



WASHINGTON COUNTY
OREGON

Neighborhood Bikeway Concept Plan



July 2014





Prepared by Washington County. TGM 1G-12 Task 3.7 Deliverable R

This project is partially funded by a grant from the Transportation and Growth Management (TGM) Program, a joint program of the Oregon Department of Transportation and the Oregon Department of Land Conservation and Development. This TGM grant is financed, in part, by federal Moving Ahead for Progress in the 21st Century (MAP-21), local government, and State of Oregon funds.

The contents of this document do not necessarily reflect views or policies of the State of Oregon.





Contents

Introduction 4

 Background 4

 Neighborhood Bikeway Characteristics 4

 Goals and Plan Process 5

Existing Conditions 8

Routing Approach 18

 Step 1: Identify and Rank Destinations 20

 Step 2: Map Existing Network 20

 Step 3: Identify Potential Neighborhood Bikeways 21

 Step 4: Evaluate and Refine Neighborhood Bikeways 21

Neighborhood Bikeway Tools and Treatments 23

 Signs and Pavement Markings 23

 Traffic Speed Management 24

 Traffic Volume Management 24

 Intersection Treatments 25

Implementation and Funding 27

 Project Development Process 28

Public Involvement and Outreach 30

 Outreach Thus Far – Plan Development 30

 Education 30

 Project Development Outreach 31

 Marketing 32

List of Appendices

- A. Neighborhood Bikeway Maps
- B. Gaps and Barriers Assessment
- C. Routing Methodology
- D. Recommended Actions
- E. Project Development Process
- F. Neighborhood Bikeway Treatments Toolkit







Introduction

Neighborhood bikeways, also known as bicycle boulevards, are low stress, active transportation corridors developed to improve bicycle safety and circulation. These corridors take advantage of the existing low speed and low volume local street network to create an environment that is comfortable for bicyclists of all ages and skill levels. Neighborhood bikeways connect users to neighborhood destinations and provide bicyclists alternatives to, or bridge gaps in, the existing bike lanes network.

Neighborhood bikeways have been shown to appeal to the widest range of bicycle users and will help the County move closer to achieving three key bicycling goals:

1. Shift biking and walking from being recreational only to a viable transportation option to get to most destinations.
2. Move beyond designing bicycle facilities for the “spandex crowd” to making bicycling attractive and convenient for all ages and abilities.
3. Encourage biking and walking as a means of creating vibrant and healthy communities, regardless of age, gender, ability, ethnicity, or economic background.



Photo: Greg Raisman

Background

Regional performance targets aim at tripling the mode share of bicycling and walking over the next 25 years. As of 2011, there were approximately 200 miles of urban collector and arterial roadways in Washington County (County), and many lack complete bicycle and pedestrian facilities. In this time of constrained resources, we need to ensure that we are utilizing our existing system to meet our community needs. Existing local and neighborhood streets present an opportunity to meet these needs quickly and at a relatively low cost. Streets with lower vehicle volumes and speeds and with bicycle boulevard design features are a key tool for attracting new bicyclists who are typically less comfortable riding in traffic or along major roadways. Moreover, a survey of county residents indicated that the majority of both current and potential users prefer low-stress facilities over major roadways carrying high volumes and/or speeds of traffic.

Neighborhood Bikeway Characteristics

Neighborhood bikeways take the concept of shared roadways to a new level, creating an attractive, comfortable and convenient cycling environment for all bicyclists’ abilities





while maintaining auto access. Although each neighborhood bikeway may vary greatly in specific design features, they will all have the same key characteristics:

Low Traffic

Neighborhood bikeways have low traffic volumes. Streets with volumes less than 1,500 vehicles per day are ideal; between 1,500 and 4,000 vehicles per day is acceptable, and; streets with traffic volumes exceeding 4,000 vehicles per day may require modifications to decrease non-local traffic volumes when designated as neighborhood bikeways.

Low Speed

Neighborhood bikeways have low posted travel speeds to minimize the speed differential between motorists and bicyclists and increase safety. Streets with travel speeds of 25 miles per hour or less are preferable for neighborhood bikeways. Roadways with higher travel speeds may need to be slowed to an acceptable level with traffic calming when designated as a neighborhood bikeway.

Connectivity

Neighborhood bikeways connect destinations such as grocery stores, schools, shopping centers, parks, transit centers. These designated routes will connect to other bicycle facilities and can fill gaps in the bicycle network or offer travel alternatives to streets with higher motor vehicle speed and traffic. Neighborhood bikeways will primarily serve local trips, but can also serve longer trips by connecting to the broader bicycle network and, in many cases, linking multiple neighborhood bikeways.

Goals and Plan Process

The primary goals of the Neighborhood Bikeway Concept Plan / Study (Plan) are to:

- Provide a network that is logical, easy to use, well marked, and distinctively signed.
- Provide bicyclists efficient and convenient access to desired destinations and connectivity to other bike facilities.
- Improve the comfort and safety of bicyclists of all ages and abilities.

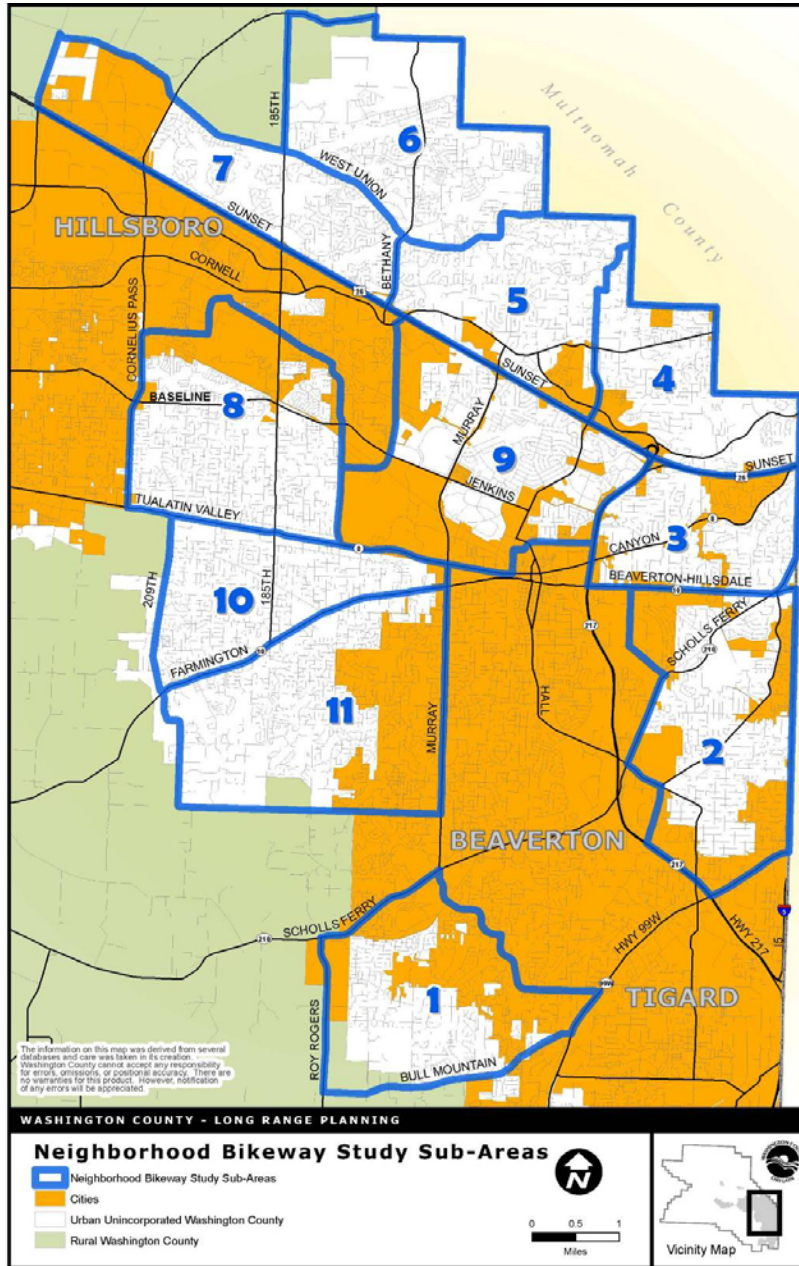
The Plan identifies a network of low-speed, low-traffic streets that offer access to local destinations and alternatives to traveling on major streets. The Plan provides a set of tools and elements that, when implemented, may make these routes more pleasant for people who live, walk, and bike on them. Finally, the Plan outlines some potential strategies for implementing and marketing neighborhood bikeways.

The Concept Plan focuses on the urban unincorporated area of Washington County. Urban unincorporated Washington County is comprised of a number of communities and subareas that provide a more localized and refined analysis. In order to identify a





network of neighborhood bikeways, the study area was delineated into eleven “neighborhood areas” or sub areas. The sub-area boundaries are generally based on major streets or other barriers and sized to about 2 square miles, a reasonable local bike trip distance. The 11 sub-areas are shown below.



Development of the Plan included reports that reviewed existing plans and policies, best practices for bike boulevard design, and specific needs, opportunities, constraints and treatments.





A Technical Advisory Committee (TAC) was established to coordinate communication with and participation of relevant agency staff and community representatives. The TAC reviewed project information and provided guidance to County staff on products, project direction, and resolution of technical, policy, and regulatory issues.

Community input and feedback through community meetings, the Plan website, an online mapping app for commenting on routes, and e-mails sent to staff shaped the development of the Plan. The public provided key insights informing routing, branding, and implementation. The Plan responds to public comments regarding neighborhood bikeway network development to the extent practicable.

TAC Roster

- Beaverton Bicycle Advisory Committee
- City of Hillsboro
- City of Tigard
- Community members
- Oregon Department of Transportation
- Oregon Safe Routes to School
- Tualatin Hills Park and Recreation District
- Urban Road Maintenance District Advisory Committee
- Washington County Health and Human Services
- Washington County Operations & Maintenance
- Washington County Planning
- Washington County Traffic Engineering

The Plan helps inform future policy and decision-making, and will be integrated into existing operational plans and planning documents such as the County's Transportation System Plan (TSP).





Existing Conditions

A recent inventory of bicycle and pedestrian facilities on urban arterials and collector roadways in Washington County indicates a lack of network connectivity. Lack of a road grid, prevalence of cul-de-sacs, and large natural and manmade barriers (e.g. industrial sites, wetlands, and rail corridors) contribute to the lack of connectivity. Moreover, residents that would or could bike more for utilitarian purposes do not because there is no comfortable or convenient network to access their desired destinations. Despite these constraints, there are many low-traffic, low-speed roadways that could serve as comfortable routes and improve network connectivity. However, since many of the potential routes are not mapped and/or marked, these alternative routes are underutilized.

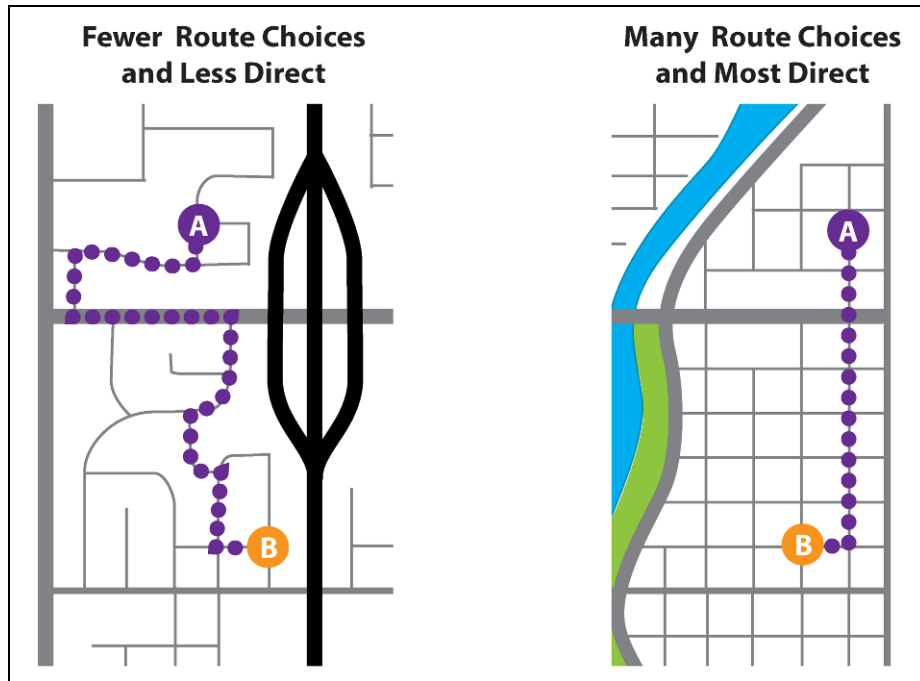
There are a variety of barriers and opportunities particular to suburban environments in the County that impact the development and implementation of a neighborhood bikeway network. The following is a summary of some key barriers, opportunities and potential strategies to mitigate implementation of a neighborhood bikeway. Where appropriate, information about the known constraint(s) of this strategy is provided. A more comprehensive discussion of gaps and barriers is presented in Appendix B. Chapter 4 – Tools and Treatments and the *Neighborhood Bikeway Toolkit* further discusses strategies to overcome these gaps and barriers.

Street Connectivity

A disconnected street pattern, as is common in suburban contexts like urban unincorporated Washington County, limits route options for all roadway users. Fewer route choices, due to lower street and intersection densities, means that there are decreased opportunities for individuals to use low-stress streets to reach their destinations. In general, the routes that do connect to key destinations (e.g. commercial centers, schools, and parks) are on higher-order streets with greater motor vehicle volumes and speeds. Traveling these higher-order streets on foot or by bike is less comfortable for many individuals, and therefore these streets are generally not recommended for neighborhood bikeways.

A second outcome of a disconnected street network is that street connections are often indirect. Traveling to an adjacent neighborhood, a local park, or a commercial area may be a short distance “as the crow flies,” but taking the existing street network will lead to longer travel times due to out-of-direction travel. Since active transportation modes are self-powered, out-of-direction travel becomes a significant disincentive to walking and biking.





Transportation users have fewer choices and less direct connections in a non-grid street network.

Accessways

The disconnected street network in the suburban context can be augmented through the use of accessways. Accessways are often found at the ends of cul-de-sacs or other dead-end streets and can provide an active transportation connection where no roadway exists. The county has begun mapping and documenting public accessways. Due to absent or inadequate signing and marking, many accessways remain hidden from public view and are used mostly by nearby residents. Through better wayfinding, accessways could become an integral part of a future Neighborhood Bikeway network.



Accessways can provide connections in discontinuous networks.

Paper Streets

The County possesses a number of unimproved road right-of-ways, commonly referred to as “paper streets,” that present a unique opportunity for enhanced connectivity of the local road network for bicycle and pedestrian travel. The condition of existing paper streets varies considerably; some include local resident-developed paths (e.g. dirt paths, sawdust trails, gravel), while others remain unattended and overgrown with vegetation. Paper streets that can fill in a gap in the bicycle and pedestrian network and connect users to important destinations, or regional trails, are important to consider for development as neighborhood bikeways. Since the County already possesses the necessary right-of-way, no costly easement acquisitions are necessary to establish these connections.



“Paper streets” hold potential for new neighborhood bikeway connections.



Trails

There are a number of regional, local, and community trails in the county that can be incorporated into the neighborhood bikeway network. Trails provide a low-stress active transportation environment that is attractive to neighborhood bikeway users. Wayfinding signage, enhanced crossing locations, and ADA accessible transitions to trails from on-street bikeways are necessary to accommodate all pedestrians and bicyclists.



Connecting neighborhood bikeways with trails helps provide a network of low-stress bikeways.



Underutilized Collector Roadways

In general, Collector roadways provide more direct connections than Local or Neighborhood streets. In Washington County there are a number of Collector roadways that do not carry high volumes of motor vehicle traffic where speeds are also relatively low. Many collectors are not yet improved to the County Collector standard and in the interim, appropriate traffic calming, pavement markings, and signage would make these streets potential neighborhood bikeway routes.



Collector routes with lower traffic speeds and volumes, such as NW Burton St., are potential neighborhood bikeway routes.



Natural Waterways/Wetlands

A primary reason Washington County does not have a traditional grid network is due to a desire to preserve and protect waterways and wetlands. Where bridge connections across waterways and wetland areas do not exist, the street network will either terminate or circumvent the area, which may cause out-of-direction travel for all users. However, bicyclists and pedestrians often benefit with existing or future lower-impact bicycle and pedestrian bridges that can connect neighborhood bikeways across natural waterway and wetland barriers.



Bridges can connect neighborhood bikeways across waterway and wetland barriers.

Freeways, Highways, and Railroads

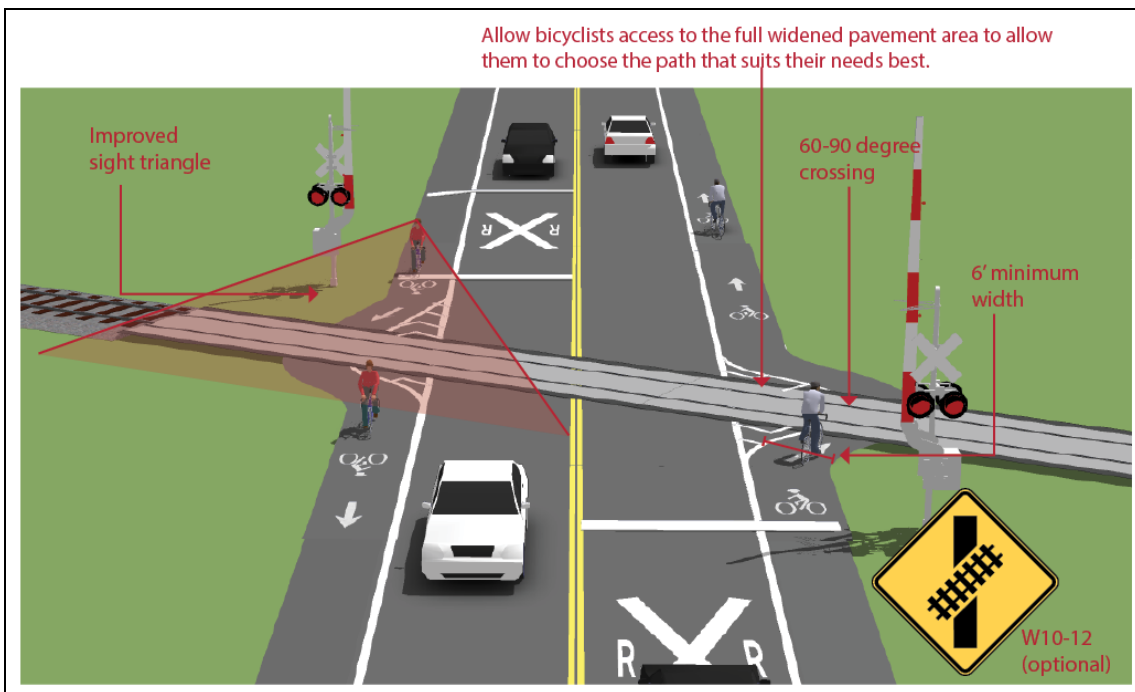
Washington County is crossed by several major highways. In general, low-traffic, low-speed streets do not cross highways, which reduces the availability of through-streets. Improving connectivity with the development of additional at-grade crossings can also be challenging because state highways are governed by the Oregon Department of Transportation (ODOT). Any proposed changes, such as signals or crossings, must be approved at the state level.





Railroads present two challenges to the development of a neighborhood bikeway network—limited access and user safety. Similar to highways, most railroad crossings are provided on higher-order streets that may not be suitable for neighborhood bikeway development. Improving connectivity by adding additional at-grade crossing locations is seldom an option. Railroads are almost always governed by an outside authority and any proposed changes that would affect rail operations are at their discretion.

Secondly, railroad tracks are frequently the cause of bicycle crashes not involving vehicles, as inexperienced riders can easily get a wheel trapped in the gap between the rail and the roadway surface, or lose balance on uneven pavement surfaces. In addition, the small number of legal railroad crossings, such as in the vicinity of Tualatin Valley Highway (OR 8), can be a barrier for access to the transit and bicycle networks. Signage and pavement markings are commonly used to alert bicyclists to cross railroad tracks at perpendicular angles, even when the maneuver is inconvenient.



Proper signing and marking of a bikeway crossing of railroad tracks.

Challenging Topography

Areas that have steep terrain can be particularly challenging for many bicyclists. The Tualatin Mountains and the vicinity of Cooper Mountain are two locations with challenging topography, with road grades of 10% or more. There is little to be done to reduce grades.





Active Transportation Connections and Transitions

Where active transportation facilities exist, such as on-street bikeways and trails, it is sometimes hard to see from the end of one segment to the beginning of the next. Lack of clear directional cues and continuous routes decreases the overall usability of the network. People walking and biking are likely to get confused, choose a suboptimal travel route, or both. Moreover, where routes terminate prematurely, or fail to direct users to the next leg of their route, fewer individuals will choose to walk or bike.



Second generation bicycle boulevard pavement marking (indicates turn)

Inconsistency between Jurisdictional Bikeways

Active transportation connection concerns are also apparent between local jurisdictions related to bikeway design, signage, maintenance, and routing. Users are unlikely to notice when they cross a jurisdictional boundary, but could become confused if the transition is not seamless. Close coordination between County planning staff and local jurisdictions for the planning and implementation of active transportation facilities will help alleviate problems of inconsistency.

Lack of Knowledge about Active Transportation Routes

Among the public, there is not a high level of awareness of existing local on-street active transportation connections, trail connections, or the length of time required to walk or bike between typical origins and destinations. Actively marketing the active transportation network, not just neighborhood bikeways, will help raise awareness of walking and bicycling in the county. A uniquely branded wayfinding system can be attractive to users and also convey to drivers that they are on a street where people are walking and bicycling.





Sign toppers can help with a uniquely branded wayfinding system.

Crossings of Major Streets

Even with marked crossings, some roads feel too uncomfortable for the average user to cross on foot or by bike. For example, in Washington County, pedestrians and bicyclists must sometimes face crossing 5-lane arterials that do not have features, such as mid-block crossings, median refuge islands or rectangular rapid flashing beacons. It is inevitable that neighborhood bikeways will need to cross these same roadways. Where proposed neighborhood bikeways cross major roadways, these intersections may be considered for crossing enhancements. Both the Washington County Bicycle Facility Design Toolkit and the Mid-Block Crossing Policy can help identify the specific design needs of the intersection to make it comfortable for active transportation users.



Mid-block crossings like this example (Rock Creek Trail at NW Evergreen Parkway) can help neighborhood bikeways cross large arterial roads.



Traffic Control at Intersections

Repeated “starting and stopping” impacts bicyclists more than individuals traveling by motor vehicle because of the energy it takes to get rolling again. Travel that is self-powered is more efficient and pleasurable when the amount of stop time along a route is minimal. For this reason, traffic control at intersections is a vital element of planning neighborhood bikeways. Bikeway routes on local streets that have frequent stop signs can lead to bicyclist non-compliance because the constant stopping and starting is cumbersome. On local streets where the right-of-way is not designated by a traffic control device, it can be confusing for all roadway users.





Routing Approach

Goals and key characteristics of neighborhood bikeways, along with existing conditions unique to Washington County, inform the approach to routing neighborhood bikeways. The County's approach to routing is based on best practices and a methodology modified for use in the suburban context. The methodology can be summarized in four steps. [Complete routing methodology details are provided in Appendix C.]

In Step 1, **identify and rank community destinations** that would attract bicycle trips.

In Step 2, **map relevant attributes** of the existing transportation and land-use network.

In Step 3, **identify potential routes** using guiding principles and assessing key characteristics, network gaps, and community input.

In Step 4, **evaluate routes** to identify preferred neighborhood bikeways.

Goals of Neighborhood Bikeways

- Provide a network that is logical, easy to use, well marked and distinctively signed.
- Provide bicyclists efficient and convenient access to desired destinations and connectivity to other bike facilities.
- Improve comfort and safety for bicyclists of all ages and abilities.





IDENTIFYING NEIGHBORHOOD BIKEWAYS

1 IDENTIFY & RANK DESTINATIONS



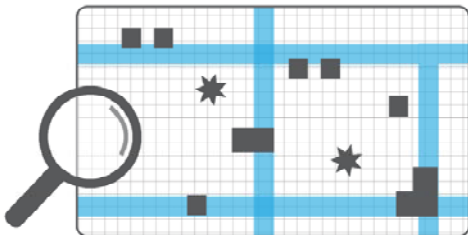
- Compile list of destinations
- Refine list of destinations
- Weight destinations
- Map location + density of destinations

2 MAP RELEVANT NETWORK FEATURES



- Road classifications
- Trails + bikeways in neighboring jurisdictions
- Accessways + paper streets
- Roadway slope
- Community-identified routes + gaps
- Signals, crossings, and traffic calming
- Transit routes

3 IDENTIFY POTENTIAL NEIGHBORHOOD BIKEWAYS



- Provide a network that is logical and easy to use
- Provide convenient access to destinations and connectivity to other bike facilities
- Provide comfortable and safe routes for bicyclists of all ages and abilities.

4 EVALUATE & REFINE NEIGHBORHOOD BIKEWAYS



- Solicit feedback from TAC members, County staff, other agencies, community groups, and the public
- Measure route features (e.g. length, # of major crossings, destinations served) in GIS
- Test ride routes and review



Step 1: Identify and Rank Destinations

A good neighborhood bikeway network connects people to the places they want to go. Bicycle network planning for this study focused on creating targeted facilities for active transportation users to move between the places they would like to go. A list of community destinations was generated based on common trip destinations for residents. The list was narrowed down to 16 destination types that would be more likely trip attractions *for bicyclists*. Since some destinations attract more trips than others, a weighting system was devised.

Destinations and Weights Based on Attractiveness		
Low	Medium	High
Bars + pubs	Shopping centers	Parks
Barber shops	Fitness centers	MAX stops + transit centers
Beauty salons	Restaurants	Schools
General merchandise	Banks	Libraries
Movie theaters	Savings institutions	Workplaces > 300 employees
	Credit unions	Colleges + universities
		Specialty food stores

A point and heat (density) map of these destinations was generated for use in the next routing steps.

Step 2: Map Existing Network

In Step 2, the County examined relevant attributes, network gaps, and community input for neighborhood bikeway routing using maps and Geographic Information System (GIS) tools. Relevant attributes include:

- Road classifications
- Bikeways in neighboring jurisdictions
- Accessways
- Unimproved road right-of-way (paper streets)
- Multi-use trails
- Traffic calming features
- Traffic signals and mid-block crossings
- Transit routes
- Community-identified routes
- Existing inventory/gaps in bicycle network
- Roadway slope/grade





Step 3: Identify Potential Neighborhood Bikeways

In Step 3, potential routes were identified that were judged to connect residents with destinations and the wider bicycle network. The following considerations, organized by general themes of directness, connectivity, and safety, were used to identify routes for each of the subareas:

Directness

- Make routes reasonably continuous, minimizing jogs;
- Recognize that not all neighborhood bikeways will get community members to the front door of all their destinations;
- Utilize accessways when needed but if an equally convenient road is available, use the road;

Connectivity

- Prioritize connections to destinations rather than spacing to geographic area equally;
- Connect routes to existing multi-use trails, bike lanes, and low-traffic through streets in the County and neighboring jurisdictions;
- Avoid close parallel connections along regional trails;
- Connect routes from adjacent subareas when possible;
- If a neighborhood bikeway route is not possible but destinations need to be served, consider an Enhanced Bikeway on nearby arterial/collector streets.

Comfort and Safety

- Prioritize comfort and safety over directness;
- Use local and neighborhood streets before choosing a collector; If choosing a collector, select routes with low traffic volumes (3,000 vehicles per day or less) and low traffic speeds (25 mph or less);
- Take advantage of streets with existing traffic calming;
- Avoid or minimize steep hills/grades;
- Use signalized crossings where possible, but consider that these locations may need upgrades;
- Suggest new crossing locations where appropriate;
- Avoid truck and bus routes;
- Avoid roads with existing bike lanes.

Proposed routes are presented in Appendix A.

Step 4: Evaluate and Refine Neighborhood Bikeways

In Step 4, the County evaluated potential neighborhood bikeways using several factors and using GIS analysis. The County actively solicited initial feedback on the routes from the TAC members, County staff, and other agencies. Changes to the proposed routes based on their feedback were made before presenting the routes to the public.





The public was asked to review the routes, which were posted on the County’s website for comment using a GIS-based mapping app. Over 100 comments were received regarding specific locations, overall routes, and suggestions for additional routes. Neighborhood bikeway network maps were also presented to Citizen Participation Organizations (CPOs) and other community groups. The Bicycle Transportation Alliance, a non-profit local advocacy group, assisted the County by asking its members to test ride the routes and provide comments. The comments were used to add, remove and change proposed routes.

Finally, County staff checked all proposed neighborhood bikeways and route alternatives by bike. This on-the-ground fieldwork was used for a final round of refinements to the proposed neighborhood bikeway routes.

The final proposed network includes 96 miles of neighborhood bikeways covering the majority of areas of Washington County.





Neighborhood Bikeway Tools and Treatments

A variety of tools are available to achieve the desired characteristics of a neighborhood bikeway. The specific tools and treatments applied to a neighborhood bikeway will vary with the unique conditions and context of each route. The treatments can be grouped into two primary categories – basic treatments and route specific treatments. Basic treatments are used on all neighborhood bikeway routes. Route specific treatments enhance bicycle travel and improve safety on the neighborhood bikeways including intersection treatments, traffic calming and traffic reduction measures.

In general, treatments of any neighborhood bikeway may include:

- Signing and Pavement Markings (Basic Element)
- Intersection Treatments (Route Specific)
- Traffic Speed Management (Route Specific)
- Traffic Volume Management (Route Specific)

All of these items or a select few may be employed on a single corridor based upon the existing conditions of the street for bicycle travel. The combined impact of these elements is far greater than any single element alone. A brief description of each of the treatment categories follows. Additional descriptions, illustrations, and considerations regarding the tools and treatments are found in the Neighborhood Bikeway Toolkit in Appendix F. The selection of the appropriate tools should be determined in collaboration with local residents, stakeholders and public agencies and may vary significantly from one corridor to the next.

Signs and Pavement Markings

Signs and pavement markings comprise the basic elements of a neighborhood bikeway. These elements differentiate the facility from other local streets as a neighborhood bikeway, providing both bicyclists and motorists information, direction, and warning.

Signs and pavement marking treatments

- Warning Signage
- Modified Street Signs
- Wayfinding Signage
- Pavement Markings
- Shared Lane Markings (SLMs)



Traffic Speed Management

The closer the average operating speed of bicyclists is to moving vehicle traffic, the more comfortable it is for bicyclists. A small speed differential also has the added benefit of improving motorist’s reaction time, thereby decreasing the chances of a crash involving bicyclists, pedestrians and motorists and reducing the chance of injury should a crash occur. For this reason, the motor vehicle travel speeds on neighborhood bikeways are preferred to be 25 mph or lower (see the Washington County Bicycle Design Toolkit’s discussion of “Bicycle Boulevards”).

Treatments that reduce speed

- Raised Crosswalks
- Reduced Speed Limits
- Speed Display Boards
- Horizontal and Vertical Deflection
 - Curb Extensions
 - Mini Traffic Circles
 - Speed Cushions and Speed Humps
 - Narrow Streets



Speed display boards have been shown to slow traffic.

Traffic Volume Management

Maintaining low motor vehicle volumes below 3,000 vehicles per day (VPD) will increase bicyclists’ comfort. To manage volumes, physical or operational measures can be taken





on routes that have been identified as a neighborhood bikeway. If volumes of 3,000 VPD are not possible for a short segment of the neighborhood bikeway, then an enhanced on-street bikeway may be considered.

The volume management elements below also provide an opportunity for landscaping, stormwater management, and other pedestrian and bicycle supportive amenities. Due to the constraints of existing soils in Washington County, green stormwater treatments are not currently being considered as part of the Neighborhood Bikeway Plan. Because many of these treatments are new to the County, a public education campaign may be necessary to alert all roadway users the need for and safe use of these facilities.

Intersection Treatments

The level of traffic control installed at intersections along a neighborhood bikeway is dependent on whether the intersection occurs at a major or minor street and the complexity of the intersection. These factors dictate the level of treatment that should be considered to make it safer, convenient, and comfortable for active transportation users.

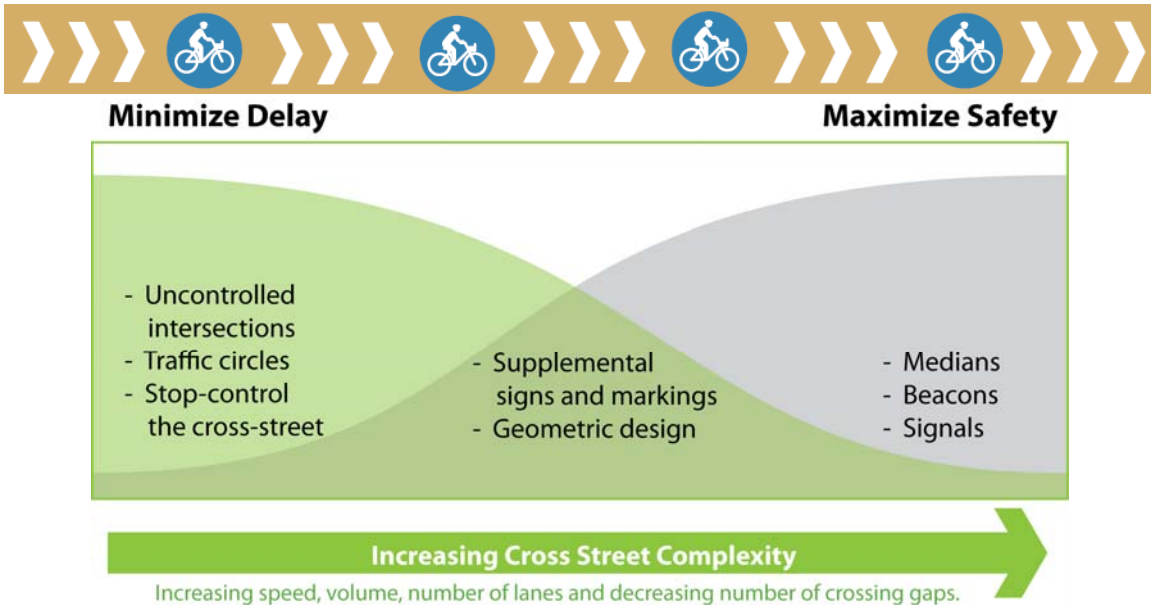
Striking a balance between

maximizing active transportation user

safety and minimizing delay will lead to a successful neighborhood bikeway that feels logical and comfortable for all roadway users. The diagram below from the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide offers guidance on design features that can be added as intersection complexity increases, while accounting for delay and safety concerns.

Traffic volume management treatments

- Traffic Restriction Signage
- Choker Entrances
- Diagonal Traffic Diverters
- Median Diverters



Striking a balance between safety and convenience on a neighborhood bikeway is best accomplished by assessing intersection complexity and adjusting the design accordingly.
 Source: NACTO Urban Bikeway Design Guide 2014

Minor Street Crossings

Intersections with minor streets may be considered for modification to reduce bicyclist delay on neighborhood bikeways. Based on current best practices often the user traveling on the neighborhood bikeway is given priority—creating fewer stops for bicyclists. Fewer stops reduces travel time, minimizing efforts required to get started after stopping, and helps improve compliance with traffic control devices.

- Minor street crossing intersection treatments**
- Stop Sign Placement
 - Mini Traffic Circles

Major Street Crossings

At intersections with major roadways, safety takes precedence above minimizing delay for bicyclists. There are many different kinds of treatments that may help to improve safety at major intersections.

- Major street crossing intersection treatments**
- Bicycle Detection at Intersections
 - Bike Boxes
 - Median Refuge Island
 - Mid-block Crossings
 - Treatments for Route “jogs”





Implementation and Funding

Today in Washington County, there are numerous gaps in the bicycle network. The County is making progress towards connecting these gaps but it will take substantial investments and many years to complete. Improvements to local and neighborhood streets can be built at a much lower cost and implemented more rapidly than improvements to higher-order streets. The Neighborhood Bikeway Concept Plan provides potential network investments that can make efficient use of resources while substantially increasing network connectivity.

Currently there is no designated funding stream to implement the neighborhood bikeway network. Existing funding sources that may play a role in future funding include:

- Grants (State and Federal)
- Major Street Transportation Improvement Program (MSTIP) Funds
- Urban Road Maintenance District Safety Improvement Project Funds
- Minor Betterment Program Funds
- Foundation Grants

Installation of the neighborhood bikeways can currently be implemented under the existing authority of the County Engineer as operational traffic improvements. It is expected that installation of neighborhood bikeways will be completed by the County over time as funds become available, rather than in conjunction with new development.

Development of the neighborhood bikeway network will be accomplished by collaborating with local residents, stakeholders and public agencies to determine how to prioritize investments and design solutions. Public outreach and education will help to maximize neighborhood bikeway usage. A list of recommended actions to follow this plan is provided in Appendix D.





Project Development Process

The County envisions a project design will be conducted prior to implementation of any neighborhood bikeway along corridors identified in the Plan. The purposes of the project design is to gather technical data, work directly with the adjacent property owners and surrounding community, verify the viability of the route as a neighborhood bikeway, and identify appropriate neighborhood bikeway treatments. Although each corridor/project will be unique, it is desirable to have a general outline for the project development process.

Draft Project Development Outline

1) Identify Project Area

Based on previously decided approaches and prioritization and may either be a route corridor or an area.

2) Data Collection - Existing Conditions

First step in project development, the data collection effort will be tailored to fit the unique conditions of the subject corridor.

3) Preliminary Project Design-Alternatives

During preliminary design, data and existing conditions will be analyzed to provide an assessment of the technical feasibility and potential benefits or tradeoffs of implementing a bike boulevard. They may also be used to understand the level to which traffic calming and/or traffic diversion would be necessary to achieve the desired conditions of a bike boulevard, as described in the key neighborhood bikeway characteristics.

4) Public Meeting #1

The first public meeting is an opportunity to introduce neighbors to the concept of neighborhood bikeways and the tools and treatments to maintain or achieve the desired characteristics. Treatment or route alternatives will be presented if applicable.

5) Refine Project Design

Based on community feedback and any additional data, design alternatives will be refined to a recommended project design.

6) Public Meeting #2

The community will be presented with the recommended design and schedule. Any additional concerns or questions about installation will be addressed.

7) Approval of County Engineer

8) Identify funding and proceed to construction/installation

9) Education and marketing of Neighborhood Bikeway





The process will likely be refined as County staff engage in project development and learn from each project experience. Additional information relating to project development and implementation can be found in Appendix E.



Public Involvement and Outreach

Community outreach and involvement are essential for success of the Neighborhood Bikeway Plan, route implementation and use of the network. Residents are interested and concerned about changes to roadways near their homes and routes they commonly travel. There may be negative perceptions of the concept or potential impacts that will need to be addressed, and positive experiences that should be celebrated. It is important to reach out to the public at the different stages of neighborhood bikeway development and implementation.

This section first summarizes neighborhood bikeways outreach performed thus far. It then covers neighborhood bikeways education, project-specific outreach and marketing.

Outreach Thus Far – Plan Development

As of June 2014, the County has made substantial public outreach during the development of this plan, as described in the *Goals and Plan Process and Routing* sections. In short, by using a variety of media (e.g. project websites and email lists), the County has informed the public about neighborhood bikeways in general, tools and treatments, proposed routes, and public TAC meetings.

The original proposed routes were developed with the help of an app on the County's website during October-December 2013, in which participants were able to draw lines on a map to identify routes, as well as post notes at locations they have identified as opportunities or constraints. The app was publicized via the county's email list and bike/ped webpage, and two major local websites (BikePortland.org and OregonLive.com) published stories on the effort. Routes were refined by posting the routes in a separate mapping app during May and June, 2014. The public provided over 100 comments on these routes.

Throughout the project, Washington County will continue to employ these practices, which are consistent with best practices from jurisdictions around the country that have successfully implemented bicycle boulevards (e.g. Santa Monica, CA, Tucson, AZ and Portland, OR). Prior to adoption of any neighborhood bikeway map or supporting material into existing plans such as the County's Transportation System Plan, there will be additional outreach and opportunities for public comments.

Education

Neighborhood bikeways are a new concept to Washington County residents and property owners. General public education of a neighborhood bikeway's purpose and function will be helpful to county residents and property owners. Until neighborhood bikeways are constructed, photos and other visualization tools will be useful to show





residents what changes to expect and what they might experience as a bicyclist on a neighborhood bikeway. Public outreach materials, including videos, to communicate the purpose, function, and benefits of neighborhood bikeways can be developed so that a consistent message is shared with the community. This information can also educate users about the different terminologies (e.g. neighborhood bikeway, bike boulevard, neighborhood greenway) used by various jurisdictions while emphasizing the consistency of the facilities. Posting materials and videos on the County’s Neighborhood Bikeway website and providing ways to contact staff with questions will also be integral to the education process. Successful education outreach may also include tabling at various events located at schools, farmers markets, and community events around the county, and making presentations to neighborhood, business, and school association meetings.

Project Development Outreach

The transition of a street into a neighborhood bikeway can change the appearance and function of the street. In conducting a neighborhood bikeway project, a public outreach process will be implemented that allows the property owners along the route and in adjacent corridors and the larger community to be involved in the process.

Reaching out to adjacent property owners early in the process helps to alleviate concerns about traffic impacts, parking issues, and property access before major planning is underway. The neighborhood bikeway concept can also be clarified since it can entail a combination of treatments in order to make the street more comfortable for active transportation. Initial outreach to property owners is important and may include mailers and flyers that can better explain the concept of neighborhood bikeways and their benefits and may attract support for the project prior to any public meetings.

Public meetings are an important step in any project development process in that they help develop an understanding of needs and concerns of the community as well as educate the public on the concept and purpose of the project. It is envisioned that one or two public meetings will help support a neighborhood bikeway project development process.





Optional outreach tools and approaches

- Small group workshop(s) with adjacent property owners;
- Public open house(s);
- Use of established neighborhood groups, bicycle advocacy groups, or other non-profit organizations that promote non-motorized travel to engage the public, reach their constituents, and advertise public meetings;
- Presentations at established neighborhood/school meetings;
- Walking or biking tour of corridor with residents;
- Door-to-door surveys to solicit input from property owners, including those who may not be inclined to participate in community meetings;
- Direct mailings to residents and businesses along or near the corridor;
- Post current information on a project website, and include contact information and/or solicit input directly on the website;
- Use of social media to advertise community meetings and/or website updates;
- Videos and other visualization or interactive materials to share user experience;
- Use of an interpreter for meeting flyers and at community meetings;
- Frame the discussion around overall benefits of a neighborhood bikeway (walkability and livability) to help engage property owners who may not be interested in cycling.

Outreach should be customized to meet the needs of the specific community and project area. Many of the common concerns can be adequately addressed during a public outreach process. Residents, owners, and any other concerned community members will have the opportunity to discuss safety issues throughout the process.

Marketing

The active promotion of the route and network to the community is an important step in continuing the successful build-out of the county's bicycle network. Marketing can celebrate the success of active travel along neighborhood bikeways and is important for establishing the value of these facilities for the community.

Other key messaging points about benefits:

- Improve safety for all users
- Protect residential character and livability
- Make biking an option for more users
- Support safe routes to school

On a larger scale, increased marketing of low-stress bikeways will help to alleviate general fears and skepticism about using active transportation. Calmer, quieter streets are great places for people to walk, bike, and skate. Promoting the neighborhood bikeway network as a great place to spend time outdoors and be active is a good way to increase positive sentiment in the community about these facilities. Marketing will be most effective when the County reaches out and coordinates with community partners, who often have marketing experience and innovative ideas.





*Calmer, quieter streets are great places for people to walk, bike, and skate.
Photo: Greg Raisman*

Many jurisdictions host annual festivals that celebrate walking and biking by temporarily restricting motor vehicle access on select routes (e.g. Sunday Parkways in Portland, OR, Open Streets in Minneapolis, MN, and Summer Streets or Play Streets in NYC). These festivals encourage people to get outside, talk with neighbors, walk, bike, and play in places that are usually reserved for the use of vehicles. Neighborhood bikeways are excellent places to host street festivals because they are already low traffic roads that often have a strong neighborhood feel. These events help reinforce the value of neighborhood bikeways for the community and can help increase support for their development in other areas of the community.

Establishing a unique style of wayfinding signage or graphic images that clearly differentiate Washington County's neighborhood bikeways from other kinds of facilities will improve the visibility of the network as a whole. Unique branding can help users navigate transitions between facilities better and increase awareness. For example, if an on-street neighborhood bikeway transitions to an existing multi-use path, the path may already have a sign identifying it as such. However, a second sign of a differing color and/or shape will allow users to quickly identify the route as being part of the





neighborhood bikeway network. The unique branding allows existing facilities to more easily serve a dual purpose.

Sharing information to the community about the new routes may also take the form of maps both on paper and the web.

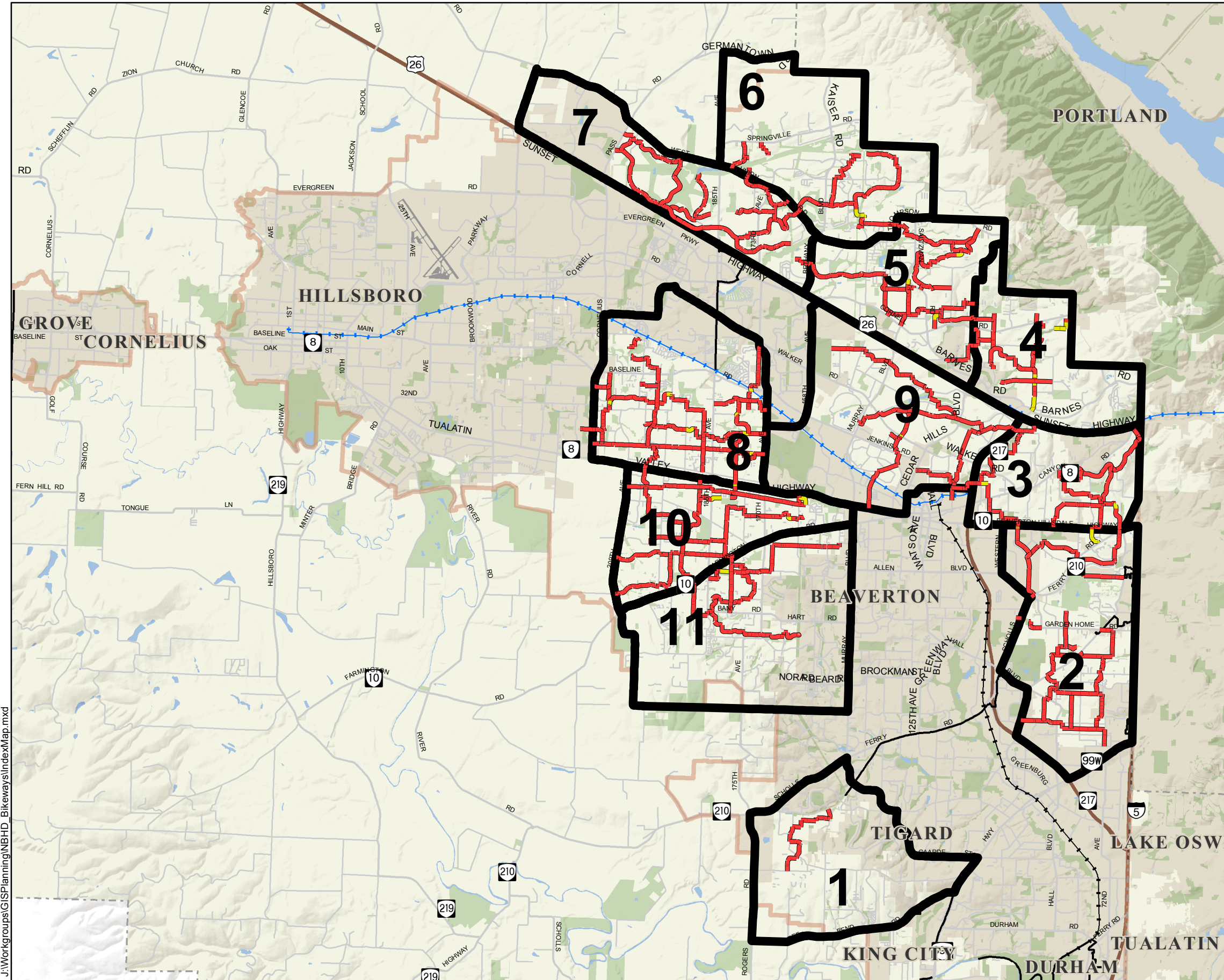
These maps can offer bicyclists the opportunity and confidence to explore areas of their neighborhood and reach destinations that they had not considered accessing by bike or on foot. These maps can include community destinations and businesses and may be produced through partnerships.




Potential partners for marketing:

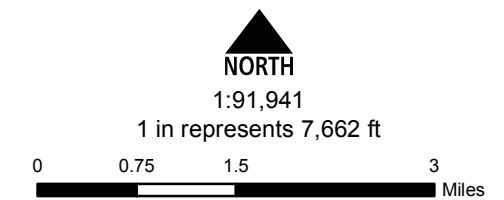
- Businesses
- Schools
- Park Districts
- Libraries
- Citizen Participation Organizations
- Home Owners Associations
- Bicycle Clubs
- Other community groups

Appendix A: Neighborhood Bikeway Maps

Proposed Neighborhood Bikeway Subarea Index



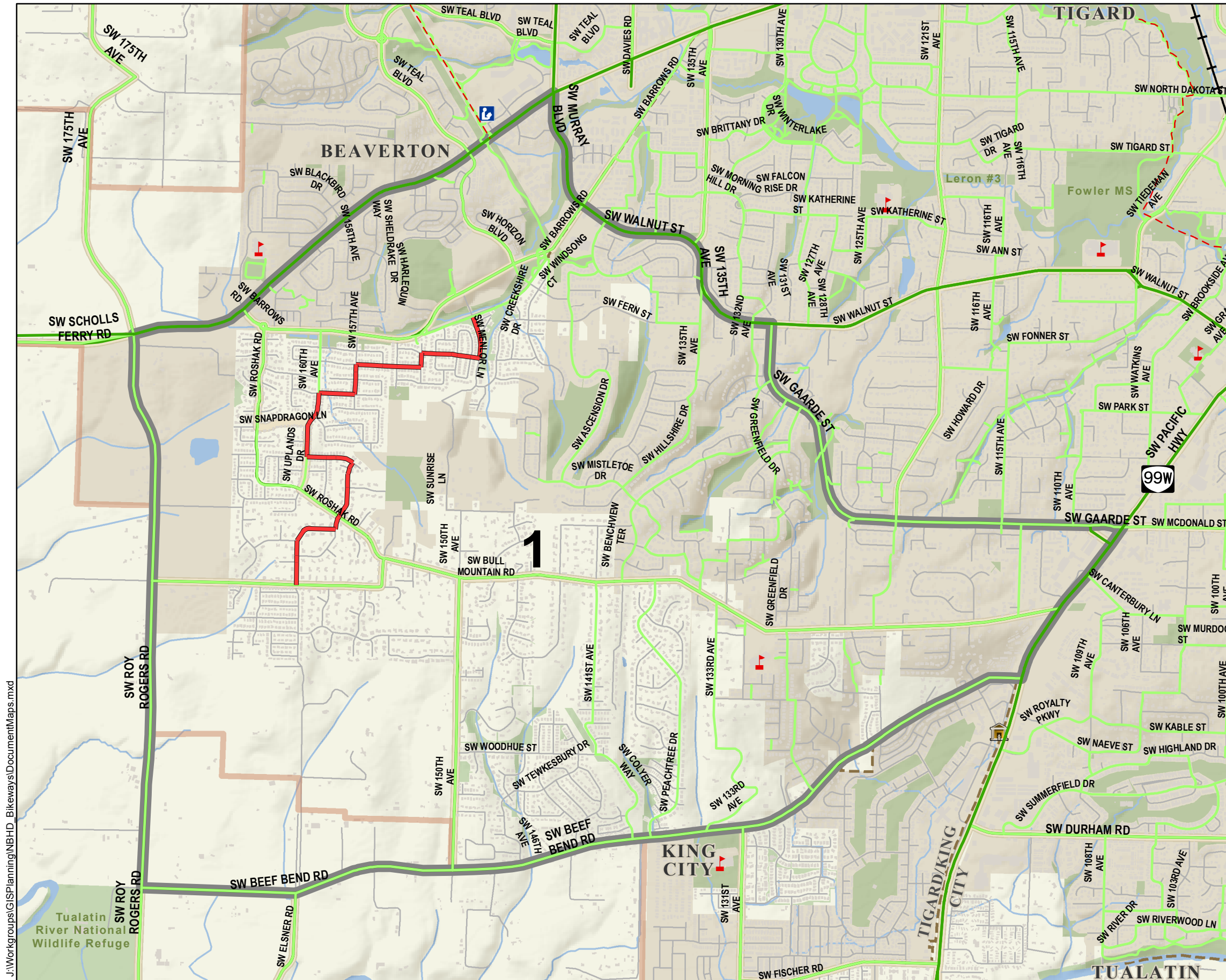
-  Subarea Boundary
- Proposed Neighborhood Bikeways**
-  Existing Segment
-  Missing Segment









Disclaimer:
 The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

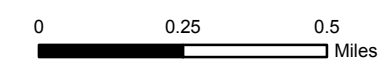


Proposed Neighborhood Bikeways Subarea 1



Proposed Neighborhood Bikeways

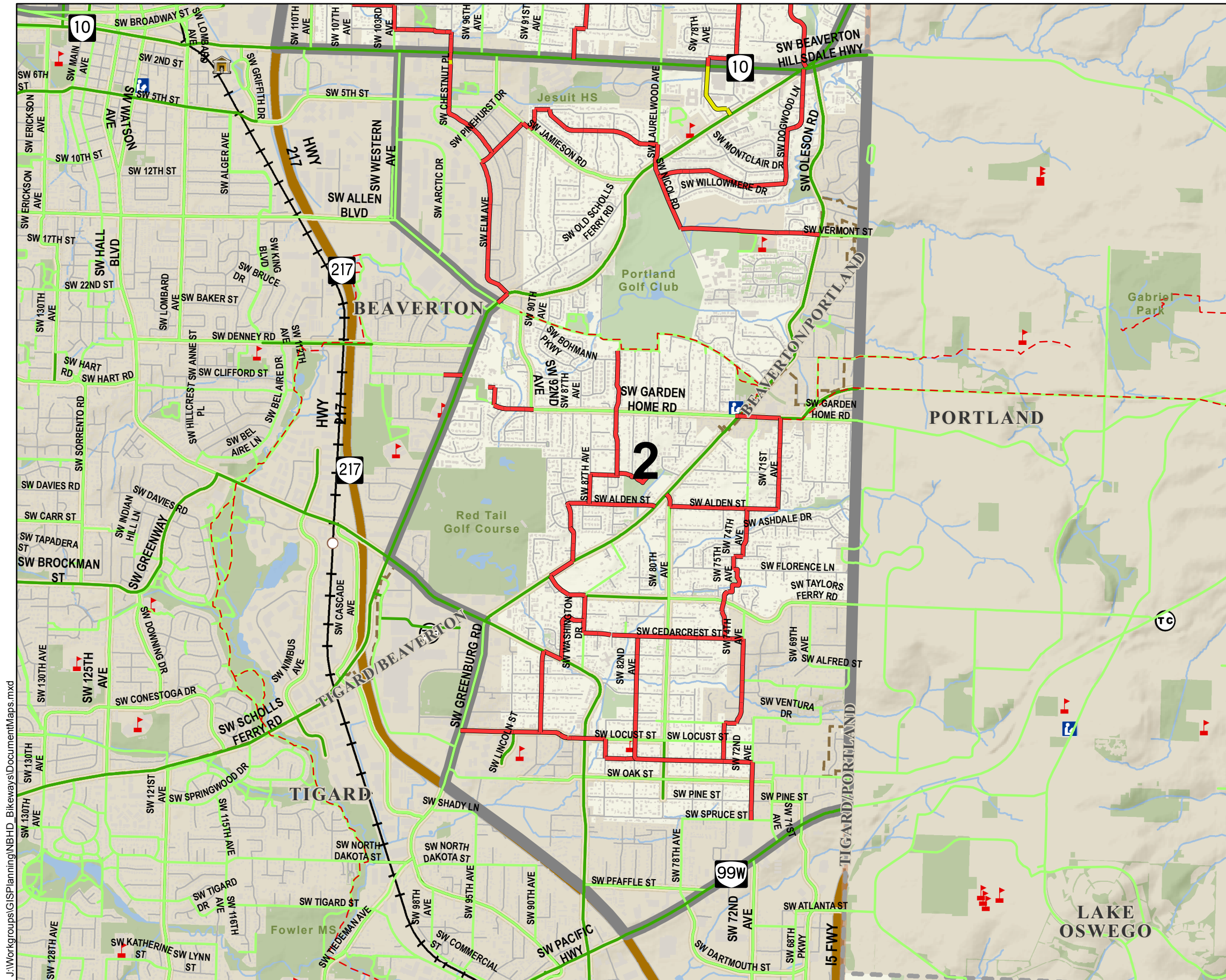
-  Existing Segment
-  Trail (Existing)
-  County Bikeway (Existing or Planned)
-  City Bike/Walkway (Existing or Planned)
-  Subarea Boundary
-  School










Disclaimer:

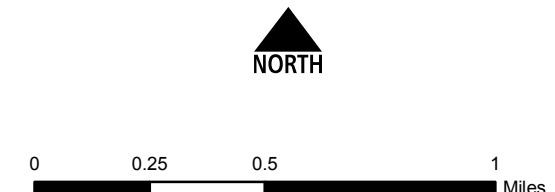
The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

Proposed Neighborhood Bikeways Subarea 2



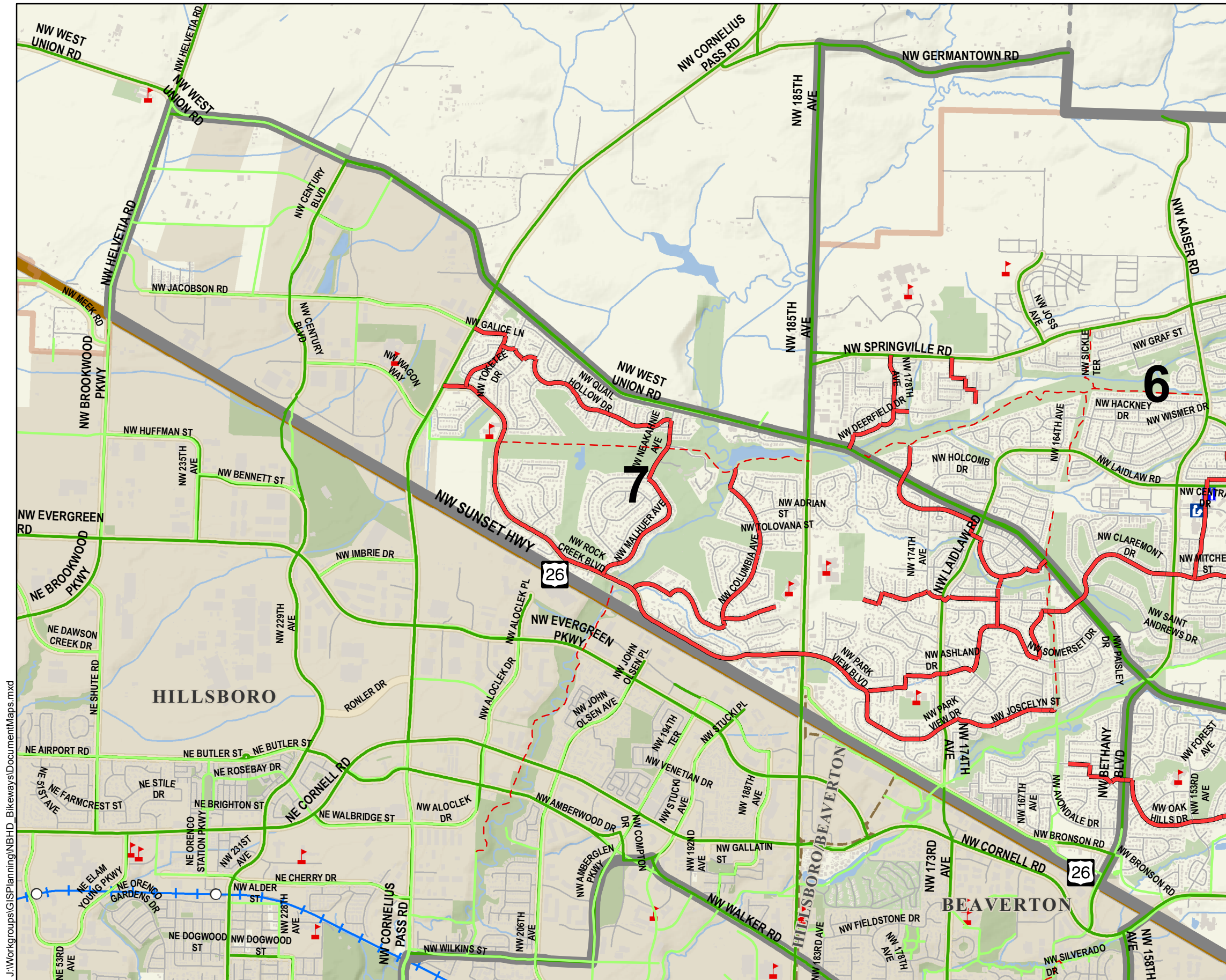
Proposed Neighborhood Bikeways

-  Existing Segment
-  Missing Segment
-  Trail (Existing)
-  County Bikeway (Existing or Planned)
-  City Bike/Walkway (Existing or Planned)
-  Subarea Boundary
-  School



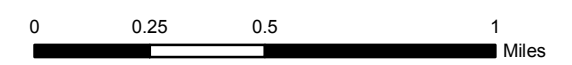
Disclaimer:
 The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

Proposed Neighborhood Bikeways Subarea 7



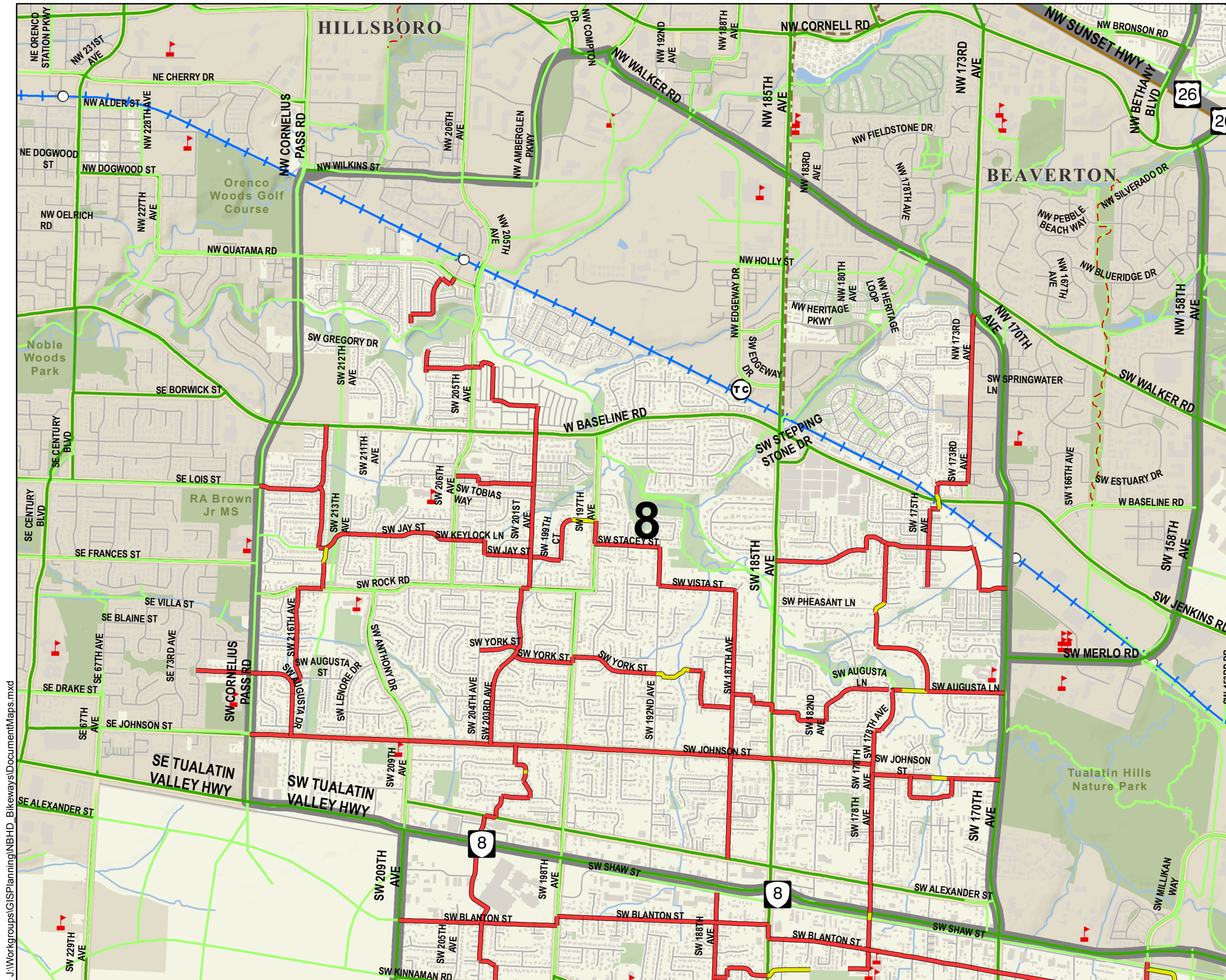
Proposed Neighborhood Bikeways

- Existing Segment
- - - Trail (Existing)
- County Bikeway (Existing or Planned)
- City Bike/Walkway (Existing or Planned)
- Subarea Boundary
- ▲ School



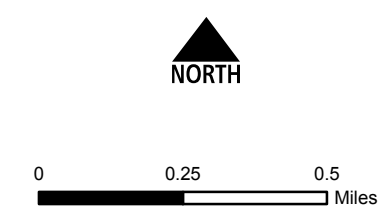
Disclaimer:
 The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

Proposed Neighborhood Bikeways Subarea 8



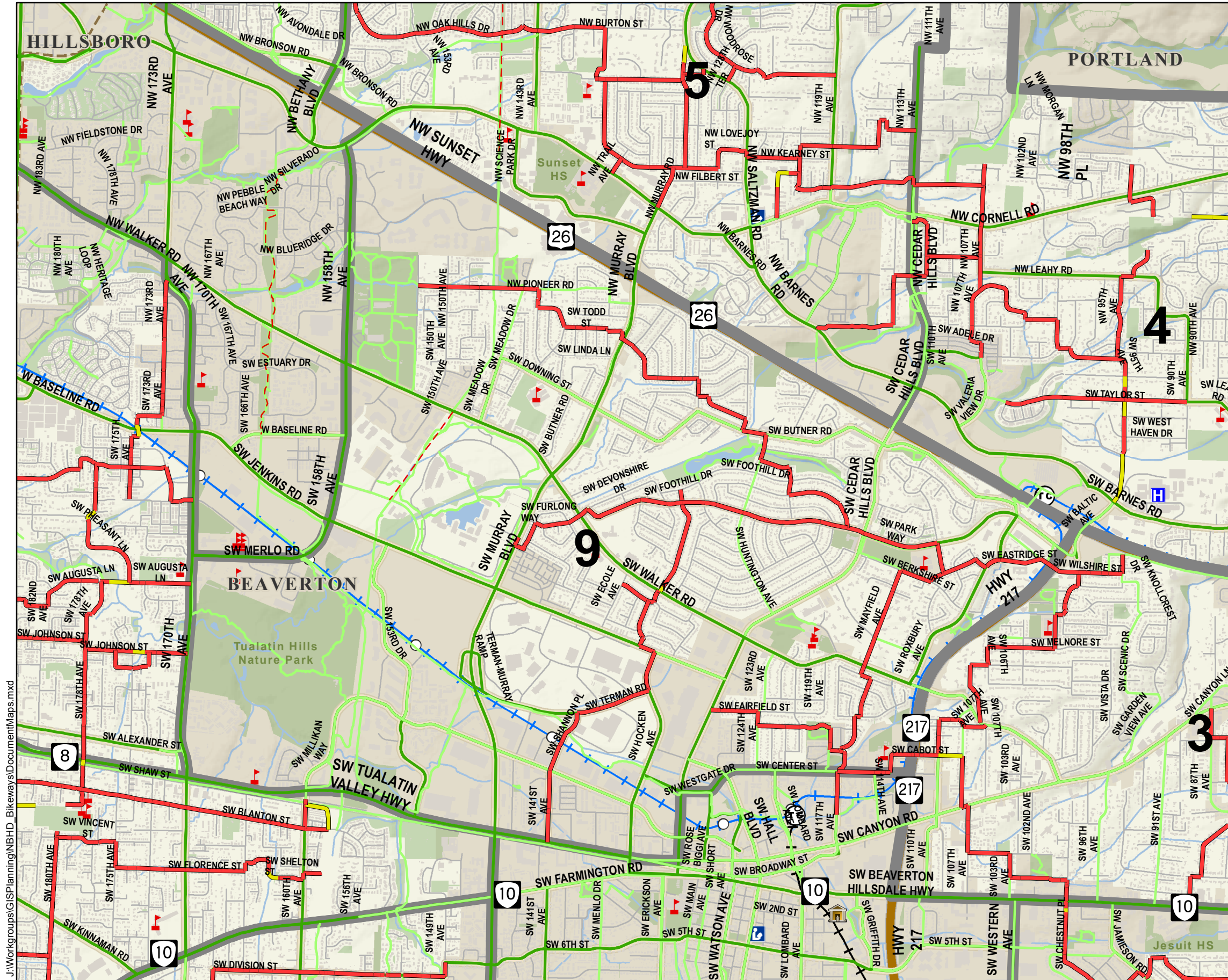
Proposed Neighborhood Bikeways

- Existing Segment
- Missing Segment
- - - Trail (Existing)
- County Bikeway (Existing or Planned)
- City Bike/Walkway (Existing or Planned)
- Subarea Boundary
- ▲ School



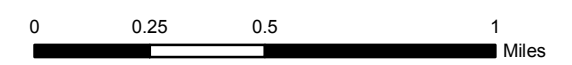
Disclaimer:
 The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

Proposed Neighborhood Bikeways Subarea 9



Proposed Neighborhood Bikeways

- Existing Segment
- Missing Segment
- - - Trail (Existing)
- County Bikeway (Existing or Planned)
- City Bike/Walkway (Existing or Planned)
- Subarea Boundary
- ▲ School

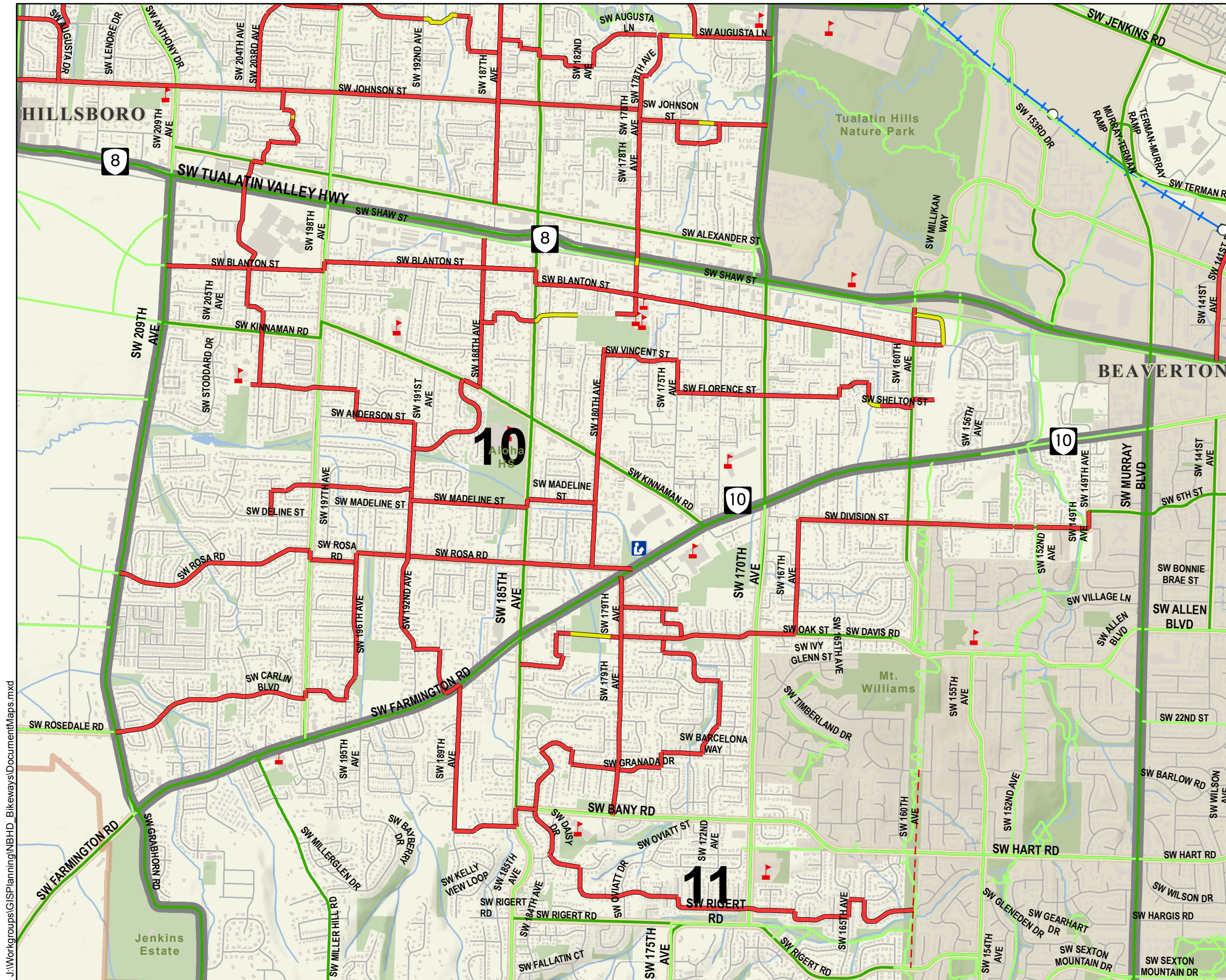


Disclaimer:
 The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

J:\Workgroups\GIS\Planning\NBHD_Bikeways\Document\Maps.mxd

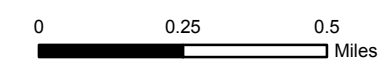


Proposed Neighborhood Bikeways Subarea 10



Proposed Neighborhood Bikeways

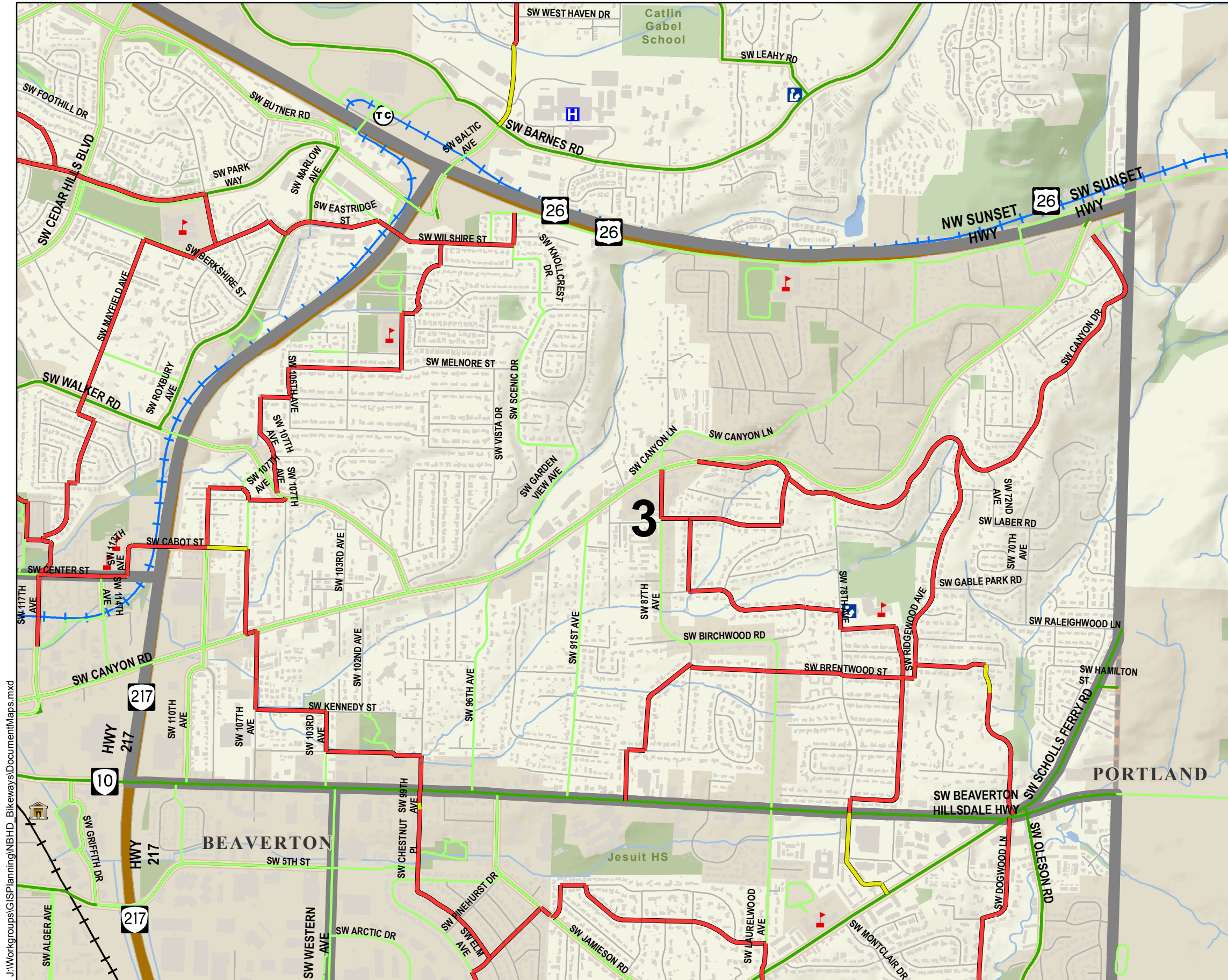
- Existing Segment
- Missing Segment
- Trail (Existing)
- County Bikeway (Existing or Planned)
- City Bike/Walkway (Existing or Planned)
- Subarea Boundary
- School



Disclaimer:

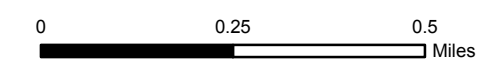
The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

Proposed Neighborhood Bikeways Subarea 3



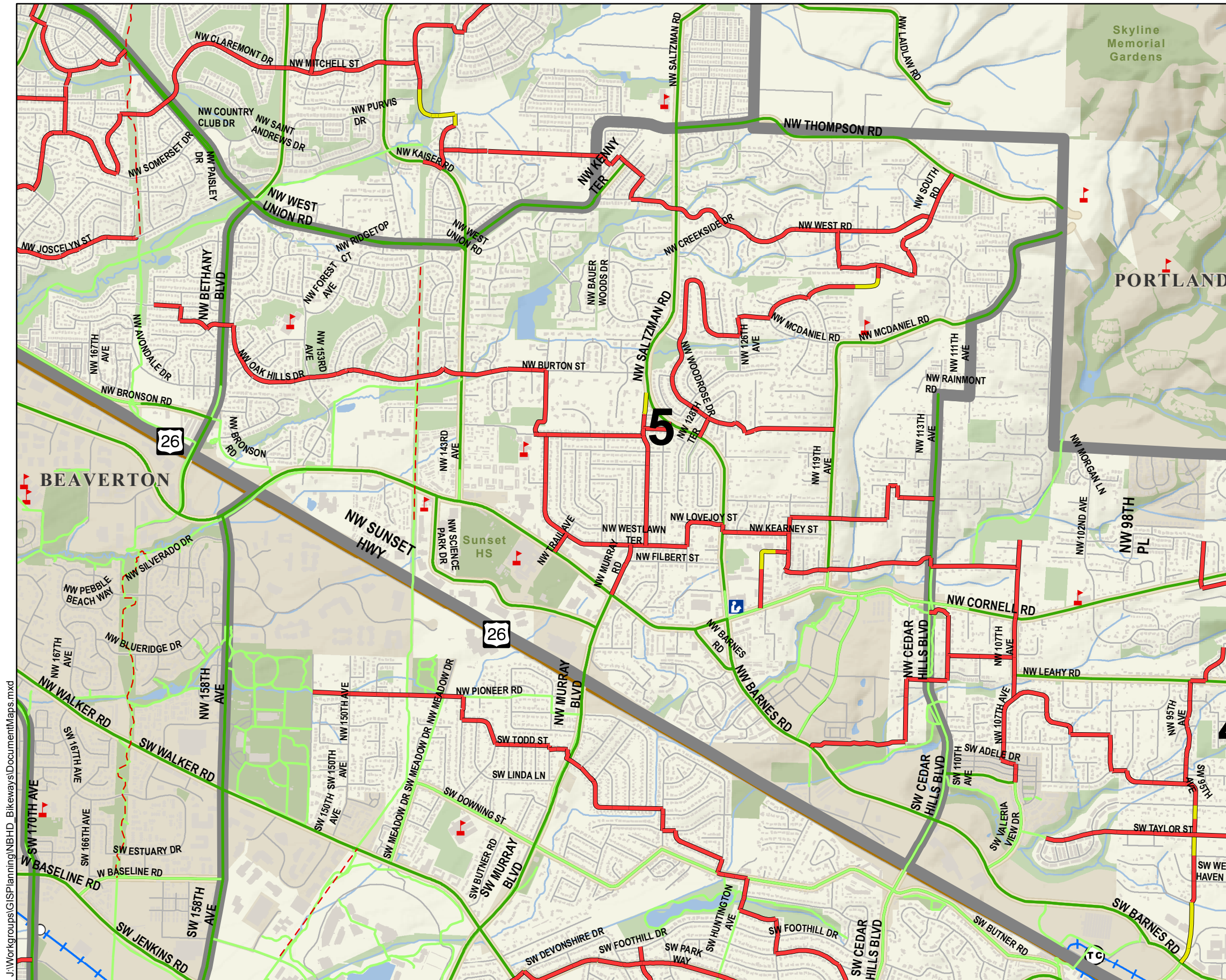
Proposed Neighborhood Bikeways

- Existing Segment
- Missing Segment
- County Bikeway (Existing or Planned)
- City Bike/Walkway (Existing or Planned)
- Subarea Boundary
- School



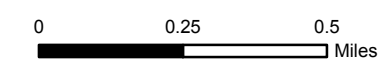
Disclaimer:
 The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

Proposed Neighborhood Bikeways Subarea 5



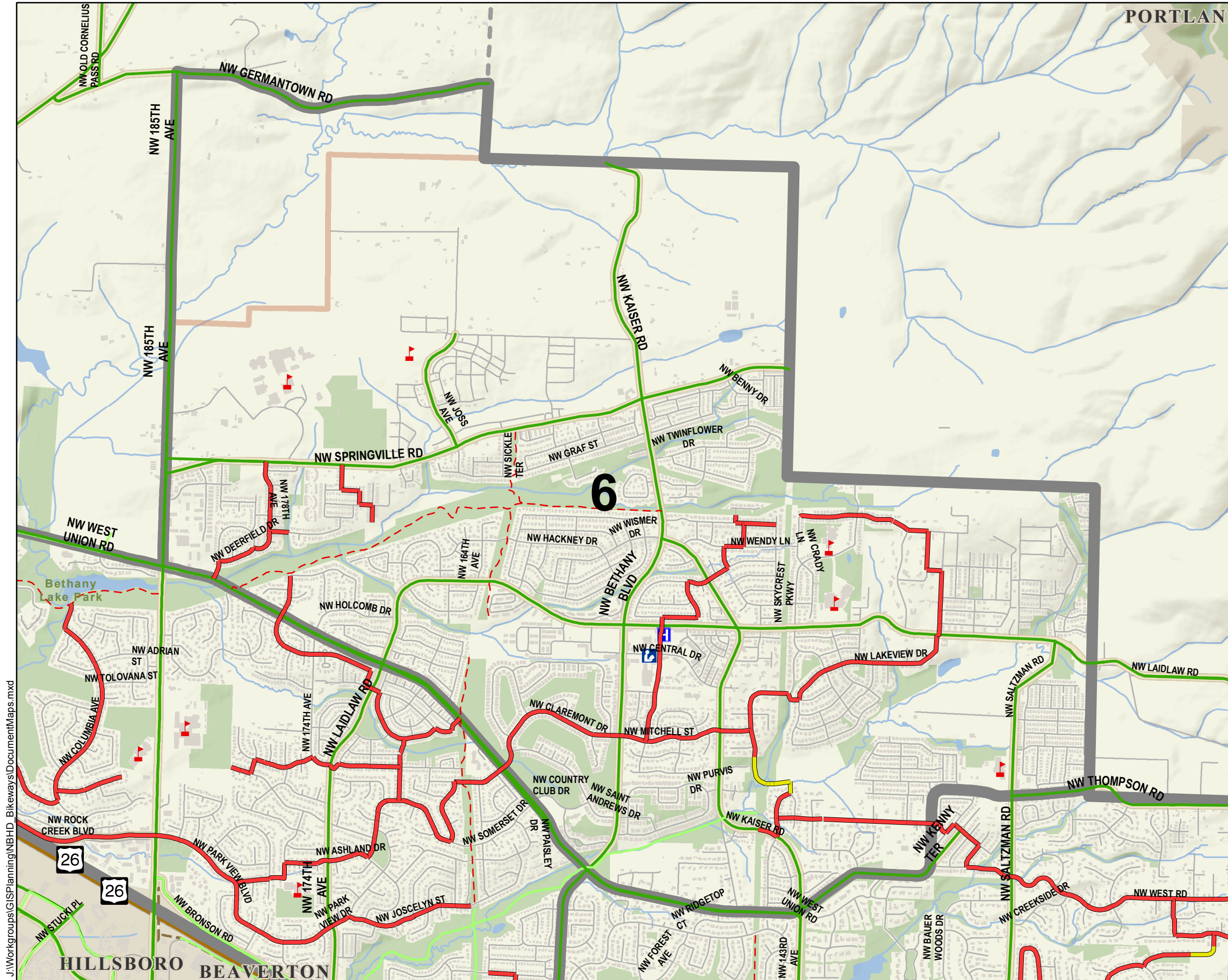
Proposed Neighborhood Bikeways

- Existing Segment
- Missing Segment
- - - Trail (Existing)
- County Bikeway (Existing or Planned)
- City Bike/Walkway (Existing or Planned)
- Subarea Boundary
- ▲ School










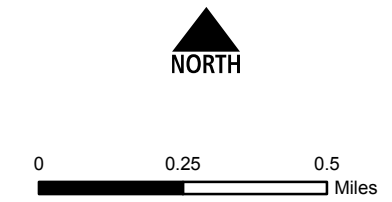
Disclaimer:
 The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

Proposed Neighborhood Bikeways Subarea 6



Proposed Neighborhood Bikeways

-  Existing Segment
-  Missing Segment
-  Trail (Existing)
-  County Bikeway (Existing or Planned)
-  City Bike/Walkway (Existing or Planned)
-  Subarea Boundary
-  School



Disclaimer:
 The information on this map was derived from digital databases on Washington County's Geographic Information System (GIS). Care was taken in the creation of this map, however, Washington County cannot accept any responsibility for errors, omissions, or positional accuracy. Therefore there are no warranties which accompany this product. Notification of any errors will be appreciated.

Appendix B: Gaps and Barriers Assessment

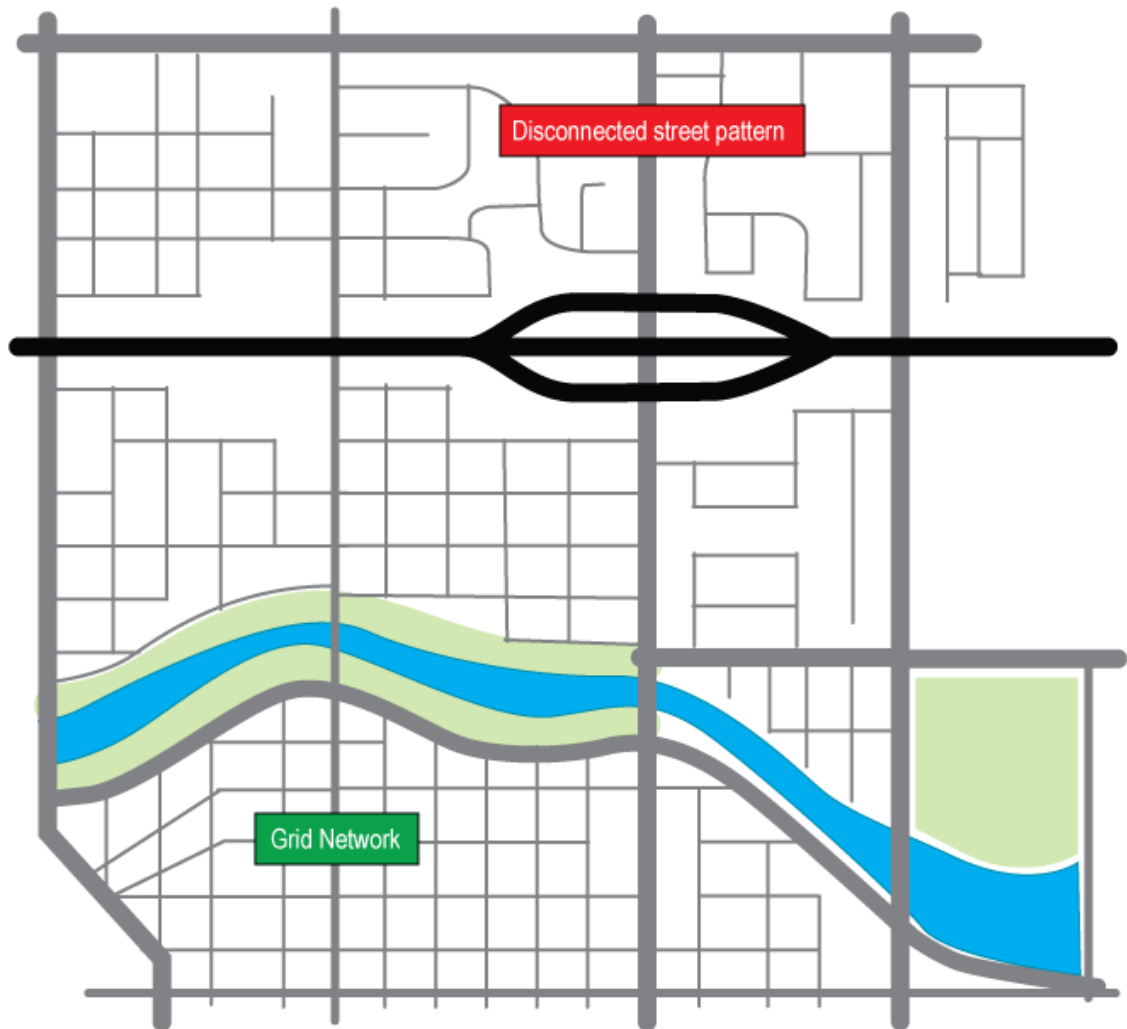
Gaps and Barriers Assessment

This section identifies general challenges for the development and implementation of a Neighborhood Bikeway network in Washington County. Each problem is followed by potential strategies to mitigate the identified gap or barrier. Where appropriate, information about the known constraint(s) of this strategy is provided.

Street Connectivity

A disconnected street pattern, common in suburban contexts, limits route options for all roadway users. Fewer route choices, due to lower street and intersection densities, means that there are decreased opportunities for individuals to use low-stress streets to reach their destination. In general, the routes that *do* connect to key destinations (e.g. commercial centers, schools, and parks) are on higher order streets with greater motor vehicle volumes and speeds. Traveling these higher order streets on foot or by bike does not feel safe or comfortable for many individuals, and therefore these streets are generally unsuitable for Neighborhood Bikeways.

A second symptom of a disconnected street network is that street connections are often indirect. Traveling to an adjacent neighborhood, a local park, or a commercial area may be a short distance “as the crow flies”, but taking the existing street network will lead to longer travel times due to out-of-direction travel. Since active transportation modes are self-powered, out-of-direction travel places a disproportionate burden on people walking and biking.



The disconnected street pattern in the suburban context creates unique challenges for Neighborhood Bikeway development.

Strategies that improve connectivity

Accessways

The disconnected street network in the suburban context can be augmented through the use of accessways. Accessways are often found at the ends of cul-de-sacs or other dead end streets and can provide an active transportation connection where no roadway exists. The majority of accessways in the county are publicly accessible and available for use though some may be overgrown. Due to absent or inadequate signing and marking, many accessways remain hidden from public view and are used mostly by nearby residents. Through better wayfinding, accessways could become an integral part of a future Neighborhood Bikeway network.

- *Constraint:* Existing accessways may be too narrow, not look formal, or be otherwise unpleasant to use. Actual access may be poor if curb ramps do not exist

to allow bicyclists and other users to transition to street level. Though the County's existing guidance for accessways provides width, landscaping, lighting, and curb ramp design recommendations, the existing accessways do not always conform to this guidance. Many accessways require design retrofits, or minor improvements, to provide an optimal walking and biking experience aligned with the goals of a Neighborhood Bikeway network.

Paper Streets

The County possesses a number of unimproved right-of-ways, commonly referred to as "paper streets," that present a unique opportunity for enhanced connectivity of the local road network for bicycle and pedestrian travel. The condition of existing paper streets varies considerably; some include local resident developed paths (e.g. dirt paths, sawdust trails, gravel), while others remain unattended and overgrown. Paper streets that can fill in a gap in the bicycle and pedestrian network and connect users to important destinations, or regional trails, are important to consider for development as Neighborhood Bikeways. Since the County already possesses the necessary rights-of-way, no costly easement acquisitions are necessary to establish these connections.

- *Constraint:* Some adjacent property owners may be concerned about the development of a paper street into an active transportation connection. Public outreach will be necessary to alleviate concerns about vandalism, property values, and privacy.
- *Constraint:* Paper streets are planned street developments or street extensions. Their development into a facility that only serves active transportation users could have implications at the county level for both transportation planning and maintenance.

Trails

There are a number of regional, local, and community trails in the county that can be incorporated into the Neighborhood Bikeway network. Trails provide a low-stress active transportation environment that is attractive to Neighborhood Bikeway users. Wayfinding, enhanced crossing locations, and ADA accessible transitions to trails from on-street bikeways are necessary to accommodate all pedestrians and bicyclists.

- *Constraint:* Washington County's Land Use and Transportation Department does not manage the maintenance and development of trails. Coordination with parks districts and/or local jurisdictions' parks departments would be required to adopt existing/planned trails into the Neighborhood Bikeway network.
- *Constraint:* Retrofits may be necessary for trails that have been identified as potential Neighborhood Bikeway links where the existing design does not meet the minimum multi-use off-street path standards outlined in the Washington County Bicycle Design Toolkit. Many existing trails may be unpaved and of insufficient width to comfortably accommodate bicyclists and pedestrians.

Underutilized Collector Roadways

In general, Collector roadways provide more direct connections than Local or Neighborhood streets. In Washington County there are a number of Collector roadways that do not carry high volumes of motor vehicle traffic and where speeds are relatively low. With appropriate traffic calming, pavement markings, and signage, these streets are potential Neighborhood Bikeway routes. The process outlined in the 'Neighborhood Bikeway Routing' Chapter will help identify these streets.

Active Transportation Connections and Transitions

Where active transportation facilities exist, such as on-street bikeways and trails, it is sometimes hard to see from the end of one segment to the beginning of the next. Lack of clear directional cues and continuous routes decreases the overall usability of the network. People walking and biking are likely to get confused, choose a suboptimal travel route, or both. Moreover, where routes terminate prematurely, or without warning, and fail to direct users to the next leg of their route, fewer individuals will choose to walk or bike.

Strategies to Improve Navigation

Wayfinding

The intent of wayfinding is to help active transportation users navigate turns and transitions between facilities along the designated route. A Neighborhood Bikeway is not necessarily *always* on-street. Some routes may connect with a multi-use path through a park and return on the other side to a low-stress local street. In other instances it may be necessary to route active transportation users onto a more protected bikeway, such as a cycle track or buffered bike lane, where the Neighborhood Bikeway is forced to utilize a connection on a higher order street. To improve the legibility of the network, wayfinding signage and pavement markings should be used at all decision points along a route and locations where a transition between two different facilities occurs.

- *Constraint:* Sign clutter, where many signs are in close proximity, can have the effect of hiding important information from users. This occurs because the human eye becomes overwhelmed by the surplus of information and, as a result, retains none of it. Pavement markings are a good alternative strategy for circumventing this issue. Especially for bicyclists, who tend to ride with their eyes scanning the roadway surface for potential hazards, the use of pavement markings to communicate changes in the route is quite effective.

Inconsistency between Jurisdictions

Active transportation connection problems are also exacerbated by inconsistencies between local jurisdictions related to bikeway design, signage, maintenance, and routing. Users are unlikely to notice when they cross a jurisdictional boundary, but could become confused if the transition is not seamless.

Strategies for a Seamless User Experience across Jurisdictions

Trainings

Close coordination between County planning staff and local jurisdictions for the planning and implementation of active transportation facilities will help alleviate problems of inconsistency. The Washington County Bicycle Design Toolkit specifies the preferred bikeway terminology and design guidance for most bikeway facilities and treatments in the County. A county-led 'Bicycle Design Toolkit' training with local jurisdictions would make existing planning efforts at the local level transparent and give all practitioners an opportunity to understand the existing framework provided in the toolkit.

Facility Selection, Signage and Maintenance Standard Practices

Close coordination between County and local agency Public Works and Engineering departments could lead to collaborative strategic decisions about how to choose and maintain new and existing bikeway facilities. There may also be cost savings advantages to working together on contract and procurement efforts for maintenance and signs.

Database Standards

Standards that govern the development and maintenance of an ArcGIS active transportation network geodatabase at each local jurisdiction would also be an asset for the County. If all jurisdictions are collecting the same roadway information and classifying it using the same terminology, it will be easier to compile this information for benchmarking progress, making routing decisions or updating the inventory.

Lack of Wayfinding

Wayfinding signage provides active transportation users with valuable travel information, including direction, travel distance, and often estimated travel time. Signs help people reach destinations via optimal routes, with minimal uncertainty. The lack of wayfinding in Washington County limits the number of people who know how to access local destinations (e.g. parks, schools, and commercial centers) using low-stress routes, trails, and on-street bikeways, where they exist.

Strategy

Develop Wayfinding Standards

Wayfinding is one of the most critical components of a Neighborhood Bikeway system. The County possesses general design guidance about the use of wayfinding signage in the Bicycle Design Toolkit, but the development of specific language governing the design and placement of wayfinding signs and pavement markings would be an asset for the

Neighborhood Bikeway network. Wayfinding helps break down barriers to using active transportation by providing useful information to individuals on route choices, estimated travel time, and distance. By eliminating much of the “guess work” out of traveling by foot, or by bike, choosing either mode for utilitarian trips is made easier. Detailed information on wayfinding standards and best practices is found in the NACTO Urban Bikeway Design Guide and the IBPI Bicycle Boulevard Planning and Design Guidebook.

The use of wayfinding as a branding tool is also an important consideration. Establishing a unique style of wayfinding signage that will clearly differentiate Washington County’s Neighborhood Bikeways from other kinds of facilities will improve the visibility of the network as a whole. Unique branding will also help users navigate transitions between facilities better. For example, if an on-street Neighborhood Bikeway transitions to an existing multi-use path the path may already have a sign identifying it as such. However, a second sign of a differing color and/or shape will allow users to quickly identify the route as being part of the Neighborhood Bikeway network. The unique branding allows existing facilities to more easily serve a dual purpose. The FHWA will allow for experimentation with bicycle wayfinding signage if an application is submitted and the new device is evaluated for its performance.

- *Constraint:* The Oregon Supplement to the MUTCD specifies the design dimensions, color, and information that bicycle wayfinding signage should include. If an FHWA request to experiment with new wayfinding is not filed, the guidance in the Oregon MUTCD must be used.
- *Constraint:* The Neighborhood Bikeway corridor should be long enough to warrant having its own unique name/identity.

Lack of Bike Routes to Major Employers and Transit Stations

The lack of low-stress walking and biking routes connecting residents to local employers and transit facilities reduces the likelihood of people in Washington County using active transportation for their work commute trip.

Strategy for connecting Neighborhood Bikeways to Employment and Transit

Routing Analysis

Major employers and transit centers should be ranked appropriately as active transportation trip attractors during the Neighborhood Bikeway routing analysis. This will help to prioritize the development of Neighborhood Bikeway routes that connect individuals to these destinations.

Lack of Knowledge about Active Transportation Routes

Among the public, there is not a high level of awareness of existing local on-street active transportation connections, trail connections, or the length of time required to walk or bike between typical origins and destinations.

Strategies for Increasing Awareness of Active Transportation

Marketing Campaign

Actively marketing the active transportation network, not just Neighborhood Bikeways, will help raise awareness of walking and bicycling in the county. See the ‘Marketing and Branding’ chapter for more detailed information on marketing strategies.

Wayfinding Signage

A uniquely branded wayfinding system can be attractive to users and also convey to drivers that they are on a street where people walking and bicycling are a priority. See ‘Develop Wayfinding Standards’ above.

Existing Bikeways Do Not Encourage “Interested, but Concerned”

The “Interested, but Concerned” bike user includes a wide range of people of all ages who enjoy bicycling occasionally, but may only ride on multi-use paths, protected on-street facilities, or low traffic local streets. The majority of the population falls into this category. The focus on bikeway development in Washington County has historically been oriented toward bike lanes on major roadways. These facilities are not comfortable for the types of users that Washington County hopes to encourage to travel on foot, or by bike, more frequently.

Strategies for Attracting All User Types

Neighborhood Bikeway Development

There are many roads in Washington County that can be optimized to serve bicyclists with minimal improvements. The development of a network of low-stress facilities that utilize low traffic volume and low speed local streets, existing multi-use paths and accessways will allow a greater number of people to comfortably choose walking and biking to meet their travel needs.

Protected Bikeway Development

Protected bikeways, such as cycle tracks and buffered bike lanes, increase the physical space between motor vehicle traffic and bicyclists. These facilities appeal to a wider range of bicycle users than a conventional bike lane. For Neighborhood Bikeways to be continuous routes it will sometimes be necessary to route users for a short time onto streets with higher volumes and speeds. Where this condition occurs a protected bikeway should be considered, even if there is an existing bike lane or shoulder bikeway. Special emphasis should be placed on safely getting bicyclists across major roadways (see ‘Neighborhood Bikeway Tools’ for a more detailed discussion of intersection crossings).

User Perceived Safety Barriers

Walking and biking, in any land use context, may be perceived as unsafe or uncomfortable by potential users. Most often these perceived safety barriers are related to the proximity to, or presence of motor vehicles. A lack of marked crossings across major roadways is a major barrier affecting both pedestrians and bicyclists. Similarly, the amount of space, or buffer, between walking and biking facilities and fast-moving motor vehicle traffic can have a significant impact on the level of comfort people feel—more separation equates to increased comfort. Concern about personal safety, in terms of criminal activity and the threat of collisions with motor vehicles, is another cited reason to eschew active transportation.

Strategies to Address User Concerns about Safety

Public Outreach

Many of the personal safety concerns that people have about choosing walking and biking for transportation may be adequately addressed during a public outreach process. Significant public outreach will be part of any Neighborhood Bikeway implementation project and residents, neighbors, and any other concerned citizens will have the opportunity to discuss safety issues. On a larger scale, increased marketing of low-stress bikeways will help to alleviate general fears and skepticism about using active transportation. The ‘Marketing and Branding’ chapter provides additional detail about marketing the Neighborhood Bikeway network.

Low-Stress Bikeway Development

Streets with low traffic volumes and speeds are pleasant places to walk and bike. As more streets are developed into comfortable Neighborhood Bikeways, the user experience will improve.

Crossings of Major Streets

Even with marked crossings, some roads feel too uncomfortable for the average user to cross on foot or by bike. For example, in Washington County, pedestrians and bicyclists must sometimes face crossing 5-lane arterials devoid of features, such as mid-block crossings, median refuge islands or rectangular rapid flash beacons. It is inevitable that Neighborhood Bikeways will need to cross these same roadways.

Strategies to Improve Crossings

Identify Difficult Intersections

Where proposed Neighborhood Bikeways cross major roadways these intersections should be slated for crossing enhancements. The ArcGIS Network Routing model that is

described in the ‘Neighborhood Bikeway Routing’ chapter will help identify these intersections.

Utilize Existing Crossing Design Guidance

Both the Washington County Bicycle Facility Design Toolkit and the Mid-Block Crossing Policy can help identify the specific design needs of the intersection to make it comfortable for active transportation users.

Natural Waterways/Wetlands

Where bridge connections across waterways and wetland areas do not exist, the street network will either terminate or circumvent the area, which may cause out-of-direction travel for active transportation users.

Strategies for Crossing Waterways

Undercrossings/Overcrossings

Bicycle and pedestrian bridges can be developed to connect Neighborhood Bikeways across natural waterway and wetland barriers.

- *Constraint:* Overcrossings are often prohibitively expensive. Securing funds for their development can be a long term challenge.

Develop Active Transportation Connections

Active transportation facilities are less impactful on the environment than a typical roadway. In wetland areas it may be possible to develop a raised multi-use path or other environmentally sensitive facility to provide a more direct connection.

- *Constraint:* Development in wetlands triggers many rules and regulations that will need to be carefully addressed throughout the planning and implementation of a facility.

Freeways, Highways, and Railroads

Washington County is bifurcated by several major highways. In general, low-traffic, low-speed streets do not cross highways, which reduces the availability of through-streets. Improving connectivity with the development of additional at-grade crossings can also be challenging because state highways are governed by ODOT and any proposed changes, such as signals or crossings, must be approved at the state level.

Railroads present two challenges to the development of a Neighborhood Bikeway network—limited access and user safety. Similar to highways, most railroad crossings are provided on higher order streets that may not be suitable for Neighborhood Bikeway development. Improving connectivity by adding additional at-grade crossing locations is seldom an option either. Railroads are almost always governed by an outside authority and any proposed changes that would affect rail operations are at their discretion.

Secondly, railroad tracks are frequently the cause of bicycle crashes not involving vehicles, as inexperienced riders can easily get a wheel trapped in the gap between the rail and the roadway surface, or stumble over uneven pavement surfaces. In addition, the small number of legal railroad crossings, such as in the vicinity of Tualatin Valley Highway, can be a barrier for access to the transit and bicycle networks.

Strategies for Crossing Highways and Rail

Signing and Marking at RR Crossings

Signage and pavement markings are commonly used to alert bicyclists to cross railroad tracks at perpendicular angles, even when the maneuver is inconvenient. Where Neighborhood Bikeways cross railroad tracks, steps should be taken to sign and mark these areas appropriately.

Undercrossings/Overcrossings

Bicycle and pedestrian bridges or undercrossings can be developed to connect Neighborhood Bikeways when an on-street protected bikeway is not feasible, or is undesirable. Such bridges could be attractions on their own and serve to heighten awareness of the active transportation network across the county.

Constraint: Overcrossings and undercrossings are expensive and securing funds for their development could be a long-term challenge.

Protected Bikeway Development

At some locations it may be possible to create a protected bikeway that can get active transportation users across the barrier. A cycle track or buffered bike lane can be comfortable and attractive to the average Neighborhood Bikeway user and should be considered whenever the Neighborhood Bikeway must take advantage of a higher volume street to cross a highway.

Eliminate the Gap between Rail and Road Surface

There are existing materials on the market that can fill in the gap between the rails and the roadway surface in a manner that does not impact *low-speed rail function* and that creates a safer environment for bicyclists. This rubber insert maintains a height consistent with roadway grade and then depresses under the weight of a passing train—returning to its original shape once the train has passed.

- *Constraint:* Rubber flangeway filler is not available in a form that can be used on corridors with higher speed rail function needs

Traffic Control at Intersections

Repeated “starting and stopping” impacts bicyclists more than individuals traveling by motor vehicle because of the energy it takes to get rolling again. Travel that is self-powered is more efficient and pleasurable when the amount of stop time along a route is minimal. For this reason, traffic control at intersections is a vital element of planning Neighborhood Bikeways. Bikeway routes on local streets that have frequent stop signs

can lead to bicyclist non-compliance because the constant stopping and starting is cumbersome. On local streets where the right-of-way is not designated by a traffic control device, it can be confusing for all roadway users.

At signalized intersections, a bicycle push button, loop detector, or video detector should always be available to help trigger a green phase for bicyclists or pedestrians. Where this condition is not met, bicyclist compliance with the traffic control will be much lower. For pedestrians at signalized intersections, the duration of time that an individual must wait before receiving a 'walk' signal *and* the amount of time that the 'walk' signal is lit impact the comfort of the pedestrian crossing. Shorter wait times, shorter signal cycles, and ample pedestrian green and clearance time to cross the street help improve the pedestrian and bicyclist experience.

Strategy: Improve User Experience and Compliance with Traffic Control Using Neighborhood Bikeway Intersection Best Practices

The 'Neighborhood Bikeway Tools' Chapter provides more details about the intersection design needs along Neighborhood Bikeways. The Washington County Bicycle Design Toolkit also provides design guidance to help make intersections function better for bicyclists.

Challenging Topography

Areas that have steep terrain (10% or above) can be particularly onerous for many utilitarian bicyclists. The Tualatin Mountains and the vicinity of Cooper Mountain are two locations with challenging topography. There is little to be done to reduce grades.

Strategy: Identify Alternate Routes

When planning routes in these areas, efforts should be made to identify through streets that have the most gradual grades, while still connecting to important destinations. This may require some out-of-direction travel for bicyclists.

Traffic Calming Development

The current process for developing traffic calming on Washington County streets is handled via the Neighborhood Streets Program (NSP). This program allows residents to apply to have their street evaluated for potential traffic calming enhancements. However, this process relies on votes by the neighborhood to implement physical roadway traffic calming elements. This process could conflict with the Neighborhood Bikeway development process.

Strategy: New Traffic Calming Development Process

Create new thresholds and a new process for implementation of traffic calming for Neighborhood Bikeways that is different from the NSP. Traffic calming treatments that are available through the Neighborhood Bikeway Plan should be consistent with the treatments in the NSP and policy agreements with Tualatin Valley Fire and Rescue.

Impact to Travel Patterns

Driver preference or traffic calming strategies may cause motorists to change their routes following a Neighborhood Bikeway installation. Though the intent of a Neighborhood Bikeway is to improve the environment to support active transportation, volume reduction strategies in suburban contexts can significantly impact motor vehicle operations. The lower street connectivity in Washington County means that all roadway users have fewer route choices. Eliminating access for motor vehicles on a designated route could cause some motorists to travel a significant distance before reaching an alternative street that can get them to their destination. Conversely, on a grid street network, restricting access to a corridor will only cause the motorist to travel a city block before returning to a route that can get them to their destination.

Strategy to Minimize Motor Vehicle Diversion

Engineering Analysis

Traffic engineers should examine the potential traffic impact to motor vehicles on proposed routes and nearby routes where plans identify possible restrictions of motor vehicle access.

- *Constraint:* Making it difficult to restrict motor vehicle access may make it more difficult to achieve appropriate traffic volume reductions on Neighborhood Bikeways.

The matrices below summarize the identified gaps and barriers, along with the strategies that may be used to mitigate these issues.

CHALLENGES STRATEGIES	Street Connectivity	Active Transportation Connections and Transitions	Inconsistency Between Jurisdictions	Lack of Wayfinding	Lack of Bike Routes to Major Employers and Transit Stations	Lack of Knowledge about Active Transportation Routes	Existing Bikeway Facilities Do Not Encourage 'Type C' Users
Accessways	●						
Paper Streets	●						
Trails	●						
Underutilized Collector Roadways	●						
Wayfinding		●		●		●	
Trainings			●				
Facility Selection			●				
Agency Collaboration			●				
Database Standards			●				
Routing Analysis					●		
Marketing Campaign						●	
Neighborhood Bikeway Development							●
Protected Bikeway Development							●

CHALLENGES STRATEGIES	User Perceived Safety Barriers	Crossings of Major Streets	Natural Waterways/ Wetlands	Freeways, Highways, and Railroads	Traffic Control at Intersections	Challenging Topography	Traffic Calming Development	Impact to Travel Patterns
Public Outreach	●							
Low-Stress Bikeway Development	●							
Identify Unsafe Intersections		●						
Utilize Existing Crossing Design Guidance		●						
Undercrossings/ Overcrossings			●	●				
Develop Active Transportation Connections			●					
Protected Bikeway Development				●				
Appropriate Signing and Marking at RR Crossings				●				
Eliminate the Gap Between Rail and Road Surface				●				
Neighborhood Bikeway Intersection Best Practices					●			
Identify Alternative Routes						●		
New Traffic Calming Development Process							●	
Engineering Analysis								●

Appendix C: Routing Methodology

Neighborhood bikeway routing in the suburban context has different requirements than in urban areas because of the relative lack of through streets with low speeds and traffic volumes. Washington County approached routing neighborhood bikeways based on best practices and a network routing methodology modified for use in the suburban context. Best practices indicate that a successful neighborhood bikeway in Washington County should generally:

- Be logical and devoid of excessive out-of-direction travel. However, neighborhood bikeway routes should always sacrifice speed and directness for a more comfortable experience
- Avoid higher speed and volume roads wherever possible, and where jogs in the route require riding on higher order streets, protected bikeway facilities should be required
- Connect people to the places they want to go (e.g. libraries, schools, parks, cultural centers, etc.)
- Complement and provide a seamless connection to existing on-street and off-street bikeways, improving the overall usability of the bikeway network for transportation purposes.

Based on these best practices, the County employed the following methodology for identifying a neighborhood bikeway network.

In Step 1, the County identified and ranked community destinations that would attract bicycle trips.

In Step 2, the County identified examined relevant attributes for neighborhood bikeway routing using maps and GIS tools. These attributes include road classifications, bike networks in neighboring jurisdictions, accessways and paper streets, traffic calming features, mid-block crossings, transit routes, traffic signals and, as in step 1, possible destinations.

In Step 3, the County identified potential routes by evaluating relevant attributes, network gaps, and community input. Using these attributes, possible routes were identified that were judged to connect residents with destinations and the wider bicycle network. At least two neighborhood bikeways were included in each sub-area except Area 1.

In Step 4, the County evaluated potential neighborhood bikeways using several factors and using GIS analysis. The County actively solicited initial feedback on the routes from the TAC members, County staff, and other agencies. Changes to the proposed routes based on their feedback were made before presenting the routes to the public. The public was asked to review the routes, which were posted on the County's website for comment. In addition, bikeway network maps were presented to Citizen Participation Organizations (CPOs) and other community groups. Feedback was analyzed and used to refine the proposed neighborhood bikeway routes to the recommended network.

Step 1: Identify and Rank Attractors/Destinations

A good neighborhood bikeway network connects people to the places they want to go. Network planning in an urban area might focus more on the density of bikeways; however in the suburban context, the focus is on the ability of the facility to move active transportation users between the places they would like to go. A list of community destinations was generated based on common trip destinations for residents. The list was narrowed down to 16 destination types that would be more likely trip attractions for bicyclists. Since some destinations attract more trips than others, a weighting system was devised.

Rank Key Attractors/Destinations

A good neighborhood bikeway network connects people to the places they want to go. Where neighborhood bikeway planning in an urban area might focus more on the density of bikeways, in the suburban context the focus is on the ability of the facility to move active transportation users between the places they would like to go.

Some attractors strongly influence the number of active transportation trips. To help model the effect that each type of attractor has on potential biking and walking trips, destinations can be assigned a factor score based on relative potential to generate active transportation trips. The individual factors can be modeled to demonstrate the “pull” of areas with high and low concentrations of attractors. In general, neighborhood parks, schools, cultural centers, and libraries have the greatest attraction for users of the bikeway network. By identifying and ranking the different attractors in the county, neighborhood bikeway routes can be identified and prioritized based on the level of access they provide.

Possible destinations were identified based on four sources:

1. Metro’s Active Transportation Plan, which examines regional destinations.¹
2. A Portland-based and peer-reviewed study of neighborhood bikeability and local destinations.²
3. Destinations identified in a suitability analysis as part of Washington County’s Bicycle and Pedestrian Improvement Prioritization Project, conducted in 2012.³
4. 2012 North American Industry Classification System (NAICS) codes, which provides classifications and definitions for all business establishments.⁴

¹ Metro Active Transportation Plan, Existing Conditions, Findings and Opportunities Report, August 2012.

² McNeil, Nathan, 2011. Bikeability and the 20-min Neighborhood How Infrastructure and Destinations Influence Bicycle Accessibility. Transportation Research Record: Journal of the Transportation Research Board, No. 2247, pp. 53–63.

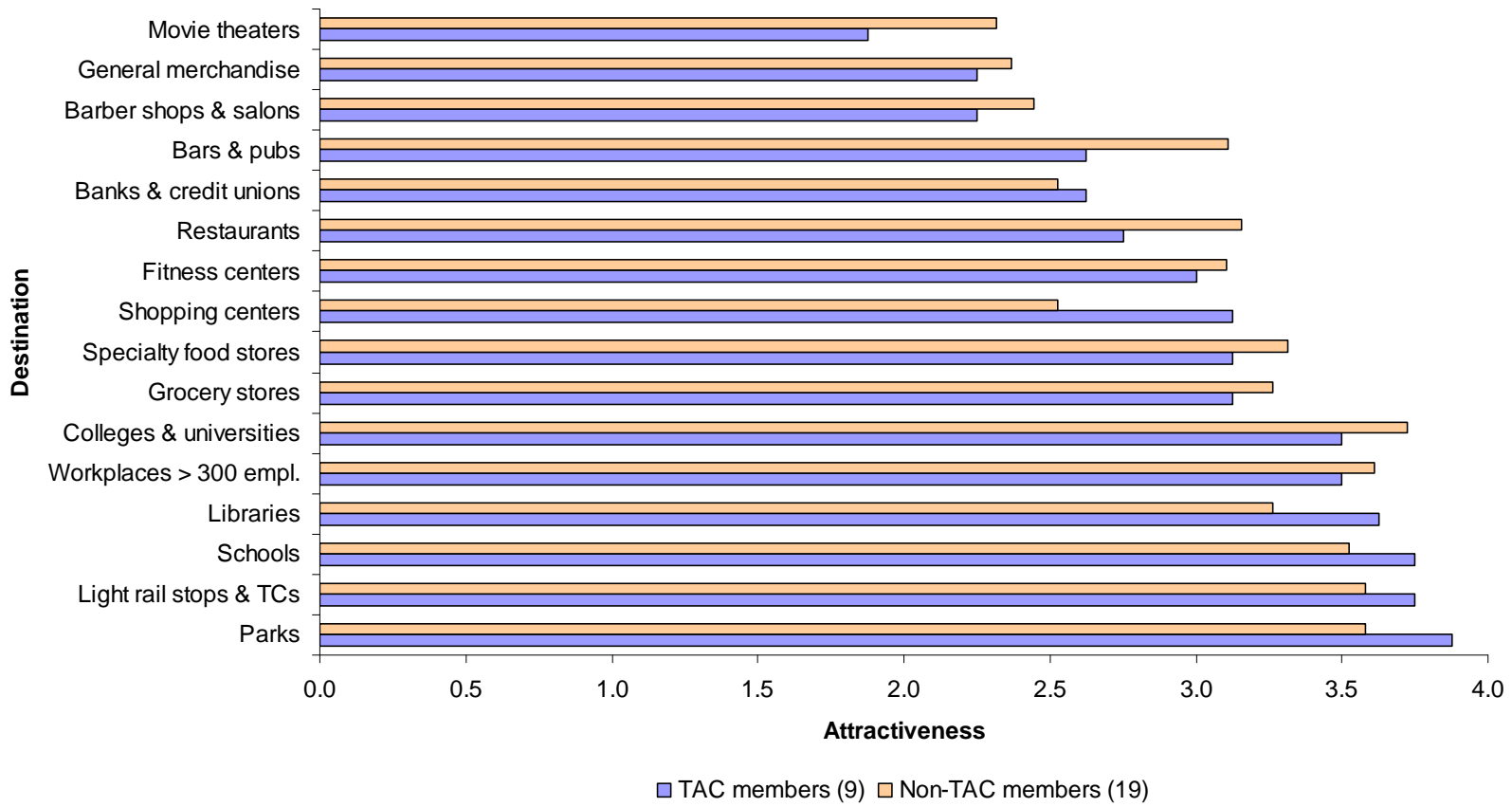
³ Washington County, 2012. Bicycle and Pedestrian Improvement Prioritization Project. <http://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/PlanningPrograms/TransportationPlanning/bikeandped/suitability-mapping.cfm>.

U.S. Census, 2014. ⁴ North American Industry Classification System. <http://www.census.gov/eos/www/naics/>.

Possible destination types and NAICS codes

Destination/NAICS Title	NAICS Code
Nature Parks and Other Similar Institutions	71219
Elementary and Secondary Schools	61111
Colleges, Universities, and Professional Schools	61131
Libraries and Archives	51912
Grocery Stores	4451
Light Rail Stops and Transit Centers	NA
Employment Sites with >300 Employees	NA
Shopping Centers	NA
Specialty Food Stores	4452
General Merchandise Store	452
Fitness and Recreational Sports Centers	713940
Restaurants and Other Eating Places	72251
Barber Shops	812111
Beauty Salons	812112
Commercial Banking	52211
Savings Institutions	52212
Credit Unions	52213
Postal Service	4911
Drinking Places (Alcoholic Beverages)	7224
Motion Picture Theaters (except Drive-Ins)	512131

A list was narrowed down to 16 destination types that would be likely trip attractions for neighborhood bikeway users. Since some destinations attract more trips than others, a weighting system was devised. We surveyed TAC members about the relative strength of different destinations in attracting trips on neighborhood bikeways. For each destination, respondents were asked to rate the amount of bike trips likely to be made using neighborhood bikeways on a scale from “none” to “a lot.” Twenty-nine responses were received and roughly one-third (10) of these were from TAC members. The figure below summarizes responses among both TAC and non-TAC members.



Destination ranking survey results

Based on the survey results, a weighting system was applied that accounts for the level attractiveness of each destination type. The table below shows this scheme.

Final destination list and weighting scheme

Low	Medium	High
Parks	Shopping centers	Bars & pubs
Light rail stops + transit centers	Fitness centers	Barber shops
Schools	Restaurants	Beauty salons
Libraries	Banks	General merchandise
Workplaces > 300 employees	Savings institutions	Movie theaters
Colleges + universities	Credit unions	
Specialty food stores		

A heat map of these destinations, based on their location and weighting, is shown in Appendix A.

Step 2: Map Existing Network

In Step 2, the County examined relevant attributes, network gaps, and community input for neighborhood bikeway routing using maps and GIS tools. These attributes include:

- Road classifications
- Bikeways in neighboring jurisdictions
- Accessways
- Unimproved road right-of-way (paper streets)
- Multi-use trails
- Traffic calming features
- Traffic signals and mid-block crossings
- Transit routes
- Community-identified routes
- Existing inventory/gaps in bicycle network
- Roadway slope/grade

A description of candidate streets and non-candidate streets follows.

Candidate Streets

Local and Neighborhood Streets

In general, roadways that have been classified as a Local or Neighborhood street are all candidates for neighborhood bikeway treatment. Some of the streets may already be identified as existing or proposed neighborhood bikeways by a local jurisdiction. All streets that have been identified by local jurisdictions, as well as those local streets that serve important destinations and fill gaps, should be included in the pool of potential neighborhood bikeway routes.

Collector streets with traffic volumes near 3,000 vpd and 30 mph or less

The County and other jurisdictions regularly collect motor vehicle traffic speed and volume data for Collector and Arterial roadways. Not every roadway will have speed and volume data associated with it, but this information is helpful when available. For example, this data is also collected on Local and Neighborhood roadways when a request is submitted for traffic calming. Collector streets with traffic volumes near 3,000 vpd and speeds of 30 mph or less should be added to the pool of potential neighborhood bikeway routes. These streets are often more direct than adjacent Local streets. They also have the potential to be traffic calmed to create a comfortable active transportation environment.

Self-Identified Bicycling Routes

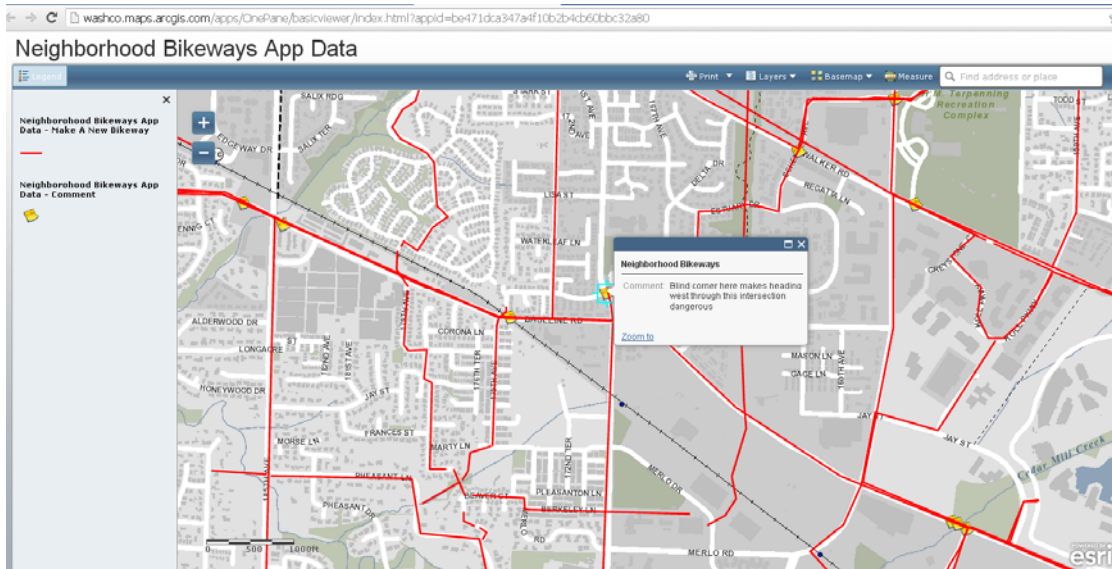
The County collected data on routes that bicyclists say they currently use, or would like to see improved. Neighborhood routes were collected using an online mapping tool from October to December 2013. Participants visiting the site were able to draw lines on a map to identify routes, as well as drop notes at locations they have identified as opportunities or constraints. The app was publicized via the county's email list and bike/ped webpage, and two major local websites (BikePortland.org⁵ and OregonLive.com⁶) published stories on the effort. 513 routes and 148 comments were recorded by the app over the three month period.

In addition, comments on the BikePortland.org story were reviewed. Comments included:

- "There are lots of great paths through the cul-de-sacs. Often they're quite narrow, frequently unkempt, and poorly lit. Hopefully some more lights, better signs, and perhaps a bit better tree trimming will help more people find them." - Andrew Seger September 10, 2013
- "Inevitably in Beaverton, Tigard or points west, the residential routes dump you on a major street and you are trapped... We spend more time on our phones trying to find a more pleasant way to get places... because of the cul-de-sac nature of the neighborhoods then we do riding... It reminds me of what I grew up in, but I was a teenager then and had time to investigate every little turn and swerve to find the safe escape from one neighborhood to another." - Terry D September 10, 2013

⁵ Andersen, M., 2013. "Washington County seeks input on 'Neighborhood bikeway' routes." September 9, 2013. <http://bikeportland.org/2013/09/09/washington-county-seeks-input-on-neighborhood-bikeway-routes-93707>.

⁶ Hudson, C., 2013. "Washington County's Neighborhood Bikeway Plan seeks public comment." October 31, 2013. http://www.oregonlive.com/washingtoncounty/index.ssf/2013/10/washington_countys_neighborhood.html.



Screenshot of neighborhood route mapping app

County GIS staff processed the app data to use as one of several sources of info in selecting and prioritizing potential neighborhood bikeway routes. Routes entered on arterials or outside the study boundaries and other obvious non-candidates for neighborhood bikeways were filtered out. Routes and comments were used to better understand how which local and neighborhood streets people currently ride on and issues with particular sites.

Existing Accessways and Paper Streets

Accessways and paper streets are unique assets. All known accessways and paper streets that help fill a gap, or provide a potential connection to a key destination should be added to the pool of potential neighborhood bikeway routes.

Existing Multi-Use Trails

There are a number of local and regional multi-use paths in Washington County that serve both pedestrians and bicyclists. These facilities provide recreational opportunities and also serve a transportation function. Where bicycle supportive trails exist, or where regional bike parkways are planned as off-street trails (Metro ATP), efforts should be made to incorporate these facilities into the larger neighborhood bikeway network. This may be as simple as adding unique neighborhood bikeway signage to the off-street facility and providing smooth and legible connections from the on-street network.

Existing Traffic Calmed Streets

The Neighborhood Streets Program (NSP) works with neighborhoods to improve roadway conditions on local streets through the use of traffic calming. To take advantage of existing resources, these streets should be added to the pool of potential neighborhood bikeways wherever they exist.

Emergency Vehicle Routes

The Tualatin Valley Fire and Rescue (TVFR) have mapped all emergency services routes in the County. Where an identified neighborhood bikeway route is present on one of these routes TVFR should be consulted. This will help avoid creating adverse impacts to their operations.

Non-Candidate Streets

Steep Grades

Grade can be used as a filter to reduce the number of neighborhood bikeway routes under consideration. As mentioned in the 'Gaps and Barriers' section, topography is a serious constraint on utilitarian bicycling. The County has undertaken a slope analysis of its Local and Neighborhood streets. Sections of identified routes that have grades of 10% or greater should be eliminated and alternative route segments should be identified.

Park Pathways

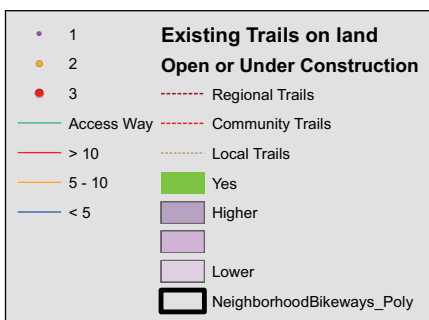
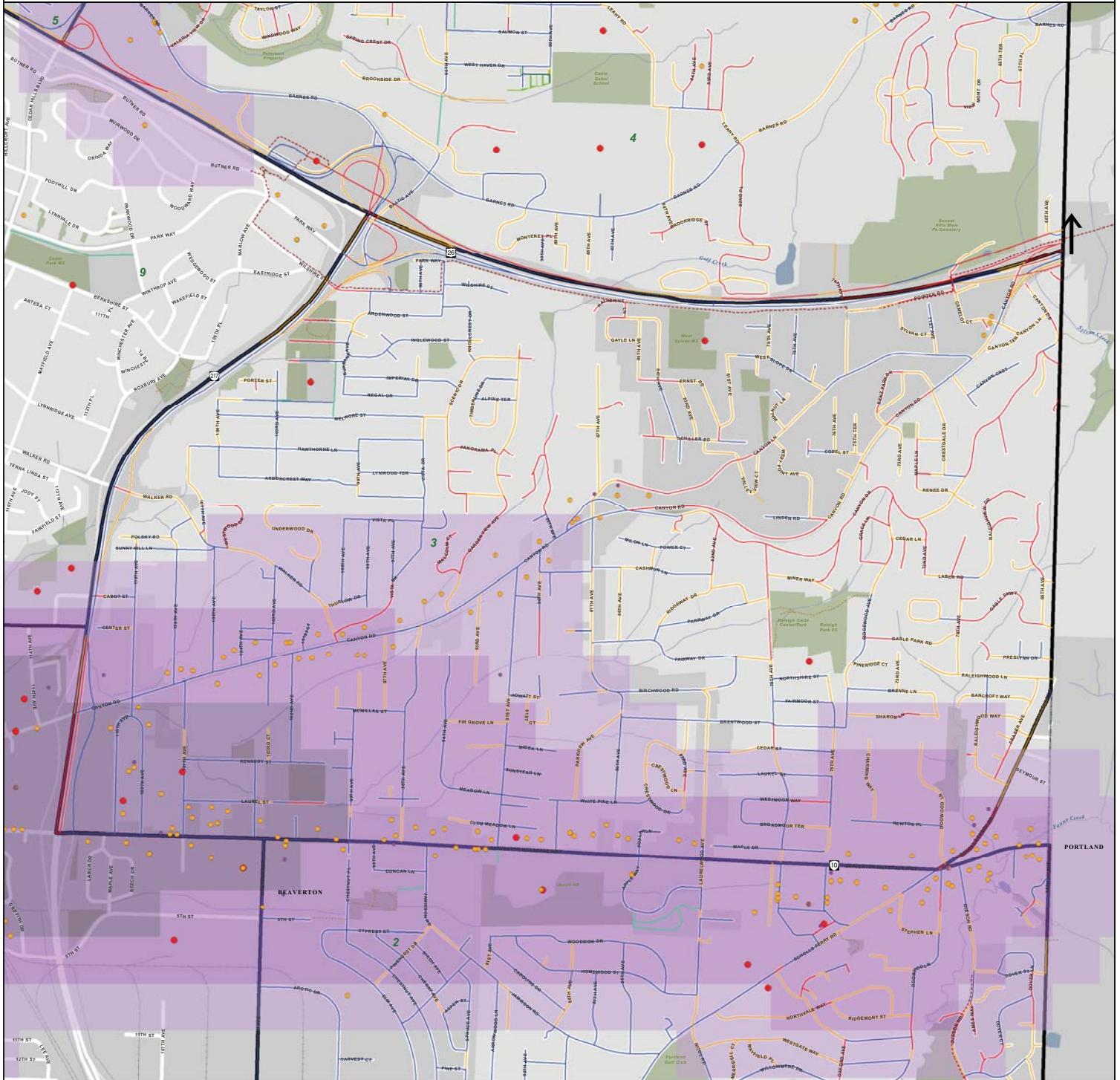
Most paths in parks are not candidates for multi-use trails. Unless trails have been, or are planned to be, improved to accommodate bicyclists these facilities should not be included as potential routes.

The map on the following page is an example of one of the maps generated for use in routing. It highlights destinations and destination densities, road grades, trails and accessways within sub-areas.

Neighborhood Bikeways Routing Subarea 3



0 0.075 0.15 0.3 Miles 1:5,000



Step 3: Identify Potential Neighborhood Bikeways

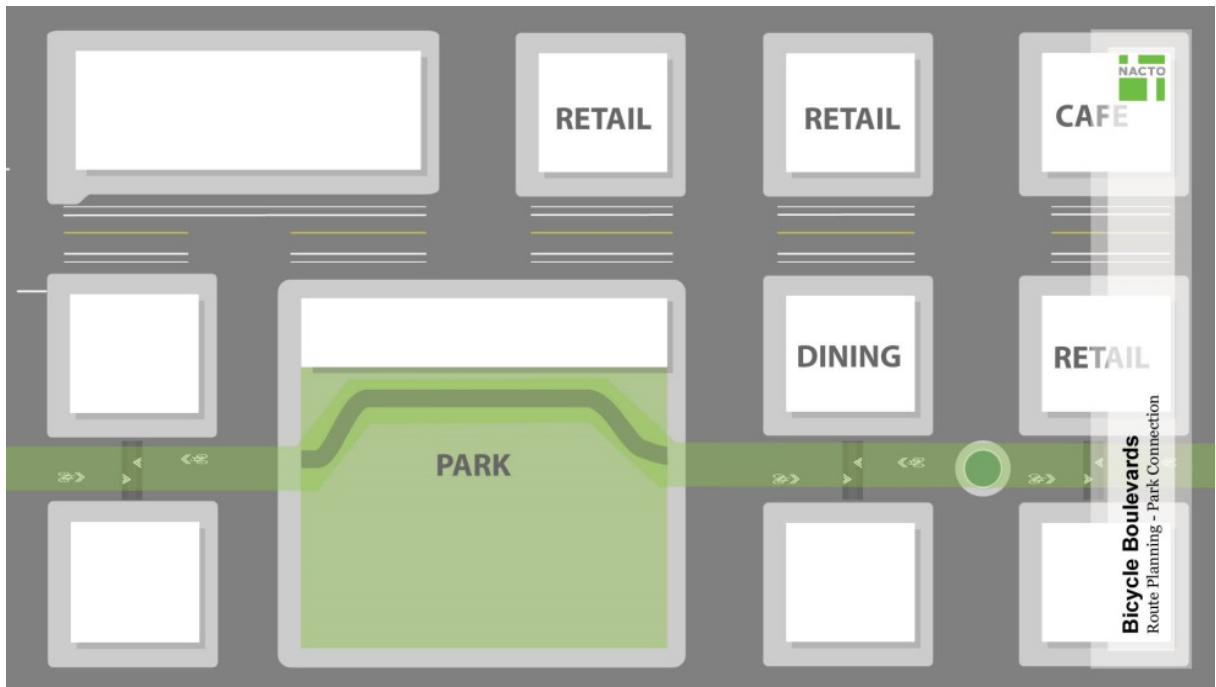
In Step 3, potential routes were identified that were judged to connect residents with destinations and the wider bicycle network. Along with the criteria for “candidate streets” described above, the following guidelines, organized by general themes of directness, connectivity, and safety, were used to identify routes:

Directness

- Make routes reasonably continuous, minimizing jogs
- Acknowledge that there are many great local streets to ride on but not all will be neighborhood bikeways;
- Recognize that not all neighborhood bikeways will get community members to the front door of all their destinations;
- Reference potential routes with the routes identified by the public via a web application;
- Utilize accessways when needed but if equally convenient road is available, use the road;
- Identify potentially useful accessway locations.

Connectivity

- Prioritize connections to destinations rather than spacing to geographic area equally;
- Connect routes to existing multi-use trails, bike lanes, and low-traffic through streets in the County and neighboring jurisdictions;
- Avoid close parallel connections along regional trails;
- Connect routes from adjacent subareas when possible;
- If a neighborhood bikeway route is not possible but destinations need to be served, consider an Enhanced Bikeway on nearby arterial/collector streets.



Neighborhood bikeway routes should take advantage of existing facilities and connect individuals to key destinations (Source: NACTO Urban Bikeway Design Guide)

Comfort and Safety

- Prioritize comfort and safety over directness
- Use local and neighborhood streets before choosing a collector; If choosing a collector, select routes with low traffic volumes (3,000 vehicles per day or less) and low traffic speeds (25 mph or less);
- Take advantage of streets with existing traffic calming
- Avoid or minimize steep hills/grades
- Use signalized crossings where possible, but consider that these locations may need upgrades;
- Suggest new crossing locations where appropriate;
- Avoid truck and bus routes;
- Avoid roads with existing bike lanes.

With data, criteria, and guidelines at hand, study area maps were reviewed and potential routes were discussed. The process of selecting routes was iterative; initial draft maps of potential routes were created for each sub-area, followed by second drafts.

Large portions of routes were examined using Google Maps and the County's Asset Browser, which provide street level photos, aerial views, and other information about the transportation network. Taxlot maps were consulted to understand where current property boundaries and easements may impact sections of potential routes. In addition, site visits were made to examine locations where sufficient information was not available. County staff traveled by bike and car to document conditions in

accessways, parking lots, and in other locations along routes. Information obtained was used to adjust route locations and understand where improvements are necessary.

All together, at least two neighborhood bikeways were included in each sub-area except Area 1. Many of these routes connect across sub-area boundaries. Proposed routes are presented in Appendix A.

Step 4: Assess and Refine Potential Neighborhood Bikeways

In Step 4, the County evaluated potential neighborhood bikeways using several factors and using GIS analysis. The County actively solicited initial feedback on the routes from the TAC members, County staff, and other agencies. Changes to the proposed routes based on their feedback were made before presenting the routes to the public.

The public was asked to review the routes, which were posted on the County's website for comment using a GIS-based mapping app. Over 100 comments were received regarding specific locations, overall routes, and suggestions for additional routes. Neighborhood bikeway network maps were also presented to Citizen Participation Organizations (CPOs) and other community groups. The Bicycle Transportation Alliance, a non-profit local advocacy group, assisted the County by asking its members to test ride the routes and provide comments. The comments were used to add, remove and change proposed routes.

Finally, County staff checked all proposed neighborhood bikeways and route alternatives by bike. This on-the-ground fieldwork was used for a final round of refinements to the proposed neighborhood bikeway routes.

The final proposed network includes 96 miles of neighborhood bikeways covering the majority of areas of Washington County.

Appendix D: Recommended Actions

Recommendations and Action Items:

The following recommendations and action items relate to public outreach and marketing, plan implementation, and project development. Most items are focused on near and mid-term actions the County may consider.

Public Outreach and Marketing

- Generate an information packet that answers the question “what is a neighborhood bikeway?” to be used at meetings, tabling events, and on the County’s website.
- Develop a marketing campaign to inform and educate the public about neighborhood bikeways and benefits of biking/walking. Ensure that the campaign reaches out to those with above average poverty, limited English proficiency, and higher levels of youth and the elderly.
- Explore partnerships to create neighborhood and county-wide bike/walk maps.

Plan Implementation

- Convene a committee, similar to the Minor Betterment Committee, to discuss route prioritization, funding mechanisms, and other key details.
- Explore opportunities for education of pertinent staff regarding neighborhood bikeway concept and potential neighborhood bikeway treatments.
- Identify a potential demonstration project.
- Gain more certainty about how different funding mechanisms will help build neighborhood bikeways.
- Identify a list of at least one neighborhood bikeway in each sub-area that would best serve current needs, based on usage, safety, social equity concerns.
- Identify neighborhood bikeway routes that leverage other upcoming projects such as mid-block crossings or trails.
- Look for opportunities to collect traffic data for proposed routes through other projects or efforts.
- Generate wayfinding signage content guidelines.
- Incorporate network map into TSP or other planning documents.
- Coordinate with cities to connect neighborhood bikeways across jurisdictional boundaries.
- Verify ownership status and conditions of accessways and paper streets.
- Compile list of route crossings of major streets for treatment analysis.

Project Development

- Engage partners in marketing efforts.
- Generate a list of potential resident concerns and responses.
- Expand the County’s website with info on current neighborhood bikeway projects.

Strategies and Route Prioritization

There are many ways to approach prioritizing neighborhood bikeways for implementation. The follow describes some approach strategies that were discussed by the Technical Advisory Committee in the development of the concept plan.

Three broad strategies have been suggested for implementing the neighborhood bikeway network.

- *Approach A:* Construct all routes one sub-area at a time. This creates a completed network in specific neighborhoods making it highly usable for local bicyclists. More routes in an area increases their visibility, raising awareness of neighborhood bikeways among potential users. This approach concentrates resources in one area rather than spreading the benefit over a broader geographic area.
- *Approach B:* Construct one route in each of the sub-areas. This approach provides one project in each sub-area and introduces neighborhood bikeways throughout the county. The routes may not necessarily connect routes across sub-areas.
- *Approach C:* Construct routes that provide connectivity or length across several sub-areas. This approach would introduce some sub-areas to neighborhood bikeways while providing functionality for longer trips. The approach could also overcome barriers bicyclists find in their neighborhoods such as a major street crossing.

The TAC recommended a combination of approaches B and C, whereby the County would construct one route in each of the sub-areas with the goal of providing connectivity across several sub-areas. However, there was general agreement among TAC members that a follow-up committee should be established to discuss route prioritization as funding becomes available.

Upon selection of the best approach, there are a variety of ways to prioritize projects for implementation. Prioritization could be based on:

- Community request and/or level of public support
- Routes that leverage other upcoming projects in the area such as mid-block crossing or trails
- Serving schools with Safe Routes to School Action Plans
- Serving transit centers or stations
- Routes that don't require the most expensive treatments (such as major street crossings or facility enhancements)
- Staff choice of a demonstration project based on estimated cost, feasibility and range of design treatments
- Routes that serve more walking, bicycling, transit dependent areas of the county
- Routes that serve areas with the most gaps or that lack bicycle facilities
- Funding or grant opportunities

In 2012, Washington County completed the Bicycle and Pedestrian Prioritization Project, which compiled an inventory of sidewalk and bicycle lane gaps on urban arterial and collector roadways within the county. This project identified areas where improvements would likely have the highest impact, considering the following factors:

Land Use: Population density, proximity to transit and other essential destinations like grocery stores, schools, senior housing and services, civic centers, major employment areas, colleges, hospitals, libraries and parks. A high score indicates multiple land uses within close proximity to each other.

Street Network: Density of streets serving an area. A high score indicates an area with a lower number of roads and intersections per square mile and therefore fewer route options for bicyclists and pedestrians.

Safety: Number of bicycle and pedestrian crashes, daily traffic volumes, and whether the road is a truck route. A high score indicates a road segment with a higher rate of crashes or daily traffic volumes and whether it is located on a truck route.

Social Equity: Areas with above average poverty, limited English proficiency, and higher numbers of children and the elderly. A high score indicates a higher number of potential users who are dependent on walking, biking, and transit for transportation.

The project engaged the community using a survey to weigh each of the prioritization factors. Survey results generated the following weighted factors: safety 36%, land use 30%, street network density 21% and social equity 13%. Existing gaps in the bicycle and pedestrian systems were scored in each of the four areas, and then multiplied by the weighted factors. From the weighted values a list of high priority needs was generated. The same factors can be considered in the prioritization of neighborhood bikeway projects, with alterations to better fit the context when necessary. Similar criteria are used in the process of selecting projects for the Minor Betterment Program and Urban Road Maintenance District Safety Improvement projects. The TAC recommended using similar criteria, which are simple and helpful for the public to understand the process and offer meaningful participation. There was general agreement from the TAC that a neighborhood bikeway route prioritization committee would add validity and transparency to the implementation process.

Appendix E: Project Development Process

Goals of Neighborhood Bikeways are to:

- Provide a network that is logical, easy to use, well marked, and distinctively signed.
- Provide bicyclists efficient and convenient access to desired destinations and connectivity to other bike facilities.
- Improve the comfort and safety of bicyclists of all ages and abilities.

Project Development

A project design will be completed prior to implementation of any neighborhood bikeways along the corridors identified in the Neighborhood Bikeway Plan. The purposes of the project design is to gather technical data, work directly with the adjacent property owners and surrounding community, verify the viability of the route as a neighborhood bikeway, and identify appropriate neighborhood bikeway treatments.

Draft General Project Development Outline

- 1) Identify Project Area: This would be based on previously decided approach and prioritization and may either be a route corridor or an area. The area may be refined based on a review of data and existing conditions.
- 2) Informational Mailing: Optional mailing to project area to provide introduction to neighborhood bikeway concept.
- 3) Data Collection-Existing Conditions: First step in project development, the data collection effort will be tailored to fit the unique conditions of the subject corridor.
- 4) Preliminary Project Design-Alternatives: During preliminary design, data and existing conditions will be analyzed to provide an assessment of the technical feasibility and understand the level to which traffic calming and/ or traffic diversion would be needed to achieve the desired conditions: low volumes, low speed, connectivity to destinations and other bicycle facilities.
- 5) Public Meeting #1: The first public meeting is an opportunity to introduce neighbors to the concept of neighborhood bikeways and the tools and treatments to maintain or achieve the desired characteristics. Treatment or route alternatives will be presented if applicable.
- 6) Refine Project Design: Based on community feedback and any additional data, design alternatives will be refined to a recommended project design.

- 7) Public Meeting #2: The community will be presented with the recommended design and schedule. Any additional concerns or questions about installation will be addressed.
- 8) Final Design: Design exceptions maybe required depending on design treatments.
- 9) Approval of County Engineer
- 10) Funding and Construction/Installation
- 11) Education and Marketing of Neighborhood Bikeway
- 12) Evaluation: Data collection, observations, and/or surveys to determine the acceptance and efficacy of installed neighborhood bikeway treatments, where applicable.

Existing Conditions

A field review and data will be conducted and analyzed to provide an assessment of the technical feasibility and to understand the level to which traffic calming and/ or traffic diversion would be needed to achieve the desired conditions of a neighborhood bikeway.

- Existing and future land uses and zoning –particularly presence of schools
- Road Classification, Transit Route, Emergency Vehicle Route Classification
- Street cross-section(s) including dimensions of travel lanes, parking, sidewalks, etc.
- Existing network map
- Traffic control including traffic signals, stop signs (and orientation), posted speed limits, other signs
- Type and location of the existing traffic calming device
- Existing volumes data and turning movement counts at major intersections
- Speed data
- Any impediments to bicycle travel such as crossing a major arterial, odd intersection alignments, excessive stopping, and pavement surface issues.

An example of a worksheet for collecting and documenting data for a proposed route, from the City of Berkley, California is attached for information.

Neighborhood Bikeway Design Treatments

A variety of tools are available to achieve the desired characteristics of a neighborhood bikeway. The specific tools and treatments applied to a neighborhood bikeway will vary

with the unique conditions and context of each route. The treatments can be grouped into two primary categories – Basic treatments and route specific treatments. Basic treatments are used on all neighborhood bikeway routes. Route specific tools enhance bicycle travel and improve safety on the neighborhood bikeway and including intersection treatments, traffic calming and traffic reduction measures.

In general, treatments of any neighborhood bikeway may include:

- Signing and Pavement Markings (Basic Element)
- Intersection Treatments (Route Specific)
- Traffic Speed Management (Route Specific)
- Traffic Volume Management (Route Specific)

All of these items or a select few may be employed on a single corridor based upon the existing conditions of the street for bicycle travel. The combined impact of these elements is far greater than any single element alone. Additional descriptions, illustrations, and considerations regarding the tools and treatments are found in the Neighborhood Bikeway Treatment Toolkit.

During the design study, it will be determined whether or not the corridor is a transit, emergency route; or collector roadway and this determination may influence the design elements that are appropriate for the corridor.

Public Involvement and Outreach

The transition of a street into a neighborhood bikeway can change the appearance and function of the street. Residents and property owners along the route may be concerned about the resulting impact. During project development a public outreach process will be conducted that allows property owners on the route and the larger community to be informed and involved. The outreach can be customized to meet the needs of the project area but should occur once or twice and cover the following points.

- Educate the public on the concept and purpose of a neighborhood bikeway
- Share design treatments and alternatives
- Solicit input and comments
- Answer community concerns and questions

Optional outreach tools and approaches

- Small group workshop(s) with adjacent property owners;
- Public open house(s);
- Use of established neighborhood groups, bicycle advocacy groups, or other non-profit organizations that promote non-motorized travel to engage the public, reach their constituents, and advertise public meetings;
- Presentations at established neighborhood/school meetings;
- Walking or biking tour of corridor with residents;

- Door-to-door surveys to solicit input from property owners, including those who may not be inclined to participate in community meetings;
- Direct mailings to residents and businesses along or near the corridor;
- Post current information on a project website, and include contact information and/or solicit input directly on the website;
- Use of social media to advertize community meetings and/or website updates;
- Videos and other visualization or interactive materials to share user experience;
- Use of an interpreter for meeting flyers and at community meetings;

Evaluation

After the installation of a neighborhood bikeway additional data collection, observations, and/or surveys are useful to determine the acceptance and efficacy of the facility. The need and scope of any evaluation will vary with each project, and should be determined as early in the process as possible. For example, design treatments along a neighborhood bikeway may change traffic patterns for some residents, and may even require some out-of-direction travel as well. Local traffic patterns adapt to motor vehicle movement restrictions over time, and the adjacent property owners often value the resulting reduction in through traffic. However, traffic calming or movement restrictions along a neighborhood bikeway may induce traffic on adjacent parallel streets; these possible impacts should be evaluated post installation. Volumes, both bicycle and vehicle counts, are also desirable after installation. Surveys of user experience and awareness of the neighborhood bikeway could also be conducted. The evaluation information is valuable in the refinement of the program, public involvement, and design process.

Additional Reference Resources:

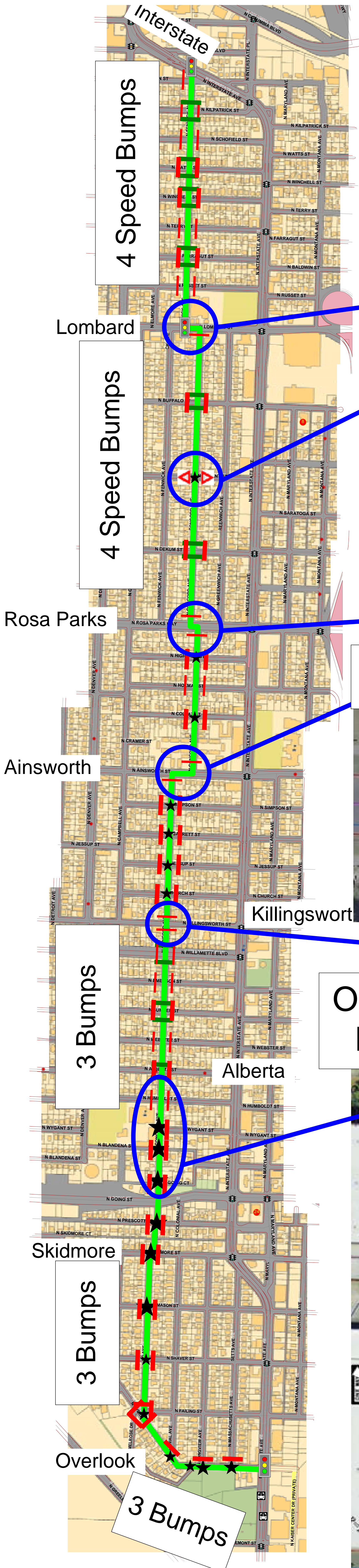
- Neighborhood Streets Program Policy and Procedure 2005
- TVFR Neighborhood Traffic Calming Measure Policy and Agreement
- Washington County Land Use and Transportation Public Involvement Guidelines for Transportation Planning, Programs and Projects
- Washington County Bicycle Facility Design Toolkit
- Neighborhood Bikeway Treatment Toolkit

BOWDITCH/HILLEGASS		
Location	Issues/Problem Areas to Resolve	Possible Actions
Crossing Major Streets		
Dwight Way ADT= Ashby Avenue ADT=	Major streets: Difficult for bikes to cross the street during peak hours.	Help crossing needed, see Category E options.
Travel Impeded by STOP Signs		
STOP sign evaluation: Hillegass/Bowditch has ROW at none of the 12-intersections between Woolsey and Bancroft.		
Hillegass at: Parker- 4-way Derby- 4-way Stuart- 4-way Webster- 4-way Woolsey- 1-way SB	ADT*: M M M	Potentially unwarranted STOP signs virtually every block impede bicyclists travel time
If remove STOP signs for bicycle boulevard, replace with Category C or D options.		
Bowditch at: Bancroft –all-way Haste – 4-way Dwight Way – 2-way	ADT*: M M H	Most likely warranted STOP sign on the bike boulevard.
Due to high traffic volume on cross street, Stop sign control may have to remain as is.		
Channing Way 4-way Russell Street 2-way	Intersections with other bike boulevards	Replace all-way and 2-way STOP sign control with mini-Roundabout.
Other Bike Boulevard Issues		
Woolsey	Diagonal diverter at Woolsey with STOP sign for only SB is confusing	TBD
Jogged intersection at Dwight Way	Jogged intersection at Dwight Way combined with one-way flow on Dwight Way presents problems for southbound bicyclists accessing Hillegass from Bowditch	TBD
Hillegass at Webster	Two half barriers at /near Webster creates very little cross traffic	TBD
Bicycle Accident History* - 9 accidents		
Hillegass/Parker	2 bike accidents	TBD
Bowditch/Channing	3 bike accidents	
School Zones	none	
ADT = Average Daily Traffic Volume, (ADT) L, M ,H = Relative estimate of ADT by City staff : L=<500, M=500-1000, H=>1000. Actual counts to be conducted in the near future. *City of Berkeley, January 1995 - June 1998		

MILVIA STREET			
Location	Issues/Problem Areas to Resolve	Possible Actions	
<i>Crossing Major Streets</i>			
Adeline (for bicyclists continuing east on Russell or north on Adeline at south end of Milvia)	Major streets: difficult to cross during peak hours	Help crossing needed, see Category E options.	
Hopkins (north end of Milvia)	Turns could be difficult at peak hours		
<i>Travel Impeded by STOP Signs</i>			
STOP sign evaluation: Milvia Street has ROW at 8 of the 30 intersections between Russell and Hopkins.			
Milvia at: Vine Street Addison Kittredge Haste Dwight Blake Parker Carleton Derby Stuart Oregon	ADT*: M M M M M M L M M M M	Potentially unwarranted Stop signs impede bicyclists' travel time.	If remove STOP signs for bicycle boulevard, replace with Category C or D options.
Berryman – 4-way L Rose – 2-way ADT=5700 Cedar – 4-way	Most likely warranted STOP sign on the bike boulevard.	Due to high traffic volume on cross street, Stop sign control may have to remain as is.	
Virginia –4-way Channing – 4-way Russell 1-way	Intersections with other bike boulevards	Replace all-way STOP sign control with mini- roundabout	
<i>Other Bike Boulevard Issues</i>			
Diagonal diverter at Yolo	Motorists do not yield when turning. Spaces between bollards are narrow.	TBD	
Other issues:	Bike lanes not signed	Install signs	
<i>Bicycle Accident History* - 29 accidents</i>			
Milvia at Dwight Milvia at University	4 bike accidents 3 bike accidents	TBD	
<i>School Zones</i>	Arts Magnet Elementary School at Virginia Berkeley High School		
ADT= Average Daily Traffic Volume, (ADT) L, M, H=Relative estimate of ADT by City staff : L=<500, M=500-1000, H=>1000. Actual counts to be conducted in the near future. * City of Berkeley, January 1995- June 1998			

N Concord/Fenwick, Interstate to Overlook Bike Street - Projects

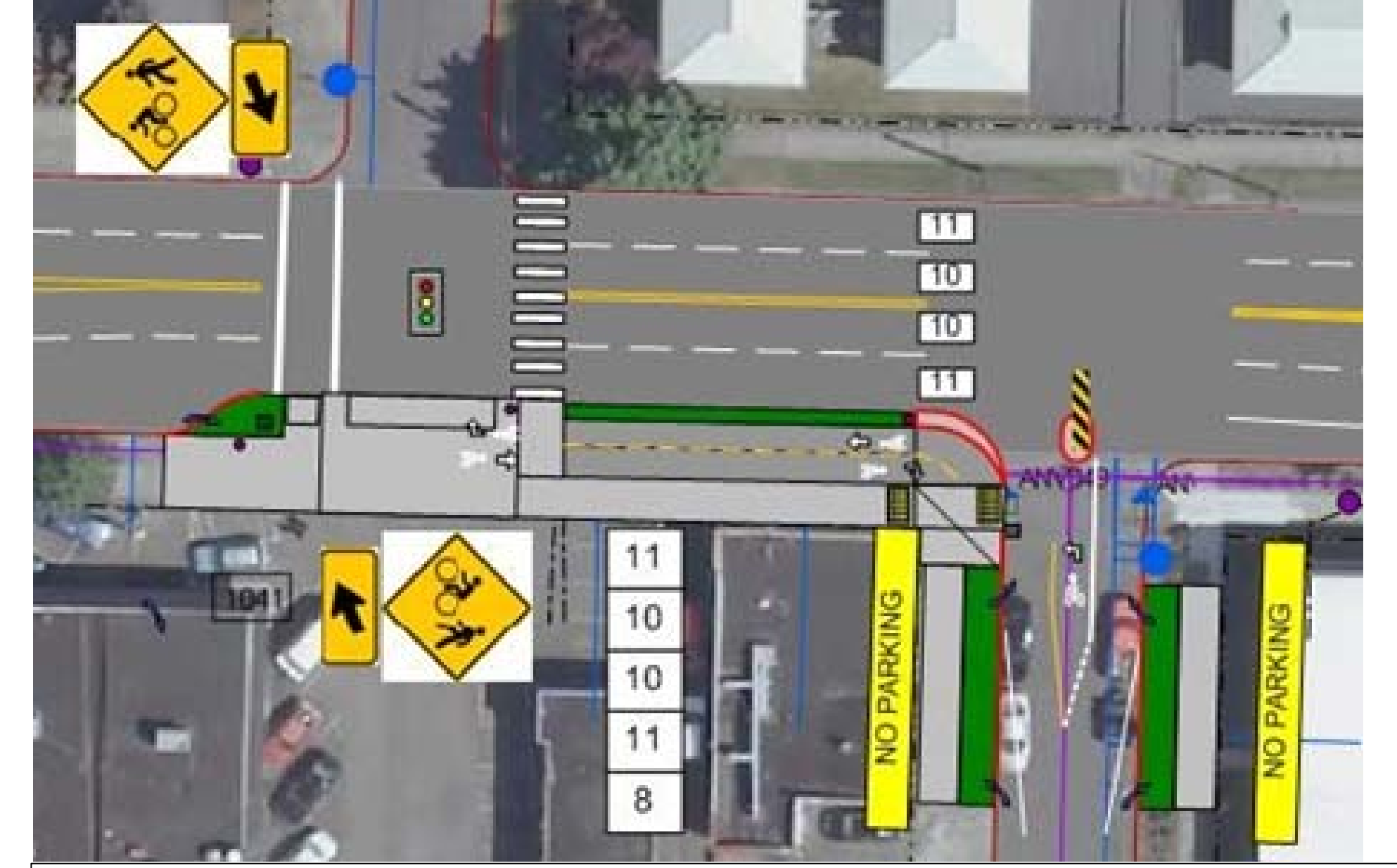
- Project
- ★ No Current Traffic Control
- Existing Stop Sign
- New Stop Sign
- Remove Stop
- Bike Boulevard



Raised Crossing



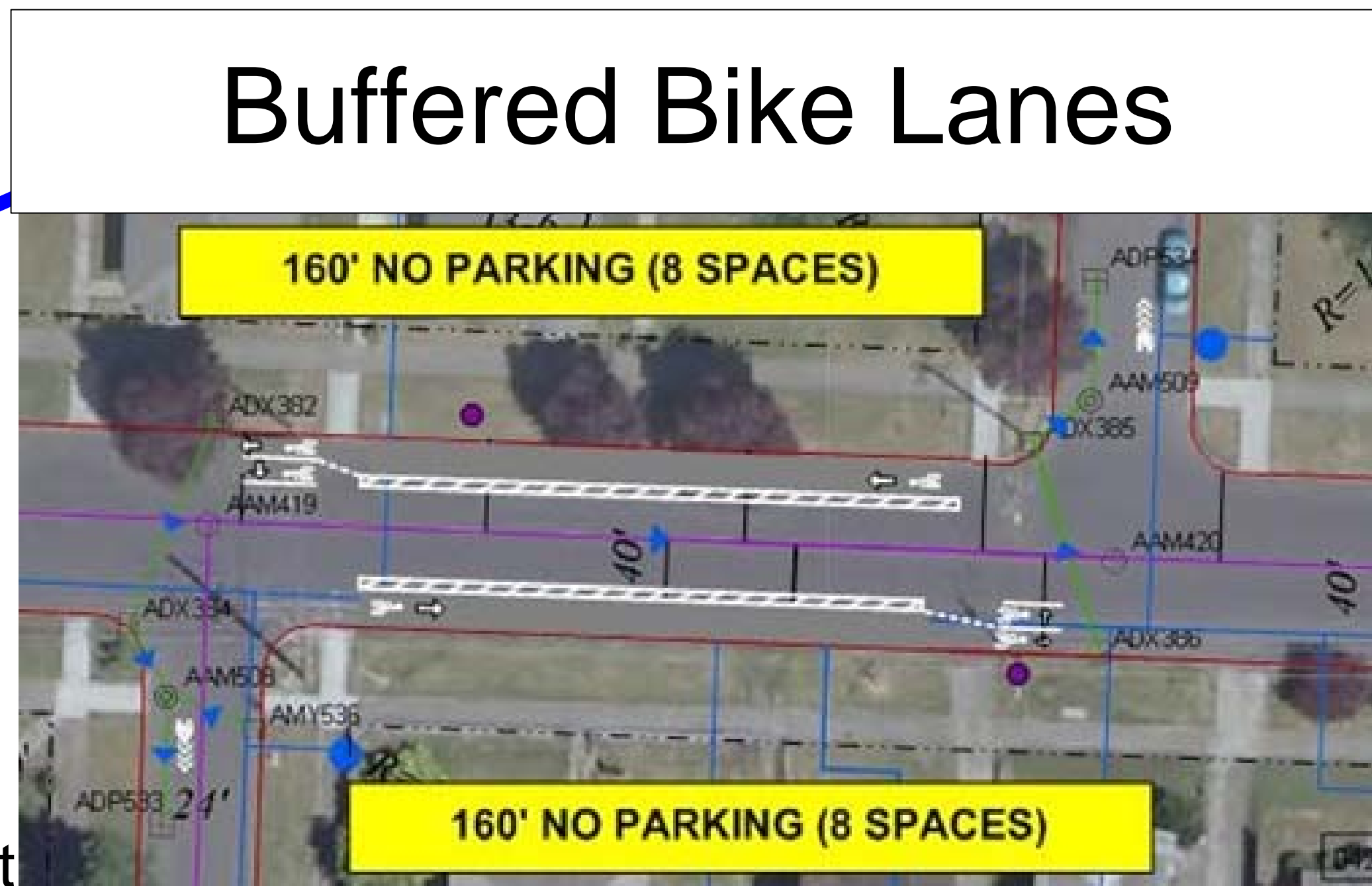
Cycle Track



Median Barrier



Add Refuge Island



One Way Street Except Bikes



- Remove Stop Signs at 2 Intersections
- Turn Stop Signs at 7 Minor Intersections
- Add Stop Signs at 17 Intersections
- Guide Signing and Markings – Full Length

***Appendix F: Neighborhood Bikeway Treatment
Toolkit***



Neighborhood Bikeway Treatments



June, 2014

Acknowledgements

Washington County Staff

Shelley Oylear - Washington County Traffic Engineering

Oliver Smith - Washington County Engineering

Alta Planning + Design

Drusilla van Hengel - Project Manager

Drew Meisel - Planner

Parametrix

Bill Ciz - Project Manager

Oregon Department of Transportation (ODOT)

Ross Kevlin - Grant Manager

Technical Advisory Committee (TAC) Members

Aisha Willits - Tualatin Hills Park and Recreation District

Brad Choi - City of Hillsboro

Dyami Valentine - Washington County Planning

Jeff Petrillo - Washington County Planning Commissioner

Kevin O'Donnell - Citizen

Lynn Mutrie - Oregon SRTS

Martin Granum - Urban Road Maintenance District Advisory Committee

Mike McCarthy - City of Tigard

Mike Mills - Washington County Traffic Engineering

Nathan Potter - Beaverton Bicycle Advisory Committee

Peter Welte - Citizen

Rose Sherwood - Washington County Health and Human Services

Victoria Saager - Washington County Road Operations

James Trumper - Urban Road Maintenance District Advisory Committee

Jessica Horning - ODOT Region 1 Active Transportation Liaison

Susan Otcenas - Citizen

Table of Contents

Introduction.....	1
Chapter 1: Signs and Pavement Markings.....	3
Warning Signage.....	4
Modified Street Signs.....	5
Wayfinding Signage.....	6
Pavement Markings.....	7
Shared Lane Markings (SLMs).....	8
Chapter 2: Speed and Volume Management..	9
Median Diverters.....	10
Speed Reader Boards.....	11
Curb Extensions.....	12
Mini Traffic Circles.....	13
Speed Cushions	14
Raised Crosswalks.....	15
Narrow Streets.....	16
Traffic Restriction Signage.....	17
Choker Entrances.....	18
Diagonal Traffic Diverters.....	19
Chapter 3: Intersection Design.....	21
Stop Sign Placement.....	22
Mid-Block Crossings.....	23
Bicycle Detection at Intersections.....	24
Bike Boxes.....	25
Addressing Neighborhood Bikeway ‘Jogs’.....	26
Treatments for Route ‘Jogs’.....	27



This page intentionally blank



Introduction

Neighborhood Bikeways, also known as Bicycle Boulevards or Neighborhood Greenways, are low stress, active transportation corridors that enhance bicycle and pedestrian travel. These corridors take advantage of the existing low speed and low volume local street network and major street crossings to make them comfortable for walking and bicycling. Neighborhood Bikeways have been shown to appeal to the widest range of bicycle users and will help Washington County move closer to achieving its three key bicycling goals:

- Shift biking and walking from being recreational only to a viable transportation option to get to most destinations.
- Move beyond designing bicycle facilities for the ‘spandex crowd’ to making bicycling attractive and convenient for all ages and abilities.
- Encourage biking and walking as a means of creating vibrant and healthy communities, regardless of age, gender, ability, ethnicity, or economic background.

This Toolkit provides general design guidance for treatments that may be used on designated Neighborhood Bikeway routes, with special considerations for their appropriateness in the suburban context, and whether the County has existing guidance to govern their use and implementation.

In general, tools can be categorized into three separate categories:

- Signs and Pavement Markings
- Speed and Volume Management
- Intersection Design

This page intentionally blank



1

Signs and Pavement Markings

Signs and pavement markings comprise the basic elements of a Neighborhood Bikeway. These elements differentiate the facility from other local streets and identify the Neighborhood Bikeway as a shared street for comfortable and convenient bicycle and pedestrian travel. The treatments included in this category are discussed on the following pages.

Warning and Regulatory Signage

Discussion

Warning and regulatory signs may be directed at motorists, pedestrians or bicyclists. They alert road users to expect changing conditions. Warning signs should be placed where there is a high probability that a road or trail user will come upon the condition conveyed by the sign, such as trail crossing signs that let motorists and bicyclists know to decrease their speed and look for pedestrians / bicyclists crossing the roadway ahead.

Regulatory signs convey the legal rights and responsibilities of all road users. For example, the “Bikes May Use Full Lane,” which works well on low traffic, low speed streets, lets motorists and bicyclists know that they are legally permitted to share the same lane.

Application

Warning signs along Neighborhood Bikeways should be used wherever people need to be informed about roadway conditions that require increased attention. The use, number and placement of signs is at the discretion of county traffic engineers.

Design Details

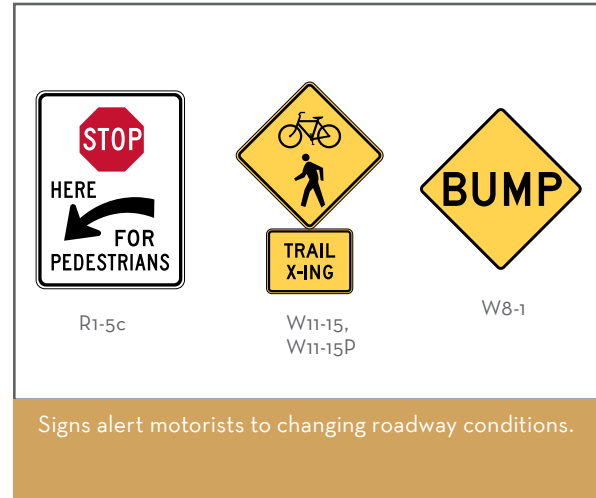
The size and spacing of signs varies considerably by type. The Federal Highway Administration’s (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) provides explicit design requirements for each type of warning and regulatory sign.

Suburban Context Considerations

None

Existing Guidance at County Level

FHWA MUTCD governs the use of warning and regulatory signs.



The ‘Bikes May Use Full Lane’ sign helps reinforce that bicyclists may be on the roadway and that the travel lane is a shared environment.

Treatment Effect

				COST
Impacts mobility	Green	Green	Yellow	\$ \$ \$
Reduces risk	Green	Green	Yellow	\$ \$ \$

Green positive effect Yellow minimal effect Red negative effect

Modified Street Signs

Discussion

Modified street signs, using a visual cue such as a unique color or stencil, help users quickly identify the street as a Neighborhood Bikeway. These signs provide an opportunity to uniquely brand the Neighborhood Bikeway network.

Application

Modified street signs should be placed at the entrance to a Neighborhood Bikeway Route, as well as at intersections or decision points along the route for confirmation.

Design Details

The Federal Highway Administration’s Manual on Uniform Traffic Control Devices provides guidance for signage along roadways.

Suburban Context Considerations

The size of these may need to be scaled up in the suburban context to improve visibility.

Existing Guidance at County Level

To be developed.



Washington County will be using this black sign with a utilitarian bicyclist on it as the street signs on Neighborhood Bikeways



This commuter bicyclist symbol will be used to identify Neighborhood Bikeways in Washington County

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

 positive effect  minimal effect  negative effect

Wayfinding Signage

Discussion

A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. The Oregon Manual on Uniform Traffic Control Devices (MUTCD) provides guidance on the use of signs on bikeways. There are three general types of wayfinding signs:

Confirmation Signs

- Indicate to bicyclists that they are on a designated bikeway. Make motorists aware of the bicycle route.
- Can include destinations and distance/time. Do not include arrows.

Turn Signs

- Indicate where a bikeway turns from one street onto another street. Can be used with pavement markings.

- Include destinations and arrows.

Decisions Signs

- Mark the junction of two or more bikeways.

- Inform bicyclists of the designated bike route to key destinations.
- Provides information about destinations with arrows, distances and travel times.

Application

Wayfinding signage is installed, at minimum, at all decision points along a Neighborhood Bikeway Route.

Design Details

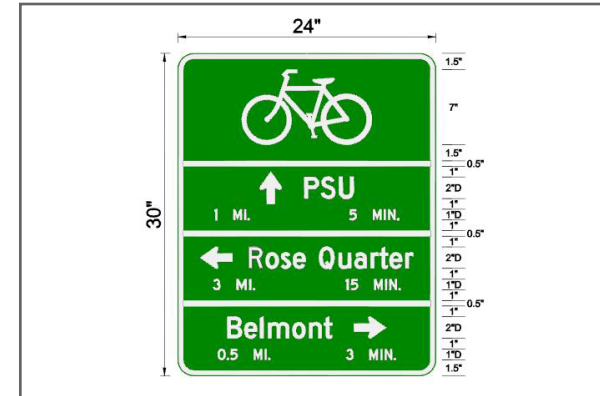
The Oregon MUTCD governs the size of bicycle wayfinding signs.

Suburban Context Considerations

Though not suburban specific, increasing the size of bikeway signage and the font size for destinations, mileage, and time estimates may help improve user visibility.

Existing Guidance at County Level

Washington County Bicycle Design Toolkit and the Oregon Supplement to the MUTCD, the Federal Highway Administration's MUTCD.



This bicycle wayfinding sign adheres to the design specified in the Oregon Supplement to MUTCD



The City of Berkeley brands their wayfinding signage with a unique graphic and vibrant color to visually stand out from other roadway signs

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

positive effect

minimal effect

negative effect

Pavement Markings

Discussion

Pavement markings increase visibility of Neighborhood Bikeways and reinforce that cyclists are on a bicycle facility. The pavement markings also help direct riders through jogs along the route. Pavement markings vary widely by jurisdiction. Some communities develop unique, custom markings to reinforce the branding of the Neighborhood Bikeway network.

Application

Pavement markings should be placed at regular intervals along a designated Neighborhood Bikeway to aid with wayfinding and to serve as a visual reminder that the route is optimized for bicyclists.

Pavement markings may also be used on trails or paths to help separate pedestrians and bicyclists traveling on the same facility.

Design Details

The size of pavement markings is determined by the county traffic engineer.

Suburban Context Considerations

Due to longer blocks and fewer intersections along a route, the spacing between pavement markings may be longer than typical.

Existing Guidance at County Level

Washington County Bicycle Design Toolkit and the National Association of City Transportation Officials' (NACTO) Urban Bikeway Design Guide



Unique pavement markings vary in size and level of detail depending on the specifications of the jurisdiction



Neighborhood Bikeway pavement markings are an opportunity to develop unique branding with wayfinding

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

positive effect minimal effect negative effect

Shared Lane Markings

Discussion

Shared Lane Markings (SLMs), also known as “sharrows,” delineate where bicyclists should operate within a shared vehicle/bicycle travel lane. They also help alert motorists that they are traveling on a designated bikeway and that they should expect bicyclists on the route.

Application

Because SLMs do not provide a physically separated space for bicyclists to operate, they are generally best suited for use on low traffic, low speed streets.

Design Details

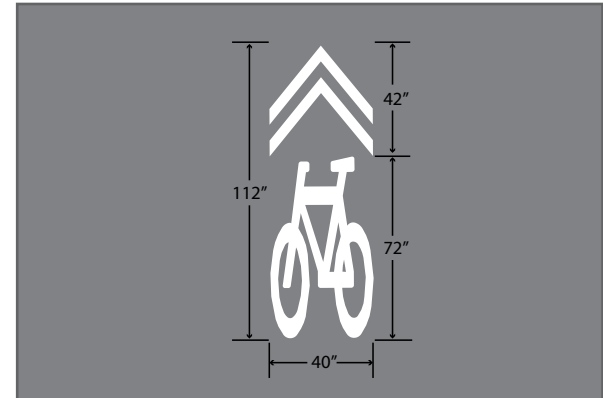
SLMs used on Neighborhood Bikeways should be applied using the same basic principles as any other street. The center of the marking should be a minimum of 4’ from the pavement edge, or parking lane (if present). However, placing SLM in the center of the travel lane increases the life of the markings because there is less tire wear from motor vehicles.

Suburban Context Considerations

Due to longer blocks and fewer intersections along a route, the spacing between pavement markings may be longer than typical.

Existing Guidance at County Level

The Federal Highway Administration’s Manual on Uniform Traffic Control Devices (MUTCD) and the Oregon Supplement to the MUTCD, Washington County Bicycle Design Toolkit



The standard dimensions for SLMs are governed by the FHWA MUTCD



Shared lane markings in the middle of the travel path increases the longevity of the markings

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

positive effect minimal effect negative effect



2

Speed and Volume Management

Creating a Neighborhood Bikeway environment that is comfortable for bicyclists of all ages and skill levels reduces the likelihood and severity of collisions, by reducing motor vehicle speeds and volumes. A good rule of thumb is to design Neighborhood Bikeways in a manner that causes the speed differential between motorists and bicyclists to be as small as possible. A small speed differential is more comfortable for bicyclists and has the added benefit of improving motorist's reaction time. For this reason, the motor vehicle travel speeds on Neighborhood Bikeways are desired at 25 mph.

Maintaining low motor vehicle volumes will also increase bicyclists' comfort. Volumes below 1,500 vehicles per day (vpd) are ideal with volumes below 3,000 vpd preferred. If volumes of 3,000 vpd are not possible for a short segment of the Neighborhood Bikeway, then a protected on-street bikeway, such as a cycle track, may be considered.

To maintain desirable traffic volumes, physical or operational measures can be used on routes that have been identified as Neighborhood Bikeways. These elements also provide an opportunity for landscaping, stormwater management, and other pedestrian and bicycle supportive amenities. Because many of these treatments are new to the county, a public education campaign will be initiated to alert all roadway users about the benefits and safe use of Neighborhood Bikeways.

Median Diverters

Discussion

Median diverters are extended median refuge islands. A median refuge island provides a protected space for pedestrians and bicyclists to cross one direction of traffic at a time, without causing out-of-direction travel, while prohibiting motor vehicles from making the same movement. Median diverters extend the refuge across the intersection, serving a traffic calming function by restricting through and left turning motor vehicle movements from the Neighborhood Bikeway.

Application

This treatment is appropriate for use at the intersection of a Neighborhood Bikeway and a major roadway where active transportation safety is very important. Median diverter use is at the discretion of the county engineer.

Design Details

Curb separation in the center of the roadway separates opposing lanes of traffic, and provides a sheltered place for pedestrians and bicyclists to wait for an adequate crossing gap. The median should be sufficiently wide to allow a bicyclist to comfortably wait for traffic to clear. At intersections the diverter should also include a gap for legal crosswalks. Right Turn Only signs direct motorists to the appropriate vehicular movement.

Suburban Context Considerations

Treatments that fully restrict motor vehicle access have a potentially negative impact on motor vehicle operations. This is due to fewer alternative through-routes and greater spacing between streets than in the urban context.

Existing Guidance at County Level

Washington County Mid-Block Crossing Policy (2010), Washington County Pedestrian Island Crossing and Raised Median Nose Treatment Standard Details








Median diverters assist with volume management on Neighborhood Bikeways by directing motor vehicles to use alternate routes



The preferred design for median diverters includes separate median refuges for bicyclists and pedestrians to minimize conflict between users

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

positive effect minimal effect negative effect

Speed Reader Boards

Discussion

Speed reader boards use radar and an electronic display to alert drivers of the speed at which they are traveling. Many signs can be pre-set to flash warnings when speeds are above an established threshold. These signs have been shown to be highly effective at reducing motorist's speeds where in use intermittently. The addition of speed reader boards on Neighborhood Bikeways can contribute to slower overall travel speeds.

Application

The use and placement of speed reader boards is at the discretion of the county engineer.

Design Details

Speed reader boards may be installed in a fixed location or affixed to a trailer and transported to different locations as needed.

Suburban Context Considerations

Speed reader boards are generally more supported by adjacent property owners than speed humps/cushions.

Existing Guidance at County Level

Neighborhood Streets Program.



Speed reader boards use radar to alert drivers of current speed and encourage them to slow down. This is a permanent installation.



Speed reader boards can also be used on moveable trailers or platforms so that they can be moved to various locations for shorter durations.

Treatment Effect

				COST
Impacts mobility	Minimal effect	Minimal effect	Minimal effect	\$\$\$
Reduces risk	Positive effect	Positive effect	Positive effect	

■ positive effect
 ■ minimal effect
 ■ negative effect

Curb Extensions

Discussion

Curb extensions, placed on both sides of the street, narrow the travel lane and encourage all road users to slow down. When placed at intersections, they reduce the crossing distance for pedestrians and increase visibility of individuals crossing the street. They reduce the overall curb radii and further reduce motor vehicle turning speeds.

Application

Curb extensions can be used in many roadway contexts. On Neighborhood Bikeways they are appropriate for any crosswalk where it is desirable to shorten the crossing distance and where a parking lane exists adjacent to the curb. Reducing crossing distance is especially desirable near schools, parks, and other destinations that children and older adults often access.

Design Details

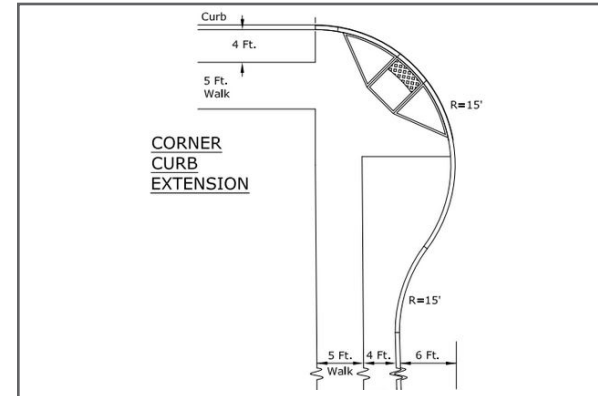
Curb extensions are intended to simulate the horizontal dimensions of a parked vehicle without impeding visibility at the intersection.

Suburban Context Considerations

Not all streets have dedicated parking lanes.

Existing Guidance at County Level

Washington County Road Design and Construction Standards, Standard Drawing 2230













The County has existing design guidance for curb extensions in its Road Design and Construction Standards



Curb extensions are also an opportunity to beautify the street with attractive landscaping

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

 positive effect

 minimal effect

 negative effect

Mini Traffic Circles

Discussion

Mini traffic circles are raised or delineated islands placed at minor intersections that reduce motor vehicle speeds through tighter turning radii and narrowed vehicle travel lanes. These traffic calming devices can effectively slow vehicle traffic while allowing all turning movements at an intersection. Mini traffic circles create a more comfortable crossing for all users, increasing the likelihood of motorists to stop for pedestrians at approaches.

Application

Mini traffic circles are appropriate for use at minor intersections where two local streets intersect. Vegetation should not limit visibility.

Design Details

Mini traffic circles can be constructed from concrete for a permanent installation, or can be created using removable rubber curbs. The county engineer approves the location, diameter and materials that are used.

Suburban Context Considerations

Neighborhood Streets Program. Special agreements for maintenance of vegetation or other features may be needed.

Existing Guidance at County Level

Washington County Road Design and Construction Standards



Mini traffic circles can be created using temporary materials, such as rubber curbs



Mini traffic circles are also an opportunity to beautify the street with attractive landscaping

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

 positive effect  minimal effect  negative effect

Speed Cushions

Discussion

Speed cushions are rounded raised areas of pavement that require motor vehicles to reduce speed because of vertical deflection. These devices also discourage through vehicle travel on streets where a parallel route without traffic calming exists. Maintaining lower vehicle travel speeds improves the pedestrian and bicyclist environment.

Application

Speed cushions are placed on two lane roadways with lower traffic speeds and volumes.

Design Details

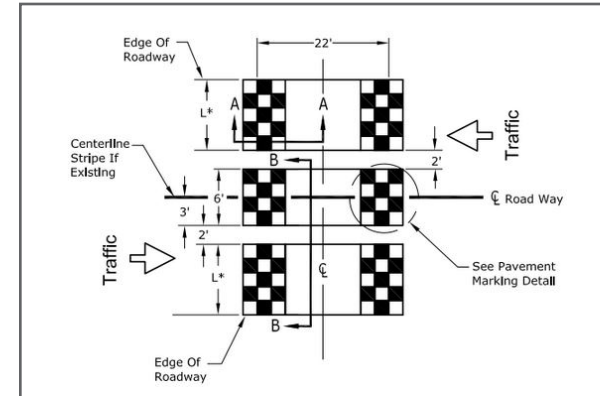
Speed cushions are placed in a series across both travel lanes. The design of speed cushions accommodates the wheel tracks of emergency vehicles.

Suburban Context Considerations

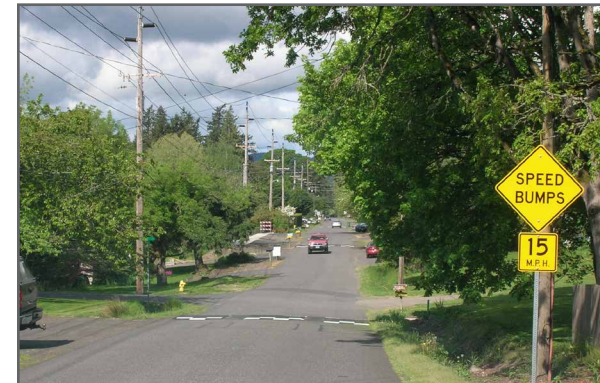
None

Existing Guidance at County Level

Washington County Road Design and Construction Standards, Standard Drawing 6060-6063






The County has existing design guidance for speed cushions in its Road Design and Construction Standards



The County prefers the use of speed cushions over traditional speed humps

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

positive effect

minimal effect

negative effect

Raised Crosswalks

Discussion

Raised crosswalks are designed to heighten driver awareness of pedestrian crossings and assign priority to active transportation users crossing the street. A raised crosswalk or intersection can eliminate grade changes from the pedestrian path and provide greater prominence for pedestrians as they cross the street.

Application

Raised crosswalks can be used at any intersection or mid block crossing where reduced vehicle speeds and heightened driver awareness are desired. Location selection of raised crosswalks is at the discretion of the county engineer.

Design Details

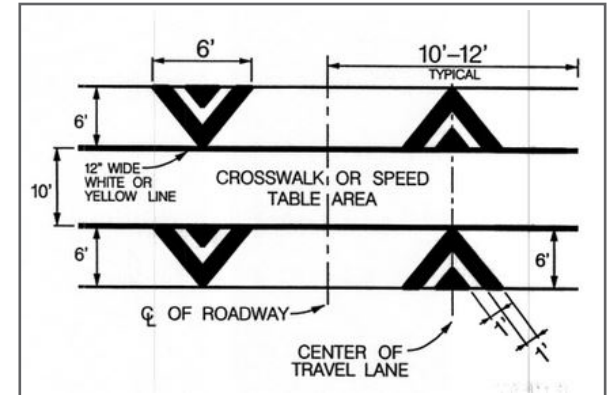
Best practices for raised crosswalks is to use the same elevation and grade as a speed hump with the addition of an 8 foot to 10 foot marked crossing in the middle where the hump is flat.

Suburban Context Considerations

May be appropriate near schools, mid-block, and trail crossings.

Existing Guidance at County Level

Midblock and unsignalized intersection crossing policy






Raised crosswalks are of similar dimensions as a regular speed hump



Raised crosswalks double as vertical traffic calming elements

Treatment Effect

				COST
Impacts mobility				\$\$\$
Reduces risk				\$\$\$

positive effect minimal effect negative effect

Narrow Streets

Discussion

Physically narrowing the street, with or without the presence of parking, helps to reduce motor vehicle speeds and improve the walking and biking environment.

Application

Narrow streets are most appropriate in the neighborhood context where traffic volumes are already low and it desirable to maintain low volume and speeds.

Design Details

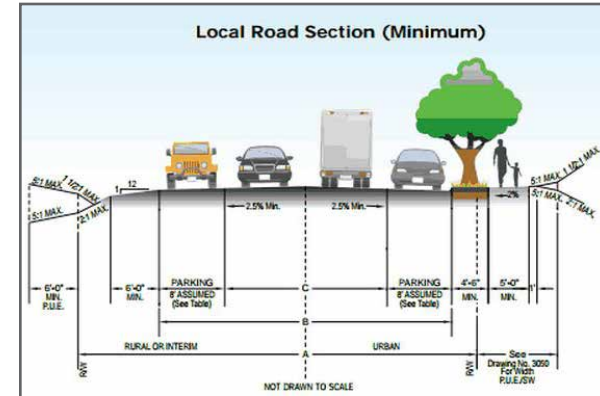
Narrow streets (classified as L-5 in the Washington County Road Design and Construction Standards) require approval through the land use process. The County also has a Special Area street classification that explicitly allows traffic calming. The Special Area classification allows for increased flexibility in this type of street's design making it more conducive for Neighborhood Bikeway treatments.

Suburban Context Considerations

None

Existing Guidance at County Level

Washington County Road Design and Construction Standards






This is the basic configuration for a county local street. A narrow street is classified as L-5 and has 20' of pavement width



There is no on-street parking allowed on narrow streets to allow for emergency vehicle access

Treatment Effect

				COST
Impacts mobility				\$ \$ \$
Reduces risk				

positive effect

minimal effect

negative effect

Traffic Restriction Signage

Discussion

The most straightforward traffic volume reduction strategy is signage restricting motor vehicle through movements. However, if signage is not combined with more intensive traffic diversion it is not very effective, due to low compliance. Restricting motor vehicle through movements reduces auto-connectivity, but increases bicyclist and pedestrian comfort by decreasing overall traffic volumes.

Application

This treatment may be used where it is desirable to improve access for pedestrians and bicyclists, but not motorists. For example, restricting motorists from turning onto a Neighborhood Bikeway from a major street can help maintain lower than average vehicle volumes for the length of the corridor. Traffic restriction signage is at the discretion of the county engineer.

Design Details

The traffic restriction signage may or may not be combined with physical curbs or planters to help enforce the restriction.

Suburban Context Considerations

Treatments that restrict motor vehicle access have a potentially negative impact on motor vehicle operations. This is due to fewer alternative through-routes and greater spacing between streets than in the urban context.

Existing Guidance at County Level

The Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) and the Oregon Supplement to the MUTCD



R5-1



R5-3

The rules for the use of traffic restriction signage is found in the FHWA MUTCD



The curb extension pictured here reduces the chance of right turns from the through roadway.

Treatment Effect

				COST
Impacts mobility	Minimal effect	Minimal effect	Negative effect	\$ \$ \$
Reduces risk	Minimal effect	Minimal effect	Minimal effect	

■ positive effect
 ■ minimal effect
 ■ negative effect

Choker Entrances

Discussion

Choker entrances are used to reduce motor vehicle volumes by restricting/constraining vehicle passage while allowing full bicycle passage to a Neighborhood Bikeway.

Application

This treatment may be used where it is desirable to improve access for pedestrians and bicyclists, but not motorists. For example, restricting motorists from turning onto a Neighborhood Bikeway from a major street can help maintain lower than average vehicle volumes for the length of the corridor. Traffic restriction signage is at the discretion of county traffic engineers.

Design Details

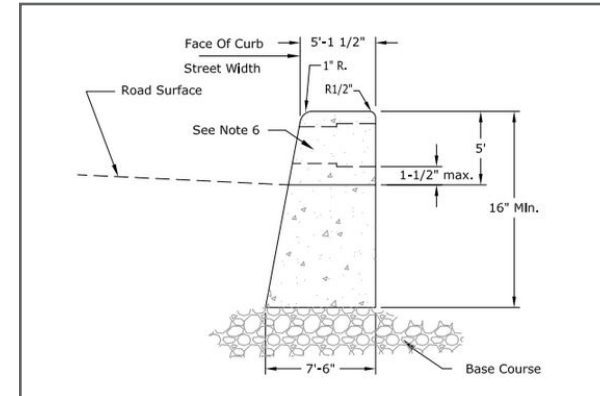
Choker entrances have a curb separated island that physically narrows the entrance to the street and only allows motor vehicles to exit. An at-grade space for bicyclists to pass through the narrowed intersection is provided at the same width as a standard bike lane.

Suburban Context Considerations

Treatments that restrict motor vehicle access have a greater potential negative impact on motor vehicle operations because there are fewer alternative through routes and greater distance between streets than in the urban context.

Existing Guidance at County Level

None



The County does not have existing design guidance for a choker entrance, but it would use a vertical non-mountable curb as shown above



Choker entrances allow motor vehicle access in one direction only, reducing overall volumes. The bike pathway is 5' -6' wide

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

positive effect minimal effect negative effect

Diagonal Traffic Diverters

Discussion

Diagonal traffic diverters are similar to choker entrances, but they restrict both directions of vehicle traffic off of the Neighborhood Bikeway by requiring motorists to turn, while allowing pedestrians and bicyclists to continue through a gap in the curb.

Application

This treatment may be used where it is desirable to improve access for pedestrians and bicyclists, but not motorists. For example, restricting motorists from turning onto a Neighborhood Bikeway from a major street can help maintain lower than average vehicle volumes for the length of the corridor. Traffic diversion is at the discretion of county traffic engineers.

Design Details

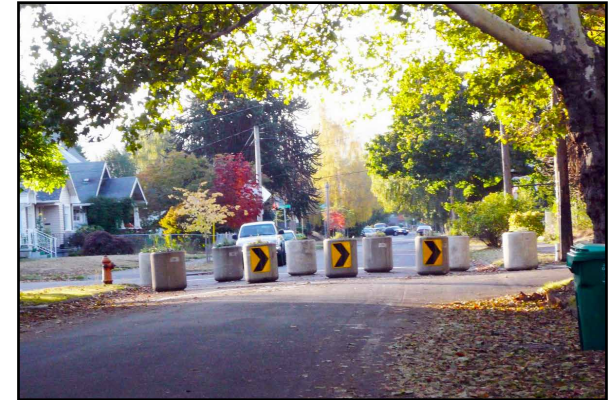
Diagonal diverters effectively close the end of a street to motorists altogether, requiring them to turn off the bikeway. The curbed area can provide an opportunity for attractive landscaping and informal social space.

Suburban Context Considerations

Treatments that fully restrict motor vehicle access have a potentially negative impact on motor vehicle operations. This is due to fewer alternative through-routes and greater distance between streets than in the urban context.

Existing Guidance at County Level

None



Diagonal diverters require motorists to turn at the intersection, but allow bicyclists to travel through



A variety of design elements can be used to enhance bicycle and pedestrian connectivity while rerouting cars

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

 positive effect  minimal effect  negative effect

This page intentionally blank



3

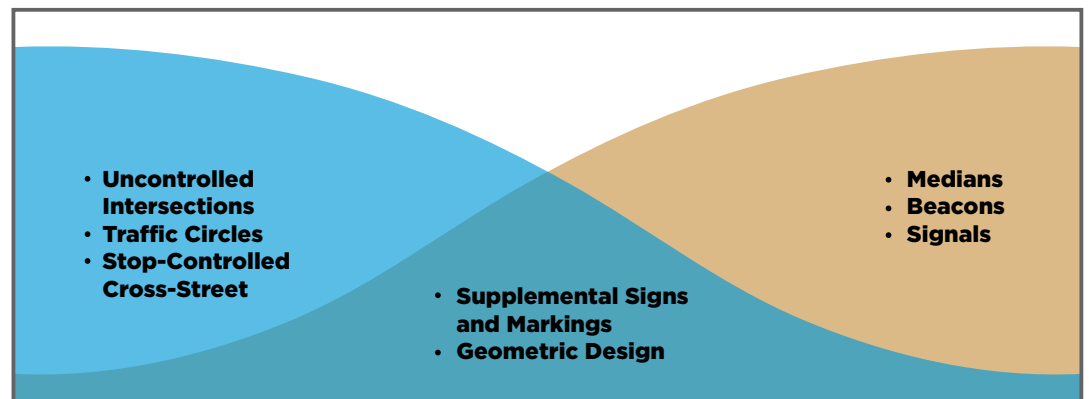
Intersection Design

The level of traffic control installed at intersections along a Neighborhood Bikeway Route is dependent on whether the intersection occurs at a major or minor street and the complexity of the intersection. These factors dictate the level of treatment that should be considered to make it safer, convenient, and comfortable for active transportation users. Striking a balance between maximizing active

transportation user safety and minimizing delay will lead to a successful Neighborhood Bikeway Route that feels logical and comfortable for all roadway users. To this end, the diagram below, modified from the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide, is a helpful resource. This figure recommends design features to be added as intersection complexity increases, while accounting for delay and safety concerns.

Minimize Delay

Maximize Safety



Increasing Cross-Street Complexity

Increasing speed, volume, number of lanes and decreasing number of crossing gaps.

Stop Sign Placement

Discussion

Stop signs on Neighborhood Bikeways should be placed on side street approaches in a way that favors through traffic on the Neighborhood Bikeway. This creates fewer stops and starts for bicyclists. This treatment is only appropriate at minor intersections and should be used judiciously.

Application

Based on current best practices, intersections with minor streets have potential to be modified to reduce bicyclist delay. This means that, where possible, the user traveling on the Neighborhood Bikeway should be given priority—creating fewer stops for bicyclists. Fewer stops reduces travel time, minimizes effort required to get started after stopping, and helps improve compliance with traffic control devices. Stop sign use is at the discretion of the county engineer, in accordance with the Manual of Uniform Traffic Control Devices (MUTCD).

Design Details

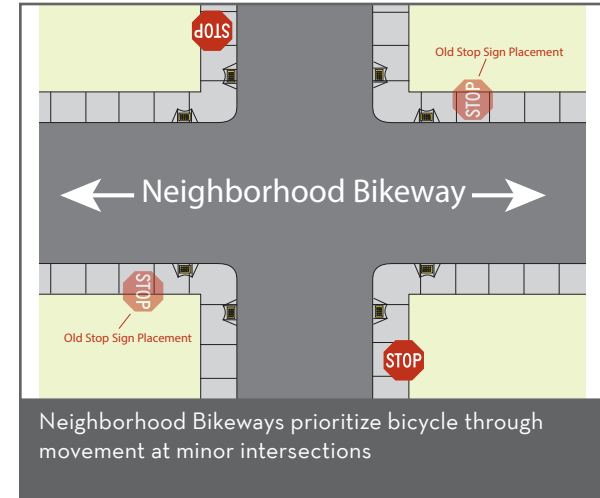
This entails no deviation from a standard stop sign controlled intersection.

Suburban Context Considerations

None

Existing Guidance at County Level

Washington County Bicycle Design Toolkit addresses this treatment in the section on ‘Bicycle Boulevards’, MUTCD



Treatment Effect

				COST
Impacts mobility				
Reduces risk				

positive effect minimal effect negative effect

Mid-Block Crossings

Discussion

Mid-block crossings provide a crossing opportunity where there is no intersection. At mid-block locations, crosswalks are marked where there is a high demand for crossing, and there are no nearby marked crosswalks.

Application

Mid-block crossings along Neighborhood Bikeways can typically occur where there is a transition from an off-street to on-street bikeway, or where there is a connection to a key destination such as a park, trail, or school.

Design Details

The design of a mid-block crossing varies based on location (see existing County Guidance). All mid-block crossing facilities include high visibility crosswalks and warning signage. The installation of midblock crossings occurs after an independent analysis is performed and approval from the County Engineer. Applications can be submitted to the Department of Land Use & Transportation.

Suburban Context Considerations

None

Existing Guidance at County Level

Mid-block crossings are governed by the County's Mid-Block Crossing Policy (2010) that categorizes crossings into 4 tiers of progressively intensive treatment:

Tier 1: Crosses a 2-lane street with or without an Island/refuge-install high visibility (curb extensions considered)

Tier 2: Crosses a 3-lane street with island/refuge-install high visibility signs and markings (flashing beacons considered)

Tier 3: Crosses a 3-lane street without island/refuge—install high visibility signs and markings or pedestrian actuated signal

Tier 4: Crosses a 4-lane or greater street without island/refuge, install pedestrian actuated signal (pedestrian actuated signal, pedestrian over or undercrossing considered)














Median refuge islands enhance the safety and comfort of midblock crossing locations.



The level of design emphasis at mid-block crossing locations depends on the roadway context

Treatment Effect

				COST
Impacts mobility				
Reduces risk				

 positive effect  minimal effect  negative effect

Bicycle Detection at Intersections

Discussion

Bicycle detectors send a request for service to a traffic signal to turn green when a bicyclist is waiting to cross. They improve safety and reduce red light running, because the bicyclists do not have to wait for a motorist to actuate the signal. Video detection, loop detectors, and actuated push buttons are three types of bicycle detection devices. Washington County most commonly uses video detection.

Application

Bicycle detection should be used at all intersection approaches that are actuated, with priority on bikeway routes. Clearly marked pavement that indicates where the bicyclist should wait should be placed in the travel lane on intersection approaches without bike lanes, and in bike lanes or left turn lanes. On major roadways, safety takes precedence above minimizing delay for bicyclists.

Design Details

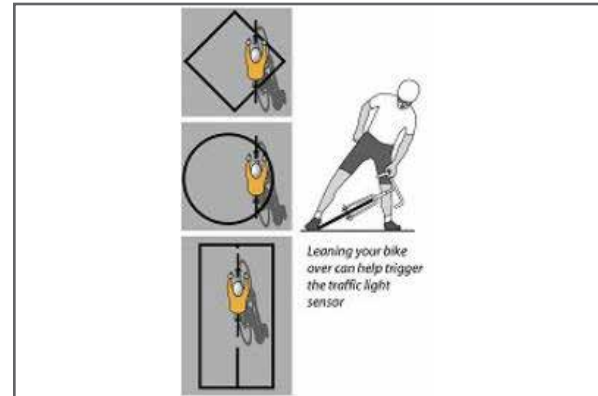
The placement and design of bicycle detection varies based on whether it uses video detection, in-street loop detectors, actuated push buttons, or a combination of treatments. Pavement markings indicating where bicyclists should wait in order to trigger detection at signalized intersections make bicycling on Neighborhood Bikeway Routes more intuitive.

Suburban Context Considerations

None

Existing Guidance at County Level

Oregon Department of Transportation Bicycle and Pedestrian Plan - Chapter 2.7F: Signals, Federal Highway Administration's Manual on Uniform Traffic Control devices



Washington County provides guidance on how to most effectively activate the signal.



Accompanying signage lets bicyclists know how to signal a green light

Treatment Effect

				COST
Impacts mobility	Minimal effect	Positive effect	Minimal effect	\$\$\$
Reduces risk	Minimal effect	Positive effect	Minimal effect	

■ positive effect
 ■ minimal effect
 ■ negative effect

Bike Boxes

Discussion

Bike boxes help increase bicyclist visibility to motorists at intersections by providing them a presence in front of queued traffic. This treatment reduces the danger of right “hooks” by providing a space for bicyclists to wait where they are visible at signalized intersections.

Application

Bike boxes are appropriate at major signalized intersections where the benefit to bicyclist safety can balance vehicular level of service considerations.

Design Details

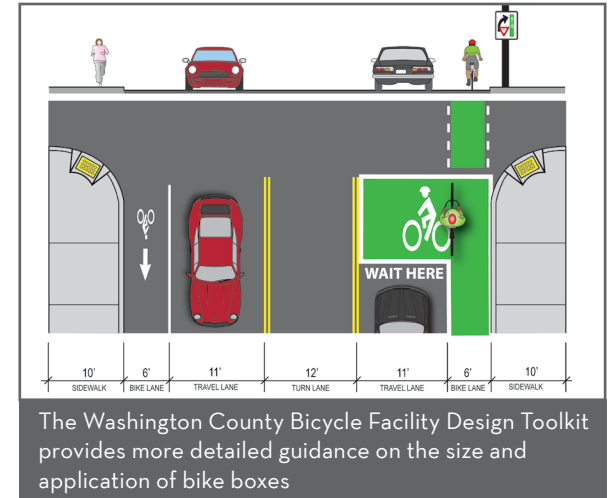
Bike boxes vary in design based on how lanes are arranged at the intersection. They are typically placed at the front of the through-travel lane that is closest to the curb. The transition from the on-street bikeway into the bike box should be as seamless as possible.

Suburban Context Considerations

None

Existing Guidance at County Level

Washington County Bicycle Facility Design Toolkit



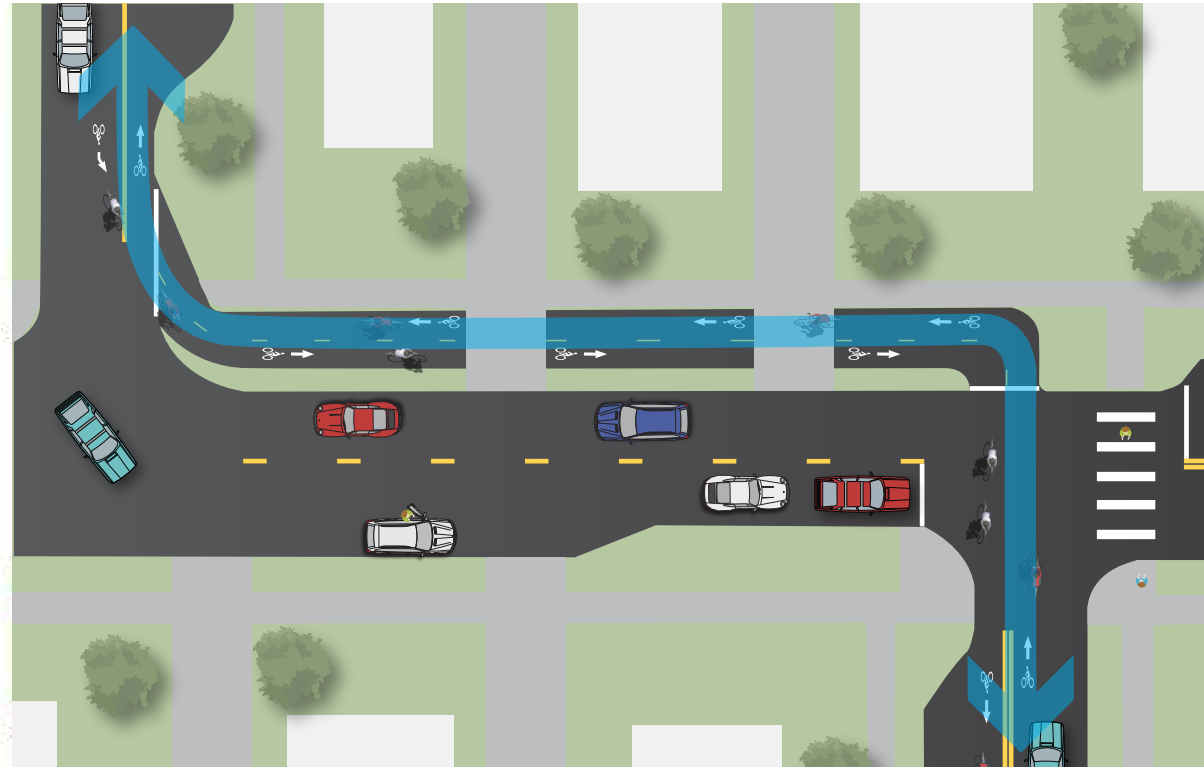
Treatment Effect

				COST
Impacts mobility				
Reduces risk				

positive effect minimal effect negative effect

Addressing Neighborhood Bikeway “Jogs”

Neighborhood Bikeways utilize Local streets which are often less direct than collector or arterial streets. Local streets that intersect with a major roadway may not pick up again on the opposite side, preventing a direct connection. In these situations the pedestrian or bicyclist must travel on a busier street (usually for a short distance) before they can once again continue their trip on the local street. This condition, where users must route onto and then quickly off of a major roadway is called a ‘jog’. When these instances occur along a Neighborhood Bikeway Route it is important to maintain the same level of safety and comfort that people associate with traveling on those sections of the route with low travel speeds and volumes. In general, this means that anywhere that Neighborhood Bikeways must continue along a street that has volumes greater than 3,000 vehicles per day and/or speeds above 25 mph a greater level of separation between active transportation users and motorists is desired. For example, a jog in a Neighborhood Bikeway where users must travel on an arterial street for two blocks would benefit from the development of a protected bikeway, such as a cycle track or buffered bike lane. This increased



separation from motorized traffic maintains a higher level of comfort for people traveling on the Neighborhood Bikeway—helping to maintain a route that is attractive to users of all ages and abilities. For more information on protected bikeways and their application, see

the Washington County Bicycle Facility Design Toolkit and/or the next page of this document “Treatments for Route “Jogs””.

Treatments for Route “Jogs”

Discussion

Since Neighborhood Bikeways utilize local streets, they do not always follow a perfectly linear path, especially in the suburban context. These “jogs” in the route can be challenging for Neighborhood Bikeway users navigating the route.

Bike Left Turn Lanes can be used to help address this issue where Neighborhood Bikeways intersect with streets at off-set locations. However, these treatments involve the bicyclist navigating out into the roadway to wait and turn. This may be uncomfortable for less confident bicyclists.

Two-way Cycletracks with High Visibility Crossings can be used in place of bicycle left turn lanes to create an additional level of separation for Neighborhood Bikeway users. An example of this treatment is the NE Going St intersection at NE 33rd Ave in Portland, OR.

Application

Anywhere that the Neighborhood Bikeway must deviate from a straight path requires a safe, comfortable, and seamless transition between the disparate segments. This may usually be accomplished using one of the two treatments described above, or new innovative solutions.

Suburban Context Considerations

None

Existing Guidance at County Level

Washington County Bicycle Design Toolkit addresses ‘Two Way Cycle Tracks’



A grade separated cycle track can help bicyclists comfortably transition through a jog in a Neighborhood Bikeway



Bike left turn lanes help bicyclists conveniently navigate jogs in the Neighborhood Bikeway route

Treatment Effect

				COST
Impacts mobility				varies
Reduces risk				

 positive effect  minimal effect  negative effect

