Objective 1: Develop and maintain a safe, connected, and attractive network of bicycle facilities throughout the city.

Providing a network of bicycle facilities throughout Seattle is fundamental to achieving the goals of this Plan. Additional bike lanes, roadway crossing improvements, multi-use trails, and other facilities are needed in some areas of the city in order for bicyclists to reach key destinations and encourage more Seattleites to bicycle.

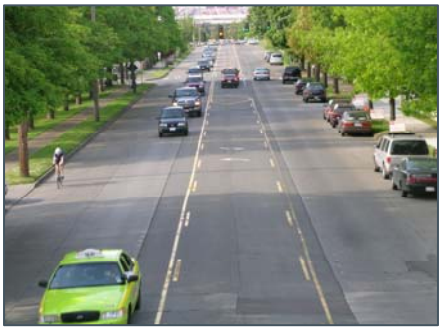
Figure 1: Conceptual Map of Major Bicycle Destinations and Key Bicycle Corridors show some of the most important existing and future corridors for bicycling in Seattle[1]. While some of these corridors have existing bicycle facilities, some are in need of physical improvements to ensure they adequately accommodate bicycle travel. The interconnected network of on- and off-road bicycle facilities recommended in this Plan will serve these critical corridors, as well as many other parts of the city.

Wayfinding signs will be installed on the lower level of the West Seattle Bridge as part of a citywide wayfinding system.

To achieve the goal of tripling the amount of bicycling in Seattle between 2007 and 2017, several key projects in areas with high bicycling demand will need to be completed (see Figure 1: Major Bicycle Destinations and Key Bicycle Corridors). These key connections include:

Lower-Cost Projects

- Redesign the existing bicycle lanes on Dexter Avenue N.
- Make wayfinding and spot intersection improvements on the West Seattle Low Level Bridge.
- Install bicycle lanes on Delridge Way SW.
- Create an Interurban bicycle boulevard to Green Lake and Burke-Gilman Trail.
- Install bicycle lanes, shared lane markings, and signs to improve the connections between Capitol Hill and the UW Campus.
- Install shared lane markings on 2nd Avenue and 4th Avenue to provide a north-south connection



Delridge Way SW offers an opportunity for bicycle lanes to be striped.

[1] *Figure 1 is a conceptual map showing existing and future bicycle connections throughout Seattle. Major activity centers include hub urban villages, Sound Transit station areas, major parks, and major neighborhood commercial areas. Key connections represent bicycle transportation corridors between activity centers. Examples of these connections include a new bicycle facility on SR-520, a trail connection between the Chief Sealth Trail and Downtown, and the completed Ship Canal Trail. The colors of the lines in each corridor represent the quality of existing bicycle connections. Line thickness indicates general levels of existing or anticipated bicycle activity in major corridors. In general, a corridor is considered to have "good" bicycling conditions if it is served by an existing bicycle lane, trail, or low-volume non-arterial street for a majority of its length. "Fair" corridors have these types of facilities for a portion of their lengths but may also have several barriers to bicycle connectivity. "Poor" corridors have limited or no bicycle facilities and may have significant barriers to bicycle connectivity. "No bicycle facility" means that there is currently no bicycle accommodation in the corridor.*

through Downtown Seattle (includes removing the existing bicycle lane on 2nd Avenue).
- Install bicycle lanes on Alaskan Way in Downtown Seattle (when Alaskan Way is reconstructed)
- Provide good bicycle connections to and work with local transit agencies to provide adequate bicycle parking at all light rail and other major transit hubs.
- Complete the citywide Signed Bicycle Route System.
- Install or upgrade traffic signals to improve bicycle crossings at all intersections identified for signal improvements in the Plan.
- Provide bicycle access to and from the ferry when the Colman Dock Ferry Terminal is reconstructed.

The next phase of the Chief Sealth Trail will be to extend the trail across I-5 to downtown.

Higher-Cost Projects

- Provide a bicycle facility connection between Downtown Seattle and the UW Campus via Eastlake Avenue N.
- Complete the Ship Canal Trail, including connections to the Fremont Bridge and Ballard Bridge.

"The most useful thing that the city can do to encourage bicycling in Seattle is to create and maintain a connected system of bicycle lanes and trails that get people where they need to go throughout the city."
-- Seattle Resident

- Construct a Chief Sealth Trail Crossing of I-5 between S Spokane Street and S Lucile Street (and provide a trail on the east side of I-5 between the Chief Sealth Trail and the I-90 Trail).
- Construct the Burke-Gilman Trail section between 11th Avenue NW and 17th Avenue NW.
- Construct a new bicycle and pedestrian bridge across I-5 between Wallingford and the University District.
- Provide a bicycle facility connection between the I-90 Trail and Downtown Seattle.
- Construct multi-purpose trail connections from the SR-520 Bridge to the UW Campus and to Downtown Seattle as a part of the bridge reconstruction project.
- Improve the bicycle lanes on Alaskan Way S/E Marginal Way S between S Spokane Street and Downtown, and complete the E-3 Busway Trail between S Spokane Street and Downtown.
- Either rehabilitate the existing Ballard Bridge or add a new bicycle and pedestrian bridge adjacent to the Ballard Bridge.

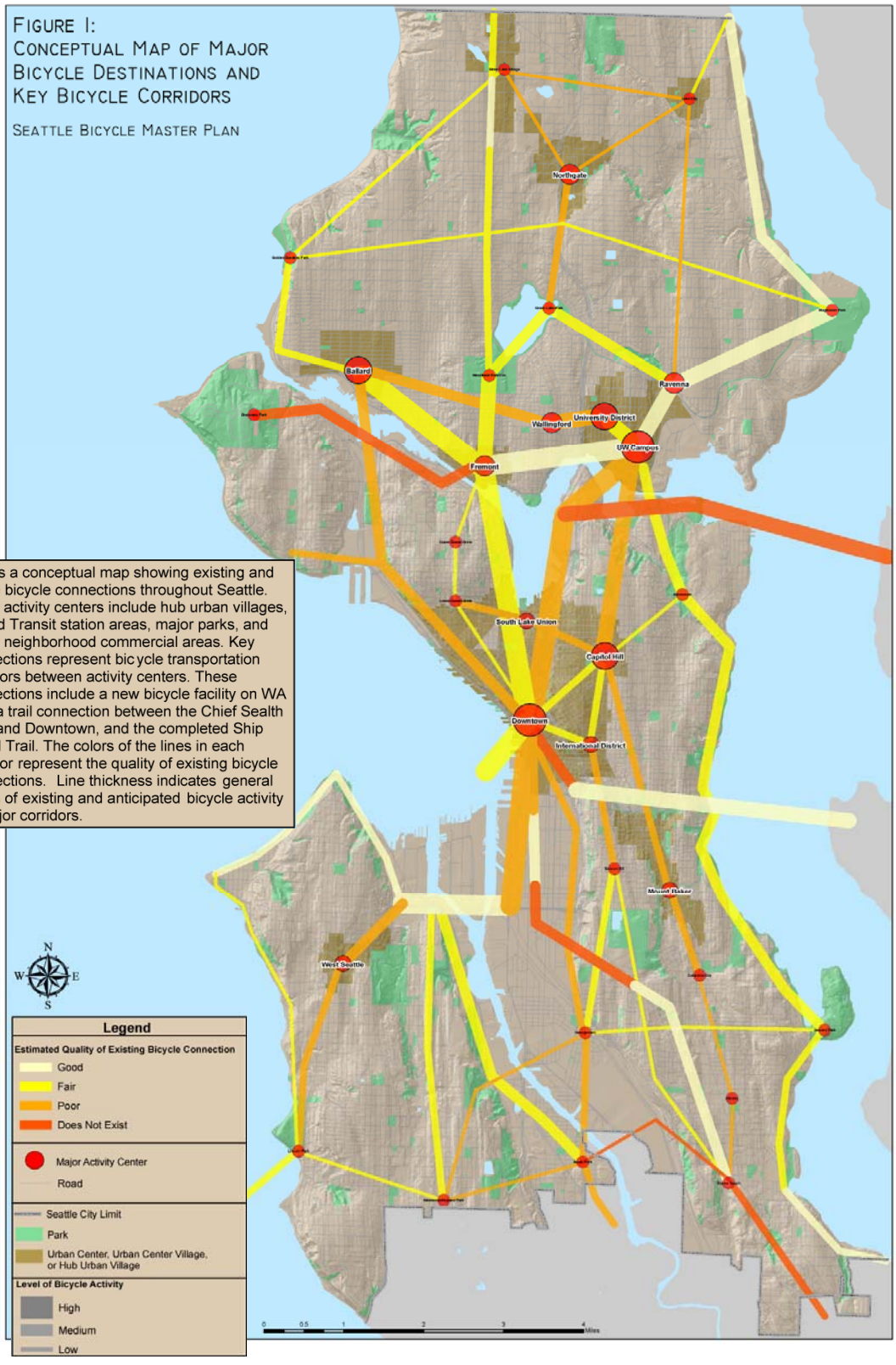
Bicycle access onto and off the Ballard Bridge should be improved.

Further Evaluation of Bicycle Facility Recommendations

The projects that are recommended in this chapter will require additional evaluation during the implementation process to determine if there are other factors that may either help or hinder their development. Additional traffic analysis will be needed in some cases to determine the optimum design for specific locations. Like other public projects, neighborhood involvement will also be an important part of the evaluation process. Some locations shown on the map may be determined, after more detailed analysis, to require different or more costly improvements and, therefore, may become longer-term projects. However, for every project, the first assumption will be that the bicycle facilities, as shown in the Bicycle Master Plan, will be implemented. If the city decides not to proceed with implementing the Bicycle Master Plan recommendation on a particular roadway, it will

document the reason for this decision. The burden is on the city to explain why it is not implementing a recommendation in the Plan.

Figure 1. Conceptual Map of Major Bicycle Destinations and Key Bicycle Corridors



Bicycle Facility Network Definition

Implementation of this Plan will establish a 450-mile network of bikeways throughout the city of Seattle. This Bicycle Facility Network is composed of all of the locations throughout the city where specific improvements have either already been made or are proposed in the future to accommodate bicycles. Subsets of the complete Bicycle Facility Network include bicycle lanes and other facilities on arterial roadways, the Urban Trails and Bikeways System, and the Signed Bicycle Route System.

Almost all Bicycle Facility Network segments will have some type of visible cue (i.e. a bike lane, a bike route sign, a pavement marking, a trail, etc.) to indicate that special accommodations have been made for bicyclists. While the network will provide primary routes for bicycling, it is important to note that, by law, bicyclists are permitted to use *all* roadways in Seattle (except limited access freeways or where bicycles are otherwise prohibited). Therefore, the Bicycle Facility Network will serve as a core system of major routes that can be used to safely access all parts of the city and other parts of the transportation system.

Portions of the Bicycle Facility Network identified as "short-term" are recommended to be implemented in the next three years. Other segments of the network will require a longer period to implement due to their higher complexity (see Table 2: Miles of Facilities Recommended for Bicycle Facility Network on next page). The completed Bicycle Facility Network will connect all parts of the city and will provide a bicycle facility within one-quarter mile of 95% of all Seattle residents (see Figure 2: Recommended Bicycle Facility Network page 17).

Descriptions of recommended bicycle facility types are provided in Appendix E: Bicycle Facility Descriptions. These facilities include:

Facilities for network segments:

- Bicycle lanes
- Climbing lanes
- Shared lane markings
- Multi-use trails
- Bicycle boulevards
- Shared roadways
- Bridge facilities

Facilities for roadway crossings:

- Signalized intersections (adding traffic signals)
- Pedestrian crosswalk signals (with appropriate elements to facilitate bicycle crossings)
- Curb extensions
- Median crossing islands
- Overpasses and underpasses
- Warning signs

The Recommended Bicycle Facility Network Map shows all facilities in the Bicycle Facility Network, in detail (North Seattle and South Seattle Bicycle Facility Network maps are enclosed in binder pocket — see separate documents).

An important subset of the Bicycle Facility Network is a 230-mile system of signed bicycle routes. This system includes local routes that connect destinations such as urban villages, transit stations, major parks, and other destinations within the City of Seattle; and regional routes that connect Seattle with other communities in the Puget Sound Region.

Table 2. Miles of Facilities Recommended for Bicycle Facility Network

	Miles of Bicycle Facilities[1]		
Facility Type	***Existing***	***Short-Term Recommended[2]***	***Total Recommended[3]***
Bicycle lanes/climbing lanes	25.5	63.7	143.3
Shared lane pavement markings	0.3	54.2	110.5
Bicycle boulevards	0.0	7.6	18.1
Other on-road bicycle facilities[4]	2.2	4.2	46.1
Signed local street connections[5]	0.0	28.6	75.9
Multi-use trails	39.4	41.9	58.2
Other off-road bicycle facilities[6]	0.2	1.0	2.6
TOTAL NETWORK	*67.6*	*201.2*	*454.8*

[1]For on-road bicycle facilities, total miles represent roadway centerline miles with bicycle facilities (e.g., bicycle lanes on both sides of the roadway are not counted separately).

[2]Short-term bicycle facilities include existing and short-term projects scheduled for 2007-2009.

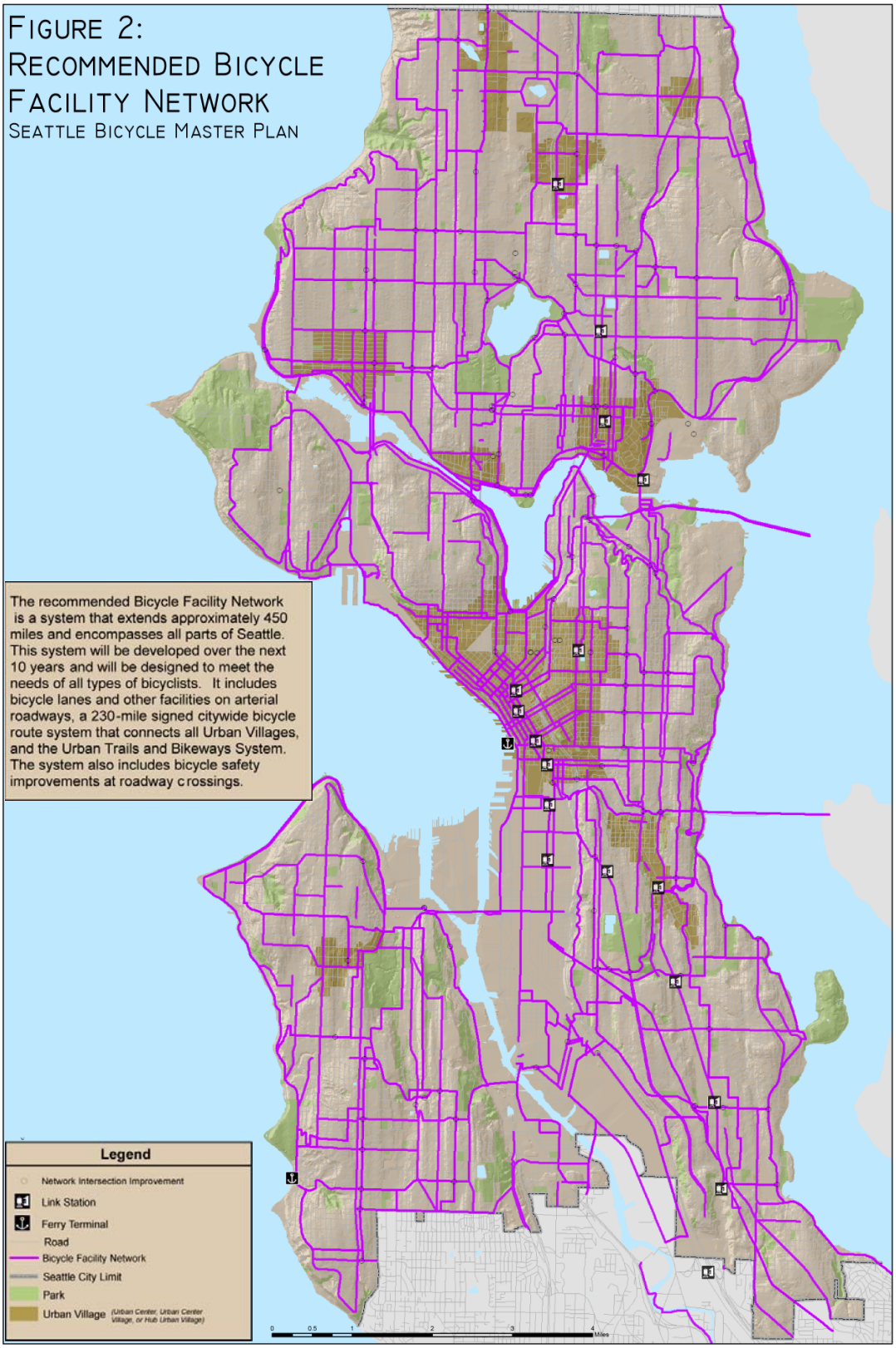
[3]Total recommended miles include the existing, previously planned, short-term categories, as well as other medium- and long-term recommendations in the 10-year timeframe, 2007-2016.

[4]Other on-road bicycle facilities include wide outside lanes, edgelines, paved shoulders, and peak hour bus/bicycle only roadways. Key corridors for short-term study and corridors where an improvement is needed, but the facility is unknown are also counted in this cateogry.

[5]Signed local street connections include shared roadways with bicycle route signs but no other designated bicycle facilities. The recommended Signed Bicycle Route System is approximately 234 miles, including 50 miles of bike lanes/climbing lanes, 32 miles of shared lane pavement markings, 14 miles of bicycle boulevards, 7 miles of other on-road bicycle facilities, 47 miles of multi-use trails, 2 miles of other off-road facilities, and 82 miles of non-arterial streets without any other type of bicycle facility.

[6]Other off-road bicycle facilities include sidepaths, one-way bike-on-sidewalk pairs, and pedestrian/bicycle-only bridges.

Figure 2. Recommended Bicycle Facility Network (see next page)



A Network to Meet the Needs of Different Types of Bicyclists

The proposed Network includes a variety of facility improvements that respond to the many different issues faced by bicyclists. Some parts of the Network will be located along independent corridors that are separated from roadways. Other parts of the network will require motorists and bicyclists to coexist in the same right-of-way. Even among "on-road" bikeways, there are a variety of different design treatments that will be used, depending on whether the roadway is a quiet neighborhood street versus a busy arterial street.

"I like to bicycle on arterial roads because they are most direct." —Seattle resident

"I would love to bike to the store and to other errands, but the traffic, even here in West Seattle, scares me. Also I have two small children, and I really don't want to jeopardize them…I really like the idea of making bike boulevards on quiet residential streets." —Seattle resident

"I generally ride 17 to 20 miles per hour, and appreciate on-street facilities that don't force me into being a pedestrian or make me stop all the time." —Seattle resident

There are important reasons for providing a mix of bicycle facility types:

- Seattle is a built environment with a finite number of corridors that can accommodate multi-purpose trails. Consequently, bicyclists need access to the roadway system in order to create an interconnected system and to be able to reach all desired destinations.

- Different types of bicycle facilities are appropriate in different situations, depending on surrounding land use characteristics, available right-of-way space, traffic volume, traffic speed and composition, on-street parking, roadway grade, etc.

- Depending upon an individual bicyclist's level of experience, some types of bikeways are preferred over others. For example, new bicyclists tend to prefer off-road multi-purpose trails and quiet neighborhood streets. More experienced bicyclists usually prefer on-road bicycle facilities such as bike lanes, wide curb lanes, paved shoulders, etc. Sometimes, more experienced bicyclists avoid using trails because they are crowded with other users.

For these reasons, the Bicycle Facility Network is composed of a variety of different facility types that can realistically be implemented and will appeal to bicyclists with varying levels of experience.

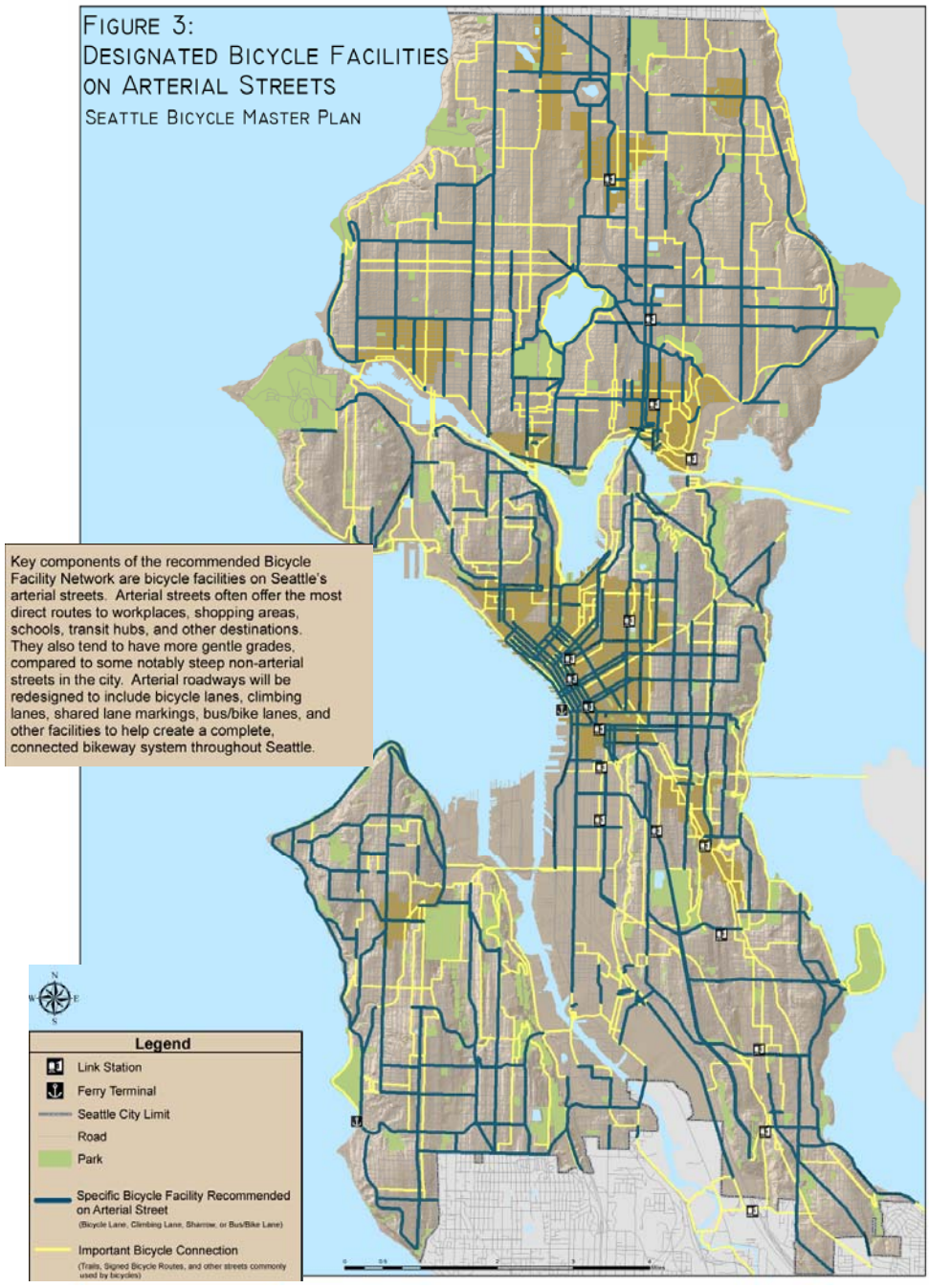
Action 1.1: Provide bicycle facilities on designated arterial streets.

Seattle's arterial streets offer the most direct routes to workplaces, shopping areas, schools, transit hubs, and other destinations. They also tend to have gentle grades, compared to some notably steep non-arterial streets in the city. A lack of bicycle facilities on the city's arterial street system prevents more people from making trips by bicycle and makes conditions less comfortable for bicyclists now. This action helps to fulfill Seattle's Complete Streets policy by ensuring that safe and comfortable bicycle travel is facilitated.

Bicycle lanes have already been striped on 25 miles of Seattle streets.

This Plan recommends bicycle lanes or climbing lanes on 143.3 miles of arterial roadways throughout Seattle. In addition to bike lanes or climbing lanes, the city will implement other types of on-road bikeways, including shared lane markings, paved shoulders, shared bus-bike lanes, and other facilities. In total, designated bicycle facilities are recommended on 295 miles of arterial roadways in the city (see Figure 3: Designated Bicycle Facilities on Arterial Streets). Facility types are defined in Appendix E: Bicycle Facility Descriptions.

Figure 3. Designated Bicycle Facilities on Arterial Streets



As a part of the detailed analysis that was completed during this Plan, typical roadway cross-sections were developed that indicate the proper placement of bicycle facilities in a variety of roadway design configurations. Appendix F: Guidance for Retrofitting Seattle Streets to Create Dedicated Bicycle Facilities provides illustrations, photographs, and lists of considerations for incorporating bicycle facilities in common curb-to-curb roadway cross-sections in Seattle.

There are several roadways in the city where the existing bicycle lanes have less than the optimal width (e.g., sections of Dexter Avenue N, Martin Luther King, Jr. Way S, 12th Avenue E). These locations will be improved with the new types of treatments

identified on the Recommended Bicycle Facilities Map and in Appendix F (e.g., narrow existing travel lanes to provide more space for bicycle lanes, utilize climbing lanes and shared lane markings, post "Look for Bicycles" when opening doors signs near parking regulation signs, etc.).

Shared lane markings have been installed on S Jackson Street.

Climbing lanes have been installed on E Union Street to allow slower bicyclists riding uphill to be in a bicycle lane and encourage faster bicyclists riding downhill to move further from parked cars and share the travel lane.

Action 1.2: Complete the Urban Trails and Bikeways System.

The Urban Trails and Bikeways System was originally adopted as the "Urban Trails System" in the SDOT Transportation Strategic Plan (2005). This system provides a spine network of high-quality bicycle facilities, many of which are on separated rights-of-way from motorized traffic. A map of this system is included in the existing conditions report (see Figure A.6: Urban Trails and Bikeways System on next page). SDOT should complete the Urban Trails and Bikeways System, as it includes a number of key components of the Bicycle Facility Network, such as completing the Burke Gilman Trail missing links, the Chief Sealth Trail, gaps in the Duwamish Trail system, the Interurban Trail bicycle boulevard, the Ship Canal Trail extension, the Mountains to Sound Greenway Trail between the I-90 Trail and Downtown Seattle, and the SR 520 Trail and its connections to Eastlake Avenue , Lakeview Avenue, Montlake Avenue, and Melrose Avenue.

Seattle currently has approximately 40 miles of multi-use trails.

Wherever possible, the City will preserve the maximum amount of green space when a trail corridor is developed and will add trees and landscaping to existing trail corridors (except for utility corridors).

This Plan recommends changing the name of this previously-adopted system from "Urban Trails System" to "Urban Trails and Bikeways System" to improve public understanding that the system utilizes some facilities other than multi-use trails, including sidewalks for pedestrians and bicycle boulevards and streets with bicycle lanes for bicyclists. This name change should be reflected in all future Seattle documents.

Figure 4. Urban Trails and Bikeways System

Action 1.3: Install a Signed Bicycle Route System.

The Bicycle Facility Network map identifies approximately 234 miles of signed bike routes that link all major destinations in Seattle. The signed route system will be a trunk route network connecting major destinations throughout the city. Appropriate sign design and placement will be critical to the success of the signage program. Signage for one to two routes will be tested in the short term after the Plan is adopted. Based on the results of this pilot program, the remainder of the network will be implemented. As new bicycle route signs are installed on each route, outdated signs will be removed. Signs should be catalogued and replaced immediately if missing or damaged.

The Signed Bicycle Route System will provide:

- Connections between Seattle's Urban Villages
- Signs directing bicyclists to all new Sound Transit rail stations
- A signed bicycle route within ¼ mile of 72 percent of Seattle's schools
- A signed bicycle route within ¼ mile of 88 percent of Seattle's parks

This important subset of the Bicycle Facility Network includes local routes that connect key parks, transit stations, urban villages, schools[2], and other destinations within the City of Seattle as well as regional routes that connect Seattle with other communities in the Puget Sound Region. These routes will indicate locations where bicycling conditions are favorable and which connect directly to major destinations throughout the city. Names of major activity centers (e.g., Urban Village Centers, other transportation hubs, and regional parks) will be the specific destinations listed on the bicycle route signs (see the major activity center names on Figure 1: Major Bicycle Destinations and Key Bicycle Corridors). The signed bicycle routes will also draw attention to bicycling as an efficient form of transportation (see Figure 4a: Recommended Signed Bicycle Route System on page 24).

Bicycle route signs will be installed to connect Urban Villages throughout Seattle. They will also show bicyclists how to access nearby destinations.

Signed bicycle routes utilize multi-use trails, bicycle boulevards, non-arterial roadways with low traffic volumes and speeds, and low-volume arterial roadways with bicycle lanes.

This bicycle boulevard in Berkeley, CA is designated by both signs and pavement markings. (Photos by Michael Moule)

The system currently includes 18 miles of planned bicycle boulevards. Bicycle boulevards are non-arterial streets that are designed to allow bicyclists to travel at a consistent, comfortable speed along non-arterial roadways and to cross arterials conveniently and safely. Other non-arterial roadways in the signed bicycle route system could also be developed into bicycle boulevards in the future because they are already comfortable for a wide range of bicyclists. The following actions should be considered in order to develop a typical non-arterial street into a bicycle boulevard:

[2] *Signed connections from the trunk bicycle routes to schools will require detailed study and are beyond the scope of this Plan. Many signed bicycle routes between the recommended trunk routes and schools as well as school walking routes may be identified through the Pedestrian Master Plan process.*

- Install pavement markings and signs to indicate that the roadway is a bicycle boulevard.
- Provide safe and convenient arterial crossings using traffic signals or other geometric improvements.
- Use traffic control or traffic calming to reduce conflicts with other non-arterial cross-streets.
- Slow motor vehicle traffic on the bicycle boulevard using traffic calming treatments.
- Limit the amount of motor vehicle traffic on the bicycle boulevard by managing traffic movements in the surrounding area.

The complete signed route system will utilize many roadways and multi-purpose trails that are already excellent places to ride, but it also includes several locations that should be improved prior to being designated. It will be particularly important to address safety concerns in locations where signed bike routes cross busy roadways. In some cases, a temporary detour may be appropriate. When partial or temporary bicycle routes are signed, they should have logical endpoints that allow the bicyclists to continue on their journey.

"Make sure that the City of Seattle works closely with King County Parks and other regional jurisdictions on trail system connectivity and standard signage." --Seattle resident

There will also be many feeder streets that connect between the trunk network and important local destinations, such as transit stations, schools, and commercial districts. Signs will be posted throughout the city to direct bicyclists to the trunk bicycle routes. Pavement markings may be used to supplement signs in some locations. Guidelines for the design and placement of signs and markings are provided in Appendix G: Bicycle Route Signage and Wayfinding Protocol.

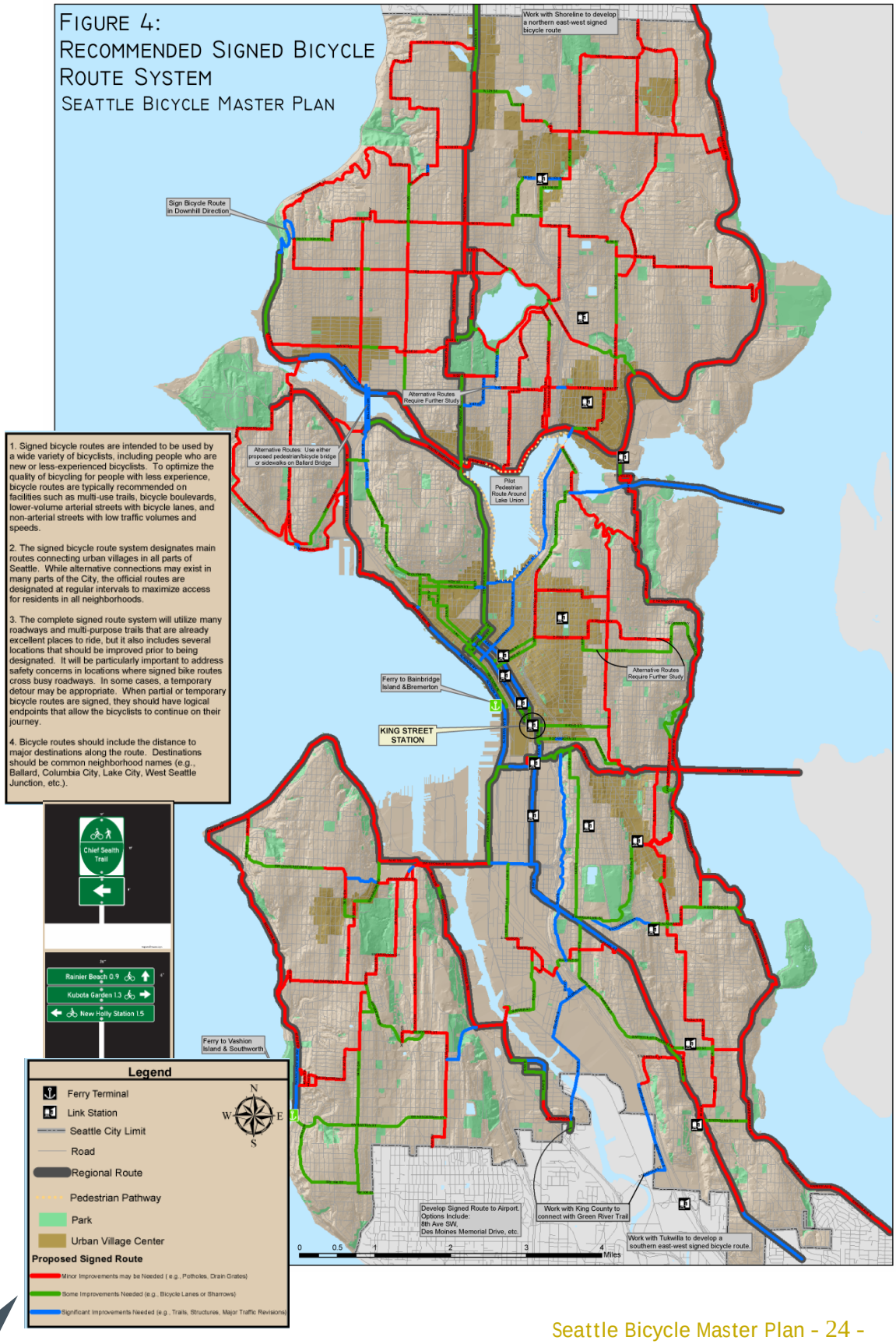
Action 1.4: Improve bicycle safety and access at arterial roadway crossings.

Improvements are needed at arterial roadway crossings in the Bicycle Facility Network to provide bicyclists with continuous, safe routes between destinations. Seattle has a number of streets that carry high-speed, high-volume traffic, such as 15th Avenue NW and Rainier Avenue S. Many other arterial streets are also challenging to cross, particularly during peak travel periods. In order to make it possible for bicyclists to travel throughout the city, there needs to be opportunities to cross major streets. Recommended improvements include treatments such as traffic signals, median crossing islands, curb extensions combined with signs, and/or markings (see crossing improvements on North Seattle and South Seattle Bicycle Facility Recommendations Maps—separate documents). These crossings must also be safe and accessible for pedestrians.

Space is limited for bicyclists waiting to cross W Nickerson Street to the Fremont Bridge.

A bicyclist uses an existing pedestrian crosswalk signal to cross Stone Way N.

Figure 4a. Recommended Signed Bicycle Route System



While the recommended facility network map (see folded in binder) identifies many critical needs, it does not represent a complete inventory of the city's intersections. The city should evaluate the Bicycle Facility Network for other potential bicycle crossing improvements. The first priority will be to improve intersections where existing bicycle facilities cross arterial roadways. Other key crossings should be considered as each new segment of the bicycle network is implemented. In addition, all future roadway improvement projects should address bicycle crossing needs as a routine part of the design process. Specific design guidelines for bicycle crossing improvements are provided in Appendix H: Roadway Crossing Design for Bicycles.

A median crossing islands helps bicyclists on the Burke-Gilman Trail cross 30th Avenue NE.

Action 1.5: Improve complex corridors and focus areas in the Bicycle Facility Network.

Bicycle improvements are proposed in a number of complex corridors and focus areas throughout the city (e.g., areas with right-of-way constraints, potential conflicts between multiple user groups, and multiple alternatives for providing bicycle facilities). In some cases, several alternative design treatments have been proposed to address the complex issues along these routes. The alternative that is ultimately chosen will depend on a variety of factors, including additional design development, cost, public input, trade-offs among other modes of transportation within the same corridor, or future development projects that provide new opportunities to improve bicycling conditions.

Eastlake Avenue E is a critical connection between the University of Washington and Downtown Seattle. Further study is needed to improve bicycle conditions on this roadway.

In other portions of the Network, one type of bicycle facility is proposed in the short term, but a different facility is proposed in the future when a roadway or bridge reconstruction project occurs or when bicycle demand increases.

For routes in the Network where complex issues are at play, circled numbers are included on the Bicycle Facilities Recommendations Map that correspond with a more detailed explanation in Appendix I: Bicycle Facility Recommendations for Key Corridors and Focus Areas.

Action 1.6: Make key operational improvements to complete connections in the Bicycle Facility Network.

There are many spot locations in the Bicycle Facility Network where bicycle access should be improved by making changes to roadway operations. The following is a list of general operational improvements that will be made by the city to complete bicycle connections:

Supplement "Dead End" and "Do Not Enter" signs, as appropriate, to indicate that bicycle and pedestrian access is allowed. Add the words "Except Bicycles and Pedestrians" (or other indication that bicycle and pedestrian access is permitted) to "Dead End" and "Do Not Enter" signs that only apply to motor vehicles. Many of these streets should only prohibit access to motor vehicles because they often lead to connector paths for bicyclists and pedestrians. Examples of locations for this improvement include:

- 25th Avenue S and S Massachusetts Street
- S Henderson Street at access to short Duwamish Trail segment at 10th Avenue S
- 17th Avenue S, 18th Avenue S, and 19th Avenue S to I-90 Trail
- 20th Avenue NE at Ravenna Park
- 17th Avenue NW to connector trail between NW 88th Street and NW 90th Street
- Melrose Avenue E and Melrose Connector Trail

Redesign traffic diverters to allow more convenient bicycle access. The city should redesign traffic diverters to accommodate the pass-through of bicycles. This includes providing curb cuts of adequate width (meeting ADA and AASHTO guidelines). Example locations where diverters should be improved for bicycle access include:

- 42nd Avenue S and S Morgan Street
- E Republican Street and 17th Avenue E
- Broadway E and E Edgar Street

A bicycle-only left-turn pocket has been provided in the median at the intersection of 8th Avenue NW and NW 77th Street to help bicyclists cross 8th Avenue NW.

Provide bicycle turn pockets at key intersections. Left-turn pockets allow bicyclists to wait in a designated space for a gap in traffic before turning left. These pockets are particularly beneficial on roadways with relatively high traffic volumes and significant bicycle turning movements. Locations with raised medians provide good opportunities to add pockets. A bicycle left-turn pocket is currently used at 8th Avenue NW and NW 77th Street in Seattle.

Improve bicycle access at pedestrian crosswalk signals. The design of pedestrian crosswalk signals should be changed in order to improve their convenience for bicyclists. Many of the pedestrian crosswalk signals that have been installed to improve arterial roadway crossings are difficult for bicyclists to use because they must dismount and become pedestrians in order to use the push button and receive the WALK signal. Further, crosswalks with pedestrian signal heads are provided only on one side of the street at these crossings. Therefore, bicyclists crossing from one side of the roadway cannot use the signal without crossing to the opposite side of the street. In order to improve bicycle access, SDOT has established a program to test installing signals and crosswalks on both sides of non-arterial roadways at selected intersections with pedestrian crosswalk signals. Motorist movements at these intersections are also restricted to left- and right-turns only to prevent cut-through traffic. At these intersections, detection is needed for bicyclists in locations that can be accessed from the street. This detection should be *in addition to* accessible pedestrian push buttons that are provided for pedestrians. Currently, push-buttons for bicyclists are acceptable on non-arterial streets. As technological improvements increase the accuracy and feasibility of electronic bicycle detection methods (e.g., video, inductive loops, infrared, etc.), they will be preferred.

"Most often crossing light activation buttons cannot be reached by a person on a bike. Buttons or electronic detection (in the case of arterial streets) should be placed in locations that are conducive to a safe and convenient crossing for all users." --Seattle resident

Change the timing of traffic signals to accommodate bicyclists.

Traffic signal timing should consider all modes including bicycling. Therefore, all traffic signals should facilitate safe bicycle crossings. This includes providing a minimum green time and a minimum yellow time to ensure that bicyclists are able to clear intersections, per the AASHTO *Guide for the Development of Bicycle Facilities* (1999 or latest edition). This is critical on the Signed Bicycle Route System. Signal timing changes must also be coordinated with transit on Urban Village Transit Network Roadways. It is important to ensure that adjusted signal timing for bicycle crossings also facilitates safe pedestrian crossings.

Lack of detection on the street requires bicyclists to cross on the sidewalk.

Explore new technologies to detect bicyclists at traffic signals.

In the future, explore new detection technologies such as infrared or video sensors that can tell the difference between bicycles and motor vehicles. This can help improve bicycle detection at actuated signalized intersections and make it possible to detect bicyclists at pedestrian crosswalk signals.

A bicycle box has been installed on N Roy Street to help bicyclists make left turns onto Queen Anne Avenue N.

Explore innovative timing and designs for bicycles at traffic signals.

This includes modifying pedestrian crosswalk signals to have separate push-buttons or sensors to detect bicyclists, pedestrians, and motor vehicles. This allows the traffic signal to stop arterial traffic for a shorter amount of time for bicyclist crossings than for pedestrian crossings. Separate crossing signals are provided for bicycles and pedestrians at these intersections. The City of Tucson, AZ has successfully used this signal design. Bicycle boxes should also be considered at signalized locations with high numbers of left-turning bicyclists (e.g., Roy Street at Queen Anne Avenue N). The design of all types of traffic signals should not confuse pedestrians and should comply with the Americas with Disabilities Act.

This bicycle box is in Victoria, BC. The color green will be used for bicycle boxes in Seattle.

Improve bicycle accommodations on bridges.

Bicycle accommodations on bridges need to be improved as well as on their approaches and access ramps. In the short term, bicycle access should be improved using signage, marking, maintenance, and other spot improvements. In the long term, bridges should be replaced with new facilities or retrofitted with facilities that provide full bicycle access (e.g., bicycle lanes or wide sidewalks - minimum 10 feet wide). Bridges are critical for providing bicycle connectivity throughout Seattle. Critical bridges for bicyclists include:

- Ballard Bridge
- 14th/16th Street Bridge
- Montlake Bridge
- Fremont Bridge
- Aurora Bridge
- West Seattle Low Level Bridge
- All bridges across I-5

Explore the possibility of using "Bicyclists Allowed Use of Full Lane" signs. These signs should be considered in high-traffic areas, such as Downtown Seattle, to remind motor vehicle drivers of the legal right of bicyclists to use the roadway. Guidelines for use of these signs, including number of travel lanes, speed limits, and other roadway factors will need to be developed. The signs have been used in San Francisco.

"Bicyclists Allowed Use of Full Lane" signs have been installed in San Francisco.

Explore the possibility of using "Share the Road" with bicycles signs. There are places where "Share the Road" signs may help alert motorists to the presence of bicyclists. For example, these signs could be posted in the Elliott Avenue W and 15th Avenue W corridor.

Continue to provide alternative bicycle access during road or trail construction projects. Detour routes for bicyclists should continue to be provided as a part of all construction projects that affect bicycle access, regardless of whether or not the roadway is in the Bicycle Facility Network.

"Detours must be created with the safety of the cycling community as well as cars and trucks in mind."
—Seattle resident

Allow bicyclists to use public hill-climb assists. Bicyclists should be allowed to use public hill-climb assists, such as elevators and escalators that are incorporated into buildings and other structures in areas with steep terrain. Opportunities for elevators are limited, but may be useful for improving access in a few parts of the Bicycle Facility Network. For example, bicyclists will be allowed to utilize the elevators that will serve the Beacon Hill light rail station to avoid major hills in the area.

"Provide advance green for bike crossings along with bike boxes at lane heads especially in high-traffic, high-bike-density areas." --Seattle resident

Investigate potential improvements for bicycle access through the Seattle Pedestrian Master Plan. SDOT will develop a Pedestrian Master Plan in 2007-2008, and this Plan is an appropriate place to examine several issues related to bicycle access. These issues include:

- Pedestrian crosswalk signal design (i.e., improve access for both pedestrians and bicyclists).
- Curb ramp design (For multi-use trails, curb ramps will be as wide as the width of the trail. For standard sidewalks that are commonly used by bicyclists, further evaluation is needed for curb ramp design).
- Additional locations for pedestrian pathways with bicycles permitted (e.g., potential pathways through parks, improvements to stairs).
- Designation of street sections for bicycle and pedestrian use only.

Action 1.7: Provide wayfinding guidance through complicated connections in the Bicycle Facility Network.

Wayfinding signs and pavement markings should be provided to help bicyclists navigate through complicated sections of the Bicycle Facility Network (in addition to official Signed Bicycle Routes). There are a number of locations in the city where it is necessary to use non-arterial streets, alleys, or sidewalks to connect between existing or proposed bicycle facilities. While many of these complicated connections are

Pavement markings can help guide bicyclists along complicated routes.

shown on the Seattle Bicycling Guide Map, there are currently no signs or markings along the actual connection to facilitate wayfinding. The city will install a combination of signs and markings to guide bicyclists through these connections. Examples include:

Signage and pavement markings will be added to improve wayfinding along the West Seattle Low Level Bridge.

- The connection between the existing bicycle lanes on Delmar Drive E and the existing multi-purpose trail on the southwest side of the Montlake Bridge.
- Connections to the I-90 Trail.
- Connections to the Magnolia Bridge.
- Connections from neighborhood streets in West Seattle to the Low Level Bridge Trail.
- Connections from northeast Seattle neighborhoods to the Burke-Gilman Trail.

Action 1.8: Improve the quality and quantity of bicycle facility maintenance. Bicycle facility maintenance will be improved by establishing clear maintenance responsibilities and continuing to involve the public in identifying maintenance needs. Maintenance agreements between SDOT and other city agencies should be renegotiated to take advantage of the strengths of each agency. In addition, there are also opportunities to utilize volunteers to assist with some maintenance tasks. These actions will improve the efficiency and quality of bicycle maintenance in the city.

Renegotiate the 1987 maintenance agreement between SDOT and Seattle Department of Parks and Recreation (DPR). The maintenance agreement should be updated to reflect the many new facilities that have been completed. The renegotiated agreement should continue to divide maintenance responsibilities along the same lines as in the past, i.e., DPR will be primarily responsible for trails that also serve as linear parks or greenways; SDOT will be primarily responsible for other trails. The SDOT Street Maintenance Division should be part of the team that renegotiates this agreement.

Negotiate a maintenance agreement between SDOT and Seattle City Light on maintenance of trails in utility corridors. The maintenance agreement should build on the principles agreed to in previous agreements to construct trails in City Light rights-of-way. The SDOT Street Maintenance Division should be part of the team that negotiates this agreement.

Encourage bicycle organizations and other community groups to assist with minor maintenance activities. The city will work with bicycle organizations, community groups, civic organizations, and businesses to provide periodic upkeep along trail corridors and bicycle facilities on bridges. This will help improve bicycle facility safety, reduce maintenance costs, and build goodwill with neighborhood residents.

"It is all well and good to create bike lanes and wide shoulders. If they are full of debris and unsafe, it's worse than if they weren't there...keep them clear." –Seattle resident

Continue to respond to citizen complaints and maintenance requests. The current Bike Spot Safety program accepts maintenance complaints and requests from citizens. It uses these requests to make short term improvements and to set maintenance priorities. SDOT should continue and expand this program to identify problems that need immediate attention, to identify recurring problems at particular locations, and to set major maintenance priorities.

Routine maintenance is needed to control vegetation along trails.

Consider different types of weather conditions when developing and maintaining bicycle facilities. Weather and seasonal issues will be considered in the development and maintenance of bicycle facilities within reasonable limits. For example, slip-resistance will be a factor considered in the selection of pavement markings for bicycle facilities, and roadway and trail sweeping may be done more frequently in the fall when leaves can cover some facilities. Drainage will also be addressed in the design of all bicycle facilities.

If bicyclists notice glass or debris on a roadway, they should report it promptly to SDOT, either by calling the Street Maintenance Dispatcher at (206)386-1218 or by filling out a request online at http://www.seattle.gov/transportation/potholereport.htm so that SDOT can clean it up.

The tables below provide general guidance on the frequency of multi-purpose trail and on-road bicycle maintenance activities, though maintenance needs will vary for different types of facilities and different locations (see Table 3 and Table 4). SDOT, Seattle Public Utilities, and Seattle Department of Parks and Recreation are responsible for specific activities.

Table 3. Multi-Purpose Trail Maintenance Activities[a]

Activity	Spot Maintenance	Routine Maintenance
Improve drainage	• Unplug individual drains (Seattle Public Utilities). • Repair trails after land slides.	• Clean all culverts, catch basins, and drainage structures on a regular schedule as needed (Seattle Public Utilities).
Trim vegetation	• Cut or remove vegetation that falls or grows onto trails (Seattle Public Utilities has certain responsibilities; other responsibilities will be established through agreement between SDOT and Seattle Department of Parks and Recreation).	• Trim all vegetation within 3 feet of either side of all trails up to 10 feet above the ground; trim additional vegetation to improve sight distances near intersections. (Responsibility to be established through agreement between SDOT and Seattle Department of Parks and Recreation.)
Replace pavement	• Fill potholes. • Remove surface irregularities.	• Replace pavement (every 10 to 20 years, but will vary significantly depending on conditions). • This Plan needs to be updated based on a sidewalk management system that will be used to estimate budget needs for pavement rehabilitation (scheduled to be completed in 2009).
Replace signs	• Replace missing or damaged warning, regulatory, or wayfinding signs.	• Replace signs based on manufacturer recommendations related to reflectivity and readability (every 15 to 20 years).
Inspect structures	• Address structural problems.	• Include trail structures in the same inspections schedule as all other structures in the city; if structure is deteriorating, it should be added to the citywide schedule for structure repair/replacement.
Clean trash and debris	• Enlist the help of bicycle and pedestrian organizations, neighborhood groups, and other	• A schedule needs to be developed for working with bicycle organizations and other groups on

	citizens to help clean broken glass and other sharp objects, loose gravel, leaves, and other debris.	trash and debris removal.
Provide adequate lighting	• Replace burned-out and broken lighting fixtures.	• Maintain lighting for trail-roadway crossings

a. The University of Washington owns and maintains the Burke-Gilman Trail between I-5 and NE 45th Street.

Table 4. On-Road Bicycle Facility Maintenance Activities

Activity	Spot Maintenance	Routine Maintenance
Sweep bicycle lanes and other on-road bicycle facilities	• Perform spot sweeping if debris collects in bicycle lanes after major rain storm. • Perform spot sweeping if sand is left in bicycle lanes after a snow/ice storm.	• Sweep bicycle lanes (two times per year). • Key roadways in the bicycle facility network that experience a large amount of debris should be given consideration for higher frequency sweeping. • If adjacent travel lanes are swept mechanically, sweepers should reach as close to the curb as possible and make sure material is not deposited in the bicycle lanes.
Repair and replace pavement	• Fill potholes. • Remove surface irregularities.	• Resurface bicycle facilities as a part of street repaving projects. • Give consideration to repaving Bicycle Facility Network streets more frequently (include bicycle facilities as a factor in determining the city repaving schedule).
Improve drainage	• Unplug individual drains (Seattle Public Utilities).	• Include bicycle facilities in all routine roadway drainage improvements.
Replace signs	• Replace missing or damaged warning, regulatory, or wayfinding signs.	• Replace signs based on manufacturer recommendations related to reflectivity and readability (every 15 to 20 years).
Replace pavement markings	• Replace faded or damaged pavement markings that cause confusion for bicyclists or other roadway users.	• Conduct annual replacement program to replace bicycle pavement markings based on a regular basis, as needed. • Replace bicycle pavement markings when roadways are resurfaced
Ensure bicycle detection at traffic signals	• Respond to citizen complaints about loops that do not detect bicycles.	• Test sensitivity of inductive loops at each approach to all intersections in the city with actuated signals, including left-turn lanes, to ensure that bicycles can be detected.
Provide adequate lighting	• Replace burned-out and broken lighting fixtures.	• Lighting is evaluated on a spot basis.

Action 1.9: Fix spot maintenance problems on existing city streets and bikeways.

Making maintenance improvements on existing on and off road bicycle facilities should be given high priority. Spot improvements, such as removing of specific surface irregularities, filling seams between concrete pavement sections, and facilitating safe railroad crossings should be made on an as-needed basis (see Tables 3 and 4, above). SDOT should address these maintenance problems in conjunction with utility providers (e.g., utility providers may have responsibility for utility pole covers, steel plates, etc.). Public feedback is critical for identifying maintenance issues.

Widen congested trail segments. The city will apply the FHWA Shared Use Path Level of Service methodology[3] to congested multi-use trail segments to identify sections that are congested and should be widened. Special attention should be given to trail sections with high use by both pedestrians and bicyclists, since these two types of trail users have different speeds and characteristics. Trail widening is often a major capital project.

Remove unused bollard receptacles at trail entrances. Bollard receptacles at trail entrances that are no longer going to be used should be removed. These bollard receptacles are of special concern at night. The placement and design of bollards on trails should also avoid potential conflicts between different modes.

Fill seams between concrete pavement sections of streets. There are many streets in the city where the concrete seam is located at or near the most appropriate place for bicyclists to ride (typically on the right side of the outside travel lane near the on-street parking). This can create a problem, particularly for bicyclists with narrow, road bike tires. Several streets that have this issue are important connections in the city's bicycle network. In some cases, this seam is located in a marked bicycle lane. In the short-term, these seams should be filled on the most important streets for bicycle connectivity. As streets are repaved in the future, seams should be located away from where bicyclists would typically ride. Examples include:

- Renton Avenue S, south of Rainier Avenue S.
- W Emerson Street transition to Ballard Bridge access ramp.
- Montlake Avenue NE near Montlake Bridge
- E John St and E Olive Way from Bellevue Avenue E to 15th Avenue E.

This seam on Renton Avenue S is approximately one inch wide in some places.

"Please fix roads that have parallel gaps in the pavement. There are a lot of roads that are made of concrete with big gaps running parallel to traffic." —Seattle resident.

Make physical improvements to improve railroad crossings. Multi-purpose trails and roadways should be designed to allow bicyclists to cross railroad lines perpendicular to the rails (or as close to perpendicular as possible). This may include adding pavement to the roadway shoulder area, modifying

Inactive railroad tracks on Alaskan Way S where flange fillers have been used.

[3] *The FHWA Shared Use Path Level of Service methodology determines the level of comfort on a trail from a bicyclist's perspective. The model uses trail width, total number of users, and percentage of different user types to estimate the amount of delay that bicyclists will experience in passing other trail users.*

striping and markings, and posting warning signs. Flange fillers are another possible treatment to improve safety on rail lines that are still in place but no longer active. Top priorities for railroad crossing improvements should be along multi-purpose trails and signed bicycle routes, but all roadways should be designed to provide bicyclists with safe rail crossing opportunities.

Repave roadways that have poor pavement condition and provide critical connections in the Bicycle Facility Network. There are a number of roadways in need of repaving throughout the city. Several of these roadways are critical to the Bicycle Facility Network but currently have particularly poor pavement condition. Examples of important bikeway connections that should be repaved in the short-term include:

- Dexter Avenue N between Mercer Street and the Fremont Bridge.
- Montlake Avenue NE near the Montlake Bridge.
- Lake Washington Boulevard S.
- Beach Drive SW.
- Sand Point Way NE.
- Airport Way S.

Improve the quality of street surfaces by reducing the problem presented by steel plates. The city's Standard Specifications and Traffic Control Manual require that whenever steel plates are used, they are shimmed and textured with a no-skid surface to reduce slipping hazards. The locations of these plates should also be highlighted by paint so that bicyclists can prepare to cross them. Further, city inspectors are required to monitor the installation of steel plates by both city work crews and contractors to ensure that all plates meet these guidelines. Inspectors must adhere to this requirement and do rigorous inspections.

Remove drainage grates with drain openings parallel to the direction of travel. Grates will be replaced, as needed, when streets are repaved and bicycle facilities are added as part of Seattle's Complete Streets policy. Of particular importance are drain grates located in curb lanes without parking. Citizens are also encouraged to contact the Pedestrian and Bicycle Program with problem grates.

"Please emphasize clearing broken glass off of streets, sidewalks, and bike paths." --Seattle resident

Action 1.10. Prioritize bicycle facility development and maintenance to maximize the use and safety benefits of these investments.

Several factors will be considered to prioritize bicycle facility development and maintenance in accordance with the Transportation Strategic Plan. The bicycle improvements that will be made first will be those that serve high volumes of users, improve safety, are cost-effective, and improve geographic equity. Prioritization criteria will be developed and may include the following:

User volumes

- Improve conditions in corridors where there is high potential to increase bicycle trips
- Increase the connectivity and safety of the Urban Trails System, Signed Bicycle Route Network, and other parts of the Bicycle Facility Network

Safety

- Improve bicycle conditions (by providing facilities that make bicycle and motorists behavior more predictable) in areas with high numbers of police-reported crashes
- Improve bicycle conditions proactively in locations where there is a high potential risk of crashes

Cost-effectiveness

- Implement bicycle facilities as a part of other projects, such as roadway repaving and reconstruction
- Make improvements that have been identified as important bicycle facilities in previous plans
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Geographic equity

- Provide facility connections in areas where bicycle lanes and trails are missing or disconnected
- Implement projects that have been identified as important bicycle facilities by the public

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