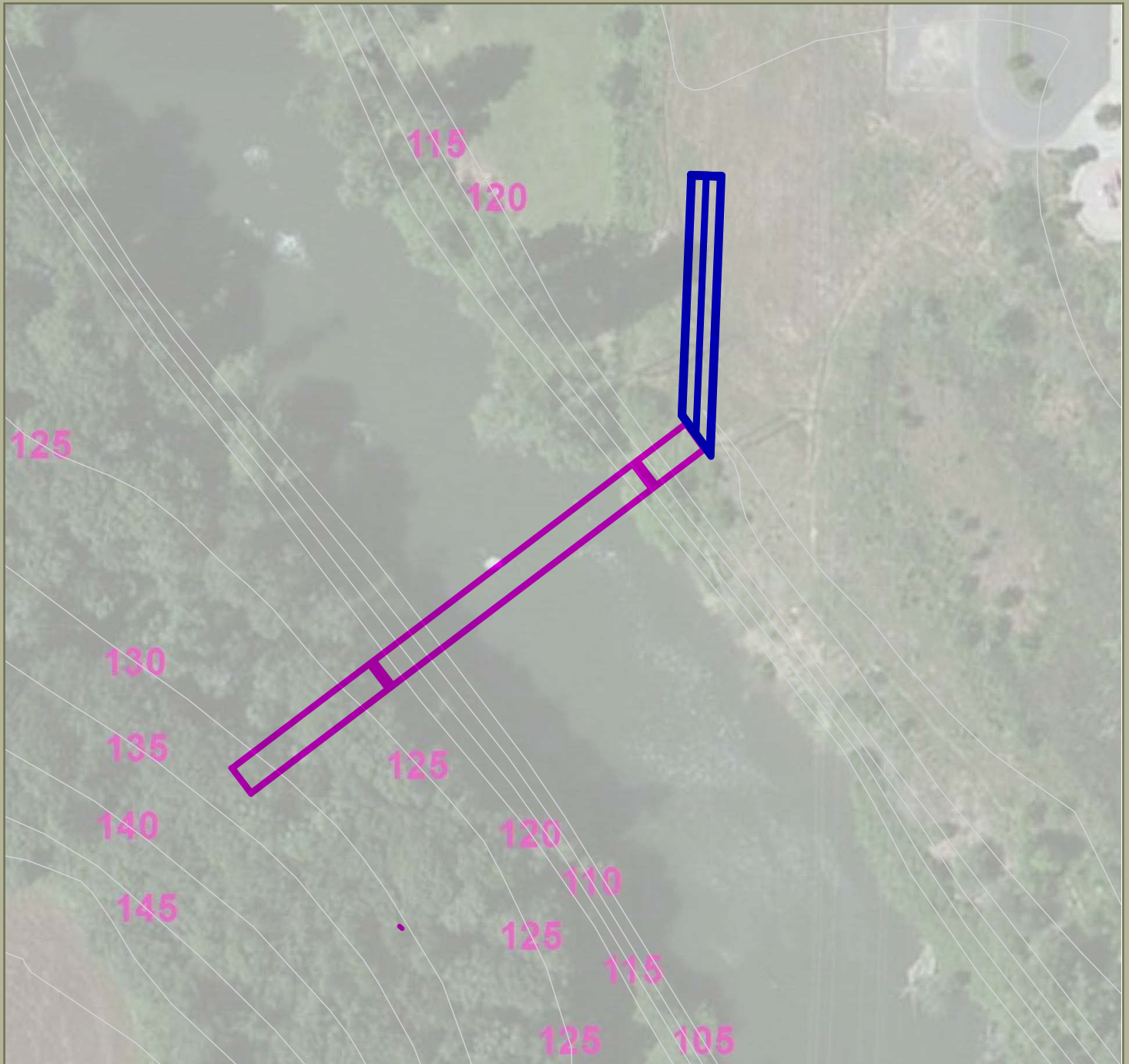


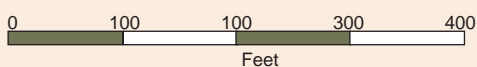


Figure 3
Tualatin River Crossing

-  Three-span Bridge
-  Bridge Approach Ramp



Segment 2: SW Beef Bend Road to Tigard city limits

Trail options

BPA owns the western 100 feet of the overall power corridor for the entire length between SW Beef Bend Road and the Tigard city limits. The 125-foot-wide corridor under the PGE power lines between SW Beef Bend Road and SW Odino Court is privately owned. The PGE corridor from SW Odino Court to SW Bull Mountain Road narrows to 100 feet, with adjacent large lots south of SW 144th Avenue and deep residential lots on the east side of BPA property. PGE owns a 125-foot-wide parcel underneath the power lines from SW Bull Mountain Road to the Tigard city limits.

In total, four in-corridor options and one partial on-street option are described below.

In-corridor options

2A **2B** **2C** **2D** The combination of very steep slopes and a narrower overall power corridor in some sections of this segment makes it difficult to meet ADA requirements of 5 percent longitudinal slope without multiple switchbacks and many retaining walls. Numerous sharp turns are difficult to navigate by bicycle. Paving a substantial portion of the power corridor to accommodate dense clusters of switchbacks also reduces its value as a wildlife corridor and open space.

All in-corridor options described below would involve obtaining access rights to private properties under PGE power lines. The up to 5 percent slope option potentially would require easements on privately owned vacant lands. The two in-corridor options using up to 8 percent slopes would require less use of private lands. Varying trail slopes combined with (see Figure 4 for all options) steps in the steepest areas effectively bar bicycle use, but could improve pedestrian functionality compared to the 5 percent and 8 percent options. Steps could include wheel gutters accommodating bicyclists who wish to walk their bikes up or down steep slope sections.

All Segment 2 in-corridor options cross a deep gully. Solutions for this gully crossing are described separately below (see Figure 5).

On-street options

2E One option using nearby developed roadways and sidewalks has been identified. Sidewalks and bike lanes developed in public rights of way are considered accessible regardless of the road slopes. Under split-mode scenarios, an in-corridor Segment 2 pedestrian trail would climb and descend steeper slopes, perhaps combined with steps. Bicycles, wheelchairs and child strollers would be directed to adjacent streets.

Connector

A very short spur connecting a bend in SW 141st Avenue to the top of the first long run of in-corridor trails switchbacks is also illustrated on the segment map. This connector provides a convenient choice to trail users between in-corridor and on-street routes.

Mid-segment gully crossing

Segment 2 crosses an approximately 40-foot-deep wooded gully. All in-corridor trail options must cross this gully. The southern slope into this gully is particularly steep, and all crossing solutions are made more complex by the already steep trail approaches. Four solutions are illustrated (Figure 5) using combinations of switchbacks and four different bridge spans, plus one short set of steps. The longest gully bridge span is 200 feet and crosses the gully at top of bank. Shorter 100-foot-long and 40-foot-long bridge options are possible using switchbacks and steps. A fourth option uses private lands west of the power corridor. The illustrated alignment is highly conceptual and would have to be refined based on property acquisition outcome.

Road crossings

SW Beef Bend Road crossing

SW Beef Bend Road divides Segments 1 and 2. SW Beef Bend Road is a Washington County arterial. The standard cross section for a County arterial roadway is two travel lanes with a middle turning lane, sidewalks and bike lanes. SW Bend Beef Road is currently developed to a lesser standard with two travel lanes with no sidewalks or bike lanes *within* the power corridor although sidewalks are present both east and west of the corridor. There are no nearby (within 300 feet) controlled intersections. The recommended midblock crossing treatment is:

- High visibility marked crossing and signage
- Refuge island
- Pedestrian-activated rapid flashing beacons
- Connecting ramps to bike lanes (if and when bike lanes are built)

SW Bull Mountain Road crossing

SW Bull Mountain Road is a Washington County collector. The standard cross section for a County collector roadway is two travel lanes with a middle turning lane, and sidewalks and bike lanes. SW Bull Mountain Road within the power corridor is currently developed with two travel lanes and no sidewalks. Paved shoulders are present in both directions that could be used as bike lanes but are not so marked or signed. There are no nearby (within 300 feet) controlled intersections. The recommended midblock crossing treatment is:

- High visibility marked crossing and signage
- Refuge island
- Pedestrian-activated rapid flashing beacons
- Connecting ramps to bike lanes

Other road crossings

In-corridor

The in-corridor trail options for Segment 2 would cross one Washington County local street (SW 144th Avenue) and two county neighborhood routes (SW Colyer Way and SW Woodhue Street). The recommended treatment is high visibility marked crossing and warning signage.

Comparative evaluation

Taken one by one, none of the in-corridor options described above clearly performs better overall than any other. The challenges and impacts of climbing and descending in-corridor steep slopes are many. The on-street option is also very steep. All options are a series of trade-offs.

Safety

The on-street option rates lower for safety because of probable conflicts with vehicular traffic. On-street steepness is also a safety factor but only as a matter of degree, as the steepness and multiple switchbacks for the in-corridor options also present safety challenges.

Trail experience and environmental impacts

The steepness of in-corridor options and the number of switchbacks, landings, and other structures may significantly impact user experience and create significant adverse environmental impacts. The number of switchbacks, landings and other structures needed to meet a 5 percent slope standard approaches a fatal flaw for the 5 percent option. The on-street option could be considered to have neutral environmental impact but only in the sense that prior street construction has already degraded environmental values.

Steepness

All options but one substantially, although not fully, exceed 5 percent grades, although on-street options are ADA-compliant.






Approvals

The 8 percent slope option, despite some attributes (fewer property acquisitions and lower cost than the 5 percent slope and 5 to 8 percent with steps options), would be difficult to build with federal funding unless paired with the on-street alternative for bicycles and ADA accessibility.

Property acquisition

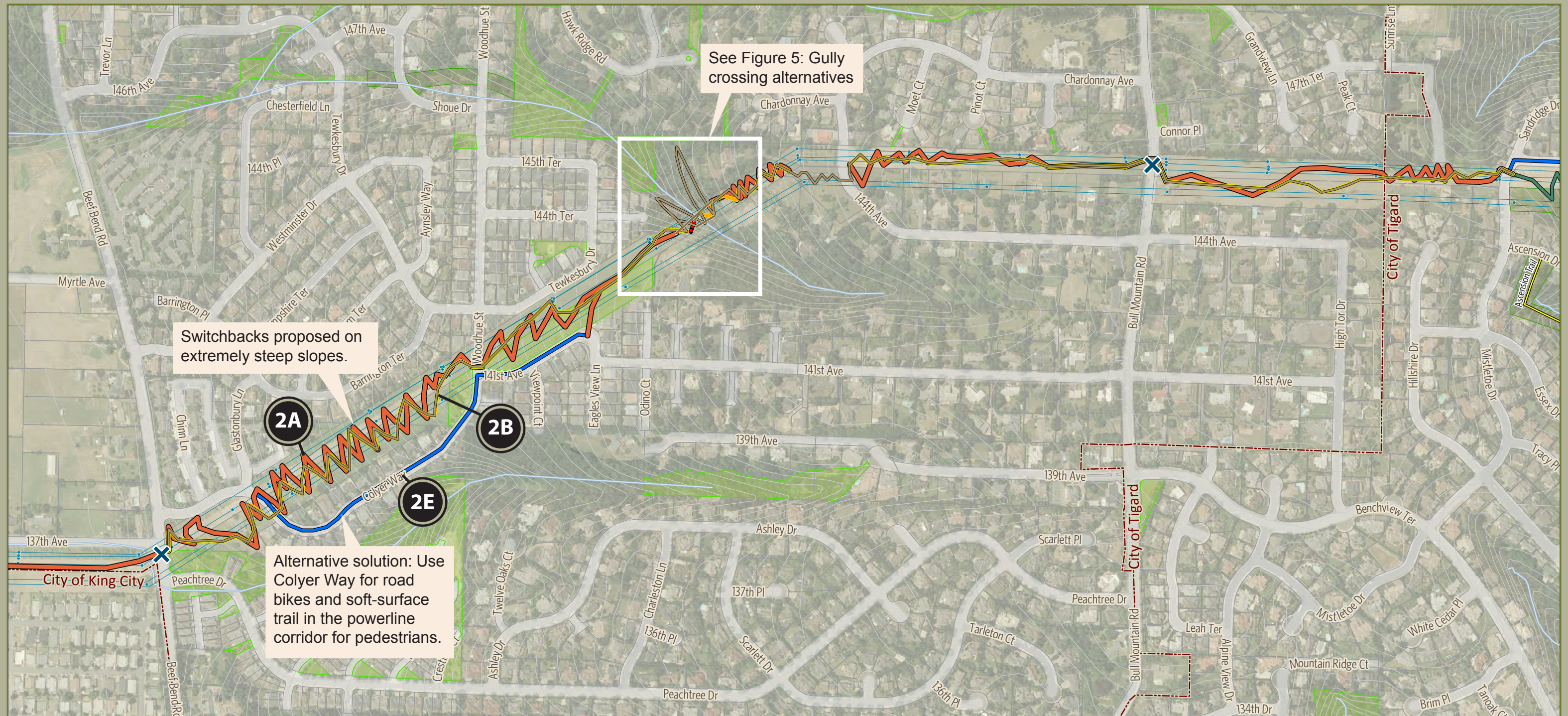
All in-corridor options would require private property easements or acquisitions under the PGE power lines. The 5 percent slope option would require the most acquisition and the 5 to 8 percent slope with steps option would require the least. The fourth gully crossing solution will require a substantial private property acquisition.

Table 2: Segment 2 key features

Option		Length	Cost	Treatment	Function	Special Features
5% slope (in-corridor)		2.0 miles	\$3,907,500 + \$538,500 bridge	10' paved	Multimodal	<ul style="list-style-type: none"> • 60 switchbacks • 200' gully bridge • Probable property acquisition
8% slope (in-corridor)		1.5 miles	\$2,721,400 + \$172,500 bridge	10' paved	Limited multimodal	<ul style="list-style-type: none"> • 26 switchbacks • 100' gully bridge • Probable property acquisition
5% – 8% slope (in-corridor, steps)		1.46 miles	\$2,656,700 + \$52,500 bridge	10' paved	Primarily ped-only	<ul style="list-style-type: none"> • 25 switchbacks • 40' gully bridge • Step section • Probable property acquisition
8% slope (requires private property)		TBD	TBD	10' paved	Gully crossing option	<ul style="list-style-type: none"> • Property acquisition required • Outside of corridor • Stream crossing
Colyer – 141st (on-street)		1.01 mile	\$5,000	On-street	Probable interim solution	<ul style="list-style-type: none"> • Bypasses steeper in-corridor section • May allow in-corridor sections to be soft surface
Midblock crossing (SW Beef Bend)		N/A	\$426,250	Flashing beacon	Road crossing	
Midblock crossing (SW Bull Mountain)		N/A	\$426,250	Flashing beacon	Road crossing	

Westside Trail Master Plan **Figure 4**

Segment 2
Beef Bend Rd to Tigard city boundary
Segment Corridor = 1.15 Miles



Westside Trail Alternatives

- Up to 5% slope, multimodal
- 5% - 8% slope, with steps
- Up to 8% slope, multimodal
- Soft surface
- On-street
- Bridge
- Steps
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings

Other Existing Trails

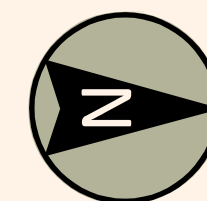
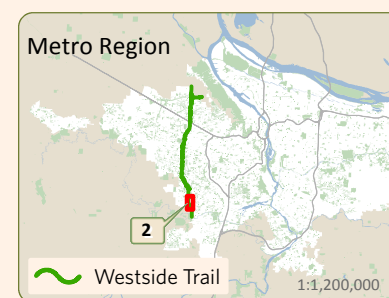
- Other Existing Trails
- School sites
- Parks and natural areas
 - Privately owned
 - Publicly owned
 - Wetlands

Taxlots

- Powerline Towers
- Powerlines
- Streams
- 10 foot contours

City Boundaries

- City Boundaries
- County Boundaries
- Tualatin Hills Park & Rec District Boundary
- Segment option number



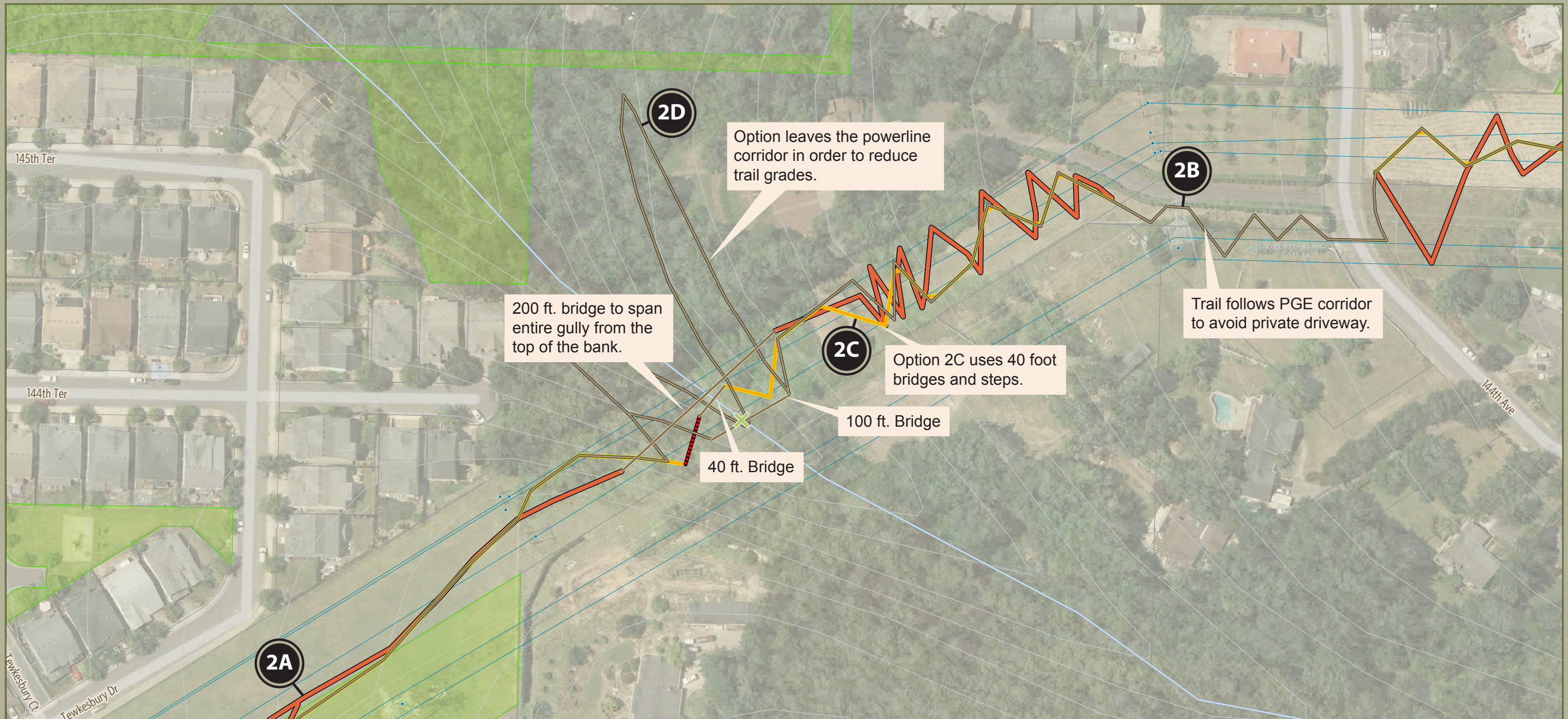
0 100 200 300 400
Feet

All illustrated alignments
subject to change based
on final design, permitting,
and engineering.

Westside Trail Master Plan

Figure 5

Segment 2 inset
Gully Crossing Alternatives
Segment Corridor = 0.18 Miles



Westside Trail Alternatives

- Up to 5% slope, multimodal
 - 5% - 8% slope, with steps
 - Up to 8% slope, multimodal
 - Soft surface
 - On-street
- Bridge
 - Steps
 - Midblock Crossings
 - Wetland Crossings
 - Minor Stream Crossings

Other Existing Trails

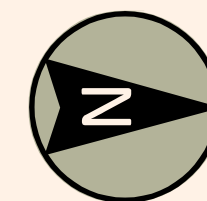
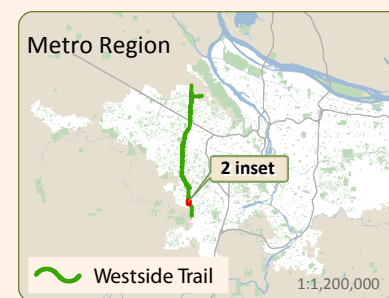
- School sites
- Parks and natural areas
- Privately owned
- Publicly owned
- Wetlands

Taxlots

- Powerline Towers
- Powerlines
- Streams
- 10 foot contours

City Boundaries

- County Boundaries
- Tualatin Hills Park & Rec District Boundary
- Segment option number



0 25 50 75 100
Feet

All illustrated alignments
subject to change based
on final design, permitting,
and engineering.

Segment 3: Tigard city limits to SW Barrows Road

Trail options

Segment 3 has many of the same attributes and challenges as Segment 2 in crossing over Bull Mountain. The similarly steep, and for one extended section even steeper, slopes in Segment 3 are further complicated by the cross slopes in the central part of this segment. BPA owns the westerly 100-foot-width of the power corridor through the entire length of Segment 3. As in Segments 1 and 2, PGE lattice towers and power lines abut and parallel the east side of the BPA property. The PGE corridor easement width varies between approximately 105 and 130 feet but is mostly 125 feet wide.

The City of Tigard is the owner of several of the parcels underlying the PGE power infrastructure, including two named parks. In some contrast to Segments 1 and 2, where private ownership under PGE infrastructure is mostly in the form of privately owned vacant land, more of the Segment 3 private lands under PGE lines consist of the backyards of residential lots. These residential backyards under the power lines are in two areas: south of SW Mistletoe Drive and south of SW Fern Street.

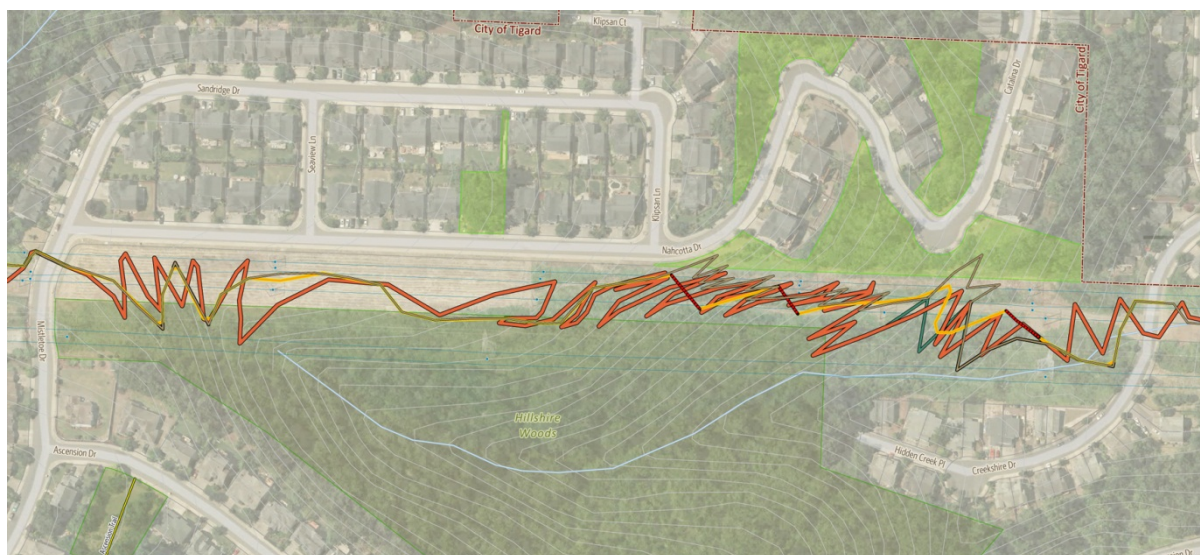
Steep to very steep slopes, and cross slopes in some sections, make it difficult to meet ADA requirements of 5 percent longitudinal slope without using multiple switchbacks and many retaining walls. The cross slope is particularly challenging between SW Mistletoe Drive and SW Creekshire Drive. Solutions that mitigate slope conditions would end up paving a substantial portion of the corridor greatly reducing its value as a wildlife corridor and open space. Numerous sharp turns are also difficult to navigate by bicycle.

In-corridor options

3A **3B** **3D** **3G** **3F** Two separated sections of 5 percent and 8 percent slope in-corridor options are described (see Figure 7). The first section is between the Tigard city limits and SW Mistletoe Drive. The second is from the point where SW Creekshire Drive crosses the power corridor and SW Barrows Road. These 5 and 8 percent slope options must be combined with the on-street and soft-surface options described below to meet ADA requirements.

An additional section of in-corridor hard-surface multimodal trail was analyzed between SW Mistletoe Drive and SW Creekshire Drive (see Figure 6). The density of switchbacks and retaining walls needed for both 5 and 8 percent slopes and cross slopes made this option fatally flawed.

Figure 6 Segment Between SW Mistletoe Driver and SW Creekshire Drive



All in-corridor options would involve obtaining access rights to City of Tigard and/or privately owned vacant land under PGE power lines. The 8 percent option would require less private land underneath PGE power lines than with the 5 percent option. The 8 percent option also requires use of some private open spaces along SW Nahcotta Drive to the west of the BPA owned corridor.

On-street

3C One on-street option is described using SW Nahcotta Drive and SW Creekshire Drive between SW Mistletoe Drive and the point at which SW Creekshire Drive crosses the power corridor. SW Nahcotta Drive is steep but would accommodate road bicycles for ADA purposes and is the shortest, most direct on-street alternative. This on-street option does include a 0.09-mile-long new multimodal trail (option 3D – see above) starting at the intersection of SW Nahcotta Drive and SW Catalina Drive and connecting to the east end of SW Creekshire Drive.

This option combined with Option 3D is approximately 0.6 mile long.

Soft surface

3E Two separated soft-surface pedestrian-only options are described. The first section is through Hillshire Woods Park. Hillshire Woods Park is owned by the City of Tigard. This soft-surface trail connects back to paved trail options at both ends. At least one minor stream crossing would be involved at the north end. A second section of soft-surface trail is within the power corridor between the new hard-surface connector between on-street options as described above and the point at which SW Creekshire Drive crosses the corridor. The approximate length is 0.62 mile.

Road crossings

In-corridor

The power corridor crosses four City of Tigard local or neighborhood streets at midblock: SW Mistletoe Drive, SW Creekshire Drive, SW Fern Street, and SW Horizon Boulevard. The recommended crossing treatment is high visibility marked crossings and warning signage.

Comparative evaluation

Safety

The on-street option rates lower than the in-corridor options for safety due to conflicts with vehicular traffic.

Trail experience and environmental impacts

The steepness of in-corridor options and the number of switchbacks, landings, and other structures may significantly impact user experience, and creates significant adverse environmental impacts. The Segment 3 on-street option could be considered to have neutral impact, but only in the sense that prior street construction has already degraded environmental values.



Steepness






Most options substantially, although not completely, exceed 5 percent grades. The combination of in-corridor hard- and soft-surface trails, a soft-surface section through Hillshire Woods, and the SW Nahcotta Drive and SW Creekshire Drive on-street alternative maximize the number of choices for both pedestrians and bicyclists.

Property acquisition

All in-corridor options would require access rights from the City of Tigard and property easements across privately owned vacant land under the PGE power lines. The hard-surface trail connector between the two on-street sections crosses private vacant land west of the corridor. No portions of private backyards under the PGE power lines would be required by any illustrated trail option.

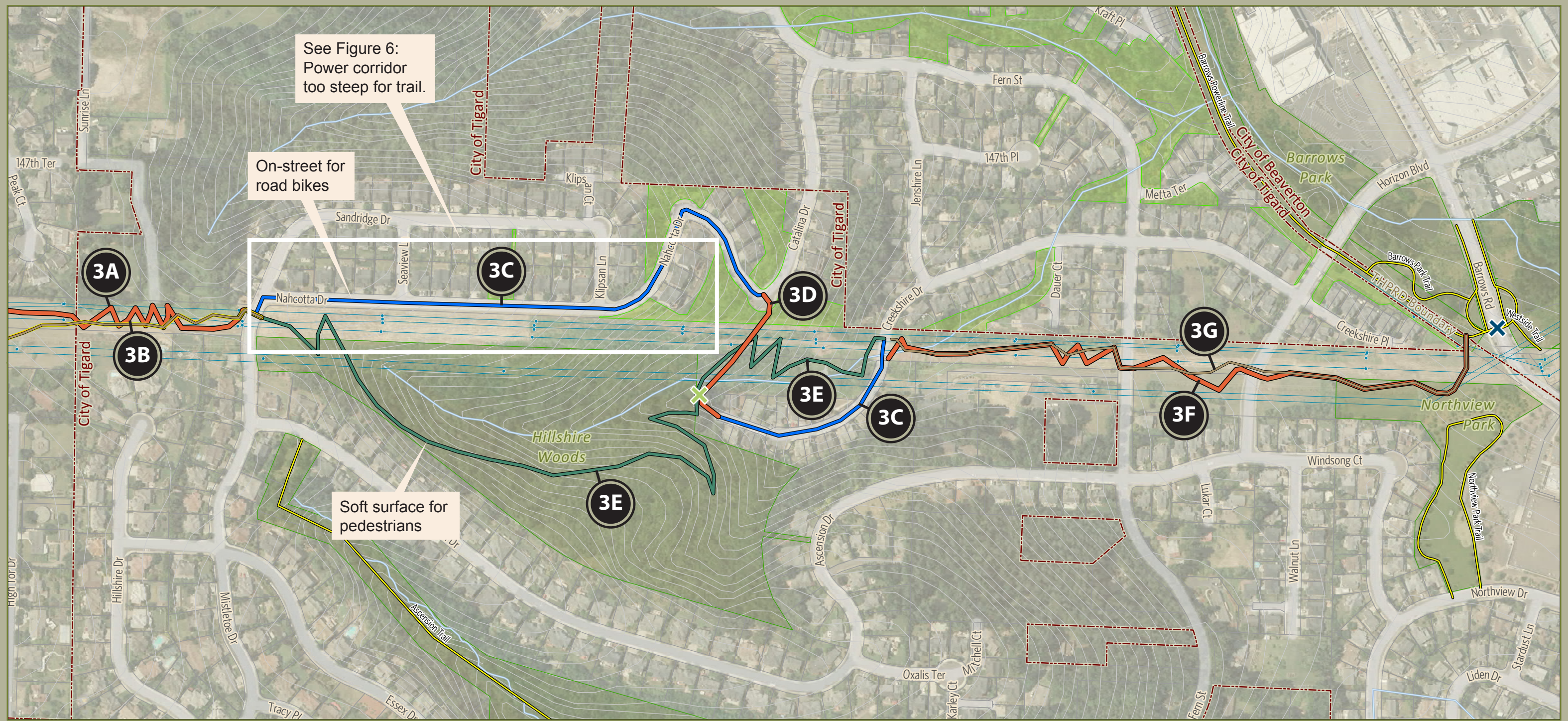
Table 3: Segment 3 key features

Option		Length	Cost	Treatment	Function	Special Features
5% or 8% slope		5% 0.17 mile	\$325,500	10' paved	Multimodal	• 9 switchbacks
(in-corridor – Tigard to Mistletoe)		8% 0.12 mile	\$201,500	10' paved	Multimodal	• 2-3 switchbacks

Option		Length	Cost	Treatment	Function	Special Features
5% or 8% slope (in-corridor – Mistletoe to Creekshire)		N/A	N/A	N/A	N/A	<ul style="list-style-type: none"> This option fatally flawed (see Segment 3: Tigard city limits to Barrows Road narrative)
On-street (Nahcotta to Creekshire)		0.5 mile	\$5,000	On-street	ADA	<ul style="list-style-type: none"> Option in 2 sections separated by paved cross corridor trail connector
5% slope (cross corridor – Nahcotta to Creekshire connector)		0.09 mile	\$151,900	10' paved	Multimodal	<ul style="list-style-type: none"> Crosses power corridor east-west Connects Nahcotta and Creekshire on-street sections
Hillshire Woods (soft surface)		0.62 mile	\$378,600	Soft surface	Ped-only alternative	<ul style="list-style-type: none"> Stream crossing Option in two sections separated by paved cross corridor trail connector
5% or 8% slope (in-corridor- Creekshire- to Barrows)		5% 0.43 mile	\$782,750	10' paved	Multimodal	<ul style="list-style-type: none"> 7 switchbacks
		8% 0.39 mile	\$645,500	10' paved	Multimodal	<ul style="list-style-type: none"> 2 switchbacks

Westside Trail Master Plan **Figure 7**

Segment 3
Tigard city boundary to Barrows Rd
Segment Corridor = 0.83 Miles



Westside Trail Alternatives

- Up to 5% slope, multimodal
- 5% - 8% slope, with steps
- Up to 8% slope, multimodal
- Soft surface
- On-street
- Bridge
- Steps
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings

Other Existing Trails

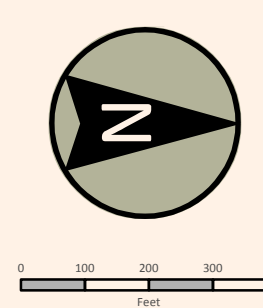
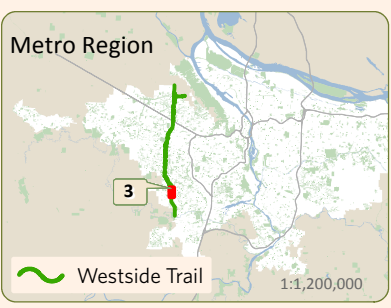
- School sites
- Parks and natural areas
- Privately owned
- Publicly owned
- Wetlands

Taxlots

- Powerline Towers
- Powerlines
- Streams
- 10 foot contours

City Boundaries

- County Boundaries
- Tualatin Hills Park & Rec District Boundary
- Segment option number



All illustrated alignments subject to change based on final design, permitting, and engineering.

Segments 4.11, 4.12 and 4.13 (south portion): MAX line crossing to Nike open space

MAX line crossing

Crossing the MAX light rail line is the key constraint in this segment. The MAX crossing solution also drives the alignment of the trail itself as it approaches, follows and/or crosses SW 153rd Drive and SW Jenkins Road. The first consideration with respect to crossing the MAX line are two light rail stops and controlled crossings in close proximity to the power corridor. The Beaverton Creek MAX station is just 490 feet east at SW 153rd Drive. The SW Merlo Road/SW 158th Avenue MAX station is more distant from the power corridor (0.32 mile) and at the northwest end of the Tualatin Hills Nature Park. Both the SW 153rd Drive and SW 158th Avenue crossings are improved to Washington County and TriMet standards. TriMet has advised that a new at-grade MAX crossing between the two existing street crossings would not be permitted.


A second set of considerations for a MAX crossing solution is land ownership and development, and wetland and stream features both north and south of the light rail line. Abutting the southeast side of the MAX light rail line in Westside Trail Segment 4.11 is a developed business park. To the southwest of the power corridor is the Tualatin Hills Nature Park. A power substation is located just north of the MAX line between the power corridor and the west side of SW 153rd Drive. A large PGE maintenance yard is to the west of the power corridor. An industrial service road accessing the PGE yard crosses the power corridor and intersects with SW 153rd Drive. Abutting the PGE yard to the immediate north is a yard used by trucks serving the nearby Reser's Fine Foods plant. A private service road connects the Reser's yard to SW 153rd Drive.

Washington County has indicated that a new midblock crossing of SW Jenkins Road would not be permitted as an existing signalized intersection is just 260 feet away at SW 153rd Drive. In addition, immediately south of SW Jenkins Road the power corridor crosses the stream channel and surrounding wetlands of Cedar Mill Creek.

The TriMet and County positions on new crossings, the complexities of land uses around the power corridor, and stream and wetland features, combine to make an all in-corridor trail option for crossing through Segment 4.12 fatally flawed. Figure 8 illustrates this infeasible option but only for the purposes of contrast to the other alternative solution shown that mitigates all the foregoing issues.

Trail options

On-street/street edge options

 On-street crossing solutions using the existing SW 153rd Drive crossing of the MAX line requires a new connector to the end of the existing Westside Trail section in Segment 4.11, and new off-street connections between the intersection of SW 153rd Drive and SW Jenkins Road and the power corridor.

From the MAX crossing of SW 153rd Drive to the signalized intersection at SW Jenkins Road, there is a privately developed 10-foot-wide trail along the east edge of the street under construction. The combined on-street/street edge solution is used for cost estimating purposes in this report. Easements or property access permissions would be required. Cost of easement acquisition is not included. If this new street edge trail is not available, existing bike paths and sidewalks along the east side of SW 153rd Drive could be used.

Connectors

4B Segment 4.11 MAX corridor. Crossing MAX of the Westside Trail at the existing controlled crossing at SW 153rd Drive would require a short connecting trail to a developed section of the Westside Trail in Segment 4.11 along the east side of the Tualatin Hills Nature Park. The length of this section is 0.12 mile.

4C SW Jenkins Road. The on-street/street-edge SW 153rd Drive option described above would cross SW Jenkins Road at the existing signalized intersection and return to the power corridor along this roadway on the north side for a distance of approximately 260 feet. A street-edge trail along SW Jenkins Road is illustrated. There are wetlands on the north side of SE Jenkins Road but a street-edge solution may not require any significant mitigation or crossing structures due to the impacts of prior arterial road constructions and structures.

4D Segment 4.13 power corridor. There is approximately 0.09 mile of new trail required within the power corridor for Segment 4.13 between SW Jenkins Road and the south end of a developed trail section that enters the main Nike campus. This short trail section meets 5 percent slope standards but crosses undeveloped private property.

Comparative evaluation

Trail experience

Although staying with the power corridor is almost a default “better” experience through most Westside Trail segments, the utility facilities and truck yards that surround the corridor on both sides through over half of Segment 4.12 degrade the potential trail experience. If trail elements along SW 153rd Drive are sited along the edges of privately owned vacant land, this trail experience may actually be superior to the power corridor.

Environmental impacts

Most of Segment 4.12 is highly urbanized. The most significant environmental impact would come from the bridge and boardwalk crossing of Cedar Mill Creek and wetlands that is required for an all-BPA alternative.

Steepness

There are no issues with respect to routes with 5 percent or less grades for the entirety of Segment 4.12 and the undeveloped section of Segment 4.13.





Approvals

The SW 153rd Drive MAX crossing would require no special permissions and processes.

Property acquisition

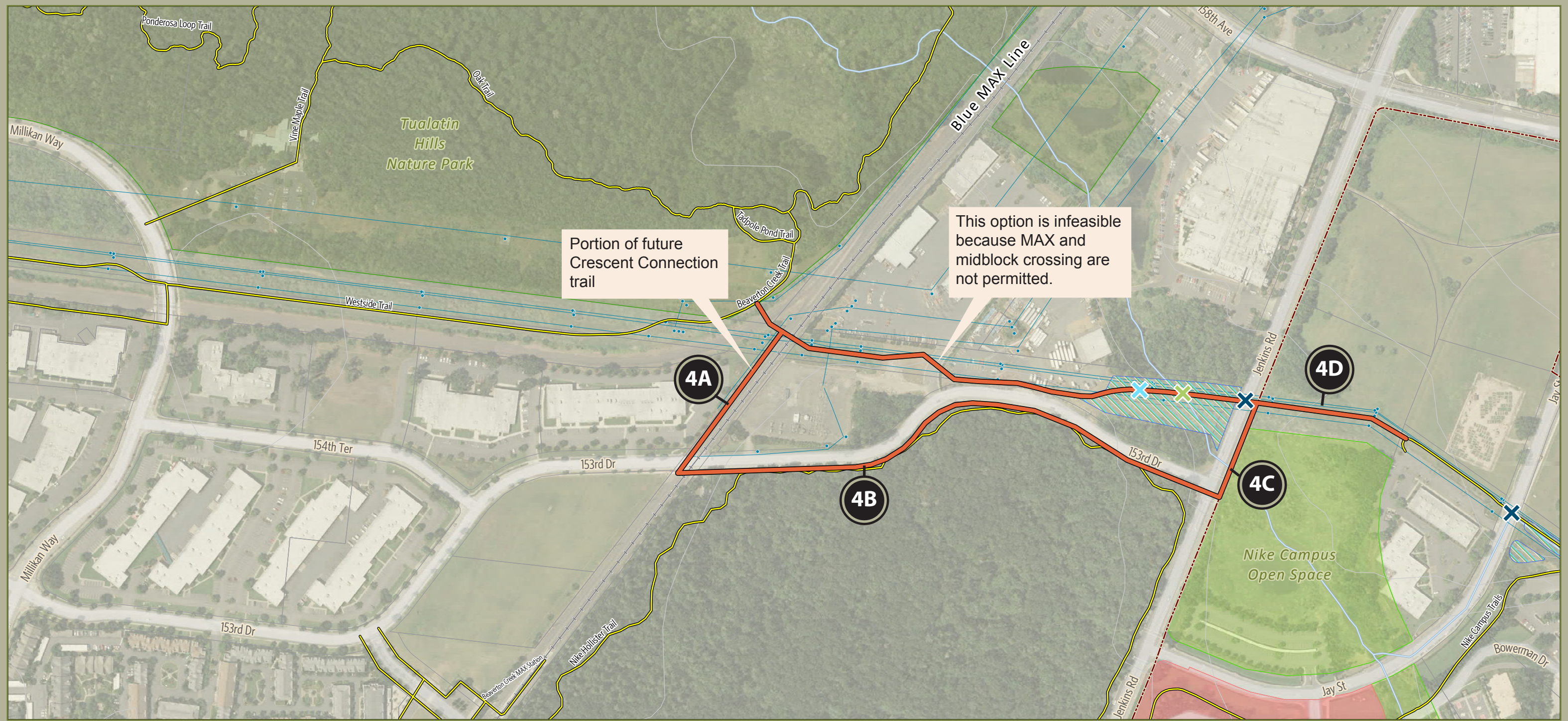
Street edge alternatives along the SW 153rd Drive and SW Jenkins Road route may require easements.

Table 4: Segments 4.11, 4.12 and 4.13 (south portion) key features

Option		Length	Cost	Treatment	Function	Special Features
New MAX crossing (BPA)		N/A	N/A	N/A	N/A	<ul style="list-style-type: none">• This option fatally flawed (see Segment 4.12 narrative)
Existing MAX crossing (SW 153rd Drive)		N/A	\$5,000			<ul style="list-style-type: none">• Uses existing 153rd Drive MAX crossing• Uses NW Jenkins intersection crossing• Uses Nike street-edge trail or on-street bike/ped facilities
Connector (Segment 4.11 MAX corridor)		0.10 mile	\$170,800	10' paved	Multimodal	<ul style="list-style-type: none">• New trail section parallel to MAX line• Part of Crescent Connector Trail
Connector (SW Jenkins)		260'	\$52,000	10' paved	Multimodal	<ul style="list-style-type: none">• New street-edge trail
Connector (Segment 4.13)		0.09 mile	\$151,900	10' paved	Multimodal	<ul style="list-style-type: none">• Short connector to Nike trail

Westside Trail Master Plan **Figure 8**

Segment 4.11, 4.12, & 4.13
MAX Line crossing to Nike Open Space
Segment Corridor = 0.74 Miles



Westside Trail Alternatives

- Up to 5% slope, multimodal
- 5% - 8% slope, with steps
- Up to 8% slope, multimodal
- Soft surface
- On-street
- Bridge
- Steps
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings

Other Existing Trails

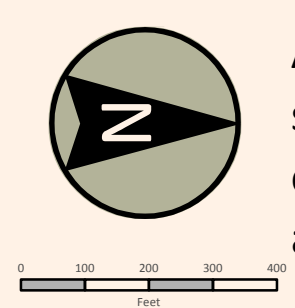
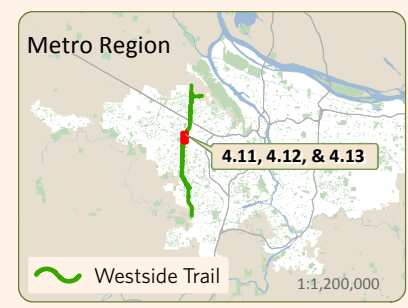
- Other Existing Trails
- School sites
- Parks and natural areas
- Privately owned
- Publicly owned
- Wetlands

Taxlots

- Taxlots
- Powerline Towers
- Powerlines
- Streams
- 10 foot contours

City Boundaries

- City Boundaries
- County Boundaries
- Tualatin Hills Park & Rec District Boundary
- Segment option number



All illustrated alignments subject to change based on final design, permitting, and engineering.

Segment 4.14: SW Walker Road to US 26

Trail options

4E There are no significant impediments or fatal flaws that constrain this entire segment from being completely developed within the BPA-owned Segment 4.14 power corridor. Slopes of 5 percent can be easily maintained with no required meanders or switchbacks, except for one 200-foot-long section immediately north of Pioneer Park (see Figure 9). This section would require approximately two switchbacks to maintain a 5 percent slope or less.

The north end of Segment 4.14 connects to a potential US 26 crossing. US 26 crossing options are described under the Segments 4.15 section of this report. Recognizing that trail construction in both Segment 4.14 and in 4.15 may precede the building of a US 26 crossing, an on-street US 26 bypass option involving roadways in Segment 4.14 and 4.15 is also described under the Segment 4.15 section of this report.

BPA owns the 100-foot-wide wide power corridor through this segment. Although the conceptual trail alignment is illustrated primarily as straight line, gentle meanders could improve the visual appearance and experience of the trail. Well-placed meanders would also provide better links to the adjacent Pioneer Park trail system.

Road crossings

SW Walker Road crossing

SW Walker Road, a Washington County arterial, divides Segment 4.13 (Nike campus) and the Segment 4.14 power corridor midblock. SW Walker Road is an extremely busy roadway. Summer 2011 traffic counts in both directions averaged 23,400 total daily trips. SW Walker Road in the vicinity of the power corridor consists of two travel lanes eastbound, one westbound, and a continuous center turning lane. Bike lanes and sidewalks are on both sides of the road. Just east of the power corridor, SW Walker Road expands to four travel lanes.

The connection to the developed trail through the Nike campus (Segment 4.13) just south of SW Walker Road is somewhat problematic as this trail intersects the road at an oblique angle and is obscured by dense landscaping. The recommended midblock crossing treatment is:

- High visibility marked crossing and signage
- Refuge island
- Pedestrian-activated signal
- Connecting ramps to bike lanes


Other road crossings

Segment 4.14 also crosses Pioneer Road, a Washington County neighborhood route, and the cul-de-sac end of Greenbriar Parkway. Greenbriar Parkway is the only City of Beaverton jurisdiction street that crosses the power corridor within the WTMP study area. The recommended crossing treatment for both these streets is high visibility marked crossing and signage.

Comparative evaluation

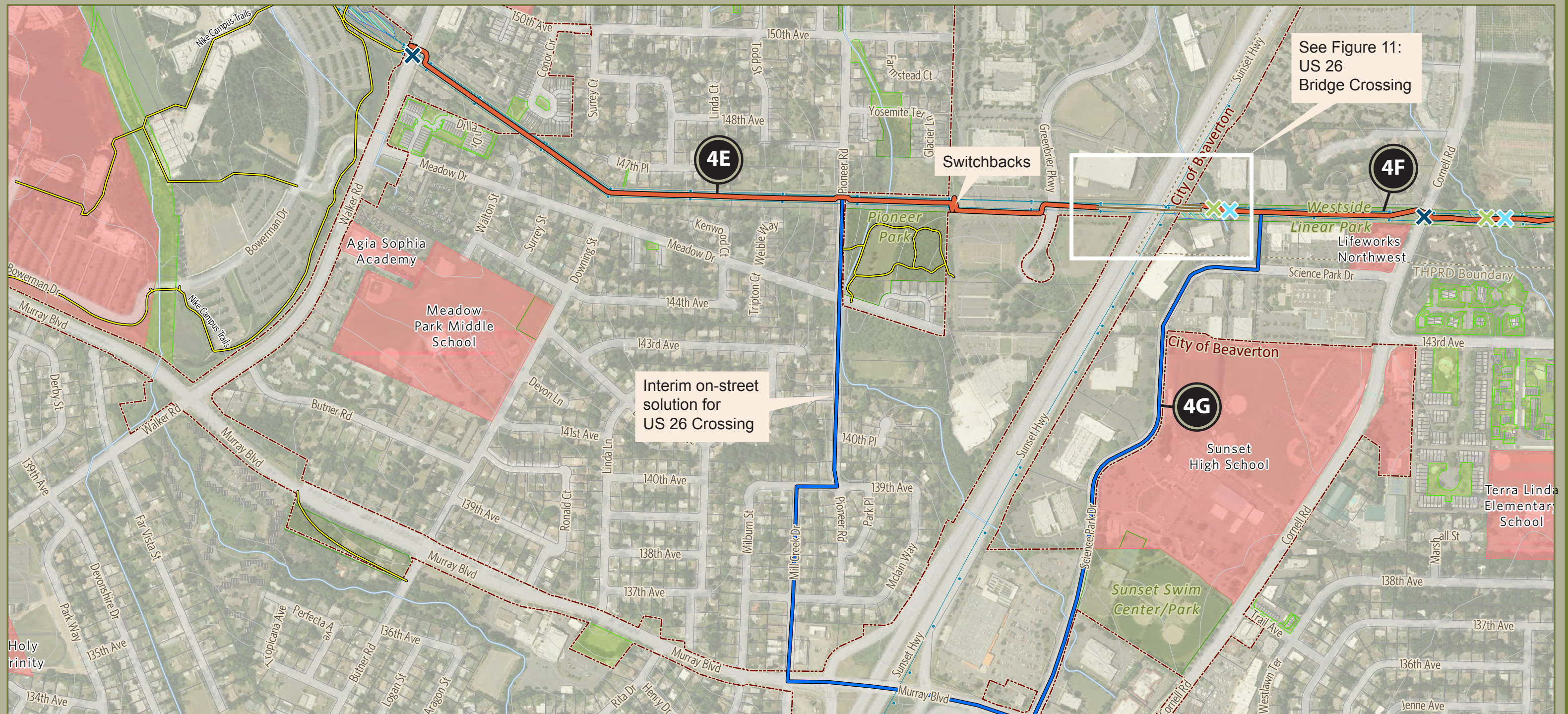
Not applicable.

Table 5: Segment 4.14 key features

Option		Length	Cost	Treatment	Function	Special Features
5% slope (all BPA)		0.86 mile	\$591,600	10' paved	Multimodal	• 2 switchbacks
Midblock crossing (SW Walker)		N/A	\$600,000	Signal	Road crossing	

Westside Trail Master Plan **Figure 9**

Segment 4.14
Walker Rd to Sunset Highway
Segment Corridor = 0.91 Miles



Westside Trail Alternatives

- Up to 5% slope, multimodal
- 5% - 8% slope, with steps
- Up to 8% slope, multimodal
- Soft surface
- On-street
- Bridge
- Steps
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings

Other Existing Trails

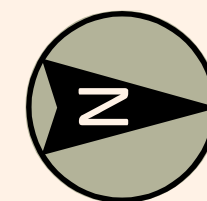
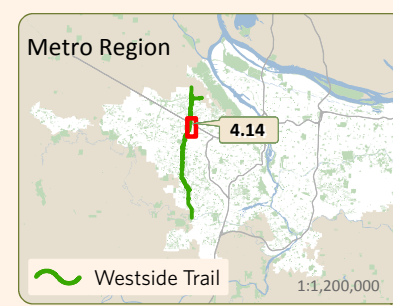
- School sites
- Parks and natural areas
- Privately owned
- Publicly owned
- Wetlands

Taxlots

- Powerline Towers
- Powerlines
- Streams
- 10 foot contours

City Boundaries

- County Boundaries
- Tualatin Hills Park & Rec District Boundary
- Segment option number



All illustrated alignments subject to change based on final design, permitting, and engineering.

Segments 4.15 and 4.16: US 26 to NW Oak Hills Drive

US 26 crossing

The Westside Trail must cross US 26 at some point to achieve the goal of a continuous bicycle and pedestrian connection between the Tualatin River and the Willamette River. The crossing of US 26 presents some unique challenges. The obvious challenge is simply the crossing of this wide and heavily trafficked highway. Other challenges include multiple electrical power transmission poles and lines within the power corridor and the relative grade differences between the probable north and south trail ends approaching any in-corridor crossing. Both bridge and tunnel options were considered for crossing US 26 as was an on-street solution. The bridge and one on-street option are illustrated in Figure 10.

Tunnel Option

A tunnel under an elevated highway is a solution if the intersecting trail sections are at similar elevations. Since US 26 is at-grade over the power corridor, and the north and south trail sections are at different elevations, any underground option would need to be below the existing highway grade to allow for highway base, cover, and overhead clearance. The least expensive method to install large underground tunnels in such circumstances is cut and cover. Because of the high volume of traffic on US 26, building a tunnel using this method would require extensive phased highway reconstruction to maintain traffic flows. Tunnel boring could be utilized to mitigate reconstruction and traffic interruptions but at a much greater expense relative to cut and cover. Several additional elements contribute to the impracticality and cost of any tunnel solution:

- To match the existing grades at both ends of the tunnel, sub-grade exit ramps would be needed.
- The exit ramp structures would require the relocation of several power poles and lines on both sides of US 26.
- There is a high probability that underground natural gas utilities would have to be relocated.
- A pumping system would likely be required to control storm water flows.
- The pond and wetland area on the north side of US 26 would be negatively impacted requiring mitigation.
- The safety and security of trail users would be of concern for a 250-foot-long tunnel even without sub-grade ramps.

Bridge Option

A 230-foot-long bicycle and pedestrian bridge is illustrated as a means to cross US 26 within the power corridor. This bridge length excludes approach ramps which are discussed separately below. Bridge design would need to conform to BDDM and the AASHTO specifications for the Design of Pedestrian Bridges. The illustrated bridge crossing is down the center of the power corridor.

A right angle bridge span of approximately 200 feet was also considered. This alternative crossed from the southwest to the northeast side of the power corridor. Closely abutting business and industrial buildings at both these corners create conflicts with approach ramps. A right angle solution also further complicates grade change issues. These conflicts offset any cost advantages of a slightly shorter span. Final bridge design could shift the crossing angle a few degrees to potentially mitigate for development impacts and also to potentially reduce the number of power pole relocations.

The illustrated bridge structure layout was based on a two-span bridge with support columns in the median between the east- and westbound traffic lanes. This structure is typical of most existing bridges crossing US 26. Per the BDDM, the minimum overhead clearance for structures on state highways is 17 feet 4 inches. Utilizing existing elevations from available GIS data and assuming a structure depth based on length, the minimum required elevation of the bridge over US 26 would be approximately 262 feet. The elevation difference to match probable trail grades at the south and north ends is 17 feet and 27 feet respectively.

For preliminary design and cost estimation purposes, the bridge was assumed to be 18 feet wide with a combination concrete steel tube rail on each side leaving an interior width of 16 feet. The minimum design load per AASHTO for pedestrian bridges is 85 pounds per square foot for pedestrians and 10,000 pounds for maintenance vehicles. Bridge types could be steel or concrete, but for estimating purposes a precast concrete superstructure was selected. The bridge would likely be supported by a deep foundation of either driven steel pile or drilled shafts. Bridge aesthetics were not considered at this master planning level.

The attached schematic drawing (Figure 11) illustrates the bridge solution using a straight 5 percent approach ramp on the south and a 5 percent switchback approach on the north. This schematic drawing also indicates the power poles that may be directly impacted by the bridge solution. BPA transmission poles in this segment are dual pole wood sets. BPA estimates the cost of relocation per set would be approximately \$50,000, plus permitting and environmental costs. Estimates for the overall costs of such relocations assume that set sets would have to be moved. Additionally, one set of local distribution power poles running east-west along US 26 that would need to be permanently relocated regardless of the approach grade or crossing type.

Bridge south approach

With a grade difference of 17 feet, the run-out length of a straight south side bridge approach structure to meet a 5 percent ADA ramp design (without landings) is 340 feet. The nearest street to the south (Greenbriar Parkway) is over 400 feet away, so there is room for this straight 5 percent grade approach without any switchbacks. There are two sets of power transmission poles approximately 200 feet south of the proposed bridge which appear to be spaced widely enough to accommodate the straight approach ramp without major conflicts. For estimation purposes, a 5 percent grade approach structure was assumed using mechanically stabilized earth retaining walls which are typically the most cost effective and easily constructed.

Bridge north approach

With a grade difference of 27 feet the run-out length of a straight north side bridge approach structure to meet a 5 percent ADA ramp design (without landings) is 540 feet. There is a private industrial service road crossing the power corridor approximately 500 feet north. A 175-foot-long 5 percent grade approach ramp structure using three switchbacks would avoid impacting the private road, but would increase the width of the approach structure. An estimated three sets of north-south power transmission poles would have to be relocated..

There is an approximate 150-foot-wide seasonal pond/wetland area just north of US 26 that could be impacted by the north approach structure. If on-site wetland mitigation is otherwise not possible, the approach structure could be built with a combination bridge and mechanically stabilized earth walls to span over the wetland before coming back down to grade. For estimation purposes, the 5 percent switchback approach was assumed to be built using mechanically stabilized earth walls and three switchbacks.


Additional bridge construction considerations

As noted above, there are potential permanent impacts from the bridge solution on power poles within the corridor. There could also be interference issues with power poles and lines during bridge and approach ramp construction. Large cranes would be used during construction requiring minimum safe-operating distances from the overhead power lines. Temporary relocation or de-energizing of the overhead lines may be required increasing cost and complexity. The north side ramp approach also impacts one set of east-west set of local distribution power poles lines. These east-west lines are not outside minimum safe-operating distances both for construction and eventual trail users. Costs associated with temporary relocations are not included in the conceptual cost estimates.

Trail options

There are no significant impediments or fatal flaws that constrain a trail from being completely developed within the BPA-owned Segments 4.15 and 4.16 power corridor, except for the timing of constructing a new crossing of US 26. The corridor through Segment 4.15 is 100 feet wide but narrows to 90 feet through most of Segment 4.16, widening back to 100 feet at the north end.


In-corridor options

 Slopes of 5 percent can be easily maintained throughout both segments with one exception. One set of approximately seven turns would be necessary to cross a 550-foot section of the Segment 4.16 corridor just south of Hunters Drive. Developing this short section at an 8 percent slope would eliminate one or two turns but raise issues of ADA compliance.

There are two gravel parking lots located within Segment 4.15 just south NW Cornell Road. These lots appear to provide overflow capacity to adjacent multifamily housing. Additional property research is needed regarding the permitting of these parking areas in that the easterly of the two lots sits astride a probable trail route between BPA power poles.

The Segment 4.16 power corridor crosses two minor streams and associated wetlands: a creek just north of NW Cornell Road and Willow Creek within the Hunters Woods Open Space just before approaching NW Oak Hills Drive. These streams and wetlands will have to be crossed with bridge and boardwalk solutions.

On-street option

 On-street options could be used as interim highway crossing solutions until a new bridge structure is constructed. The on-street solution could presumably end up as a long-term or permanent solution if new crossing funding is not forthcoming. Several on-street options were examined including using the NW Cornell Road and NW Bethany Boulevard interchanges. The SW Murray Boulevard interchange option uses local streets and better addresses safety concerns by avoiding use of the arterial NW Cornell Road by reconnecting with the power corridor via an industrial service road.

The illustrated on-street route leaves the power corridor east along NW Pioneer Road just south of Pioneer Park, intersects with SW Murray Boulevard, crosses US 26, turns west onto NW Science Park Drive, goes behind Sunset High School, and then re-enters the power corridor along a private industrial service road. Some local streets making this connection from the power corridor to SW Murray Boulevard interchange – NW Pioneer Road, NW 139th Avenue, and NW Mill Creek Drive – are primarily without sidewalks.

Road crossings

NW Cornell Road crossing

Segment 4.15 and 4.16 connect midblock over NW Cornell Road, a heavily trafficked Washington County arterial. Summer 2011 traffic counts in both directions averaged 16,143 total daily trips. NW Cornell Road to the west of the power corridor is classified as a principal arterial, the most intensive classification in the County system. The recommended midblock crossing treatment includes:

- High visibility marked crossing and signage
- Refuge island
- Pedestrian-activated signal
- Connecting ramps to bike lanes

Other road crossings

This joint segment also crosses NW Hunters Drive, a Washington County local street. The recommended crossing treatment is a high visibility marked crossing and signage.

The on-street solution described above follows, but does not have to cross, any of the streets utilized. A private service road crosses Segment 4.16 just north of US 26 and connects industrial uses to the east and west of the power corridor. Depending on how this private crossing of the corridor is permitted, access permissions and some rebuilding to accommodate bicycle and pedestrian traffic may be required.

Comparative evaluation

Safety

The tunnel option raises many concerns regarding the personal security of trail users. These concerns are not a factor on an open and visible bridge. Keeping trail traffic within the power corridor would eliminate the safety issues arising from vehicular traffic conflicts along the extended on-street option.

Trail experience

The trail experience within the power corridor and across an open bridge would be superior to the tunnel option or a lengthy on-street bypass.

Environmental Impacts

Both the tunnel and bridge options may impact the small stream and wetland/pond impoundment on the north side of the highway. The bridge option provides more flexibility for avoidance or mitigation.

Segment 4.16 crosses a small creek and wetland just north of NW Cornell Road, and also crosses Willow Creek and associated wetlands at its northern end within the Hunters Woods Open Space. Bridge and boardwalk solutions will be required.

Steepness

All options can be achieved with grades of 5 percent or less. One short section of switchbacks would be required for Segment 4.16.

Approvals

Permitting and other approvals would be most complex for a tunnel, but the bridge option would also require close coordination with ODOT. The power pole relocations associated with the bridge option (and almost certainly with tunnel solutions) would involve coordination and approvals by power utilities.



Direction of travel

The on-street option crossing US 26 at the SW Murray Boulevard interchange is nearly triple the distance the distance of trail sections it would replace in Segment 4.14 and 4.15.

Property acquisition

No acquisition is required for the US 26 bridge or tunnel crossing. Easements or some property acquisition may be required where sidewalks are not present along the segment's on-street alternative as well as potentially along a service road that connects NW Science Park Drive with the power corridor.

Table 6: Segments 4.15 and 4.16 key features

Option		Length	Cost	Treatment	Function	Special Features
US 26 crossing (bridge)		230' plus ramps	\$3,274,000	Bridge	US 26 crossing	<ul style="list-style-type: none"> • Switchback (north) and straight (south) approach ramps • Power poles relocations • Possible wetland impacts
US 26 crossing (tunnel)		250' plus ramps	\$5.0M +	Tunnel	US 26 crossing	<ul style="list-style-type: none"> • Requires boring • Subgrade approach ramps • Highway reconstruction impacts • Power pole relocations • Wetland impacts
5% slope (all BPA)		0.65 mile	\$591,600	10' paved	Multimodal	<ul style="list-style-type: none"> • 7 switchbacks (4.16) • 2 wetland and stream crossings (4.16)
Pioneer – Science Park (On-street, interim solution)		1.79 miles	\$1,019,100	On-street	US 26 crossing	<ul style="list-style-type: none"> • Uses Segments 4.14 and 4.15 • New sidewalks needed
Midblock crossing (NW Cornell)		N/A	\$600,000	Signal	Road crossing	

Westside Trail Master Plan **Figure 10**

Segment 4.15 & 4.16
Sunset Highway to NW Oak Hills Road
Segment Corridor = 0.77 Miles



Westside Trail Alternatives

- Up to 5% slope, multimodal
- 5% - 8% slope, with steps
- Up to 8% slope, multimodal
- Soft surface
- On-street
- Bridge
- Steps
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings

Other Existing Trails

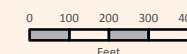
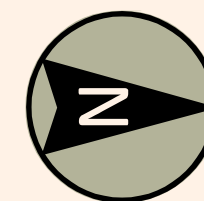
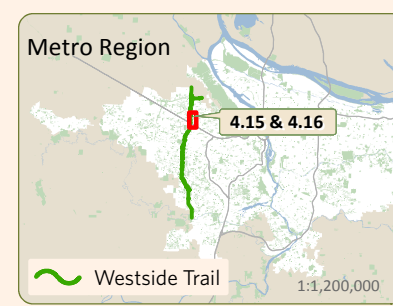
- School sites
- Parks and natural areas
- Privately owned
- Publicly owned
- Wetlands

Taxlots

- Powerline Towers
- Powerlines
- Streams
- 10 foot contours

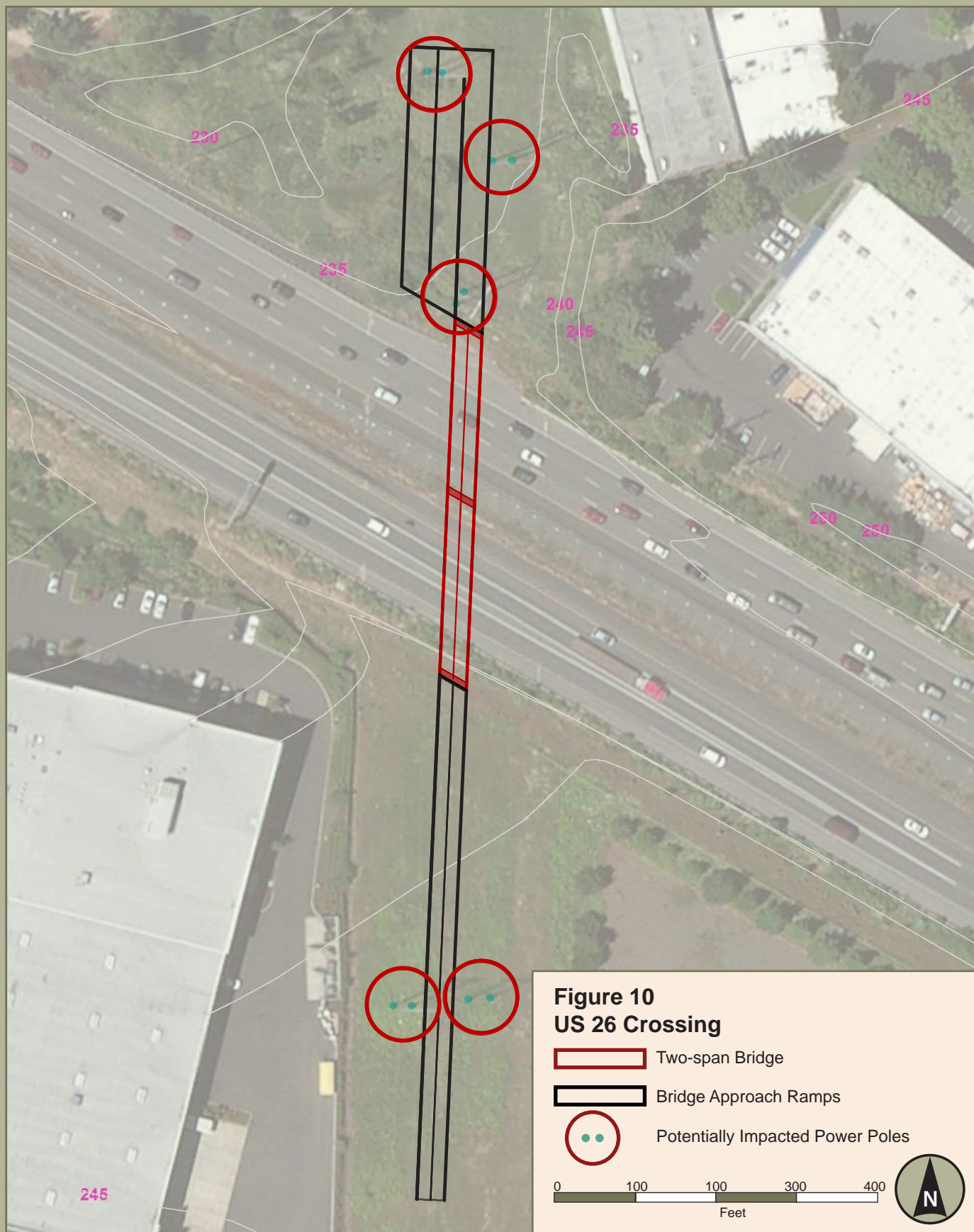
City Boundaries

- City Boundaries
- County Boundaries
- Tualatin Hills Park & Rec District Boundary
- Segment option number




All illustrated alignments subject to change based on final design, permitting, and engineering.

Westside Trail Master Plan



Segment 4.17: NW Oak Hills Drive to West Union Road

Trail options

 Segment 4.17 is completely within the Oak Hills neighborhood. There is an approximately 5-foot-wide trail constructed within the 100-foot-wide BPA-owned corridor from NW Oak Hills Drive to NW Perimeter Drive. Property research indicates this trail was never permitted by BPA. This trail is connected to other paved pathways that enter private Oak Hills open spaces to the west and east. The power corridor section between NW Perimeter Drive and West Union Road is undeveloped.

There are no significant impediments or fatal flaws that constrain trail development or re-development with a 10-foot-wide paved section totally within the BPA-owned Segment 4.17. A short series of eight switchbacks are required just north of NW Oak Hills Drive to maintain 5 percent grades (see Figure 12).

Road crossings


In-corridor road crossing

NW Oak Hills Drive is a Washington County neighborhood route. The recommended crossing treatment is high visibility marked crossing and signage. NW Perimeter Drive is a Washington County local street within the Oak Hills neighborhood. The recommended crossing treatment is a high visibility marked crossing and signage.

Comparative evaluation

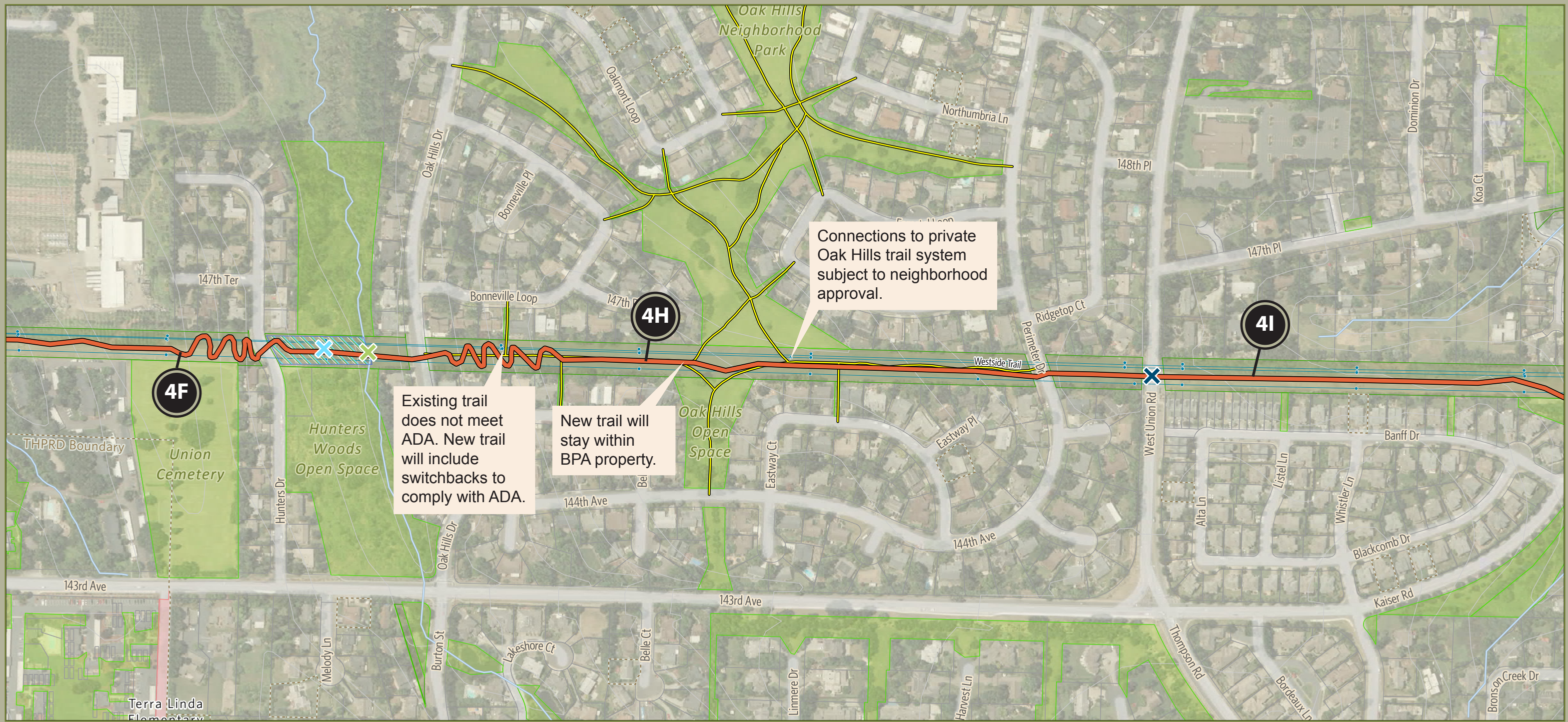
Not applicable.

Table 7: Segment 4.17 key features

Option		Length	Cost	Treatment	Function	Special Features
5% slope (all BPA)		0.49 mile	\$857,300	10' paved	Multimodal	<ul style="list-style-type: none">• Widens existing trail• 8 switchbacks

Westside Trail Master Plan **Figure 12**

Segment 4.17
Oak Hills Dr to West Union Rd
Segment Corridor = 0.43 Miles



Westside Trail Alternatives

- Up to 5% slope, multimodal
- 5% - 8% slope, with steps
- Up to 8% slope, multimodal
- Soft surface
- On-street
- Bridge
- Steps
- Midblock Crossings
- Wetland Crossings
- Minor Stream Crossings

Other Existing Trails

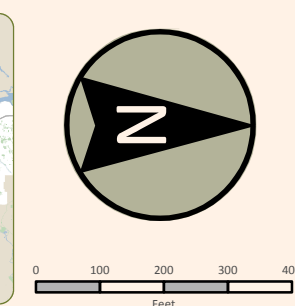
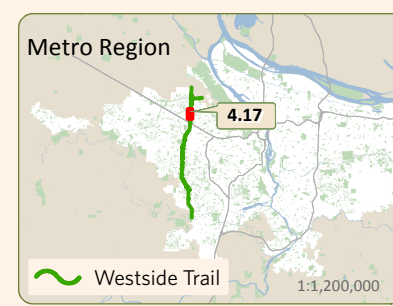
- School sites
- Parks and natural areas
- Privately owned
- Publicly owned
- Wetlands

Taxlots

- Powerline Towers
- Powerlines
- Streams
- 10 foot contours

City Boundaries

- County Boundaries
- Tualatin Hills Park & Rec District Boundary
- Segment option number



All illustrated alignments
subject to change based
on final design, permitting,
and engineering.

Segment 4.18.1: (south portion): West Union Road to NW Kaiser Road

Trail options

41 There are no significant impediments or fatal flaws that constrain the south portion of Segment 4.18.1 from being completely developed within the BPA-owned power corridor between West Union Road and NW Kaiser Road. Slopes of 5 percent can be easily maintained with no required meanders or switchbacks. At the approach to NW Kaiser Road, the illustrated trail alignment briefly shifts eastward outside of the power corridor and through a privately owned vacant parcel. This is necessary to connect the trail across NW Kaiser Road to the south end of the trail (Segment 4.18.1 north of NW Kaiser Road and Segment 4.18.2) that is scheduled for construction by THPRD in 2013-2014. See Figure 13.

Road crossings

West Union Road crossing

West Union Road divides the north end of Segment 4.17 from Segment 4.18.1. West Union Road is a Washington County arterial with growing traffic volumes as areas west and north urbanize. Presently, West Union Road is built to two travel lanes with an intermittent center turn lane. There are no bike lanes or sidewalks within the power corridor, although there is a north side sidewalk just outside of the corridor. The recommended midblock crossing treatment is:

- High visibility marked crossing and signage
- Refuge island
- Pedestrian activated rapid flashing beacons
- Connecting ramps to bike lanes (if and when bike lanes are built)

NW Kaiser Road crossing


Segment 4.18.1 crosses NW Kaiser Road, a Washington County collector. NW Kaiser is currently built to two travel lanes with sidewalks and bike lanes. The observed vehicle speeds and curve and slope of NW Kaiser Road as it crosses the power corridor suggest a more extensive midblock crossing treatment than is normally applied to collector roadways by Washington County standards. The recommended midblock crossing treatment is therefore:

- High visibility marked crossing and signage
- Refuge island
- Pedestrian activated rapid flashing beacons
- Connecting ramps to bike lanes

Comparative evaluation

Not applicable.

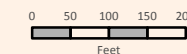
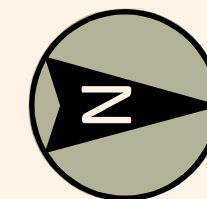
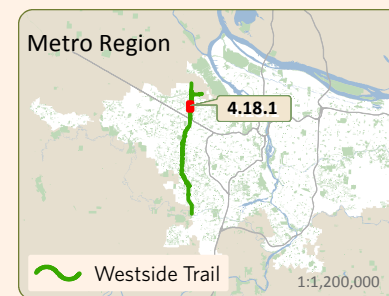
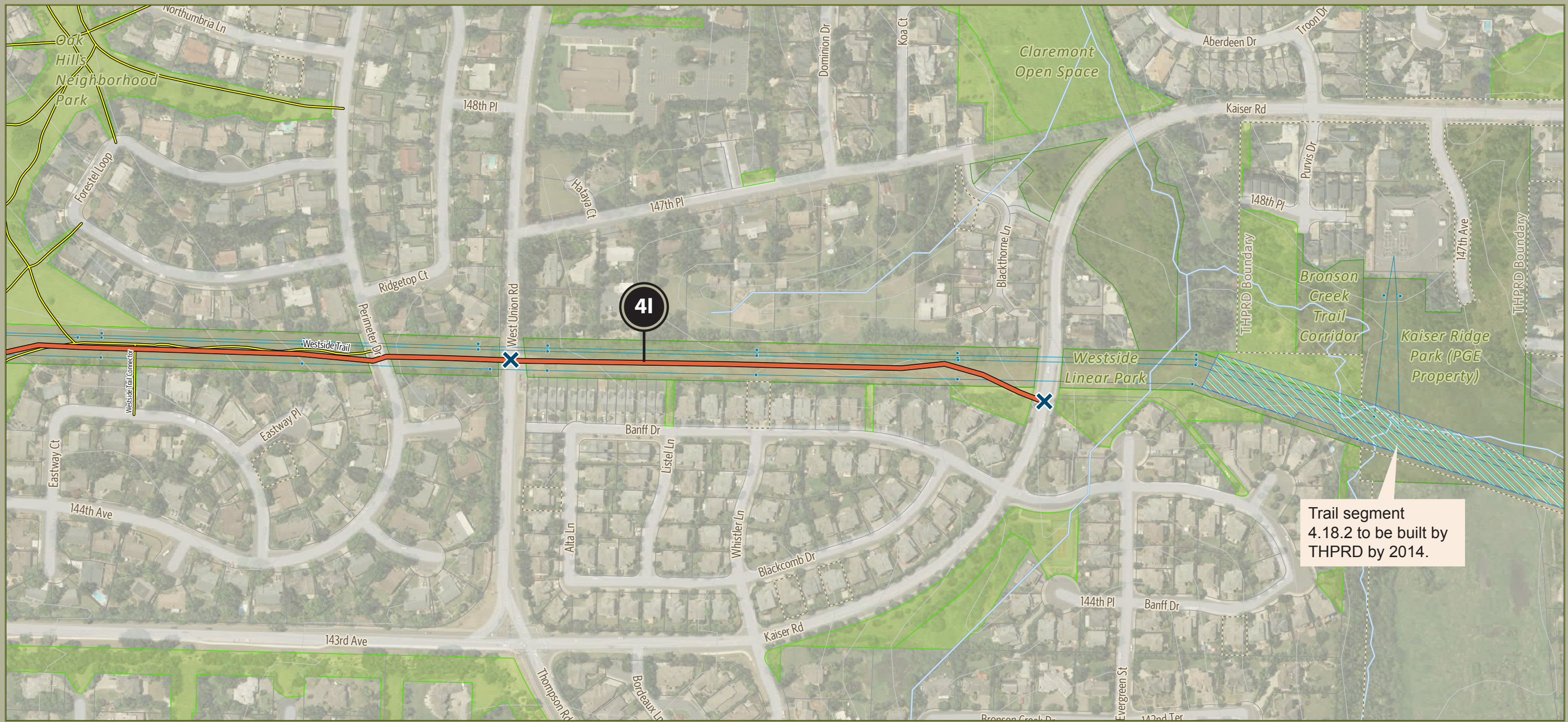
Table 8: Segment 4.18.1 key features

Option		Length	Cost	Treatment	Function	Special Features
5% slope (BPA – private open space)		0.25 mile	\$416,800	10' paved	Multimodal	• Minor acquisition at north end
Midblock crossing (West Union)		N/A	\$426,250	Flashing beacon	Road crossing	
Midblock crossing (NW Kaiser)		N/A	\$426,250	Flashing beacon	Road crossing	

Westside Trail Master Plan

Figure 13

Segment 4.18.1
West Union Rd to Kaiser Rd
Segment Corridor = 0.42 Miles



All illustrated alignments
subject to change based
on final design, permitting,
and engineering.

Segment 4.18.3: Rock Creek Greenway to NW Springville Road

Trail options

4J No significant impediments or fatal flaws constrain this entire segment from being completely developed within the BPA-owned power corridor from the intersection of the power corridor with the Rock Creek Greenway to NW Springville Road (Figure 14). This portion of the corridor is within Multnomah County. Slopes of 5 percent can be easily maintained with no required switchbacks and only one required meander. There is an emergent wetland at the south end of this segment between Kaiser Woods Park and Bethany Meadows Terrace Park that appears to have been created by prior development. This stream and wetland can be crossed with bridge and boardwalk solutions.

About halfway up this segment, the north-south power poles within the corridor intersect with an east-west set of power poles and lines, as well as with a service roadway accessing two large water tank reservoirs and farm buildings. The resulting density of poles and accesses may interfere with a straight-through routing of the trail.

The property to the west of the north-south power corridor and underneath the east-west power lines is within Washington County and was developed by THPRD as part of Kaiser Woods Park. This portion of the park includes a developed trail system with a dead-end spur built right to the edge of the corridor. A short jog of the Westside Trail into the edge of Kaiser Woods Park would avoid most of the issues raised by power poles and service roads, and connections could be made more directly to the existing Kaiser Woods trail system.

Comparative evaluation

Not applicable.

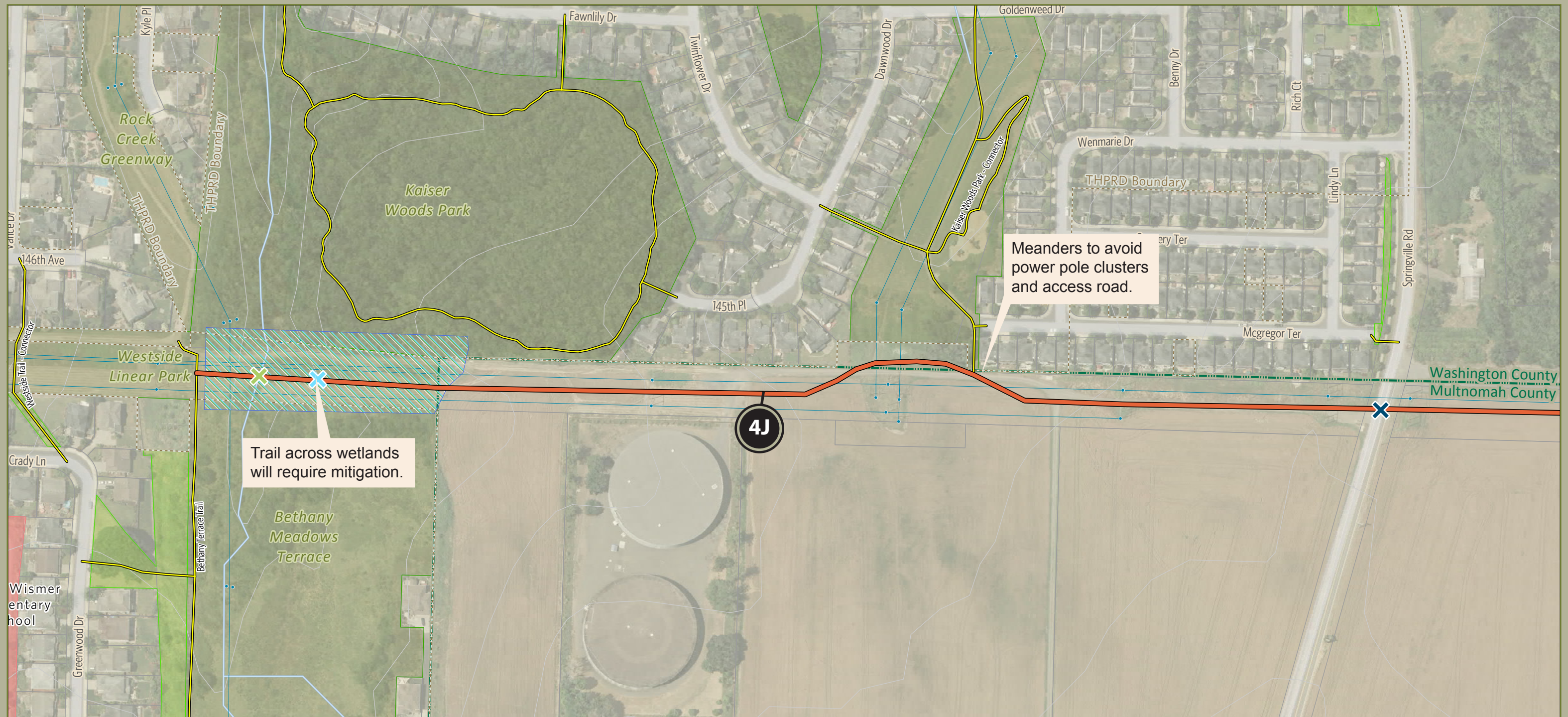
Table 9: Segment 4.18.3 key features

Option		Length	Cost	Treatment	Function	Special Features
5% slope (all BPA)	4J	0.43 mile	\$1,173,750	10' paved	Multimodal	<ul style="list-style-type: none">• Wetland and stream crossing• Major meander to avoid power towers

Westside Trail Master Plan

Figure 14

Segment 4.18.3
Kaiser Woods Park to Springville Rd
Segment Corridor = 0.44 Miles



Westside Trail Alternatives

- Up to 5% slope, multimodal
- 5% - 8% slope, with steps
- Up to 8% slope, multimodal
- Soft surface
- On-street

Bridge

- Steps

Midblock Crossings

- Wetland Crossings

Minor Stream Crossings

-

Other Existing Trails

- School sites

Parks and natural areas

- Privately owned

- Publicly owned

- Wetlands

Taxlots

- Powerline Towers

Powerlines

- Streams

- 10 foot contours

City Boundaries

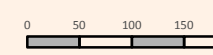
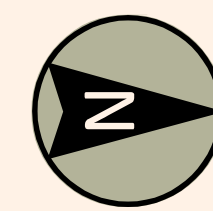
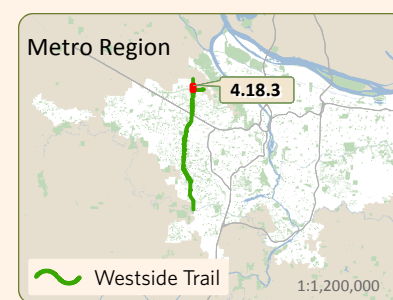
- County Boundaries

Tualatin Hills Park & Rec District Boundary

- Segment option number

-

-

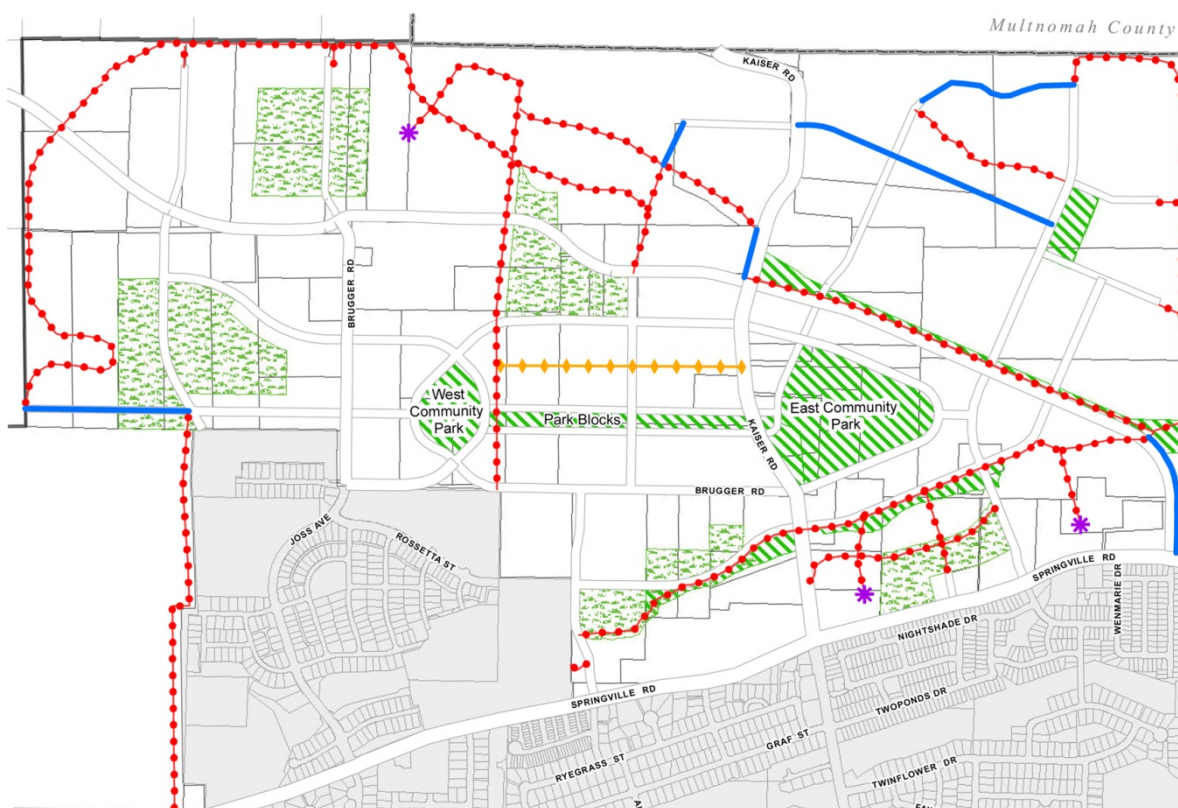


All illustrated alignments subject to change based on final design, permitting, and engineering.

Segment 4.19: North of NW Springville Road

The Washington County North Bethany Subarea Plan to the immediate west of Segment 4.19 covers lands outside of but abutting the power corridor. Significantly for this Westside Trail segment, the subarea plan describes extensive bicycle and pedestrian options in new North Bethany neighborhoods. Subarea plan mapping (see Figure 15) illustrates the BPA power corridor as part of or paralleled by these North Bethany trail options. Depending on the timing of North Bethany development and final alignments and design of North Bethany roadways and trail routes, the Segment 4.19 trail could be fully integrated into these new neighborhoods, or trails within the neighborhoods could functionally replace the Segment 4.19 in-corridor section.

Figure 15 North Bethany Trail Map



Trail options

4K Segment 4.19 (see Figure 16) starts with the crossing of NW Springville Road and continues within Multnomah County along the 100-foot-wide BPA-owned power corridor for approximately 0.46 mile. No significant impediments or fatal flaws constrain this portion of the segment from being completely developed within the BPA-owned power corridor.

Most of the trail alignment through Segment 4.19 is shown as a straight line, except for two wide turns in the northerly section. This alignment is for conceptual illustration purposes only. Several variations are possible and given development in the abutting North Bethany neighborhood to the west are highly probable. Most simply, gentle meanders could be used

throughout to improve the trail experience and to better link to future access points, particularly as new neighborhoods and trails are developed in North Bethany to the west. Segment 4.19 will most likely be integrated into the North Bethany neighborhood trail system.

Approximately two-thirds of the way up this segment, the BPA-owned power corridor turns northeast. At this point the illustrated trail option continues due north across private agricultural lands within Multnomah County for approximately another 0.23 mile, ending at a corner of the Washington-Multnomah county line. There are no significant impediments or fatal flaws that constrain this portion of the segment from being completely developed within the BPA-owned power corridor, except for the costs of easements or property acquisitions.

Road crossing

NW Springville Road crossing

The portion of NW Springville Road crossed by the power corridor is designated as a Multnomah County rural collector. West of the Washington county line, which runs along the western boundary of the BPA power corridor, the future function of NW Springville Road is closely tied to the detailed and complex recommendations in the North Bethany Subarea Plan. NW Springville Road crossing the power corridor and into Multnomah County is currently developed with two travel lanes and no sidewalks or bike lanes. Input from Multnomah County received during the WTMP Existing Conditions phase indicated that improvements to NW Springville Road rank low on the County's capital improvement program priorities, and that bicycle and pedestrian improvements rank even lower.

When the Segment 4.18.3 trail is constructed, an interim NW Springville Road midblock crossing treatment consisting of a high visibility marked crossing and signage should be installed.


As new development occurs in North Bethany and roadway improvements and trail systems are constructed, and/or Segment 4.19 is being constructed, pedestrian-activated rapid flashing beacons should be added to this midblock crossing. A midblock crossing treatment using a high visibility marked crossing and signage and pedestrian activated flashing beacons is included in conceptual cost estimates.

This could also be an opportunity to integrate a midblock or other roadway crossing into the North Bethany Subarea Plan implementation.

Comparative evaluation

Not applicable.

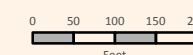
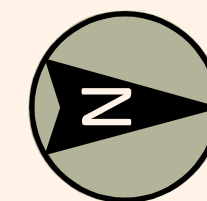
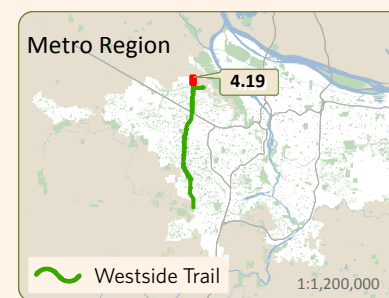
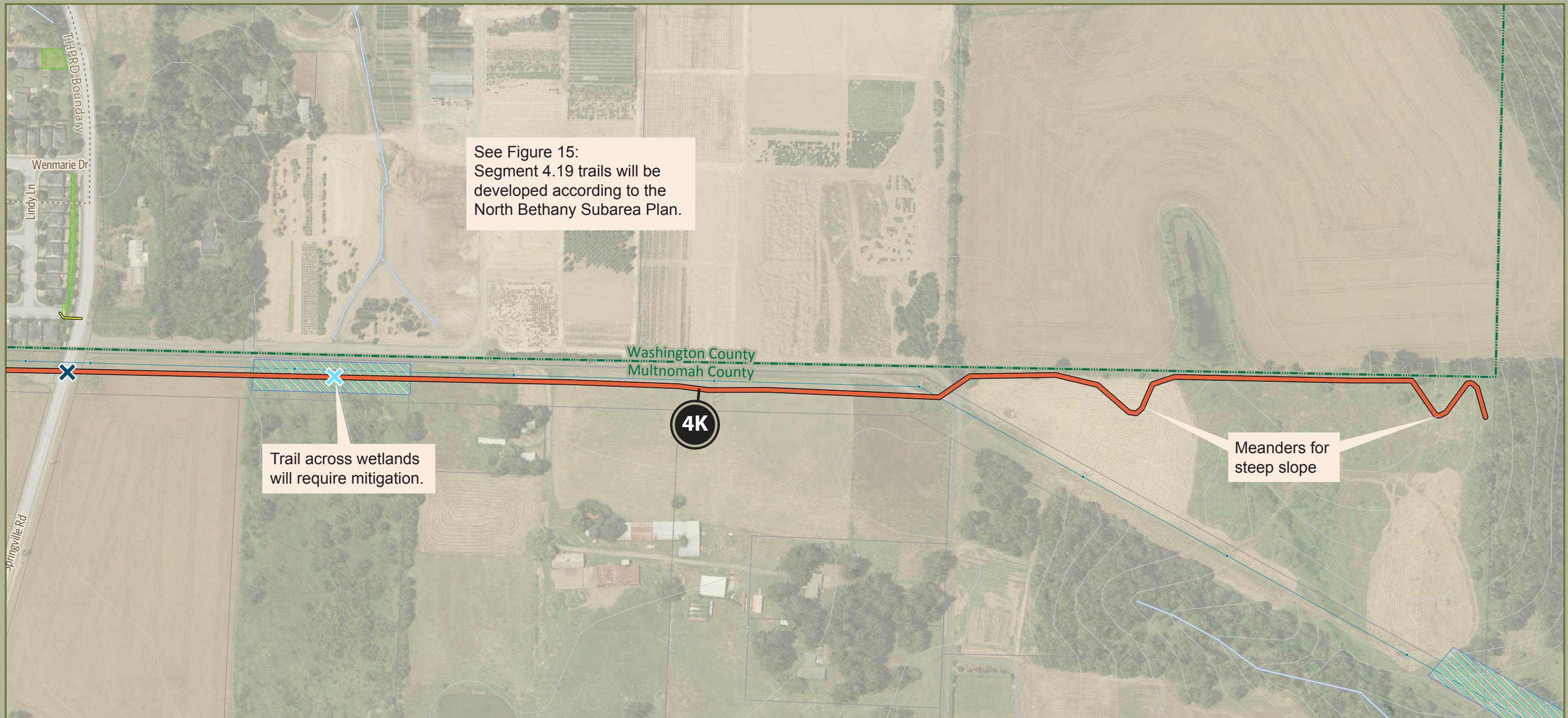
Table 10: Segment 4.19 key features

Option		Length	Cost	Treatment	Function	Special Features
5% slope (BPA – along county line)		0.69 mile	\$1,130,000	10' paved	Multimodal	<ul style="list-style-type: none"> • Integrate into North Bethany trails
Midblock crossing (NW Springville)		N/A	\$387,500	Flashing beacon, no refuge island	Road crossing	<ul style="list-style-type: none"> • Possible phased build

Westside Trail Master Plan

Figure 16

Segment 4.19
Springville Rd to Multnomah Co. line
Segment Corridor = 0.65 Miles



All illustrated alignments
subject to change based
on final design, permitting,
and engineering.

Segments 4.20 to 5: Rock Creek Greenway to NW Skyline Boulevard

Trail options

East of the main north-south power corridor and the Rock Creek Greenway, BPA power poles and lines cross private property. BPA rights are secured by easement not by land ownership, in marked contrast to the entire BPA power corridor south of the Rock Creek Greenway.

A previously developed trail section (termed the Bethany Terrace Trail on some existing mapping) follows this power line easement from the eastern terminus of the Rock Creek Greenway and Kaiser Woods Park across Segment 4.20 and into Segment 4.21. Slopes gradually and then greatly steepen through the eastern portion of Segment 4.21 and into Segment 5. Eventually the increasing steepness of the slopes under the power easement constitutes a fatal flaw for multimodal trail development.

Jurisdictional boundaries are also complex in this area, with the trail solutions described below entering and exiting THPRD, Washington County, Multnomah County, and the City of Portland. Land uses are also complex with farmed lands and subdivisions on the west end of this joint segment and large lot residential development and wooded acreages on the east. Public roadways are narrow and steep throughout the eastern sections of the joint segment with limited on-street facilities such as sidewalks or bike lanes.

A paved, short (0.12 mile) and very steep (17 to 23 percent slope) trail section just east of Segment 4.21 follows the power corridor and ends at the Multnomah County line. This short trail section is in Segment 4.22 and is called the Bannister Creek Park Trail.

Finally the trail will have to connect to WTMP Segment 6 and Forest Park.

The unique and varied challenges of building trails up into Portland's West Hills and into Forest Park dictate complex solutions. Trail solutions are illustrated on two maps (Figures 17 and 18).

Connector (to Bethany Terrace Trail)

5A All new trail options described for the combined Segments 4.20 to 5 start at the east end of THPRD's existing Bethany Terrace Trail (Segment 4.20). An approximately 520-foot-long new multimodal extension will connect to the point where the illustrated trail options split into two distinct paved multimodal routes: one at 5 percent slope and the other at 8 percent or greater slopes.

5% Option (west section)

5B This option turns north then east near the west end of Segment 4.21 in the general direction of NW Springville Lane and NW Springville Road. The option does not however connect to either of these streets. About 600 linear feet southeast of the NW Springville Lane and NW Springville Road intersection this trail option turns south for approximately another 600 linear feet at 5 percent slope. This section would require private property acquisition. The terminus of this option is common with the terminus of the 8 percent west section option.

The total length of the entire 5 percent section is 0.71 mile.

8% Option (west section)

5C This paved multimodal option starts at the end of the Bethany Terrace Trail extension at the same point as the 5 percent slope option. This 8 percent option continues due east generally under or near BPA power lines for a linear distance of approximately 1,800 feet, then turns due north for about 450 feet to the same point as the 5 percent alternative. Switchbacks will be required intermittently under the power lines to keep slopes under 8 percent. This section would require private property acquisition.

The total length of this entire 8 percent section is 0.59 mile.

8% Option (east section)

5D Irrespective of whether the 5 percent or 8 percent routes described above are selected, a single east-west paved trail section is illustrated that crosses private lands and eventually intersects with NW Springville Road. This trail is primarily at 8 percent slope. The trail section first crosses Bannister Creek, then eventually climbs the hillside approaching NW Springville Road using four very broad switchbacks. The segment map illustrates a route using the existing Bannister Creek Park Trail. Other options may be considered based on land acquisition results. This option intersects with NW Springville Road at a sharp reverse angle and will require a major landing structure. Most of the route is through cleared fields, thus, except for the final approaches to NW Springville Road, little heavily forested land would be impacted.

Total length of this section is 0.90 mile, and private property acquisition would be required.

On-street (Springville and Skyline)

5E This on-street option will accommodate road bicyclists. The option starts at the intersection of the east section 8% slope option. The on-street option follows NW Springville Road then NW Skyline Boulevard to an entry into Forest Park in the vicinity of NW Saltzman Road. New 4-foot-wide asphalt shoulders on both sides of the roadways are assumed in the conceptual cost estimates.

The NW Springville Road section of this option is especially winding and sometimes steep. Four landslide hazard areas are also along this route. Based on final design and engineering and the availability of additional right of way the 4-foot shoulder additions may be challenging to construct along the entire street section. The conceptual cost estimate assumes that approximately one-third of the length of this option will require retaining walls supporting the new shoulder on downhill sides and holding back cut slopes on the uphill.

Pedestrians could share the new paved shoulders with bicycles or use the soft-surface option described below. Overall length of this in-street option is 1.63 miles.

Soft surface (Springville to Saltzman)

5F This option starts where the 8 percent multimodal trail intersects with NW Springville Road. This soft-surface option first parallels NW Springville Road for about 200 feet downslope then meanders east through the steep and wooded West Hills until reaching NW

Saltzman Road within the City of Portland. After an approximate 900-foot-long section along NW Saltzman Road, this option briefly follows NW Skyline Boulevard. The Westside Trail would then enter the Forest Park trail system.

The meandering alignment illustrated on the Segment 5 map is dictated by slope, landscape, and property ownership considerations. The slopes within this option are highly variable. Significant steep slopes and cross slopes have to be crossed. Achieving slopes of 5 percent or even 8 percent with the 10-foot-wide paved trail standard used elsewhere along the Westside Trail would require extensive tree removal, special storm water treatments, cut and fill, and retaining walls. Even a narrower soft-surface trail design is challenged by these factors. The soft-surface trail width is assumed at an average of five feet but may vary based on localized conditions. The trail surface would be soil with an underlying gravel hardening as conditions require. Final design and engineering will be necessary to establish a balance between cost-effective and user friendly solutions, as well as to avoid adverse environmental impacts. Short bridges will be needed for approximately five minor stream or drainage crossings within Segment 5.

The overall length of this option is 1.39 miles.

Road crossing

NW Skyline Boulevard







No roadways are crossed midblock by the options described above except for a midblock crossing of NW Skyline Boulevard at the point at which the Westside Trail enters Forest Park. NW Skyline Boulevard is listed as a local service traffic street under the City of Portland's functional street classification plan but serves a broad function with respect to both local and outside traffic moving through Portland's West Hills and Forest Park. This street function, combined with the Segment 5 trail serving as the major entry point for westside bicycle and pedestrian traffic into Forest Park, merits more than a local street midblock crossing treatment. The recommended treatment is:

- High visibility marked crossing and signage
- Pedestrian-activated flashing beacon
- Paved connection to the Forest Park Saltzman trailhead

Comparative evaluation

The two paved, soft-surface and on-street options taken together are actually complementary and planned to work in concert. This split mode systems balances ADA-compliance requirements, overall safety, trail experience, the impacts of steepness, and direction of travel.

Table 11: Segments 4.20 to 5 key features

Option		Length	Cost	Treatment	Function	Special Features
Connector (to Bethany Terrace Trail)		520'	\$160,150	10' paved	Multimodal	<ul style="list-style-type: none"> • Common to all Segment 4.20-5 options • Requires private property acquisition
5% slope (West section)		0.71 mile	\$1,165,000	10' paved	Multimodal	<ul style="list-style-type: none"> • Requires private property acquisition
8% slope (West section)		0.59 mile	\$1,051,900	10' paved	Multimodal	<ul style="list-style-type: none"> • Approximately follows power lines
8% slope (East section)		0.90 mile	\$1,505,000	10' paved	Multimodal	<ul style="list-style-type: none"> • Requires private property acquisition • Stream crossing
On-street (Springville – Saltzman)		1.63 miles	\$3,612,500	On-street paved shoulders	ADA	<ul style="list-style-type: none"> • New 4' paved shoulders <i>both sides</i> • Possible road ROW widening
Soft surface (Springville – Saltzman)		1.39 miles	\$1,128,200	Soft surface	Mountain bike and ped only	<ul style="list-style-type: none"> • 5 stream crossings • Switchbacks needed • Highly variable slopes • Required private property acquisition
Midblock crossing (NW Skyline)		N/A	\$387,500	Flashing beacon, no refuge island	Road crossing	<ul style="list-style-type: none"> • Possible phased build

Westside Trail Master Plan

Figure 17

Segment 4.21
Skycrest Pkwy to Multnomah Co. line
Segment Corridor = 0.73 Miles



- Westside Trail Alternatives**

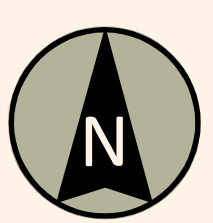
 - Up to 5% slope, multimodal
 - 5% - 8% slope, with steps
 - Up to 8% slope, multimodal
 - Soft surface
 - On-street
- Other Existing Trails**

 - School sites
 - Parks and natural areas
 - Privately owned
 - Publicly owned
 - Wetlands
- Infrastructure**

 - Bridge
 - Steps
 - Midblock Crossings
 - Wetland Crossings
 - Minor Stream Crossings
 - Taxlots
 - Powerline Towers
 - Powerlines
 - Streams
 - 10 foot contours
- Boundaries**

 - City Boundaries
 - County Boundaries
 - Tualatin Hills Park & Rec District Boundary
- Segment option number**

 - 3C

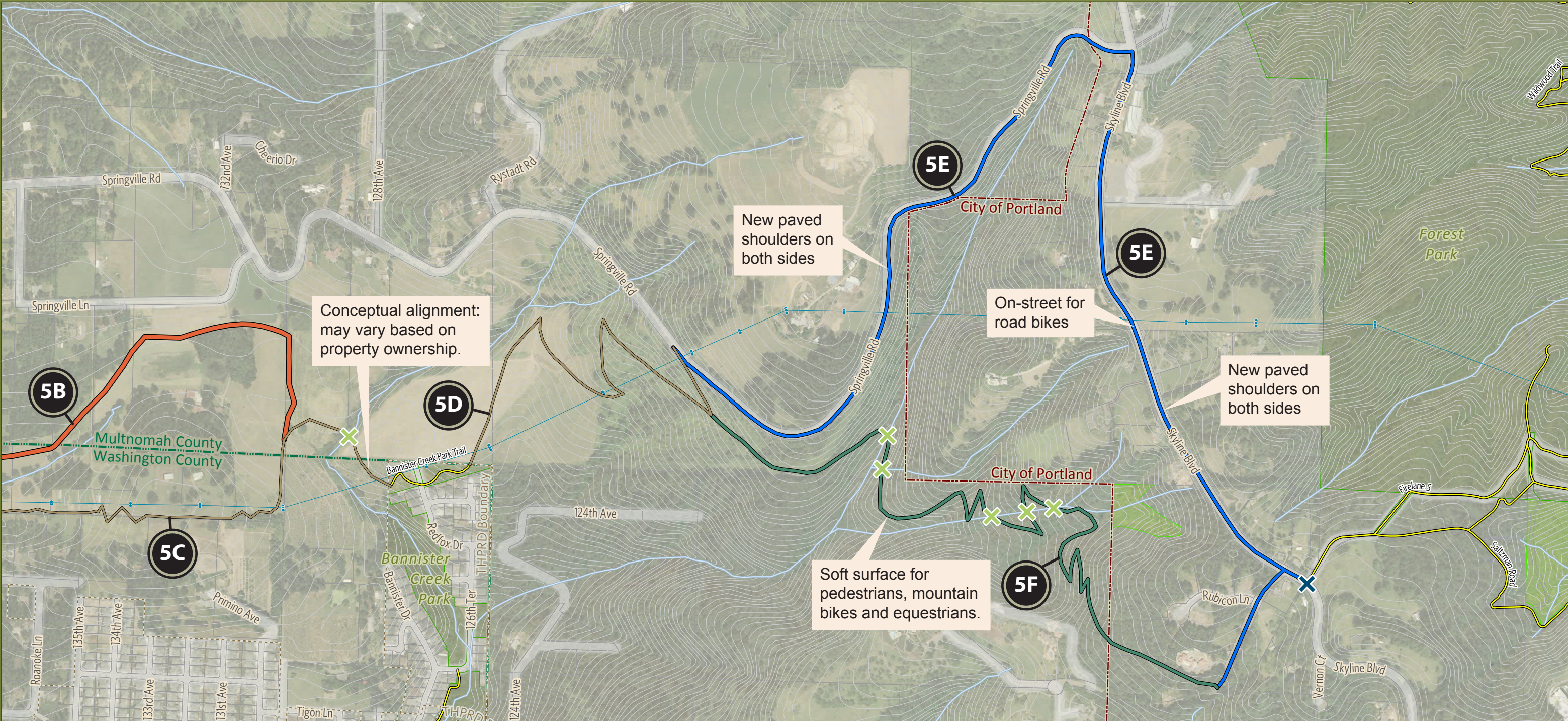


All illustrated alignments subject to change based on final design, permitting, and engineering.

Westside Trail Master Plan

Figure 18

Segment 5
Washington Co. line to Skyline Blvd
Segment Corridor = 1.21 Miles



- Westside Trail Alternatives**

 - Up to 5% slope, multimodal
 - 5% - 8% slope, with steps
 - Up to 8% slope, multimodal
 - Soft surface
 - On-street
- Bridge

Steps

Midblock Crossings

Wetland Crossings

Minor Stream Crossings
- Other Existing Trails

School sites

Parks and natural areas

 - Privately owned
 - Publicly owned
 - Wetlands
- Taxlots

Powerline Towers

Powerlines

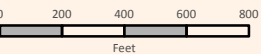
Streams

10 foot contours
- City Boundaries

County Boundaries

Tualatin Hills Park & Rec District Boundary

Segment option number



All illustrated alignments subject to change based on final design, permitting, and engineering.

