Chapter 4: The Bicycle

NETWORK

"When thinking about bicycle facilities, think about making it easy and safe for people to go where they go most: schools, grocery stores, neighborhood commercial districts and transit hubs. That means not only making it safe to get there, but making it easy to lock up your bike once you're there, find the appropriate bike route (way-finding) and connect to transit."

City Council funded the update to the BMP and provided specific policy direction to SDOT, including:

- incorporate best practices, including the National Association of City Transportation Officials (NACTO) bicycle design guidelines
- integrate neighborhood greenways and cycle tracks into the bicycle network, and
- identify routes for cycle tracks and neighborhood greenways

The current best practices for creating safe streets for the broadest range of people riding bicycles are cycle tracks, neighborhood greenways, and off-street facilities. By coordinating with the recently completed pedestrian and transit plans and identifying the best routes to employ the cycle tracks and greenways, the resulting plan is a bicycle facility network where people feel safe and comfortable riding their bicycle from their neighborhood to any destination within the city.

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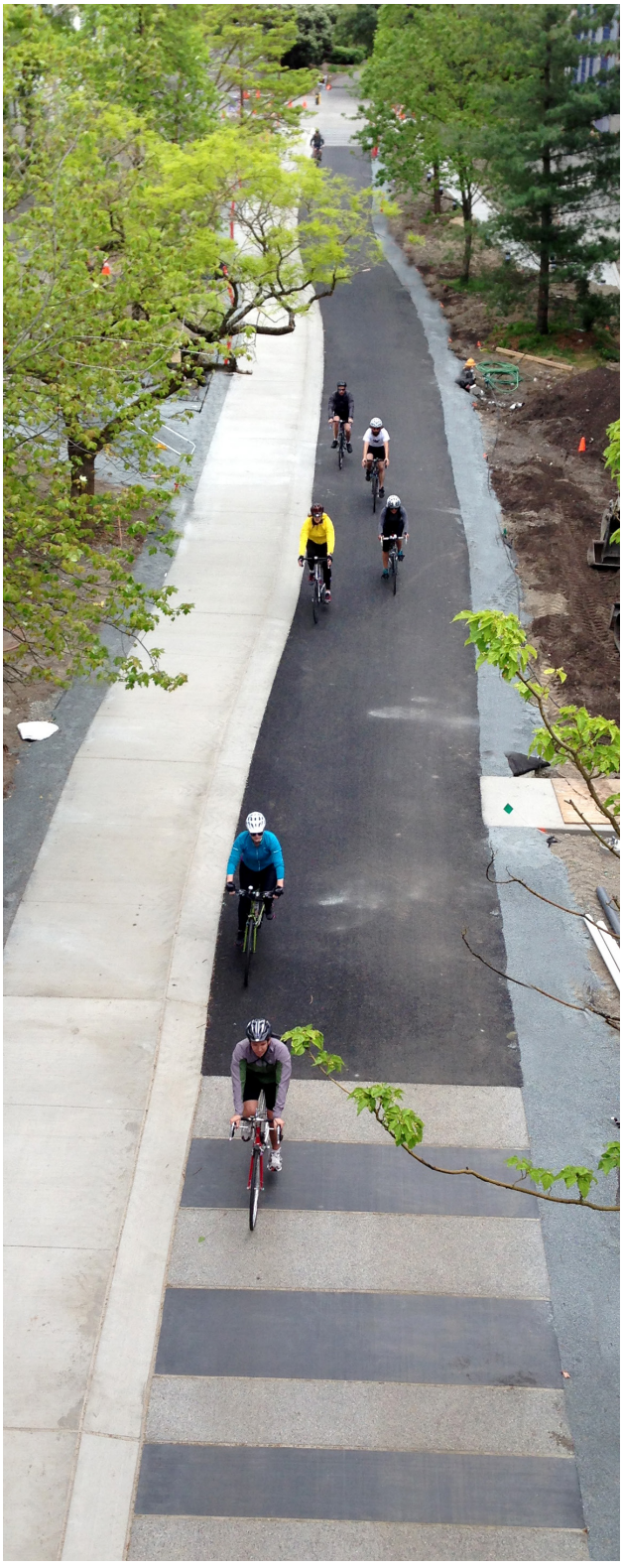


This section of the Burke-Gilman Trail is a bicycle facility that riders of all ages and abilities can comfortably use.

Bicycle Network Development

The proposed bicycle network map is the result of a collaborative planning process involving both extensive public input and technical analysis. The overall purpose of the proposed network map contained in the plan is to recommend the appropriate facility type and location in order to plan, design, and ultimately build a bicycle network that implements the goals of the BMP: provide a safe and connected bicycle network throughout the city, thereby increasing the livability of Seattle's neighborhoods as more people ride their bicycles for all trip purposes

The proposed bicycle network map was designed in two distinct phases. For development of the first draft network map, SDOT considered public comments received in the spring and summer of 2012, during the first phase of public engagement (find the summary report in Appendix 1A). People were clear that they wanted facilities that increase safety for all road users. They also suggested specific locations for improvements. The project team considered this input and other data, including:

- The location of existing bicycle facilities and system gaps based on the 2007 BMP map.
- Connections between key destinations (or land uses) that have been ranked high, medium, and low (see Table 4-1) and groupings of those destinations to create destination clusters (see Map 4-1) that are likely to generate high bicycle ridership.[1] These connections are known as travel sheds, which are defined as the area that can be accessed by riding a defined distance on connected bicycle facilities from key destinations. For more information about the specific types of land uses considered and the relative ranking used to describe demand, see Appendix 7.
- The topography of Seattle. Hills are a major feature of the city's overall landscape, as well as a barrier to riding a bicycle for many people (see Map 4-2). The creation of the all ages and abilities network attempted to recommend flat routes to destinations, but this was not always possible due to the grades of Seattle's hills.

1 One specific item that was included in the key destinations is food providers. In October 2012, the City of Seattle finalized the Food Action Plan that contains four goals. Goal 1 is "Healthy Food for All" and includes a strategy to "promote the location of healthy food access points that can be reached by walking, bike, or transit by all residents."

Map 4-1: Destination Clusters Map

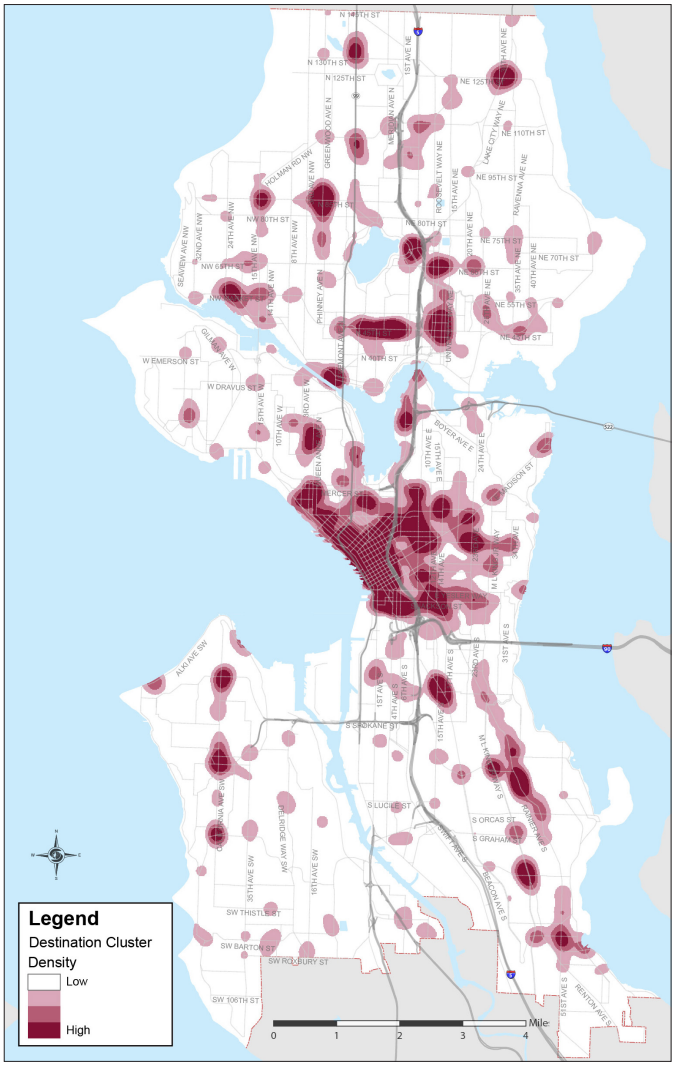
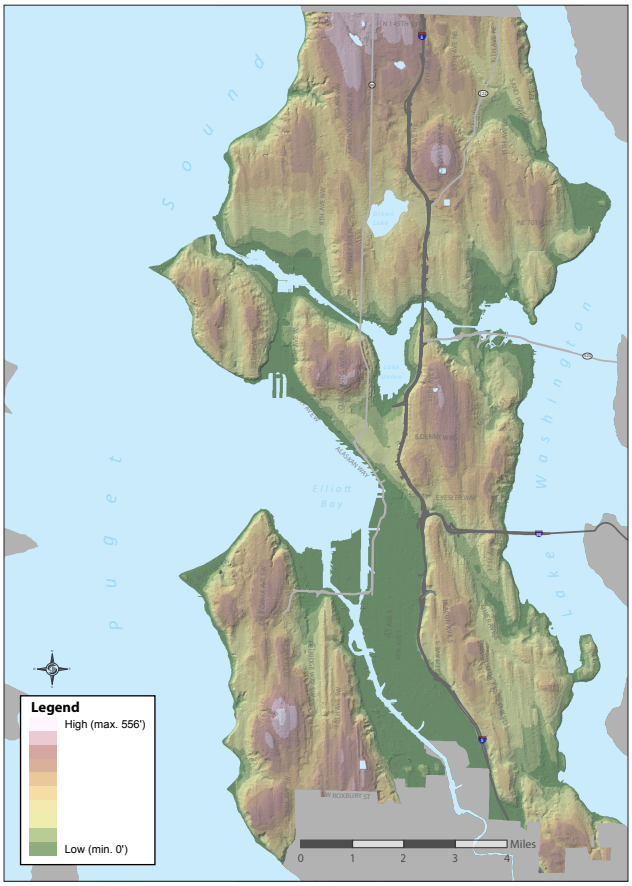


Table 4-1: Ranking of Destinations

Ranking	Destinations
High	University or college, large employers, major transit stations, neighborhood businesses, schools, neighborhood parks
Medium	Transit hubs, community centers and libraries, minor destinations, large parks, food providers (grocery store, farmer's market, p-patch gardens, produce stand, food banks)
Low	Large retail centers, other major entertainment destinations

Map 4-2: Seattle Area Topography



Seattle is a city of hills, and the bicycle facility network must reflect that. Appropriate facilities must provide both the space needed to slowly weave uphill and the accommodations to safely descend.

- Existing street characteristics. On-street bicycle facilities are highly influenced by the overall street character, such as posted speed limits, the amount of daily traffic, and the street classification.
- Designations in other modal plans. The city has adopted a number of other plans, including a Transit Master Plan and Pedestrian Master Plan, which also highlight desired improvements for these modes, and the Transportation Strategic Plan, which includes Major Truck Streets.

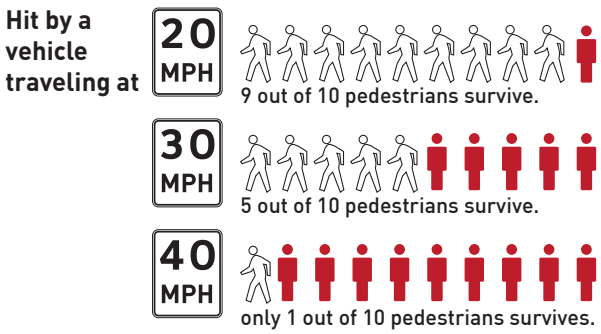
Bicycle Facility Designations

SDOT developed a set of guidelines to help determine what type of bicycle facility would generally work best on a street based on its characteristics (see Table 4-2). Recommended bicycle facilities include a range of options from shared streets to cycle tracks (protected bicycle lanes) with the goal of making riding a bicycle accessible to people of all ages and abilities. The guidelines were developed from international and US principles that reflect the need for greater bicycle separation on streets that have high motor vehicle volumes and speeds. While every facility type recommended in the plan does not follow these specific facility guidelines in Table 4-2, the criteria helped in determing the overall network. Some deviation of the guidelines occurred in order to create a connected all ages and abilities bicycle network.

Higher speeds increase the probability of fatal injury when a person driving a vehicle collides with a pedestrian.[2] While much of the research completed to date applies to pedestrians, it is likely that a person riding a bicycle would experience the similar outcome if in a collision with a fast moving motorist. Figure 4-1 shows that a small reduction in vehicle speeds has a tremendous impact on the safety of streets and on survival rates of those who may be hit by a vehicle. As SDOT's number one priority is safety for all road users, it is important to focus on the impact that motorist speed has on both pedestrians and people riding bicycles. Lower travel speeds for vehicles make bicycling safer and more attractive and streets safer as a whole.

The Washington Neighborhood Safe Streets Bill, enacted by the Washington State Legislature and signed by Governor Inslee in spring 2013, allows SDOT to design all neighborhood greenways to a maximum of 20 miles per hour (mph), which greatly

Figure 4-1: Pedestrian Survival Rate by Vehicle Impact Speed



SOURCE: FHWA. *PEDESTRIAN SAFETY STRATEGIC PLAN: BACKGROUND REPORT.* 2010.

2 World Health Organization, 2008, and OECD Transport Research Centre, 2006

A New Tool, the Washington Neighborhood Safe Streets Bill:

The bill is a simple way to improve safety by allowing municipalities to lower the speed limit on non-arterial, mostly residential streets without the need for a cost-prohibitive transportation study.

Enacted by the Washington State Legislature and signed into law by Governor Inslee in spring 2013.

influences the safety for all users of non-arterial streets. A result will be streets that more people will be comfortable using as a means of transportation while enhancing neighborhood livability.

The Recommended Bicycle Network

The bicycle network was divided into two categories to increase legibility of the network and to clearly define an all ages and abilities network. The two categories are a **Citywide Network** and **Local Connectors**.

The **Citywide Network** is a network of "all ages and abilities" bicycle facilities with comfortable separation from motor vehicles. This network is composed of cycle tracks (protected bicycle lanes), neighborhood greenways and multi-use trails connecting destination clusters. Streets on the **Citywide Network** provide short distance connections to neighborhood destinations, as well as connections to destination clusters across neighborhoods and throughout the city (see Map 4-1). People of all ages and abilities should be able to access all major destination clusters on this network. While the **Citywide Network** will be designed for all, bicyclists should always use their judgment in selecting routes that suit their experience and comfort level.

Table 4-2: Facility Designation Guidelines

Generalized Bicycle Facility Designation	Bicycle Facility Types	Posted Speed Limit (mph)	Average Daily Traffic (ADT) per day	Street Classification
Neighborhood greenway	Neighborhood Greenway	20	1,500 or less	Non-arterial
Shared street	Shared lane pavement marking (sharrow)	25 - 30	To be used due to ROW constraints or topography	Non-arterial and Collector/Minor arterials
In street, minor separation	Bicycle lane; Climbing Lane	30	8,000 or less	Collector arterial
	Buffered bicycle lane	30	15,000 or less	Collector/Minor arterials
Cycle tracks (protected bicycle lanes)	Physically separated (raised or with barrier on-street facility)	30 and greater	15,000 and above	Minor/Principal arterials
Off-street*	Multi-use trail	N/A	N/A	N/A

This chart illustrates a process to determine bicycle facility designations based on street designations as well as safety aspects. Other factors that affect bicycle facility selection beyond posted speed limit, street classification and volume include: topography, traffic mix of transit and freight vehicles, presence of on-street parking, intersection and driveway density, surrounding land use, and roadway width. These factors are not included in the facility designation chart above, but should always be a consideration in the project development and design process. Facilities may be designed to provide a higher level of safety and comfort than the minimums recommended here.

*Off-Street Trails may be developed opportunistically on corridors where there is available adjacent land, or on corridors with a special transportation function (e.g., sections of Alaskan Way)

A key objective for the **Citywide Network** was to address intersection safety. Intersection safety is an area of focus that the BMP addresses to provide more clarity for positioning of bicyclists and motorists, especially within the all ages and abilities network. Cycle tracks (protected bicycle lanes) provide greater predictability of people on bicycles, incorporates safer intersection treatments (potential conflict locations between bicyclists, pedestrians, and motor vehicle drivers), and allow for greater separation from motor vehicles.

Neighborhood greenways are a shared street environment on streets with low speeds and volumes of motorists that are safer and more pleasant for both people riding bicycles and walking. Arterial street crossings are crucial to improve so that people traveling on the neighborhood greenway can feel safe crossing the arterial intersection. Applicable intersection treatments are described further in this chapter, as well as within Appendix 4.

The **Local Connectors** network provides access to the **Citywide Network**, parallels the **Citywide Network**, and also serves destinations. While **Local Connectors** are composed of bicycle facility types appropriate for people of all ages and abilities, some segments will be served with conventional bicycle treatments, such as bicycle lanes or buffered bicycle lanes (In street, minor separation) and shared streets. **Local Connectors** are segments focused on connections within neighborhoods, to the **Citywide Network, and across the city**. Some of the bicycle facilities in the **Local Connectors** network help make connections to destinations and to the rest of the network for bicycle riders who are comfortable bicycling in or adjacent to traffic with no physical barrier. **Local Connectors** may provide more direct routes than routes suitable for bicycle riders of all ages and abilities.

Neighborhood greenways play a prominent role in both the **Citywide Network** and as a **Local Connector** facility type. The design elements of a neighborhood greenway (whether it be a part of the **Citywide Network** or a **Local Connector**) will be the same, as described further in the bicycle facilities visual glossary. The only difference is how

Biking to school on a future neighborhood greenway.

SDOT may split up the projects within the prioritization framework, as described in Chapter 7.

Upgrades of existing bicycle facilities are important to recognize as bicycle facility separation principles (the facility designation guidelines) have evolved since the 2007 BMP. There are examples of shared street bicycle facilities and bicycle lanes that have been implemented on streets that potential bicycle riders may not feel comfortable riding. Through a data-driven process, SDOT has identified existing bicycle facilities that should, over time, either be upgraded to a higher-quality bicycle facility type or decommissioned. The recommended upgrades will be included within the prioritization framework to determine when to pursue the installation of the higher-quality facility type. The existing facility still provides a connection to destinations and will remain as a part of the user map and maintained by SDOT until, as determined by the project development and design process, whether the facility should be removed with the implementation of the new, adjacent bicycle facility. Table 4-3 shows the breakdown of miles of existing bicycle facilities, recommended network improvements by facility type, and total network miles.

Table 4-3: Bicycle Facilities in the Recommended Bicycle Network (lengths in miles)

	Existing Network*	Proposed Network Improvements			Total Network	Percent of Total Network
		Upgraded to Existing Bicycle Facilities	*New Facilities*	*Total New or Upgraded Facilities to Build*		
Off Street	46.9	0	32.0	32.0	78.9	13%
Cycle Track (protected bicycle lane)	3.2	52.1	49.5	101.6	104.8	17%
Neighborhood Greenway	10.3	0	238.6	238.6	248.9	41%
In Street, Minor Separation	44.4	17.9	75.6	93.5	137.9	23%
Shared Street	30.0	0	7.8	7.8	37.8	6%
Total	**134.8**	**70.0**	**403.5**	**473.5**	**608.3**	**100%**

*Existing network totals include only existing facilities that meet the bicycle network facility designation guidelines or, in some cases, where right-of-way is limited and a higher-quality facility could not be implemented.

A small sub-set of the bicycle network are identified as catalyst projects. Catalyst projects are located at choke points in the network that pose significant challenges to implementation due to physical constraints. Catalyst projects, like the Burke-Gilman Trail missing link, also reduce critical barriers to bicycling by closing network gaps and increase safety by building all ages and abilities friendly bicycle facilities to the maximum feasible extent. The projects range from complicated intersections that serve all modes of transportation, including transit and freight, to new off-street connections and more out-of-the box ideas that help to overcome numerous topography and physical barriers that currently separate neighborhoods. The full bicycle network project list, including catalyst projects and associated project descriptions, are in Appendix 8.

Burke-Gilman Trail and trail etiquette signage.

Table 4-4: Recommended Citywide Network

Facility Designation	Length (in miles)
Cycle Track (protected bicycle lane)	102.4
Neighborhood Greenway	71.0
Off Street	52.8
Total	**226.2**

Table 4-5: Recommended Local Connectors

Facility Designation	Length (in miles)
Cycle Track (protected bicycle lane)	2.4
Neighborhood Greenway	177.9
Off Street	26.1
In Street, Minor Separation	137.9
Shared Streets	37.8
Total	**382.1**

The Bicycle Network Map

The recommended bicycle network map is shown by sector on Maps 4-3 through 4-8. There is also a full-sized map of all bicycle facilities in the city in the back pocket of the final plan. The map legend contains the following bicycle facility types within each category:

Citywide Network

- Off-Street
- Cycle Tracks (protected bicycle lanes)
- Neighborhood Greenways

Local Connectors

- Off-Street
- Cycle Tracks (protected bicycle lanes)
- Neighborhood Greenways
- In Street, Minor Separation
- Shared Streets

Catalyst Projects

Catalyst projects are critical pieces of the future bicycle network, and their implementation will often be part of a larger regional infrastructure project. They are part of both network categories. There are 27 catalyst projects identified in the bicycle network shown in Map 4-9 and described in Appendix 8.

Building for Bicycle Riders of All Ages and Abilities

Bicycling needs to be a safe, pleasant, and convenient transportation option for the broadest array of people. Map 4-10 shows the proposed network of bicycle facilities most appropriate for riders of all ages and abilities, consisting of 432.2 miles of multi-use trails, cycle tracks (protected bicycle lanes), and neighborhood greenways.

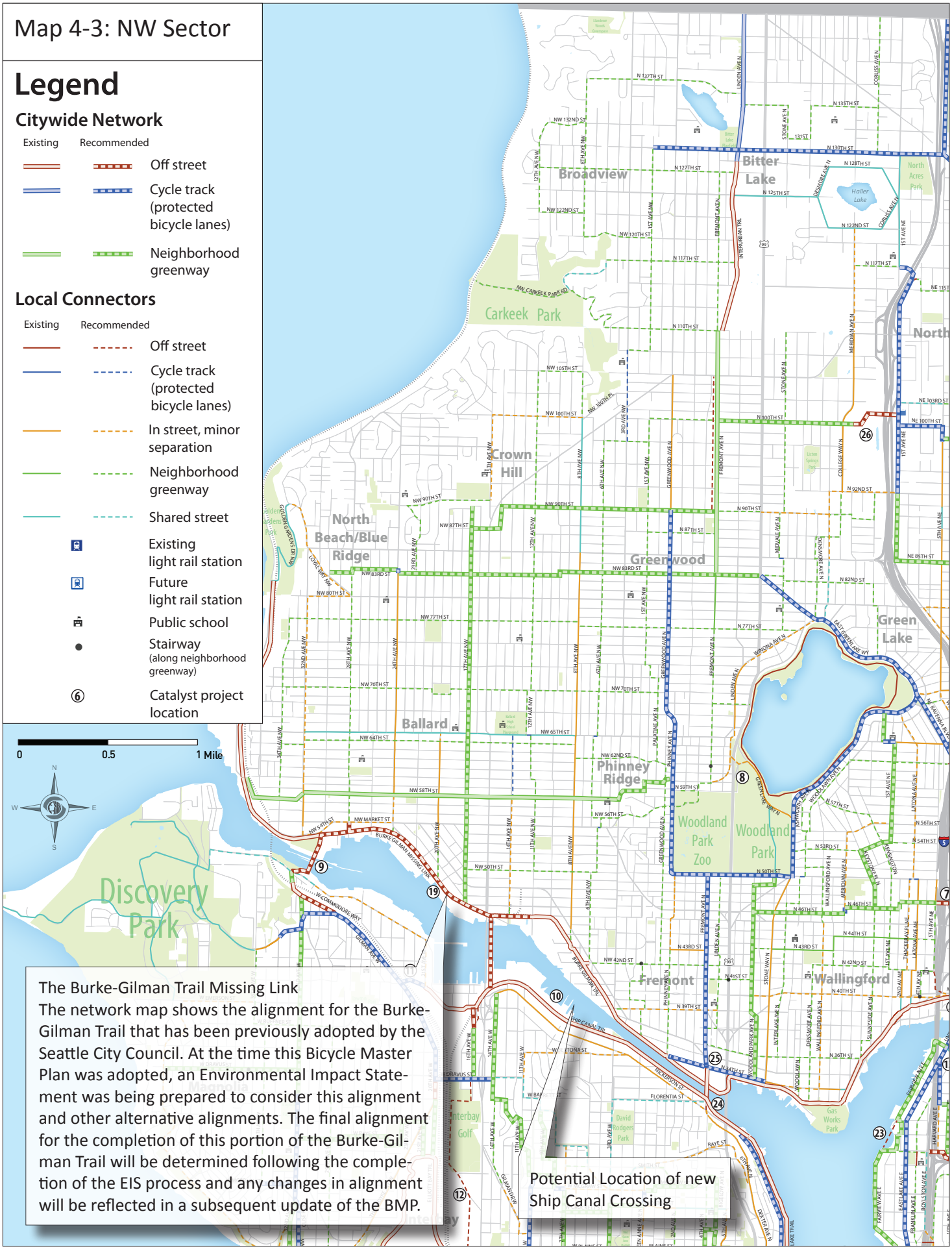
Connecting to the Region

Connections to neighboring jurisdictions and other regional destinations will support the goal of increased bicycle ridership by providing for seamless regional bicycle travel. Map 4-11 shows how the City of Seattle recommended bicycle network connects to the regional bicycle system.

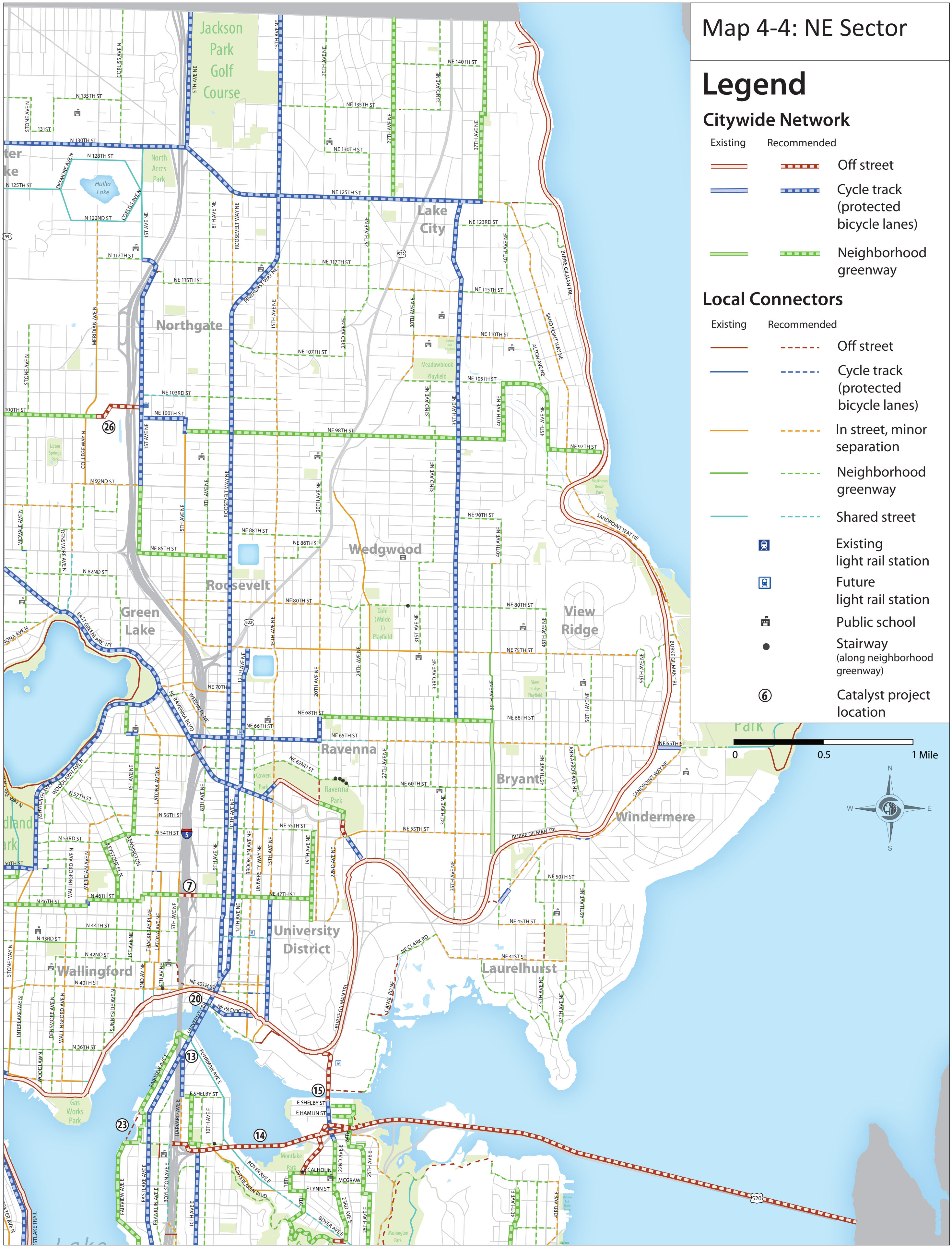
An overhead view of the Elliott Bay trail along the waterfront.

Rainier Valley Summer Streets Parade.

Map 4-3: NW Sector



Map 4-4: NE Sector



Map 4-5: W Sector

Legend

Citywide Network

Existing	Recommended	
		Off street
		Cycle track (protected bicycle lanes)
		Neighborhood greenway

Local Connectors

Existing	Recommended	
		Off street
		Cycle track (protected bicycle lanes)
		In street, minor separation
		Neighborhood greenway
		Shared street
		Existing light rail station
		Future light rail station
		Public school
		Stairway (along neighborhood greenway)
		⑥ Catalyst project location

Map 4-6: E Sector

Legend

Citywide Network

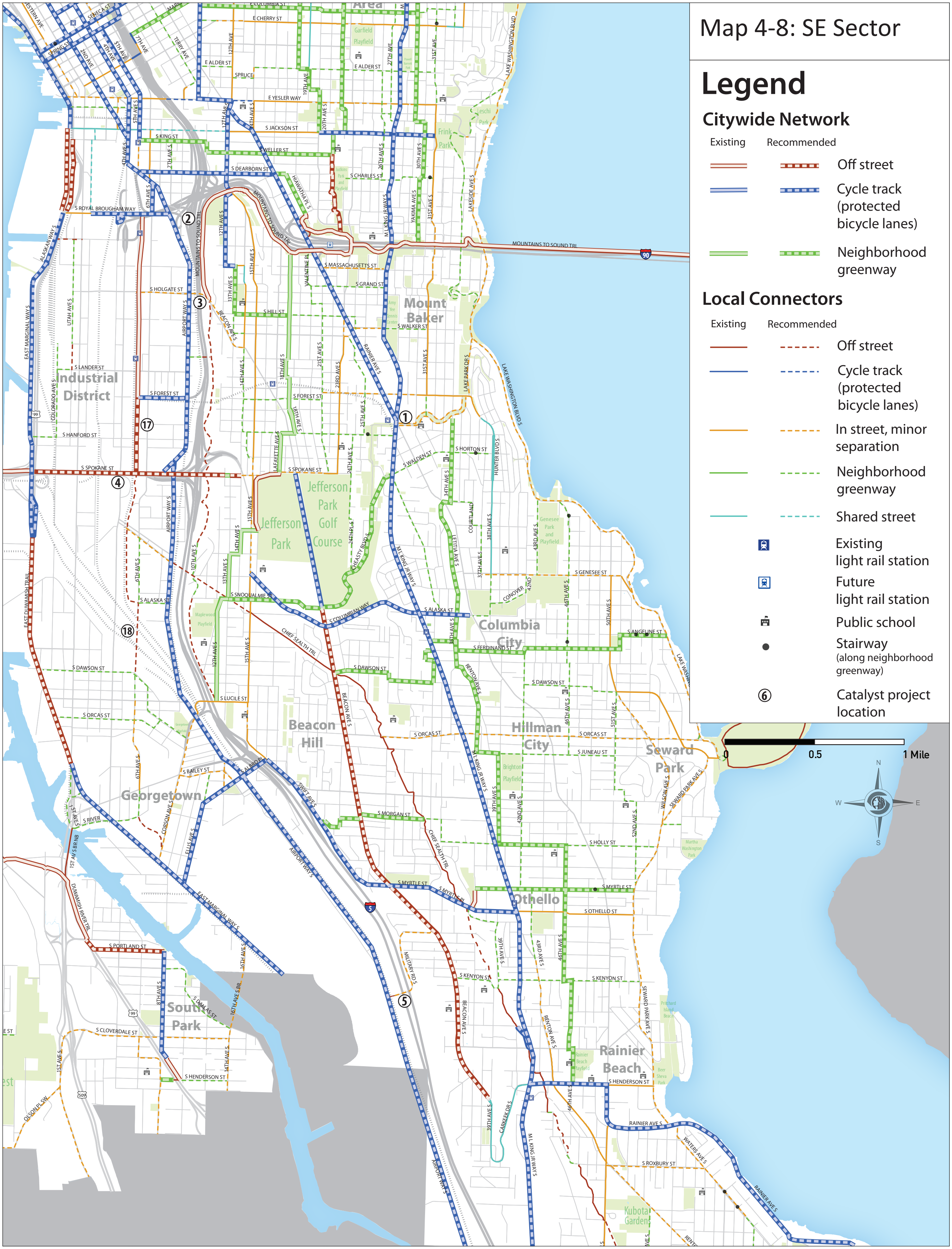
Existing	Recommended	
		Off street
		Cycle track (protected bicycle lanes)
		Neighborhood greenway

Local Connectors

Existing	Recommended	
		Off street
		Cycle track (protected bicycle lanes)
		In street, minor separation
		Neighborhood greenway
		Shared street

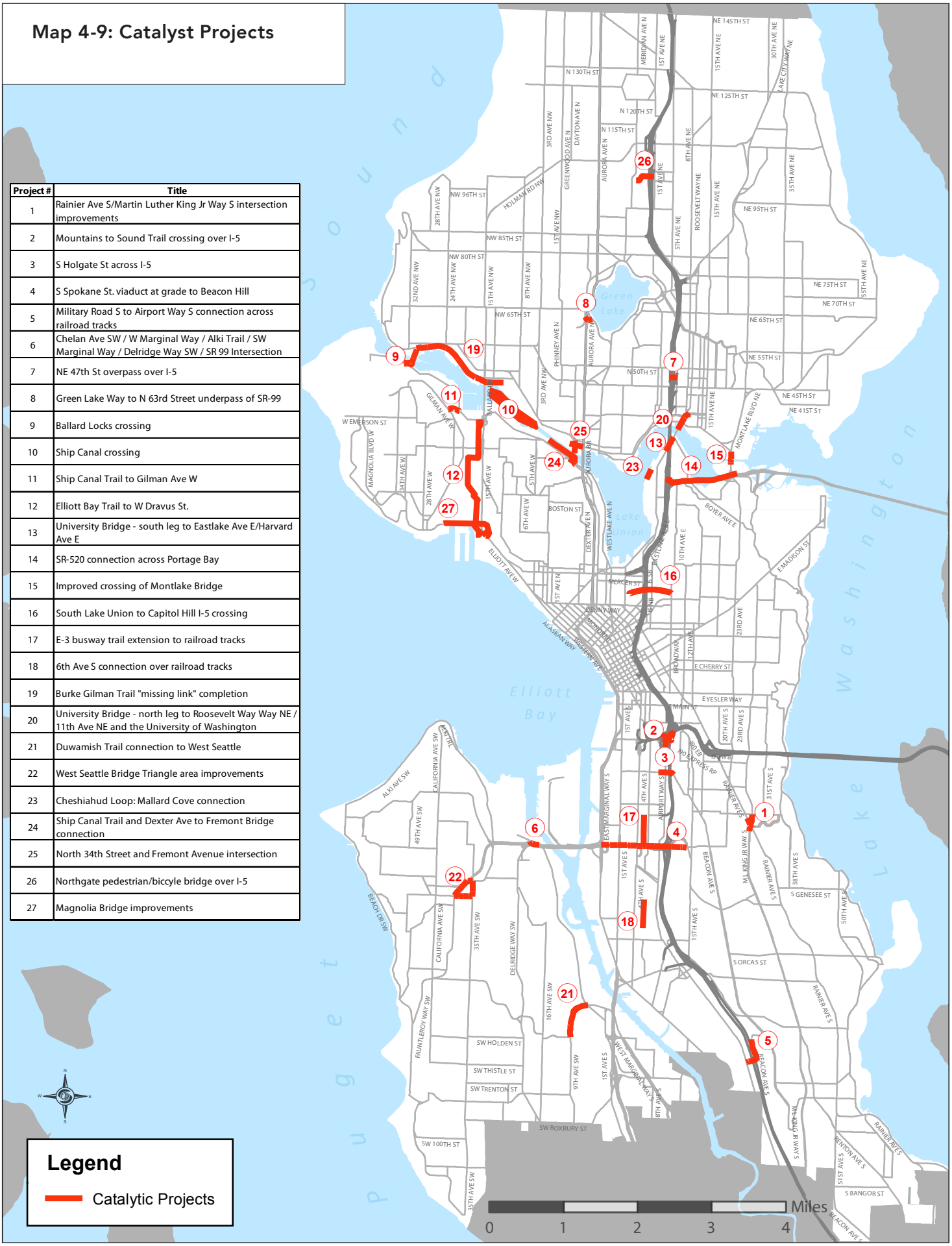
- Existing light rail station
- Future light rail station
- Public school
- Stairway (along neighborhood greenway)
- ⑥ Catalyst project location

Map 4-7: SW Sector

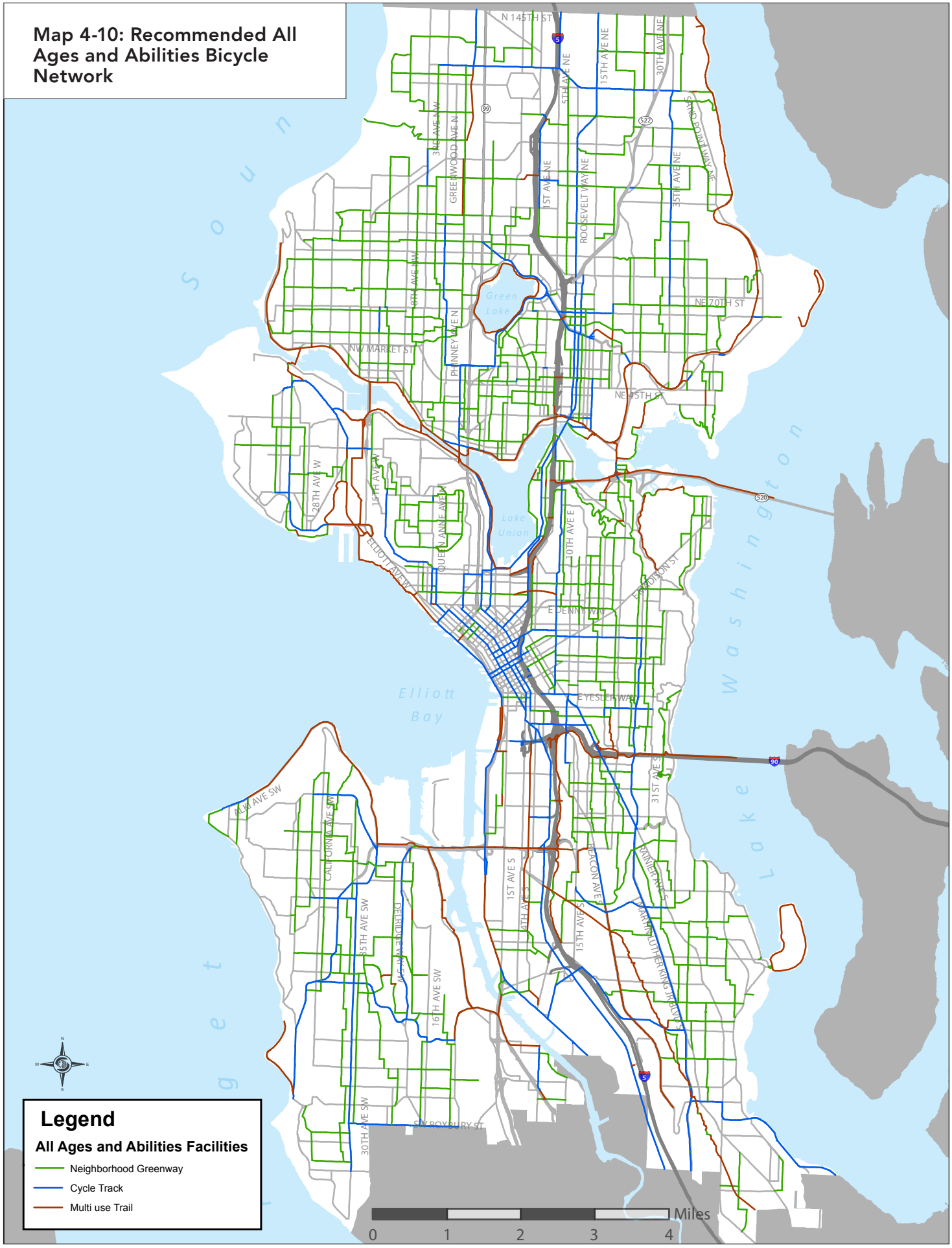

Map 4-8: SE Sector
Legend
Citywide Network
Existing
Recommended
Off street
Cycle track (protected bicycle lanes)
Neighborhood greenway
Local Connectors
Existing
Recommended
Off street
Cycle track (protected bicycle lanes)
In street, minor separation
Neighborhood greenway
Shared street
Existing light rail station
Future light rail station
Public school
Stairway (along neighborhood greenway)
Catalyst project location
0
0.5
1 Mile
N
S
E
W
Industrial District
Mount Baker
Jefferson Park
Jefferson Park Golf Course
Columbia City
Beacon Hill
Hillman City
Seward Park
Georgetown
Othello
South Park
Rainier Beach
Kubota Garden
MOUNTAINS TO SOUND TRL
LAKE WASHINGTON BLVD S
RAINIER AVE S
M L KING JR WAY S
BEACON AVE S
AIRPORT WAY S
EAST MARGINAL WAY S
CHIEF SEALTH TRL
S SPOKANE ST
S HENDERSON ST
S MYRTLE ST
S OTHELLO ST
S ORCAS ST
S DAWSON ST
S ALASKA ST
S JACKSON ST
E YESLER WAY
E CHERRY ST
S KING ST
S DEARBORN ST

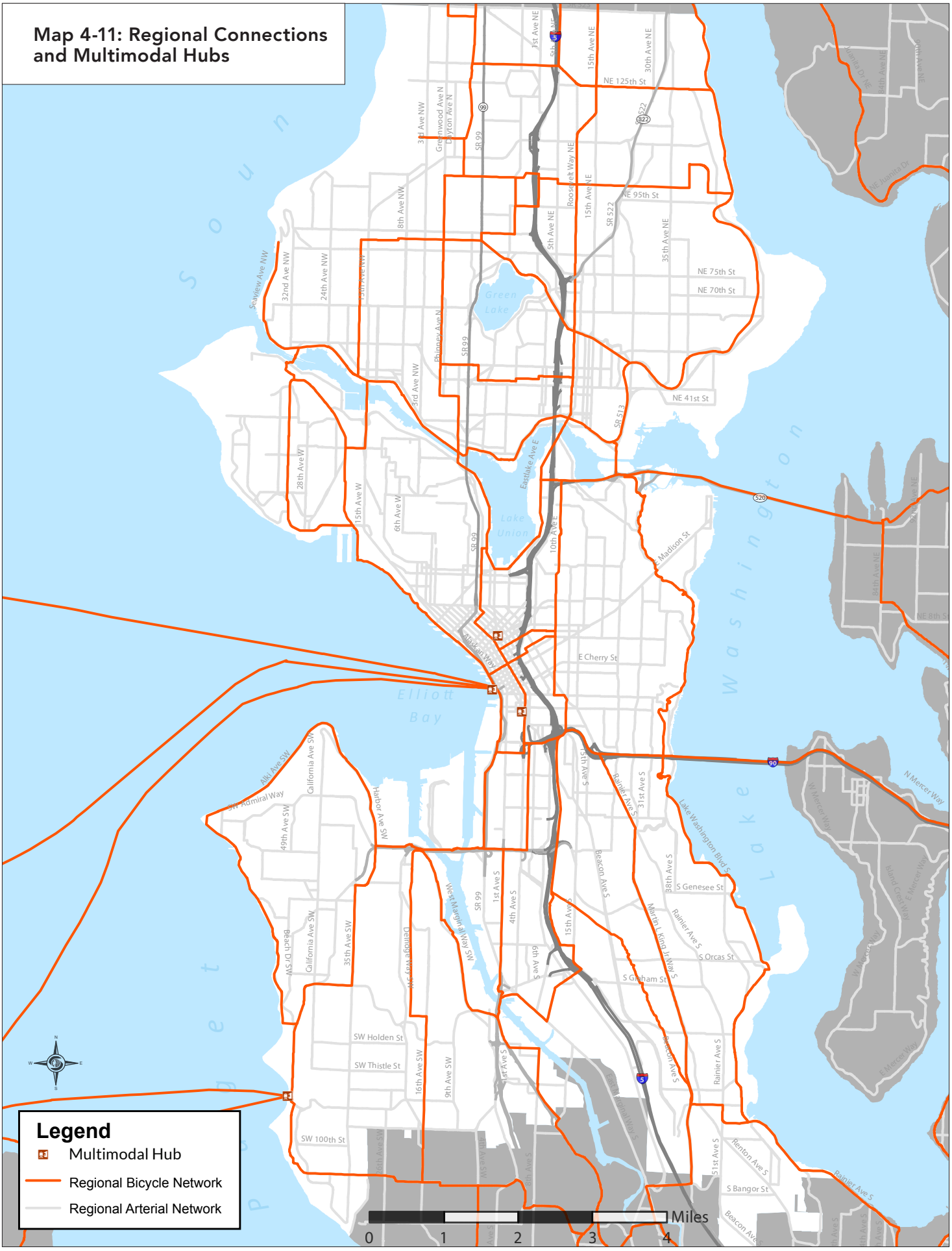
Map 4-9: Catalyst Projects

Project #	Title
1	Rainier Ave S/Martin Luther King Jr Way S intersection improvements
2	Mountains to Sound Trail crossing over I-5
3	S Holgate St across I-5
4	S Spokane St. viaduct at grade to Beacon Hill
5	Military Road S to Airport Way S connection across railroad tracks
6	Chelan Ave SW / W Marginal Way / Alki Trail / SW Marginal Way / Delridge Way SW / SR 99 Intersection
7	NE 47th St overpass over I-5
8	Green Lake Way to N 63rd Street underpass of SR-99
9	Ballard Locks crossing
10	Ship Canal crossing
11	Ship Canal Trail to Gilman Ave W
12	Elliott Bay Trail to W Dravus St.
13	University Bridge - south leg to Eastlake Ave E/Harvard Ave E
14	SR-520 connection across Portage Bay
15	Improved crossing of Montlake Bridge
16	South Lake Union to Capitol Hill I-5 crossing
17	E-3 busway trail extension to railroad tracks
18	6th Ave S connection over railroad tracks
19	Burke Gilman Trail "missing link" completion
20	University Bridge - north leg to Roosevelt Way Way NE / 11th Ave NE and the University of Washington
21	Duwamish Trail connection to West Seattle
22	West Seattle Bridge Triangle area improvements
23	Cheshiahud Loop: Mallard Cove connection
24	Ship Canal Trail and Dexter Ave to Fremont Bridge connection
25	North 34th Street and Fremont Avenue intersection
26	Northgate pedestrian/biccyle bridge over I-5
27	Magnolia Bridge improvements



Map 4-10: Recommended All Ages and Abilities Bicycle Network




Map 4-11: Regional Connections and Multimodal Hubs
Legend
Multimodal Hub
Regional Bicycle Network
Regional Arterial Network
Miles
0
1
2
3
4
Puget Sound
Lake Washington
Elliott Bay
Lake Union
Green Lake
NE 125th St
NE 95th St
NE 75th St
NE 70th St
NE 41st St
E Cherry St
E Madison St
SW Admiral Way
SW Holden St
SW Thistle St
SW 100th St
S Genesee St
S Orcas St
S Graham St
S Bangor St
N Mercer Way
E Mercer Way
Lake Washington Blvd S
Martin L King Jr Way S
Rainier Ave S
Renton Ave S
Beacon Ave S
SR 99
SR 522
SR 513
SR 520
I-5
I-90
15th Ave NE
5th Ave NE
Roosevelt Way NE
35th Ave NE
8th Ave NW
3rd Ave NW
Phinney Ave N
Greenwood Ave N
Dayton Ave N
Seaview Ave NW
32nd Ave NW
24th Ave NW
28th Ave W
15th Ave W
6th Ave W
Eastlake Ave E
10th Ave E
Aurora Ave N
Alki Ave SW
California Ave SW
Harbor Ave SW
49th Ave SW
35th Ave SW
Beach Dr SW
Fauntleroy Way SW
West Marginal Way SW
16th Ave SW
9th Ave SW
1st Ave S
4th Ave S
6th Ave S
15th Ave S
31st Ave S
38th Ave S
51st Ave S

Strategies and Actions For the Bicycle Network

This chapter and those that follow provide detailed recommendations on strategies and implementation actions needed to meet the plan's five goals and six objectives.

Strategies guide the city on how to achieve progress toward realizing the plan's goals. Actions are specific tasks and duties to pursue for plan implementation.

The strategies and actions below provide direct, clear steps the city can take to implement the proposed bicycle network. As a project on the proposed bicycle network map is prioritized, it will move into the project development and design process. The bicycle improvements identified in the plan will require additional evaluation and analysis prior to implementation. This process could include public engagement, data collection and analysis, technical analysis, conceptual design alternatives, and preferred design. Through the project development and design process, facility types and locations of neighborhood greenways will be confirmed or may be modified based on feasibility analysis. Intersection analysis and appropriate intersection design treatments will be a part of every bicycle facility project. For more details regarding the project development and design process, go to Chapter 7: Implementation Approach.

Chapter 4 Strategies and Actions: Bicycle Network

Strategies	Actions
4.1 Implement the off-street (multi-use trail) bicycle facility network	**4.1.1 Develop new multi-use trails.** Developing off-street bicycle facilities outside the public right-of-way will require additional feasibility analysis and agreements with land owners.
	4.1.2 Incorporate best practice crossing design treatments into every new multi-use trail project.
	4.1.3 Develop multi-use trails "etiquette" signs, and other creative means, to educate users traveling along the trail.
	4.1.4 Assess multi-use trail lighting needs and work with Seattle City Light (SCL) to provide adequate trail lighting.
	4.1.5 Install wayfinding with all off-street bicycle facility projects.

Walking and biking along the Burke-Gilman Trail.

Strategies	Actions
4.2 Implement cycle tracks (protected bicycle lanes) as part of the bicycle facility network	**4.2.1 Research best practices for cycle track design** and create standards. Standards needed include: • Pedestrian needs, implementing the Americans with Disabilities Act, to configure cycle track designs at intersections that are understandable for all people crossing the cycle track, as well as placement of push buttons and tactile warning strips • Emergency vehicle access needs and ways to design the cycle track that allows vehicles to either mount or enter into the cycle track • Snow removal, sweeping and other maintenance activities • Commercial load zones and driveways to encourage business vitality and access • Traffic signals
	4.2.2 Develop cycle tracks. Implementation of a cycle track may be a multi-year process. Determine the feasibility of constructing a proposed cycle track during the project development and design process. If through the process SDOT determines that a proposed cycle track is not feasible, implement a neighborhood greenway on a parallel street to provide an all ages and abilities bicycle connection to destinations and assess the feasibility of a buffered bicycle lane or bicycle lane on the arterial. When a neighborhood greenway is developed, focus on the user experience by: • installing signage directing people bicycling to destinations on the arterial • installing on-street bicycle corrals prior to the arterial provides a place for people on bicycles to park their bicycles and walk to their destination along the arterial (if they are not comfortable bicycling on the arterial without a bicycle facility)
	4.2.3 Coordinate private development projects and other agency infrastructure projects as they arise to be opportunistic about preserving the right-of-way space along a corridor where a cycle track is proposed. Use the street/alley vacation process, when applicable, to encourage a private developer to achieve public benefit requirements by designing and constructing a cycle track along the building frontage.
	4.2.4 Partner with transit agencies during project development and design to implement cycle tracks along transit corridors to allow for a continuous lane for people riding bicycles. Possible design strategies include transit bus islands or bringing bicycle riders to the sidewalk level. Consider the needs of both people on bicycles and pedestrians/transit users.
	4.2.5 Work with the freight advisory board during project development and design to implement cycle tracks along Major Truck Streets.
	4.2.6 Design downhill cycle tracks with a focus on potential bicycle travel speed and use separation methods that will not become a safety concern for people on bicycles or for other users of the roadway.
	4.2.7 Develop educational tools that teach all users of the roadway (bicyclists, pedestrians, and motorists) about cycle tracks.
	4.2.8 Install wayfinding with all cycle track bicycle facility projects.
4.3 Implement neighborhood greenways as part of the bicycle facility network	**4.3.1 Develop neighborhood greenways.** Implementation may not follow the exact non-arterial street identified in the plan, but rather the final route will be determined during the project development and design process. Focus on arterial street crossing improvements.
	4.3.2 Focus on the user experience. Improve connections to arterial streets by installing destination signage and on-street bicycle corrals that allow people to park their bicycles and walk to destinations on arterial streets. Work with partners/adjacent land owners to incorporate resting locations with benches.
	4.3.3 Assess pedestrian infrastructure and amenities during the design of each project to identify priority locations, and refer to the Pedestrian Master Plan.
	4.3.4 Add staircase runnels to all SDOT-owned staircases where a neighborhood greenway route utilizes a staircase for connectivity.
	4.3.5 Install wayfinding with all neighborhood greenway bicycle facility projects.

Strategies	Actions
4.4 Implement in street, minor separation bicycle facilities as a part of the bicycle facility network	**4.4.1 Develop in street, minor separation bicycle facilities.** Bicycle lanes or buffered bicycle lanes help make connections between destinations and to the citywide all ages and abilities network.
	4.4.2 Design in street, minor separation bicycle facilities with adequate width from adjacent on-street parking to help prevent door zone conflicts.
	4.4.3 Install wayfinding with all in street, minor separation bicycle facility projects.
4.5 Implement shared street bicycle facilities as part of the bicycle facility network	**4.5.1 Develop shared street bicycle facilities.** Shared streets help provide important connections to destinations and to the rest of the network for people riding bicycles where it is not possible to implement a bicycle lane or buffered bicycle lane.
	4.5.2 Promote visibility of the person on the bicycle. Place shared lane markings in the center of the travel lane on streets with driveways and on-street parking to encourage bicycling outside of the door zone or in potentially low visibility conflict points.
	4.5.3 Install wayfinding with all shared street bicycle facility projects.
4.6 Implement catalyst projects	**4.6.1 Develop catalyst projects.** These projects are located at significant choke points in the network and are critical to providing network connectivity for people of all ages and abilities.
	4.6.2 Seek partnerships with other agencies and land owners to implement catalyst projects.
4.7 Implement upgrades of existing bicycle facilities	**4.7.1 Upgrade existing bicycle facilities** based on analysis of evaluation criteria.
	4.7.2 Determine if and when an existing bicycle facility should be decommissioned if an upgrade is not feasible or an adjacent corridor is implemented.
	4.7.3 Install wayfinding with all catalyst projects.
4.8 Install bicycle detection at traffic signals in every new bicycle facility, as well as with all street replacement projects	**4.8.1 Develop bicycle detection standards.** Standardize (technology, placement, leading detection needs, and confirmation tools) by bicycle facility type.
	4.8.2 Continue to experiment and test new bicycle detection technology to incorporate higher-quality detection and enhanced data collection tools.
	4.8.3 Develop educational tools that teach bicycle riders about bicycle detection, bicycle placement, and visual cues that confirm detection.
4.9 Coordinate bicycle network implementation with partners	**4.9.1 Develop regional wayfinding standards** to enhance bicycle system legibility and coherence.
	4.9.2 Coordinate with neighbor jurisdictions to create network connectivity.
	4.9.3 Coordinate with transit agencies for last-mile bicycle connections.
	4.9.4 Coordinate with Puget Sound Bike Share to integrate the bicycle network alignment with station locations. Having a high-quality bicycle network will be important for bike share users.
	4.9.5 Coordinate with partners to install staircase runnels on staircases not owned by the Seattle Department of Transportation that allow bicycle accessibility to various destinations.

Bicycle Facility Design

The following **Intersection Treatment Selection** and **Bicycle Facilities Visual Glossary** sections provide brief descriptions and clear graphics to illustrate the "what" and "why" of the facilities recommended in the Plan. This section covers a range of facilities and intersection treatments. A more comprehensive glossary of bicycle facilities including end-of-trip facilities is presented in Appendix 3.

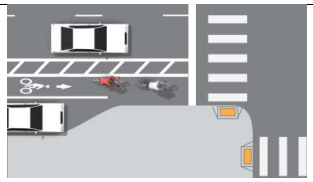
This glossary is not intended to represent detailed design standards. SDOT will develop more detailed design standards for these facilities as revisions to the Right-of-Way Improvements Manual, where they can readily be updated over time with current best practices and new design innovations. The glossary illustrates what the terms in the network map mean to help community members better understand these facilities, why they are important, and what they might mean for the future. This information will be used in educational materials for all roadway users.

Intersection Treatment Selection

The incorporation of bicycle-appropriate intersection design is important to create a safe and connected network, as well as to provide predictability for all modes. Better intersection design increases the awareness and visibility of people riding bicycles, helps bicyclists make safer intersection crossings, and encourages all modes to make more predictable approaches to and through an intersection.

The Intersection Treatment Selection Table will be used on a case-by-case basis to determine suitable intersection designs. Intersection treatments are categorized based on the type of street being crossed (arterial or non-arterial), as well as the type of bicycle facility. By using engineering judgement to select from this menu of intersection treatments, SDOT will practice more consistent design throughout the city. As intersection treatments continue to evolve, SDOT will keep up with best practices and update the table accordingly to improve intersection safety for all modes. A sample of the Intersection Treatment Selection Table is shown in Figure 4-2.; the full table is included in Appendix 4.

Figure 4-2: Sample Section of the Intersection Treatment Selection Table

Roadway Type:	**Collector Arterial**	
Auto Volumes:	<15,000 ADT	
Bicycle Facility Types	 (in street, minor separation) **Conventional Bike Lane** **Buffered Bike Lane**	
Cross Street Type:	**Non-arterial Crossings**	**Arterial Crossings**
Cross-Street Approach		• **Two-Stage Turn Box**
Intersection Treatment Options	• **Intersection Crossing Markings**	• **Intersection Crossing Markings** • **Median Diverter Island** • **Active Warning Beacons** • **Half Signal** • **Bicycle Signal** • **Full Signal** • **Green Bike Box** • **Combined Bike Lane/Turn Lane** • **Two-Stage Turn Box** • **Through Bike Lanes** • **Signal Detection** • **Forward Stop Bar** • **Offset Street Connection**

Strategies and Actions for Bicycle Facility Design

The following strategies will help Seattle achieve its safety and ridership goals by designing all bicycle facilities to the highest standards that currently exist. Additionally, the strategies encourage trying new designs that may achieve greater safety outcomes, thus encouraging more people to ride a bicycle for any trip purpose.

Chapter 4 Strategies and Actions: Bicycle Facility Design

Strategies	Actions
4.10 Design all bicycle facilities to meet or exceed the latest federal, state and local guidelines	**4.10.1 Supplement recommendations from the Bicycle Facilities Visual Glossary with engineering studies**, where necessary, and guidance from other nationally recognized guides. Resources include the Manual on Uniform Traffic Control Devices (MUTCD), National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide, American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities, the Americans with Disabilities Act (ADA) guidelines and Universal Design recommendations, Institute of Transportation Engineers (ITE) publications, and other nationally and internationally recognized guides.
	4.10.2 Establish and update bicycle facility designs and the intersection treatment selection table in the Seattle Right-of-Way Improvements Manual to reflect the Bicycle Facilities Visual Glossary.
	4.10.3 Provide ongoing education opportunities to SDOT planning and engineering staff on new and innovative bicycle facility design.
	4.10.4 Use innovative designs and study their effects. Request "experimental status" from appropriate government entities for bicycle facility designs that may not yet be recognized as standard.
	4.10.5 Work with the Washington State Department of Transportation (WSDOT) to update state bicycle facility standards.
	4.10.6 Provide bicycle detection at all signalized intersections, per Washington state law, and experiment with innovative detection technology.
	4.10.7 Work with transit agencies, freight entities, and the Seattle Fire Department to design bicycle facilities on arterials streets that provide adequate width for large vehicles, including emergency vehicles.
4.11 Improve bicycle safety and access at railroad and rail transit crossings and parallel facilities	**4.11.1 Assess all railroad and rail transit crossings that intersect bicycle facilities** and install appropriate bicycle-supportive infrastructure. Use signage and pavement markings to facilitate crossing at 90 degrees to the maximum extent feasible.
	4.11.2 Assess all railroad and rail transit lines that run parallel with existing bicycle facilities and install signage to facilitate safe travel behavior and enhance parallel bicycle facilities when possible.

Bicycle Facilities Visual Glossary

Neighborhood Greenways

Neighborhood Greenways use signs, pavement markings, and traffic calming measures to discourage through trips by motor vehicles, while accommodating local access. Intersection crossing treatments (particularly at arterial crossings) are used to create safer, more comfortable, and convenient bicycle and pedestrian-optimized streets.

Neighborhood Greenways

Neighborhood greenways are non-arterial streets with low motorized traffic volumes and speeds, designated and designed to give bicycle and pedestrian travel priority. A critical component of a neighborhood greenway is to provide arterial street crossing improvements for safer and more comfortable travel for both bicyclists and pedestrians. They provide people of all ages and abilities with comfortable and attractive places to walk and ride a bicycle. People riding bicycles should feel comfortable bicycling two abreast or "conversation riding" while traveling on a neighborhood greenway.

Pedestrian Amenities

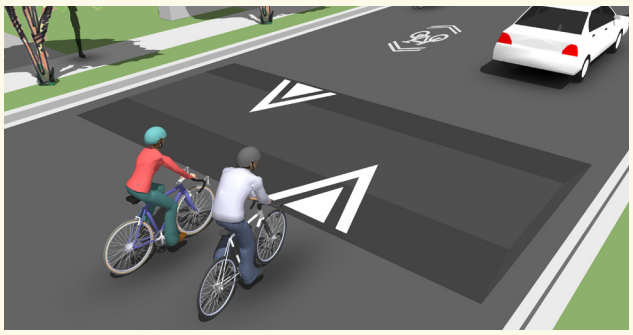
A variety of streetscape elements can define the pedestrian realm, offer protection from moving vehicles, and enhance the walking experience. This include street trees, street furniture such as benches, and pedestrian-scale street lighting. These features should be included in the design and construction of neighborhood greenways whenever possible.

Conversation Riding

Because the full street width, minus adjacent car parking, is available for use on neighborhood greenways, bicyclists traveling together will often take a side-by-side formation to allow for social interaction. This behavior should be considered acceptable on neighborhood greenways.

Universal Design

Implementing neighborhood greenways may be an opportunity to enhance streets to meet accessibility standards. ADA-compliant curb ramps should be included in the design and construction of neighborhood greenways, especially at arterial streets, and as appropriate in other locations. Universal design principles will be assessed and incorporated when implementing all bicycle facility projects.



Traffic Calming

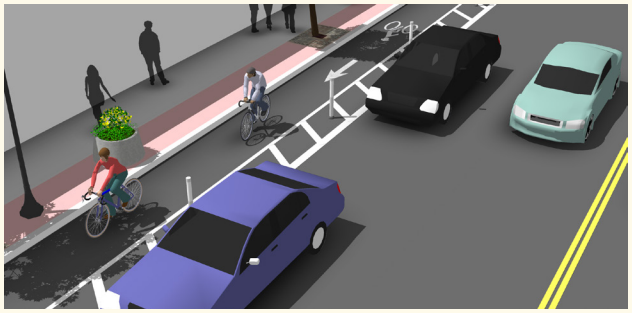
Traffic calming is an important tool for creating safe and effective neighborhood greenways. Traffic calming measures for neighborhood greenways bring motor vehicle speeds closer to those of bicyclists. Reducing speeds along the neighborhood greenway improves the bicycling and walking environment by reducing overtaking events, enhancing drivers' ability to see and react, and reducing the severity of crashes if they occur. Common traffic calming techniques include speed bumps, neighborhood traffic circles, stop signs and chokers. Other aspects of traffic calming may occur as green features of the street such as green stormwater infrastructure (bioswales) and other natural elements such as planters, street trees, or rain gardens.

Traffic calming measures can reduce or discourage through traffic on designated neighborhood greenways by managing access to the route by motor vehicles. Common techniques include partial closures, median islands, and turn restrictions.

Cycle Tracks (Protected Bicycle Lanes)

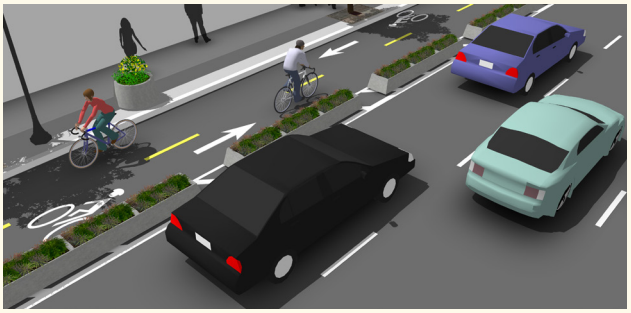
Of all on-street bicycle facilities, cycle tracks, also known as protected bicycle lanes, offer the most protection and separation from adjacent motor vehicle traffic. It is important to consider all users when designing a cycle track. Considerations include pedestrians crossing the cycle track from a parked car, access to and from transit or at the intersection, universal design/American with Disabilities Act (ADA) guidelines, commercial vehicle loading zones, trash pick-up, and motor vehicles crossing the cycle track at driveways and intersections.

Cycle tracks may be one-way or two-way, and may be at street level, or raised to the sidewalk or an intermediate level.



One-Way Cycle Track (protected bicycle lane)

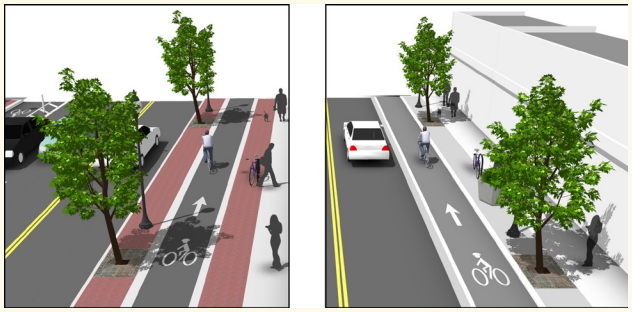
One-way cycle tracks are physically separated from motor vehicle traffic and typically provide bicycle travel in the same direction as motor vehicle traffic. They may be at street level, or distinct from the sidewalk, as a raised cycle track. In situations where on-street parking is allowed, cycle tracks are located adjacent to the curb and sidewalk, with on-street parking repositioned to buffer people on bicycles from moving vehicles.



Two-Way Cycle Track (protected bicycle lane)

A two-way cycle track is an on-street bicycle facility that allows bicycle movement in both directions on one side of the street. Two-way cycle tracks must provide clear and understandable bicycle movements at intersections and driveways. Education is important to inform people how to travel in a safe manner.

A two-way cycle track may be configured as a street level cycle track with a parking lane or other barrier or as a raised cycle track to provide vertical separation from the adjacent motor vehicle lane.



Raised Cycle Track (protected bicycle lane)

Raised cycle tracks are elevated above the street, to sidewalk level or an intermediate height. If at sidewalk level, a raised or mountable curb separates the cycle track from the roadway, while different pavement color or texture distinguishes the cycle track from the sidewalk.

A raised cycle track may be designed for one-way or two-way travel by bicyclists.

Street-Level Cycle Track (protected bicycle lane)

Street level cycle tracks are configured at the same elevation as general travel lanes. They must be protected from traffic with a physical barrier, such as bollards, planters, raised medians, or on-street parking.

A street-level cycle track may be designed for one-way or two-way travel by bicyclists.

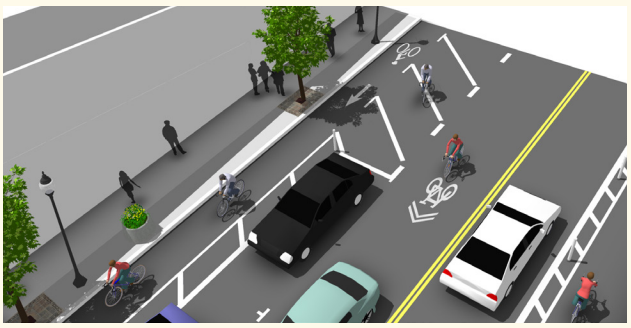
Cycle Tracks (protected bicycle lanes) at Transit Stops with a Transit Island

Designs for cycle tracks at transit stops are meant to prioritize both bicycling and transit efficiency by reducing conflicts within the roadway. When space permits, the preferred design places a raised transit island in the buffer area between the cycle track and general travel lanes. Transit passengers should wait at a transit shelter on the island, and board and alight from there.

To access the sidewalk, passengers should cross the cycle track at a specified crossing location. These crossing locations may either be at sidewalk grade, ramping the bicyclist up to the sidewalk level (providing some bicycle traffic calming to better ensure yielding to pedestrians), or at the street grade. This reduces conflict, and increases predictability for all users. Bicyclists are expected to yield to passengers crossing the cycle track.

Cycle Tracks (protected bicycle lanes) at Curbside Transit Stops

When space is constrained there may not be room for a dedicated transit island. In these cases the sidewalk, cycle track and boarding zone share the same height and more mixing of user types is expected. In this configuration, passengers wait at a stop or shelter in the sidewalk area and may cross the cycle track only when boarding or alighting the transit vehicle. Pavement markings and differences in surface materials can differentiate the sidewalk, cycle track, and boarding zones. Bicyclists are expected to yield to passengers crossing the cycle track.



Cycle Tracks (protected bicycle lanes) on Downhill Descents

Downhill bicycling may be at high-speed, potentially equal to that of motor vehicles. In some cases, it may be more appropriate to provide an alternate route for more experienced bicyclists to use so the all ages and abilities riders can travel at a slower speed within the cycle track. Bicyclists are expected to travel in a safe manner and with reasonable downhill speed in a cycle track. Signage may be installed to remind riders to slow down when approaching intersections for safety for all users. If a bicyclist wants to travel at the speed of motorists, then they may want to take the travel lane.

In the downhill direction, the cycle track should permit bicyclists to leave the cycle track prior to the descent and travel in the adjacent general purpose travel lane if they desire.

If bicyclists are expected to descend within the cycle track, adequate width should be provided clear of obstacles to reduce the likelihood of high-speed collisions with fixed objects. Adequate sight distances should also be provided to reduce the likelihood of high-speed collisions with turning motorists.

Cycle Tracks (protected bicycle lanes) on Uphill Climbs

Bicycle travel uphill is often at slow speed and may result in a wide weaving path. In the uphill direction, adequate clearance should be provided to allow for both slow weaving and parallel passing, similar to an uphill bicycle passing lane.

Off-Street Bicycle Facilities

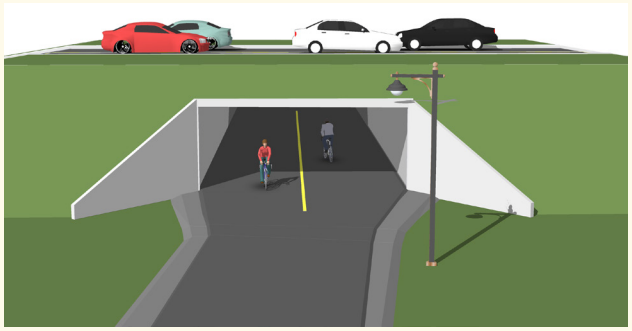
Off-street facilities are typically distanced from the roadway, are at sidewalk grade, or exist in an independent corridor not adjacent to any road.

Multi-Use Trail

A multi-use trail allows for two-way, off-street bicycle use and may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles.

Overpass

Overpasses provide critical non-motorized system links by joining areas separated by barriers such as deep ravines, waterways or major streets or freeways. Crime Prevention Through Environmental Design (CPTED) principles should be followed when designing the overpass.

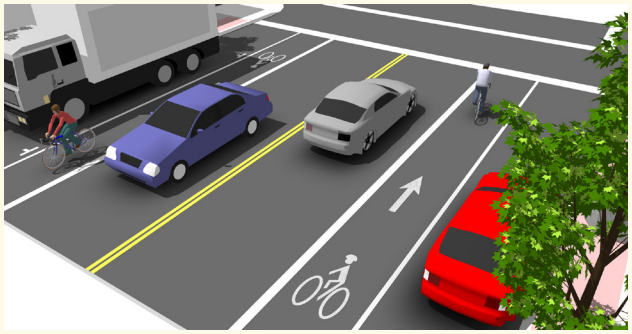


Underpass

Underpasses provide critical non-motorized system links by joining areas separated by barriers such as railroads and highway corridors. In most cases, these structures are built in response to user demand for crossings where they previously did not exist. Crime Prevention Through Environmental Design (CPTED) principles should be followed when designing the underpass.

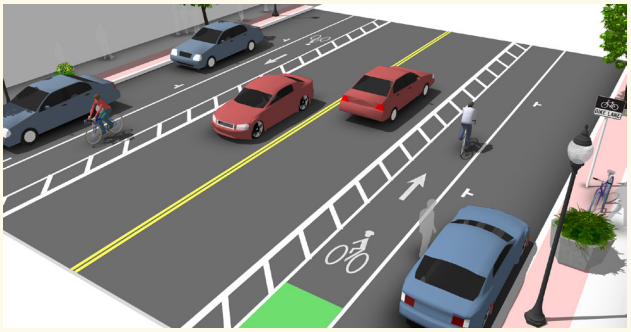
In Street, Minor Separation

In street, minor separation facility types are appropriate when the prevailing motor vehicle travel speeds and volumes are too high for a shared lane, and when traffic calming techniques are not available or appropriate.



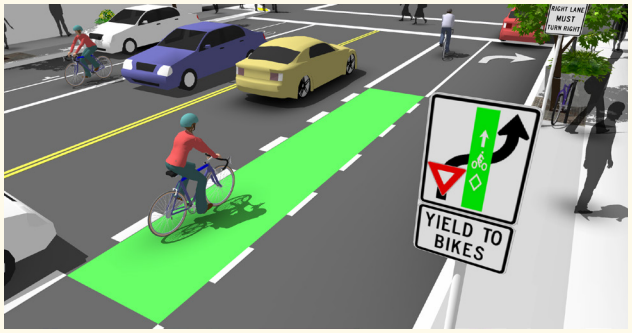
Bicycle Lane

Bicycle lanes designate an exclusive space for bicyclists with pavement markings and signage. The bicycle lane is located adjacent to motor vehicle travel lanes and bicyclists ride in the same direction as motor vehicle traffic. Bicycle lanes are typically on the right side of the street (on a two-way street), between the adjacent travel lane and curb, road edge or parking lane.



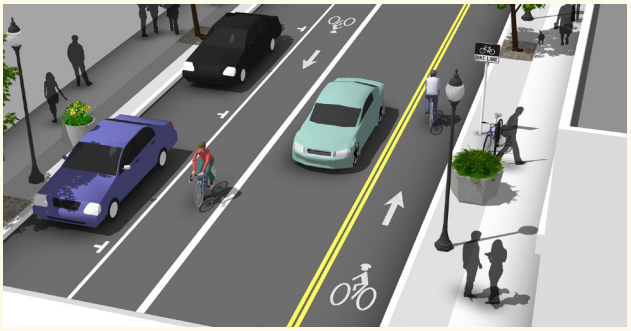
Buffered Bicycle Lane

Buffered bicycle lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. A buffered bicycle lane could potentially be converted to a cycle track.



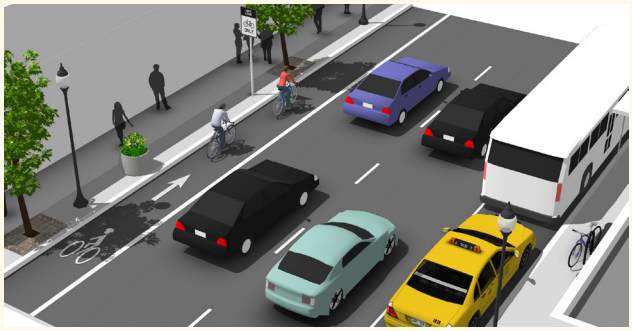
Colored Treatment

Colored treatment within a bicycle lane increases the visibility of the bicycle facility. Colored pavement may be installed to identify conflict areas along enhanced facilities such as contra-flow bicycle lanes, cycle tracks, and neighborhood greenways. Colored pavement may also be used in areas where illegal parking or encroachments are an issue.



Contra-Flow Bicycle Lane

Contra-flow bicycle lanes provide bidirectional bicycle access on a roadway that is one-way for motor vehicle traffic. This treatment can provide direct access and connectivity for bicyclists and reduce travel distances.



Left-Side Bicycle Lane

Left-side bicycle lanes are conventional bicycle lanes placed on the left side of one-way streets or two-way median divided streets.

Left-side bicycle lanes offer advantages on streets with heavy delivery or transit use, frequent parking turnover on the right side or other potential conflicts that could be associated with right-side bicycle lanes.

Uphill Climbing Lane

On streets where only one bicycle lane can be implemented, uphill climbing lanes enable motorists space to pass bicyclists, improving conditions for both travel modes. For uphill travel, where bicyclists are slow and likely to weave widely, a dedicated separated space is provided. Downhill travel, where bicycle speeds are similar to that of motor vehicle speeds, bicyclists are expected to travel in the general purpose travel lane, marked with shared lane markings.

Uphill Bicycle Passing Lane

An uphill bicycle passing lane is a second bicycle lane providing ample space for passing on steep hills.

Shared Street

On shared streets, bicyclists and motor vehicles use the same roadway space. To provide information to bicyclists, shared streets employ basic treatments such as signage and shared lane markings. Shared streets, in accordance with the Facility Designation Guidelines on page 38, are to be used due to right-of-way constraints, on arterial streets with a posted speed limit of 30 mph or less, on either collector or minor arterials or to fill a gap in the Local Connectors network.

Shared Lane Marking

Shared Lane Markings (sharrows), are road markings used to indicate a shared lane environment for bicycles and automobiles. Sharrows remind drivers of bicycle traffic on the street and recommend proper bicyclist positioning. The shared lane marking is not a facility type; it is a pavement marking with a variety of uses to support a complete bicycle facility network.

Advisory Bicycle Lane

Advisory bicycle lanes are bicycle priority areas delineated by dotted white lines and marked with sharrows. A road with advisory bicycle lanes operates as two-way street with no painted center lane to separate automobile travel lanes. A painted dotted line and sharrows (bicycle symbols to guide people riding bicycles and remind drivers to share the road) are used to highlight the bicycle lanes. Because the line is dotted, motorists can enter the bicycle lane to overtake other vehicles when no people riding bicycles are present. Advisory bicycle lanes may be considered as upgrades to streets that currently have sharrows to further define bicycle and motor vehicle separation.

BAT Lanes

"Business Access and Transit" lanes are reserved for exclusive use by buses and bicyclists. They may also be used for general-purpose traffic right-turn movements onto cross streets and for access to adjacent properties. BAT lanes should inlude appropriate signage acknowledging that bicyclists are permitted. All BAT lanes should have consistent signage throughout the city so all users understand how they are to be used and that people riding bicycles are allowed to use them.

Intersection Treatments

Intersection treatments are designed to help people riding bicycles make more predictable movements and cross intersections more easily.

Active Warning Beacon

Active warning beacons are amber flashing lights that supplement warning signs at unsignalized intersections or mid-block crosswalks. Beacons can be actuated either manually by a push-button or passively through detection. Rectangular Rapid Flash Beacons (RRFBs), a type of active warning beacon, use an irregular flash pattern similar to emergency flashers on police vehicles. Active warning beacons can be used to enhance driver yielding for bicyclists and pedestrians in the crosswalk.

Bicycle Detection and Actuation

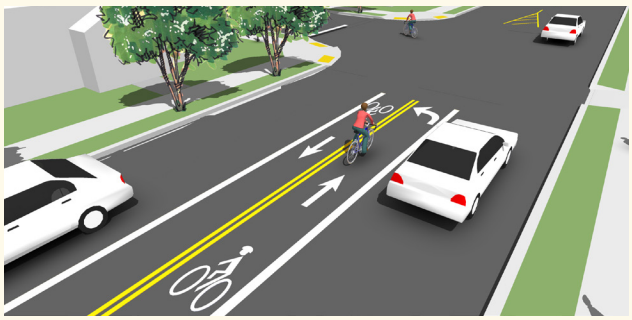
Bicycle detection is used at actuated signals (signals that are user activated by sensor/loops, video, or push buttons) to alert the signal controller of bicycle crossing demand on a particular approach. Bicycle detection occurs either through the use of push-buttons or by automated means (e.g., in-pavement loops, video, microwave, etc.). Detectors are identified with a pavement marking to inform bicyclists of proper positioning to trigger the detector. All bicycle detection should have consistent pavement markings.

Bicycle Signal

A bicycle signal is a bicycle-specific traffic signal used to improve operations for bicyclists using the intersection. Bicycle signal heads may be used to indicate an exclusive bicycle phase, separate bicycle movements from conflicting automobile turn movements, or to provide a leading bicycle interval.

Leading Bicycle and Pedestrian Interval

A leading bicycle interval is a condition where a Bicycle Signal is used to display a green signal for bicyclists a few seconds before displaying a green signal for adjacent motor vehicle traffic. Early display on a bicycle signal and pedestrian signal gives bicyclists and pedestrians a head start to increase visibility and compliance by drivers.

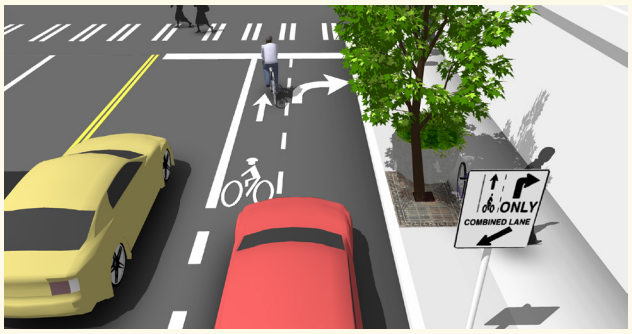


Bicycle Center Turn Lane

Bicycle center turn lanes allow bicyclists to cross an intersection that is offset to the right, or when making a left turn from a bicycle lane. Bicyclists cross one direction of traffic and wait in a separated center lane for a gap in the other direction.

Bicycle Forward Stop Bar

A bicycle forward stop bar is a second stop bar placed beyond the crosswalk. After stopping at the first stop bar, bicyclists may advance to this forward stop bar while waiting at an intersection. This increases the visibility of bicyclists waiting to cross the street and improves their ability to see approaching traffic. Bicycle forward stop bars are often paired with curb bulbs.



Combined Bicycle Lane/Turn Lane

A combined bicycle lane/turn lane places dotted bicycle lane lines or sharrows within the inside portion of a turn-only lane to guide bicyclists to the intersection. This configuration helps reduce conditions that lead to "right-hook" collisions.

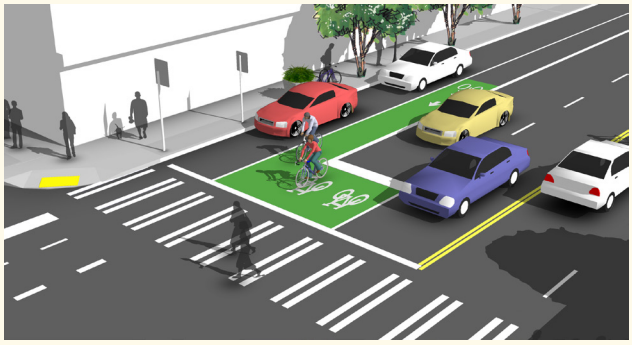
When configured on a cycle track, the combined lane is commonly called a cycle track mixing zone, and is intended to minimize conflicts with turning vehicles at intersections as an alternative to an exclusive bicycle signal phase.

Cycle Track Mixing Zone

A cycle track mixing zone is a shared lane for use by bicyclists and turning automobiles. The facility is intended to minimize conflicts with turning vehicles by requiring users to negotiate use of the lane in advance of the intersection. The narrow lane discourages side-by-side operation of bicycles and automobiles, reducing potential "right hook" collisions.

Motorists are to yield to people riding bicycles priot to entering into the mixing zone, thereby reducing potential conflicts.

When configured on a bicycle lane facility, this is called a combined bicycle lane/turn lane.



Green Bicycle Box

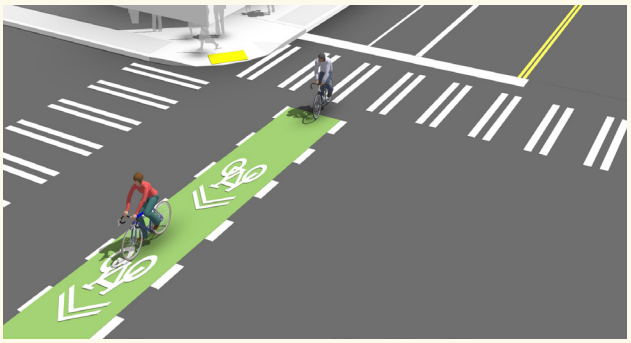
A green bicycle box is a designated area at the head of a traffic lane at a signalized intersection that provides bicyclists with a more predictable and visible way to get ahead of queuing traffic during the red signal phase. Motor vehicles must wait behind the white stop bar line at the rear of the bicycle box, and right turn on red is not permitted. This treatment reduces "right hook" collisions.

"Green Wave" Signal Timing

Green wave is a signal timing progression scheme coordinated over a series of traffic signals to allow for continuously flowing bicycle traffic over a long distance. Users traveling at the green wave design speed will encounter a cascade of green lights and not have to stop at intersections.

Half Signal (Pedestrian and Bicycle Signals)

Half signals are traffic control signals configured to control traffic along the main arterial street at an intersection. These are most commonly used to stop traffic along a major street to permit crossing by pedestrians or bicyclists. Motorists on the side street are stop-controlled.



Crossbicycle Intersection Markings

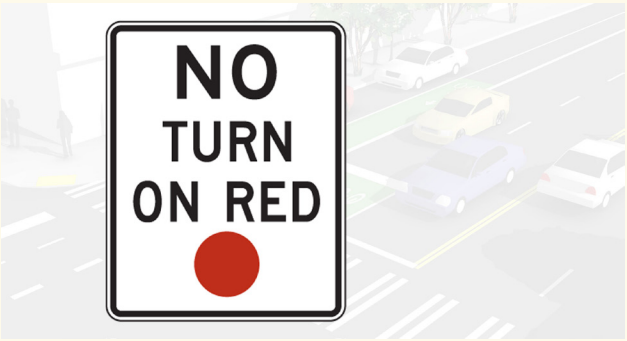
Intersection markings indicate the intended path of bicyclists through an intersection or across a driveway or ramp. They guide bicyclists on a direct path through the intersection and provide a clear boundary between the paths of bicyclists and through or turning motor vehicles in the adjacent lane. colored treatment may be used for added visibility of the facility.

All-way Green for Bicycles and Pedestrians

All-way pedestrian and bicycle signal phase allows bicyclists and pedestrians to cross in any direction within their own signal phase. Commonly called an all-way walk, but with bicycles added to the mix. Bicyclists must yield to pedestrians and move at an appropriate speed through the intersection.

Median Diverter Island

Median diverter islands are protected spaces placed in the center of the street to facilitate bicycle and pedestrian crossings. Crossings of two-way streets are simplified by allowing bicyclists and pedestrians to navigate only one direction of traffic at a time. This also functions as a traffic calming technique as part of a neighborhood greenway.



No Turn On Red

No turn on red restrictions prevent turns during the red signal indication to reduce motor vehicle conflicts with bicyclists and pedestrians. This restriction is commonly established at bicycle box installations, cycle tracks, and where bicycle signals are used to separate bicycle traffic from motor vehicle traffic.

Offset Street Connection

Offset intersections can be challenging for bicyclists to navigate, particularly on major streets. Specific configurations to connect offset streets vary based on the direction of the offset, the presence of signalization and the amount of adjacent traffic. Common configurations include bicycle lane offset street connection, cycle track offset street connection, bicycle center turn lane and two-stage turn boxes.

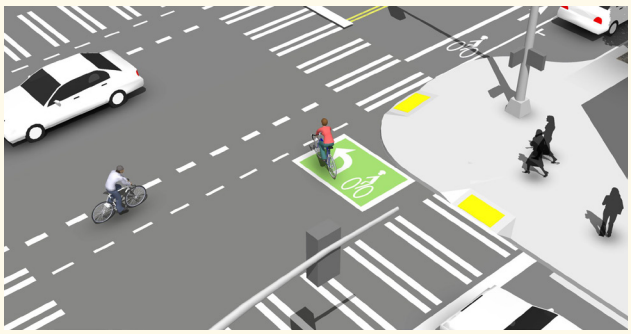
Protected Bicycle Signal Phase

Providing a protected bicycle signal phase is one way to reduce conflict between right turning vehicles and people on bicycles. Separate traffic signals control the conflicting maneuvers, increasing predictability for all users through the intersection. This treatment is combined with no right on red signs.

Through Bicycle Lanes at Right Turn Only Lanes

At right-turn only lanes the bicycle lane should transition bicyclists to the left of the right-turn only lane. Dotted bicycle lane lines or shared lane markings direct bicyclists through the merging area into the bicycle lane at the intersection.

If there is inadequate space for a dedicated through bicycle lane, a combined bicycle lane/turn lane may serve the same purpose.



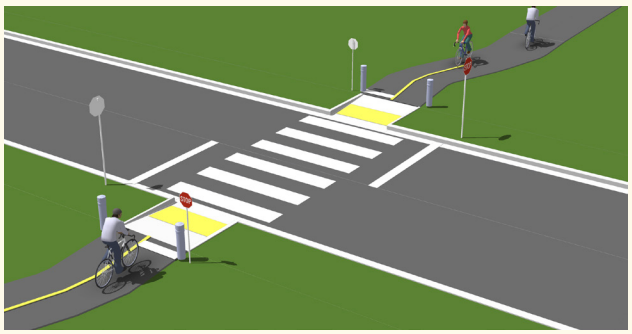
Two-Stage Turn Box

Two-stage turn queue boxes offer bicyclists a safer way to make turns at multi-lane signalized intersections from a right or left side cycle track or bicycle lane by separating the turn movement into two stages. Signage will accompany the installation to help educate bicyclists and motorists of the new intersection treatment. This intersection treatment makes turning bicyclist movements more predictable for all modes. Two-stage turn boxes require "no turn on red" signs and enforcement and create a safer overall intersection for all users of the roadway. Bicyclists wishing to make a left turn will travel straight in the bicycle facility across the intersection, then stop in a green turn box which points in the new direction they wish to travel. Bicyclists will wait to proceed straight until the signal turns green for the new direction of travel.

Turn boxes may also be used at offset street connections that jog to the right to orient bicyclists directly across the offset street.

Enhanced Trail Crossings

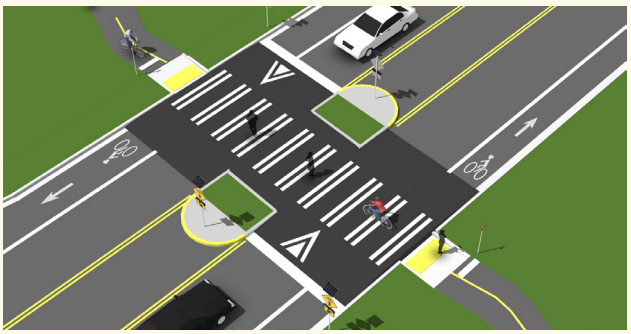
See Active Warning Beacons and Half Signals (Pedestrian and Bicycle Signal) for techniques to increase motorists yielding of drivers to trail users.



Marked Crossings

A marked crossing typically consists of a marked crossing area, Warning Signs and other markings to slow or stop traffic.

When space is available, a median diverter island can improve user safety by providing pedestrians and bicyclists space to cross one half of the street at a time. Bicyclists must yield to pedestrians and move at an appropriate speed through the intersection.



Raised Crosswalk

Raised crosswalks are crossings elevated to the same grade as the multi-use trail. Raised crosswalks may be designed as speed tables, and have a slowing effect on crossing traffic.

Signalized Crossings

Where practical, multi-use trail alignments may route users to existing signalized intersections using barriers and signing. Bicycle signals may be used to assist in bicyclist crossing.

Curb Bulbs

Curb bulbs (also called curb extensions) are areas of the sidewalk extended into the roadway, most commonly where a parking lane is located. Curb bulbs help position bicyclists closer to the cross street centerline to improve visibility and encourage motorists to yield at crossings. They also reduce pedestrian crossing distances. This treatment may be combined with a bicycle forward stop bar.

Multimodal Corridors

Some streets will accommodate bicycle facilities easily; others may be more challenging due to limited street right-of-way. It is important to establish a process to consider the mobility of all modes when implementing the recommended bicycle network on corridors with competing needs.

Multimodal Corridors are the city's main travel corridors serving all trip types and all modes. They are the streets prioritized as transit corridors by the Seattle Transit Master Plan, are a part of the frequent transit network, are designated as Major Truck Streets, and coincide with either an existing or recommended bicycle facility. These overlaps are largely due to:

- The nature of Seattle's topography
- The streets' ability to provide direct connections to destinations and between urban villages/ urban centers

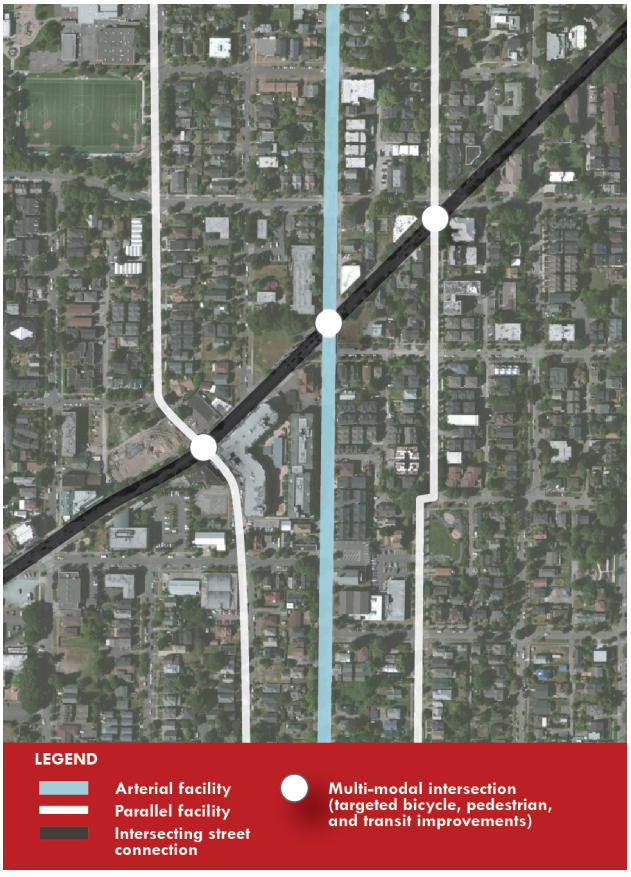
These corridors serve a variety of demands from competing modes of transportation, and the needs of large freight and transit vehicles often constrain bicycle facility development on existing roadways.

The bicycle network overlaps includes 46.1 miles of bicycle facilities that overlap with transit priority corridors and 33.7 miles of bicycle facilities that overlap with Major Truck Streets. Map 4-12 shows all of the transit priority corridors and Major Truck Streets. Note that the frequent transit network is not included on the map as it constantly evolves and was not explicitly considered when developing the bicycle facility network. Map 4-13 shows the overlap of transit priority corridors and Major Truck Streets with bicycle facilities.

As each corridor is analyzed in more detail (through additional corridor studies and alternatives analysis, the project development and design process, or within other modal plans), it is important that either (a) all modes be accommodated along the same street or (b) bicycle facilities be accommodated using a parallel route. Efforts will be made to provide standard transit and freight travel lane widths on multimodal corridors. It is not preferable for transit and freight to travel on non-arterial streets. While all efforts will be made to implement the recommended bicycle network on the multimodal corridors, people riding bicycles can more easily be accommodated on parallel non-arterial streets than the other modes.

Some corridors will need to serve the needs of bicyclists and freight vehicles.

Figure 4-3: Multimodal Corridor Example



Multimodal Corridor Decision Making Process

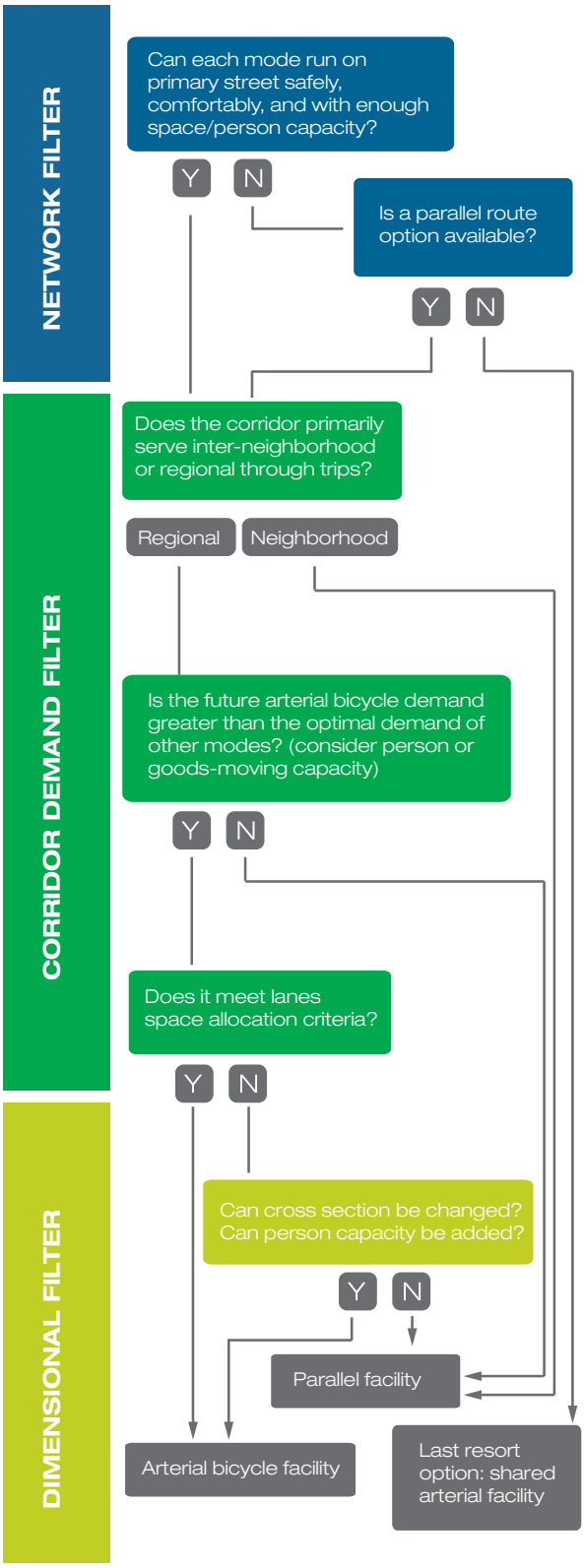
Multimodal corridors serve transit, freight, bicycles, pedestrians and other motorists and represent the most direct, and, in some cases, the only network connections to key neighborhood and regional destinations in Seattle. Decisions about how to allocate the right-of-way on these streets are made difficult by the limited number of direct connections coupled with issues of topography, differences in travel speed, and the desire for on-street parking. Mobility needs for people and safety of all modes is the number one priority when making decisions about right-of-way allocation. As mentioned earlier in this chapter, motor vehicle volumes and travel speeds and addressing how to ensure people travel the speed limit are important considerations when evaluating street design alternatives. Separation of users (either physically separated from traffic or on a parallel neighborhood greenway) and understanding the rules of the road can improve safety, efficiency, and attractiveness for people riding a bicycle, using transit, or walking; however, in dense urban areas, sometimes every mode cannot share the same street.

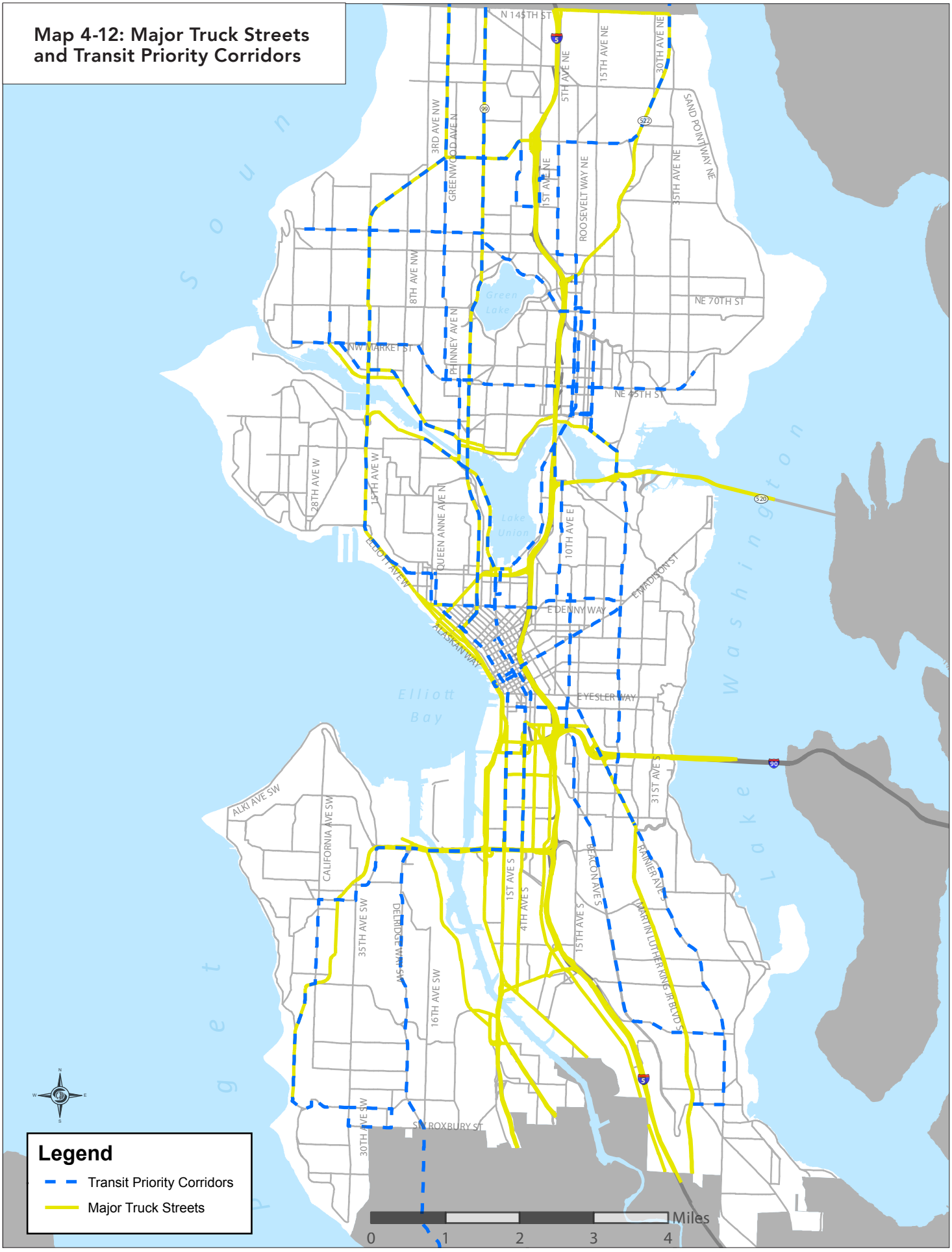
Seattle lacks a policy for determining which mode gets priority when bicycling and freight or transit modal plans designate the same corridor as a priority with limited right-of-way. A clear set of tools for making these decisions is needed.

The following strategies will guide design and operations decisions on designated Multimodal corridors. An example decision making process diagram is illustrated in Figure 4-4.

> The Complete Streets policy (adopted in 2007) directs the city to "design, operate, and maintain Seattle's streets to promote safe and convenient access and travel for all users—pedestrians, bicyclists, transit riders, and people of all abilities, as well as freight and motor vehicle drivers."

Figure 4-4: Example Multimodal Corridor Decision Making Process




Map 4-12: Major Truck Streets and Transit Priority Corridors
N 145TH ST
5TH AVE NE
15TH AVE NE
30TH AVE NE
SAND POINT WAY NE
3RD AVE NW
GREENWOOD AVE N
1ST AVE NE
ROOSEVELT WAY NE
35TH AVE NE
8TH AVE NW
PHINNEY AVE N
NE 70TH ST
NW MARKET ST
NE 45TH ST
28TH AVE W
15TH AVE W
QUEEN ANNE AVE N
10TH AVE E
ELLIOTT AVE W
E MADISON ST
E DENNY WAY
ALASKAN WAY
EYESLER WAY
ALKI AVE SW
CALIFORNIA AVE SW
35TH AVE SW
DELRIDGE WAY SW
16TH AVE SW
1ST AVE S
4TH AVE S
BEACON AVE S
15TH AVE S
RAINIER AVE S
MARTIN LUTHER KING JR BLVD S
31ST AVE S
30TH AVE SW
S ROXBURY ST
Elliott Bay
Lake Washington
Legend
Transit Priority Corridors
Major Truck Streets
Miles
0
1
2
3
4


Map 4-13: Multimodal Corridors
Legend
Proposed Network
Areas of Overlap w/ Multimodal Corridors
Miles
0
1
2
3
4
N
NE 80TH ST
NE 65TH ST
N 34TH ST
NICKERSON ST
S HOLGATE ST
S SPOKANE ST
SW BARTON ST
S MYRTLE ST
S OTHELLO ST
COLLEGE WAY N
GREENWOOD AVE N
FREMONT AVE N
1ST AVE NE
5TH AVE NE
11TH AVE NE
15TH AVE NE
24TH AVE NW
1ST AVE N
WESTLAKE AVE N
EASTLAKE AVE E
10TH AVE E
12TH AVE
RAINIER AVE S
BEACON AVE S
MLK JR WAY S
AIRPORT WAY S
EAST MARGINAL WAY S
35TH AVE SW
16TH AVE S
THOMAS ST
BROAD ST
1ST AVE
ALASKAN WAY
WESTERN AVE
4TH AVE
7TH AVE
12TH AVE
S JACKSON ST
S DEARBORN ST
S ROYAL BROUGHAM WAY
Puget Sound
Lake Washington
Elliott Bay

Strategies	Actions
4.12 Integrate a multimodal decision-making process into the update of the Comprehensive Plan	**4.12.1 Determine primary and secondary modal priorities** on arterials, including designated Multimodal Corridors, establishing a complete system focused on moving people and goods as safely as possible.
4.13 Implement citywide network bicycle facilities on or parallel to Multimodal Corridors	**4.13.1 Determine citywide network bicycle facility suitability** when developing priority transit projects or Major Truck Street improvements by the Multimodal Corridor decision-making process and/or the project development and design process. Route design and facility selection will consider whether alternative routes are convenient and permit direct access to services and destinations located throughout the Multimodal Corridor.
	4.13.2 Design bicycle priority features at intersections along Multimodal Corridors.
	4.13.3 Provide clear wayfinding to guide people bicycling between neighborhood greenways and local destinations on parallel arterial streets.
	4.13.4 Provide end-of-trip facilities at, or prior to, arterial street destinations.
4.14 Consider transit mobility improvements that minimize conflicts with people riding bicycles	**4.14.1 Integrate the needs of transit and people riding bicycles** on Multimodal Corridors as part of the project development and design or other arterial street design processes. Include all transit agencies in the design process as appropriate.
	4.14.2 Design transit passenger waiting and boarding facilities to minimize conflicts and pinch points with people riding bicycles. Consider design alternatives that avoid bicycle and bus conflict zones at the transit stop. Install signage and other visual cues or infrastructure to encourage people on bicycles to yield to pedestrians. Provide protection and visibility for pedestrians in zones where people riding bicycles and people walking may intermix at transit stops. (refer to Strategy 4.2 about implementation of cycle tracks).
	4.14.3 Discourage new bus layover facilities on the citywide bicycle network streets. Instead locate them on intersecting streets or integrate into new development (with developer incentives) or existing off-street locations, unless no other options are available. Include transit agencies in the design process. Consider relocating existing bus layover facilities on the Citywide Network.
	4.14.4 Design new bus layover facilities on local connector streets in conjunction with bicycle facility implementation. Include transit agencies in the design process.
	4.14.5 Recognize that Multimodal Corridor development is also a transit access – last mile – strategy. Enhance connections to and end-of-trip facilities at light rail stations, major transit hubs, major bus stops and park-and-ride lots.
4.15 Consider freight mobility and commercial vehicle load zones that minimize conflicts with people riding bicycles.	**4.15.1 Integrate the needs of freight mobility and commercial vehicle load zones and people riding bicycles** on Multimodal Corridors as a part of the project development and design or other arterial street design processes. Include the Freight Advisory Board in the design process as appropriate.

Strategies	Actions
4.16 Update curb space allocation priorities in the Comprehensive Plan update	**4.16.1 Explore re-purposing curb space allocation for mobility purposes** on arterials to include features such as expanded sidewalks, bicycle facilities, bicycle share kiosks, commercial vehicle load zones, and dedicated transit lanes or transit priority features.
	4.16.2 Explore re-purposing curb space allocation on streets with sufficient right-of-way width for uses other than mobility needs, such as parklets and other pedestrian buffer features, on-street bicycle parking corrals, and on-street vehicle parking.
	4.16.3 Use on-street parking as a buffer for cycle tracks where appropriate.
	4.16.4 Discourage new curb cuts and remove redundant curb cuts adjacent to cycle track alignments to decrease potential motor vehicle/bicycle conflict. Move car and commercial vehicle access to alleys or side streets to provide continuous bicycle travel flow.

Buffered bicycle lane and transit island cycle track (protected bicycle lanes) on Dexter Avenue.