seattle bicycle master plan

April 2014

appendix

SDOT

Seattle Department of Transportation

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Appendix 1:
REPORTS

1A: Public Engagement Phase 1

seattle bicycle master plan

Public Engagement Summary Report
PHASE ONE

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KEY FINDINGS & THEMES

In the spring of 2012, the Seattle Department of Transportation (SDOT) began an update of the 2007 Bicycle Master Plan (BMP). One of the first steps of the update process was to find out more about how people currently view bicycling and what they would like to see from the plan update.

The findings below summarize the results of an online survey and mapping tool conducted in May and June of 2012 as part of the plan update, in addition to information from a statistically valid phone survey SDOT conducted in April 2012, and other comments received at outreach events and via email during the spring of 2012. Several key themes emerged from outreach conducted to date:

Safety is a major concern for bicycle riders and prospective riders.

- The words “safe” and “safety” were mentioned nearly 400 times in comments (online survey)
- “Do not feel safe riding a bike” was the #1 barrier for respondents “interested in riding a bike, but concerned” (online survey) and the #2 barrier for phone survey respondents, behind weather (phone survey)

Build facilities that are comfortable for all ages & abilities.

- Generally, respondents want to see bicycle facilities that improve comfort and safety including:
    - Neighborhood greenways
    - Cycle tracks
    - Off-street paved trails
    - Safe routes to and on bridges
        — Ballard Bridge and the South end of the University Bridge were identified as top locations for crossing/intersection improvements (online mapping tool)
    - Buffered bicycle lanes
        — Dexter Ave was the most popular facility for places people like to ride (online mapping tool)
- On-street separated bicycle facilities and off-street paved trails ranked highest for increased investment (online survey)
- Low volume, low traffic residential streets without bicycle lanes are the most-used facilities currently (phone survey); residential streets and off-street paved trails were most used facilities for “interested in riding a bike, but concerned” respondents (online survey)
- Desire for separated bicycle facilities was a primary theme in comments section (online survey)
- Support for an on-street separated facility in Downtown Seattle (online survey)
- Almost every downtown street identified as “worst place to ride” (online mapping tool)

Reevaluate how well existing bicycle lanes and sharrows are working.

- Concern that sharrows are not well understood and respected by motorists and do little, if anything, to increase safety (online survey)
- Many comments reference fear of being hit by a car door while riding in bicycle lanes adjacent to on-street parking (online survey)

Plan for maintenance of the bicycle network and improve pavement quality.

- Improving pavement conditions was the second-ranked priority for encouraging bicycling, behind build more on-street bicycle facilities and off-street paved trails (online survey)
- Many comments cite locations where lack of maintenance has created hazardous conditions (e.g. 2nd Ave downtown) (online survey)

Increase efforts for education and enforcement campaigns that target all road users.

- Large number of comments about the need for increased education and enforcement of traffic laws for all road users (online survey)
- Safety concerns include getting hit or killed by drivers, distracted driving, uncertainty and lack of understanding of the rules of the road, behavior of bicycle riders, and animosity between modes (online survey)

Seattle has significant non-infrastructure related challenges.

- Weather was listed as the #1 barrier to bicycling in both the online and phone surveys
- Topography is a significant barrier for people who are “interested in riding a bike, but are concerned” and those who do not currently ride (online and phone survey)
- Only 40% of residents report having access to a working bicycle (phone survey)

INTRODUCTION

Background and Context

In 2012, the Seattle Department of Transportation (SDOT) embarked on an update to the Bicycle Master Plan (BMP). While the current BMP, which was adopted in 2007, has been effective at guiding improvements to the City's bicycle network over the last five years, an update to the plan presents an opportunity to include fast-evolving best practices and new thinking in bicycle facility planning and design. This will result in a connected bicycle network that will appeal to a larger number of bicycle riders in the future.

During the 2007 Bicycle Master Plan, public engagement included an online survey with 1,600 responses, 100 email comments, and three public meetings which drew over 800 people. However, the majority of participants in the 2007 planning process were frequent bicyclists, while occasional cyclists and potential riders were not as involved in the planning process. One of the primary goals of public outreach for the 2012 plan update is to engage Seattle's many diverse and varied communities in the planning process and broaden the conversation about bicycling in the City of Seattle.

This report provides an overview of the public outreach and engagement to date and summarizes what SDOT has heard, including results from the online survey and mapping tool, a statistically valid phone survey that SDOT conducted in spring of 2012, and specific comments received at public events, through email, and through the survey tools.

The findings described in this report will inform several parts of the plan update and upcoming work. This work includes an update to the Bicycle Master Plan vision, goals, objectives, and performance measures and an updated map showing where bicycle improvements should be built, with recommended bicycle facility types. Feedback will also inform the draft plan document, including policies and actions for plan implementation. Throughout the BMP update process, SDOT staff will continue to attend meetings and outreach events, in addition to several formal comment opportunities including public meetings and workshops to review draft plan elements.

2012 BMP Update Public Engagement Strategy

The update to the Bicycle Master Plan has two public engagement goals: 1) to engage broad and diverse segments of Seattle residents, businesses, and property owners, and 2) to update the BMP to reflect the priorities and interests of a broad segment of people, including infrequent and potential riders, in addition to current users of the bicycle system. SDOT will meet these goals through three primary phases of public engagement.

The first phase of work began in May 2012 and capitalized on a number of engagement opportunities related to National Bike to Work Month. Bike to Work Month is an advantageous time for bicycle outreach, as there are a large number of bicycle-related events and many people try riding a bike for the first time. SDOT employed several engagement strategies including the creation of several online survey and mapping tools, attendance at numerous community events and stakeholder meetings; meetings of the Seattle Bicycle Advisory Board (SBAB); direct mailings to libraries, community centers and other neighborhood destinations; emails to neighborhoods, businesses, and focused outreach to specific community groups; and outreach to local news media. The 2012 Seattle Bicycle Map, which contains BMP update specific messaging to encourage people to get involved with the process, was also released at the time of the BMP launch and maps were distributed at a number of public events. Work on the first phase of public engagement continued until the end of June, with the survey tools officially closing on July 9th.

The second phase of the public engagement process will include public meetings, briefings to the City Council, and outreach to specific neighborhood and stakeholder groups to discuss the draft materials. Following revision to the draft plan elements to reflect public comment, the third and final phase of public engagement will include an opportunity to comment on the complete BMP update document.

Throughout the process, SDOT staff will attend meetings of the Seattle Bicycle Advisory Board and other groups and continue to respond to questions and comments from citizens. SDOT will also continue to work with the Seattle Bicycle Advisory Board (SBAB), which is a citizen advisory board whose members are appointed by the Mayor and City Council, to discuss the public engagement plan and specific engagement phases, what SDOT has been hearing, and how the information will help inform the update to the plan.

SPECIFIC feedback from public engagement efforts

Much of the information from the public that SDOT received during the first phase of public engagement aligns closely with the direction that City Council provided for the update, particularly the need to include new types of bicycle facilities, such as on-street separated bicycle facilities and neighborhood greenways in development of the future bicycle network. These new bicycle facility types are already incorporated into the scope of work for the project.

Other information from the public engagement process includes identifying the geographic location of specific problem areas and gaps in the network based on comments and response to the mapping tool, encorporating new project ideas from community groups, and making sure that the plan update addresses the issue of education and enforcement for all road users.

SDOT will use information collected during this first phase of public engagement to integrate public input with field investigation, roadway characteristics, gap analysis, bicycle counts and other efforts to identify areas for bicycle facilities. Draft future bicycle network maps, based in part on public input received thus far, will be presented in community meetings in the fall. This will allow the public an opportunity to provide input to the network at both a city-wide perspective and at the neighborhood level.

TELL US! SHOW US!

Overview

The goals of the BMP Public Engagement Strategy include engaging a broad and diverse array of Seattle residents, businesses, and property owners and ensuring that the update reflects the priorities and interests of all Seattlites. In order to address these goals, SDOT conducted some focused outreach efforts and made efforts to identify the location and characteristics of those participating in the engagement process.

This initial outreach process utilized a combination of online tools, in-person meetings, and events to reach potential stakeholders. Information about the update was translated into the six most-spoken languages in the City of Seattle (Chinese, Vietnamese, Tagalog, Spanish, Korean, and Somali) and distributed at numerous events and locations. Mailings of the poster in English and translated business cards were sent to each of the six neighborhood service centers, all 37 Parks & Recreation public facilities, every library in the city, and to ten diverse community groups to encourage additional participation of potential or infrequent bicycle riders. SDOT printed 10,000 English language business cards with a link to the online survey tools and distributed posters and cards (shown above) to every bicycle shop in the City.

SDOT project team staff also attended numerous events and meetings during May and June to gather input from the community. Because May is National Bike to Work Month, a number of events were organized and sponsored specifically to promote and encourage cycling. However SDOT also made a conscious effort to attend events that did not cater specifically to bicyclists, such as Summer Streets in Alki and Ballard and the Seattle Pride Parade. SDOT staff also utilized social media and e-mail to reach out to a diverse array of community organizations and other potential stakeholder groups.

In addition to information and comments received in the on-line survey, phone survey, and web mapping tool, SDOT also received comment letters from the Seattle Greenways organizers and Cascade Bicycle Club. There were also a number of briefings with City boards and commissions and other stakeholder groups to discuss the project and solicit input. More information on these meetings is in Appendix E.

Finally, one source of information about bicycling in Seattle was from a statistically valid phone survey, conducted in April of 2012. This survey was conducted using an Interactive Voice Response (IVR) random digit dial phone survey approach. A similar survey was also conducted in 2011. The 2012 survey included 600 total interviews, with a margin of error of +/- 4.0 points, with responses weighted to accurately reflect the adult population based on Seattle Census demographics.

Online Survey Tools

WHAT SDOT HEARD

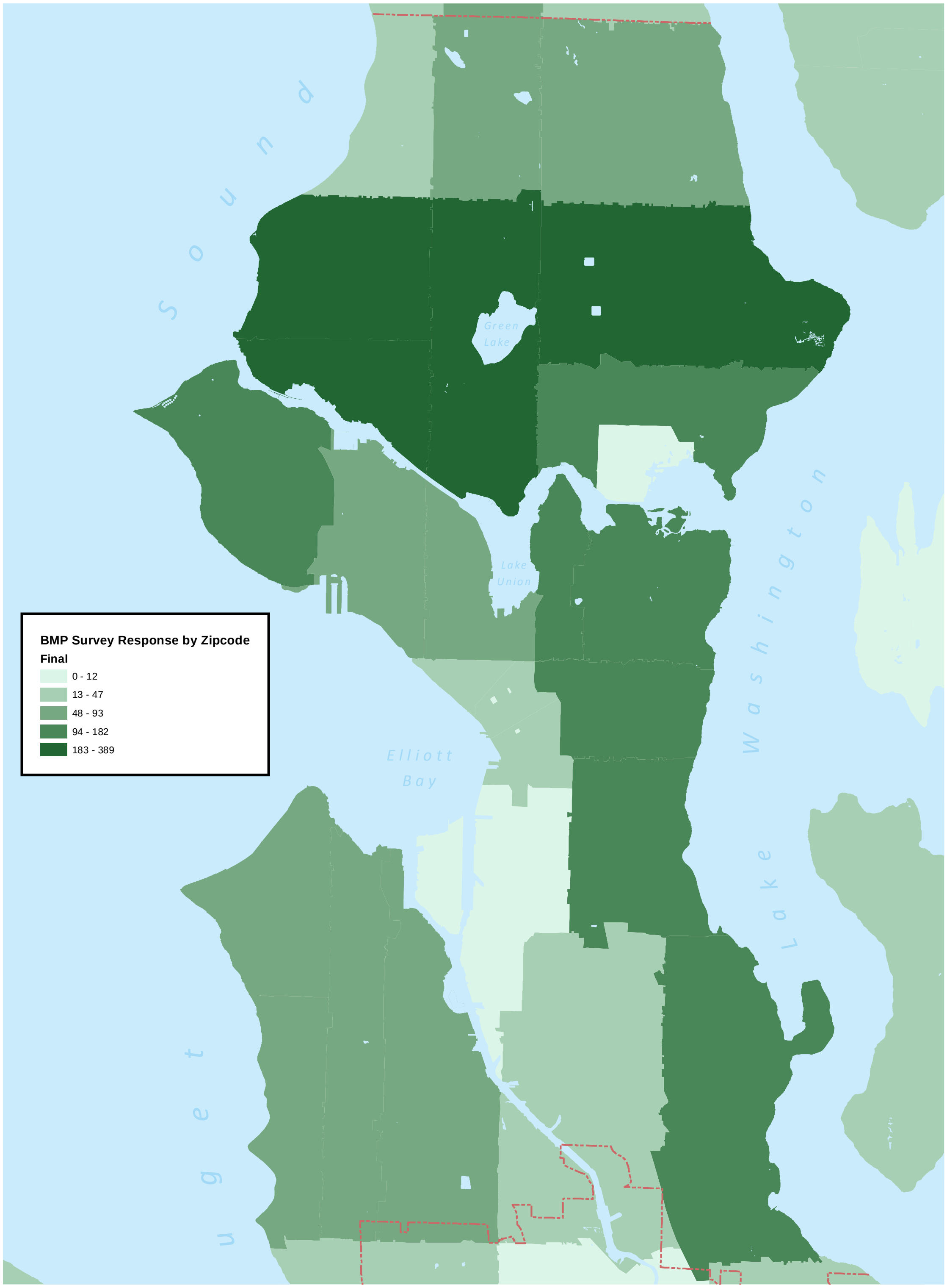
This section explains some of the findings from SDOT's survey tools including the BMP online survey and mapping tool and phone survey, as well as from the many comments we received at public events, meetings, and by e-mail.

It is important to note that the results from the BMP online survey should be read with the understanding that response to this survey does not necessarily reflect the views of the entire community. Although the online survey and mapping tools both provided an important opportunity for feedback and comment on the Bicycle Master Plan, these tools do not represent a comprehensive survey or a statistically valid sample of the population.

For comparison, the phone survey conducted by SDOT's traffic management division in April of 2012, which asked several questions about bicycling, presents a statistically valid perspective. These results will be included whenever possible so as to provide a clearer picture of bicycle perceptions and use in the entire Seattle community.

WHO we heard from in the online survey

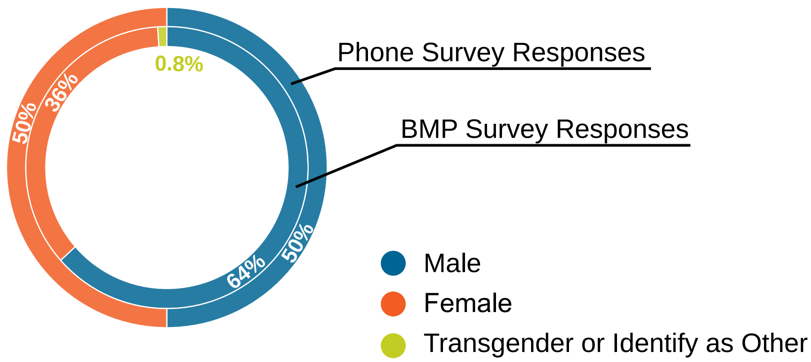
In all, there were over 3,500 responses to the BMP online survey and thousands of lines drawn on the online mapping tool. Responses came from every zip code in Seattle and some from beyond the Seattle boundaries. The response by neighborhood is shown in the map below:



Although SDOT did hear from a large number of people, some demographic groups responded more than others. The following graphics show who we heard from in the BMP online survey, compared to who was surveyed as part of the phone survey.

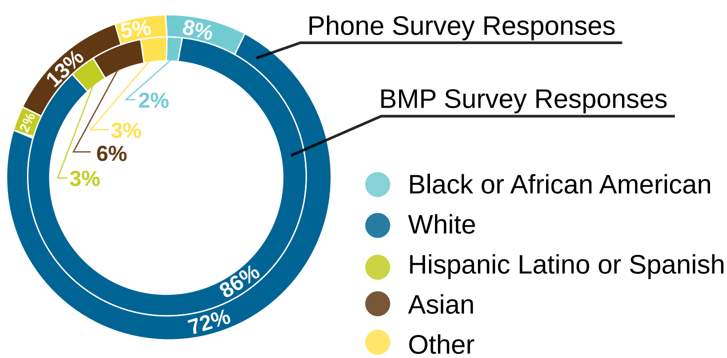
Gender:

One of the biggest differences was the response by gender. Response to the BMP online survey was heavily male compared to the phone survey, as shown at right:



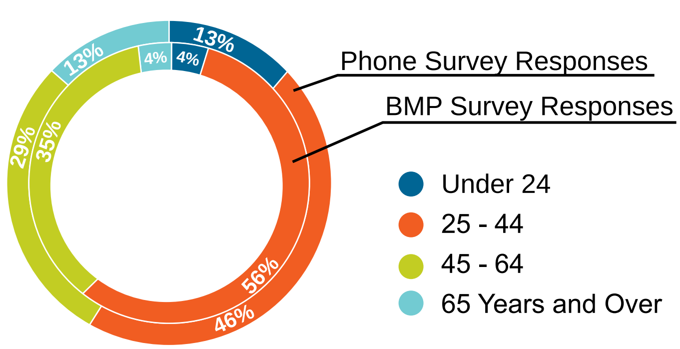
Race:

Response by race also differed between the two surveys, with the phone survey better representing the diversity of Seattle's population. In contrast, the BMP online survey respondents were more likely to be white.



Age:

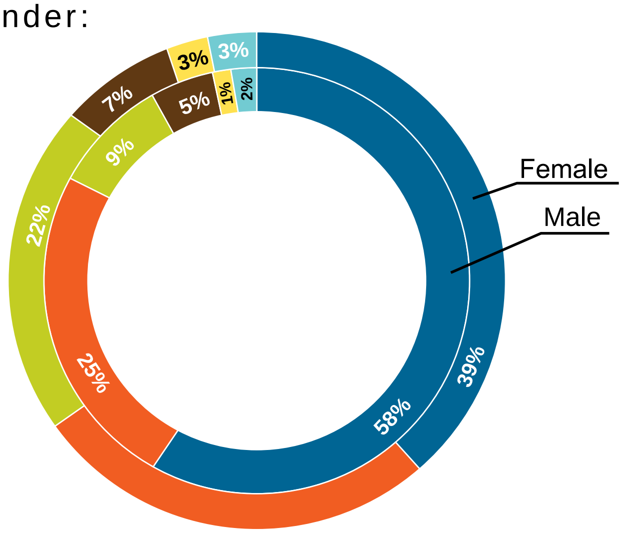
As far as age, response to the BMP online survey was much greater in the age 25-44 and 45-64 age groups than in the phone survey, which again provides a better distribution across groups.



Cyclist Type:

One question that was not on the phone survey, but provides insight as to who we heard from in the online outreach, was a question on the BMP online survey that asked respondents to identify themselves as one of several types of cyclists. These results show that many of the people who took the online survey are frequent bicycle riders.

Gender:



Online Responses:

- A frequent cyclist; rides in mixed traffic with automobiles on any type of street
- A frequent cyclist; rides on arterial streets w/ bicycle facilties and on low speed, low traffic streets when bicycle facilities are not on arterial
- Interested in bicycling; rides on low speed residential streets, but concerned about safety in mixed traffic with automobiles
- Recreational or occasional cyclist; ride primarily off-street paved trails
- I do not ride a bicycle now; might be interested if Seattle developed bicycle facilities that met my needs or made me feel safer
- I do not ride a bicycle and am unlikely ever to do so

HOW are people making trips on today's bicycle network?

The BMP online survey asked several questions about what kinds of trips people make and how often they make them. Many respondents said that they ride a bike frequently, especially for commute trips. In the warmer part of the year (April-September), 75% of respondents said they ride at least once a week, and 60% ride at least once a week in the cooler season (October-March). In comparison, the phone survey did not ask exactly the same question, but found that only 13% of all respondents reported bicycling a few times a week or daily, with an additional 20% riding a few times a month. These questions highlighted the fact that many of the BMP online survey respondents are frequent bike riders and commuters.

"I bike with my kids on board. I'd love to see biking made more family friendly in Seattle. Well marked bike lanes/boxes--especially when buffered--should be all over town. We take the Burke-Gilman whenever we can, but of course it's not complete in Ballard."

- BMP Update online survey comment

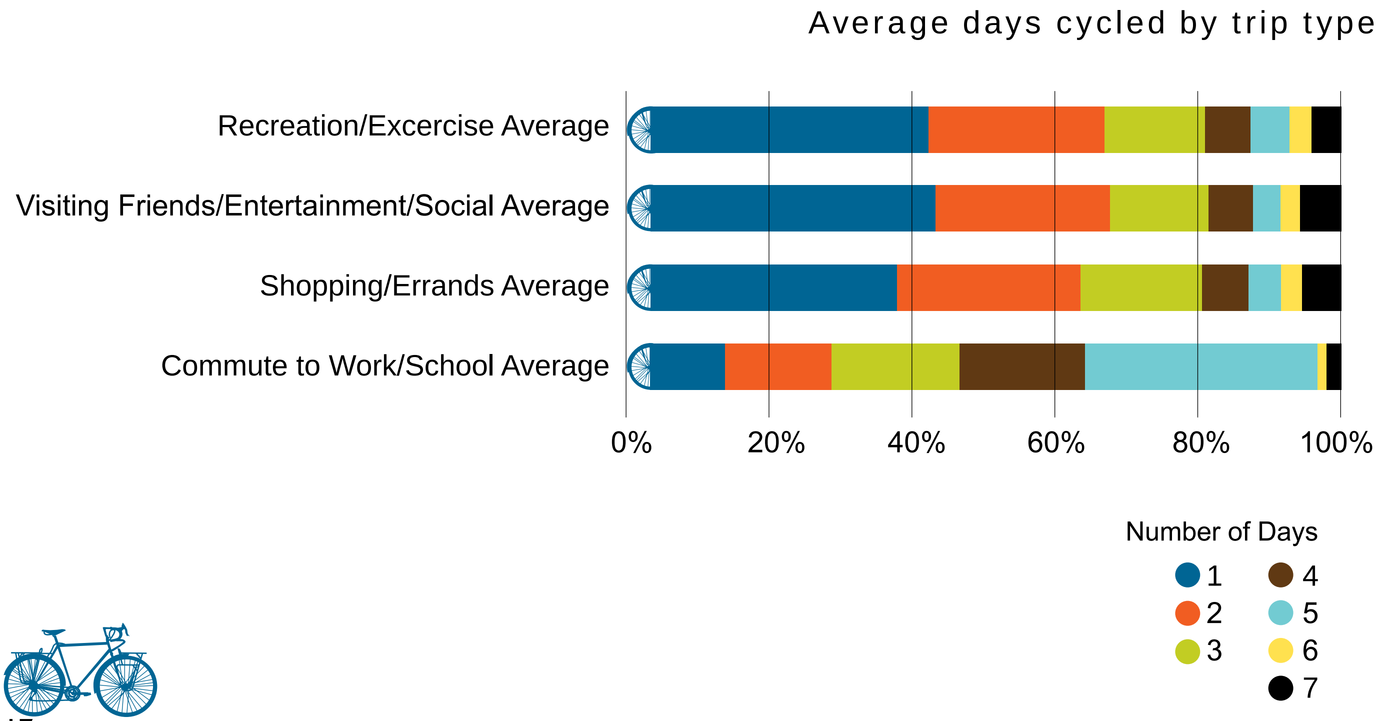
WHY are people riding bicycles?

The BMP online survey asked how often people make trips for the following purposes:

- Commute to work or school
- Shopping/errands
- Visit friends/entertainment/social
- Recreation/exercise

In general, commute trips and recreation/exercise trips were the most common. When asked what the purpose of their most recent trip was, 65% of respondents said that it was a commute trip, 25% recreation, and only 7% shopping/errands and 5% visit friends/entertainment/social.

Commute trips were also the most frequently made trip type – a third of those who ride for commuting purposes do so an average of 5 days a week throughout the year. Furthermore, commute trips were the least likely to be affected by weather. Respondents commuting by bike reported riding almost as much in the winter and rainy Seattle spring as in the summer and fall. Recreational trips, on the other hand, dropped by 25% from the warmer months to the cooler. Social and shopping trips were, however, more likely to be the kind of trip made nearly every day of the week – approximately a tenth of respondents said they make these trips 6 or 7 days a week.



TRIP length

The length of trip appears to be closely related to the type of trip. For example, the BMP online survey found that the largest portion of shopping/errands trips are 2 miles or less, entertainment/ social trips are 5 miles or less, commute trips are between 2-10 miles, and recreation/exercise trips above 10 miles. The phone survey, in comparison, found that overall the largest portion of trips are between 2-5 miles (36%), while approximately 20% are less than 2 miles, 20% are 6-10 miles, and 20% are more than 10 miles. Some of our other outreach efforts indicated that some people would like to be able to travel longer distances for commute trips – for example across the SR 520 bridge – while for other types of trips people would like to be able to make intra-neighborhood trips to the grocery store, school, and other community destinations/amenities.

HOW do people currently make bicycle trips?

One of the BMP online survey questions asked what type of streets people use when riding their bikes for different purposes. The question asked what type of facility people use for the majority of each trip, although it is likely that people often use many different kinds of streets for each trip. Because of this, it is possible that the types of facilities that people use to travel long distances may be overrepresented in these results. This question found that:

- Recreational trips mostly use off-street paved trails and arterials without bicycle facilities (63% of trips).

- Three quarters of entertainment/social trips use residential streets, arterials with sharrows, or bicycle lanes as the primary facility (29%, 27% and 19% respectively). Shopping/errands trips show similar distribution (25%, 21%, and 17%).

- Commute trips use arterials with bicycle facilities - sharrows or bicycle lanes - more than any other trip types and nearly 75% of all trips are made on either these facilities or off-street trails. Commute trips also show the most even distribution among facility types.

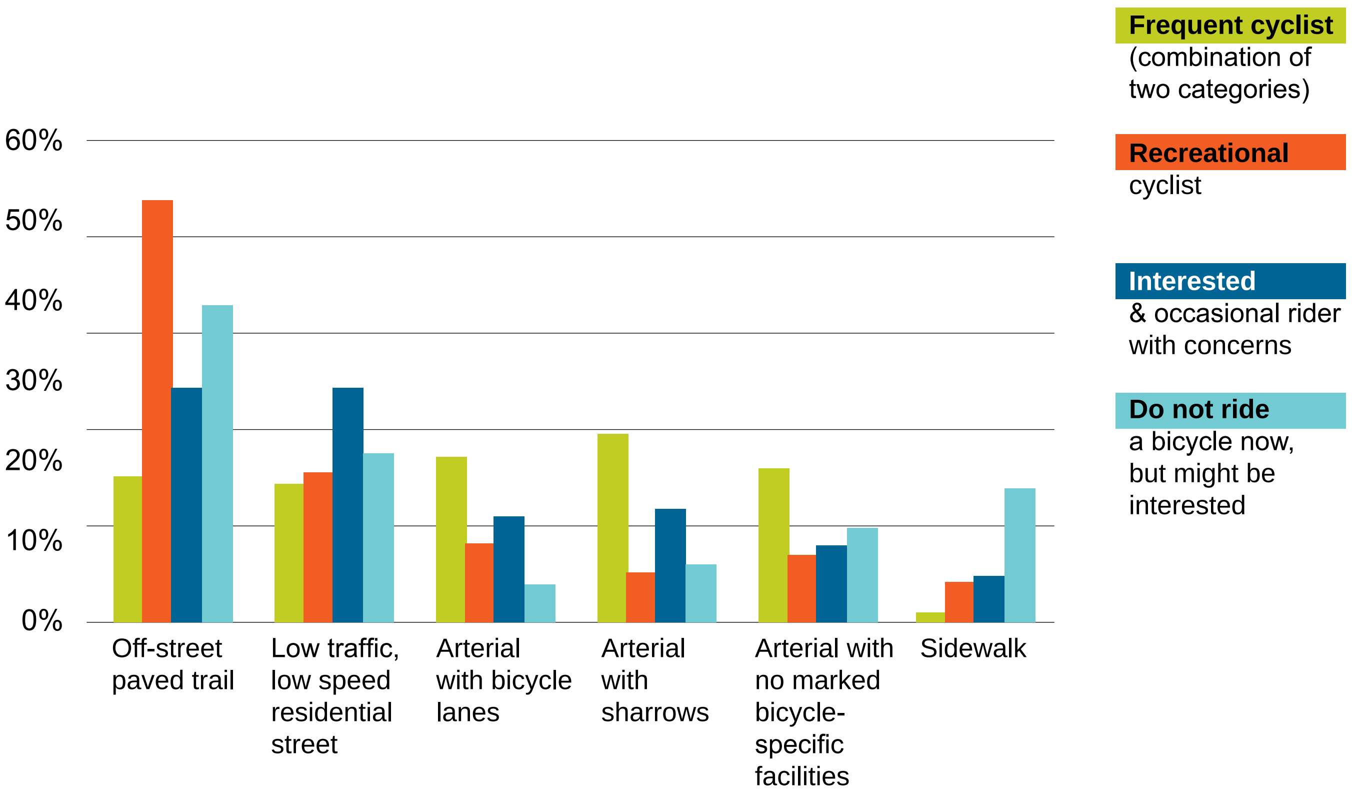
- All in all, nearly 70% of respondents report using dedicated bicycle facilities (off-street trails, bicycle lanes, and sharrows) for commute trips and recreation trips, while only half of entertainment/social and shopping/errands trips use these facilities. Instead, respondents were 3 times more likely to report using residential streets for entertainment/social and shopping/errands trips than for commute or recreational trips.

There were also some differences in how people made trips depending on what type of cyclist they identified as. As shown on the next page, frequent cyclists used arterial streets with bicycle lanes, sharrows, or with no facilities at all much more than those who are interested in riding a bicycle, but concerned, or people who do not currently ride. However, the fact that many of the people who reported not feeling safe or comfortable enough to ride a bicycle in the current conditions still reported riding on arterial roads with no bicycle facilities could suggest a few potential issues:

- Perhaps new riders use arterial roads because it is difficult to find bicycle-friendly alternatives to busy arterials using popular mapping tools, bicycle maps, or by navigating the signage and markings along the network.

- There may be areas where there are not currently enough alternatives, so people riding bikes are forced to use the arterial.

- Perhaps some people prefer to take the most direct or fastest route even if it is an arterial street without bicycle markings.



Even though the BMP online survey data is not statistically valid, it appears to show that new or occasional cyclists tend to ride mostly on trails and residential streets, and sometimes sidewalks. This contrasts somewhat with the statistically valid phone survey, which found that roughly 40% of residents who ride a bike report riding on neighborhood streets without bicycle lanes, 30% use arterial streets with bicycle lanes, and 24% use off-street trails.

“The very worst thing is when you are in a bike lane that all of a sudden ends… Connectivity is important.”

- BMP Update online survey comment

WHERE do people currently ride?

The online mapping tool asked respondents about what streets and routes they currently use when riding a bicycle. This map (below) shows that people ride in many parts of the city, but especially in Downtown Seattle and on the off-street trail network.

The following streets were identified as streets that many respondents use for bicycle trips.

Street Name
BURKE GILMAN TRL
DEXTER AVE N
FREMONT AVE N
8TH AVE NW
EASTLAKE AVE E
ALASKAN WAY
NE RAVENNA BLVD
S JACKSON ST
ROOSEVELT WAY NE
WESTLAKE AVE N
N 34TH ST
PHINNEY AVE N
N NORTHLAKE WAY
STONE WAY N
PINE ST
2ND AVE
12TH AVE
NE PACIFIC ST
E PINE ST
4TH AVE
GREENWOOD AVE N
WESTLAKE EAST RDWY AVE N
BEACON AVE S
5TH AVE

"Being able to safely bicycle to work, has made it possible for me to accept jobs and keep jobs."

- BMP Update online survey comment

Among these streets, SDOT also asked people to identify which ones they like riding on the most. This gives an idea of some of the most popular routes in terms of where people want to travel, as well as what some of the most popular streets are for getting there.

Online Mapping Tool Response: What are the best places to ride?

This map shows several trends. For one, there are many more North/South lines identified than there are East/West. Many of the top ranked roadways run North/South in the North half of the city. Dexter Ave N is the most popular roadway for bicyclists in the city. In 2011, SDOT resurfaced Dexter Avenue N from Roy Street to the Fremont Bridge. The repaving project created an opportunity for SDOT to implement a “Complete Streets” approach to the roadway, which strives to improve conditions for all users of the street – including pedestrians, cyclists, transit, and those who live on the street. Cyclists benefits from many components of the project, including traffic calming effects, 6-foot buffered bicycle lanes, and bus islands that allow bicycles to continue unimpeded by buses pulling into stops.

The map also shows that more streets were selected in the North portion of the city than in the South. Additionally, there are no downtown streets in the top results, despite the fact that the previous map showed that many respondents do ride downtown. It could be that people who used the mapping tool were most familiar with streets in the north part of the city; the mapping tool was not able to capture zip codes. However, these results could also indicate that there needs to be greater investment in providing good bicycle facilities throughout the city, particularly in Southeast, South, Southwest, and Downtown Seattle.

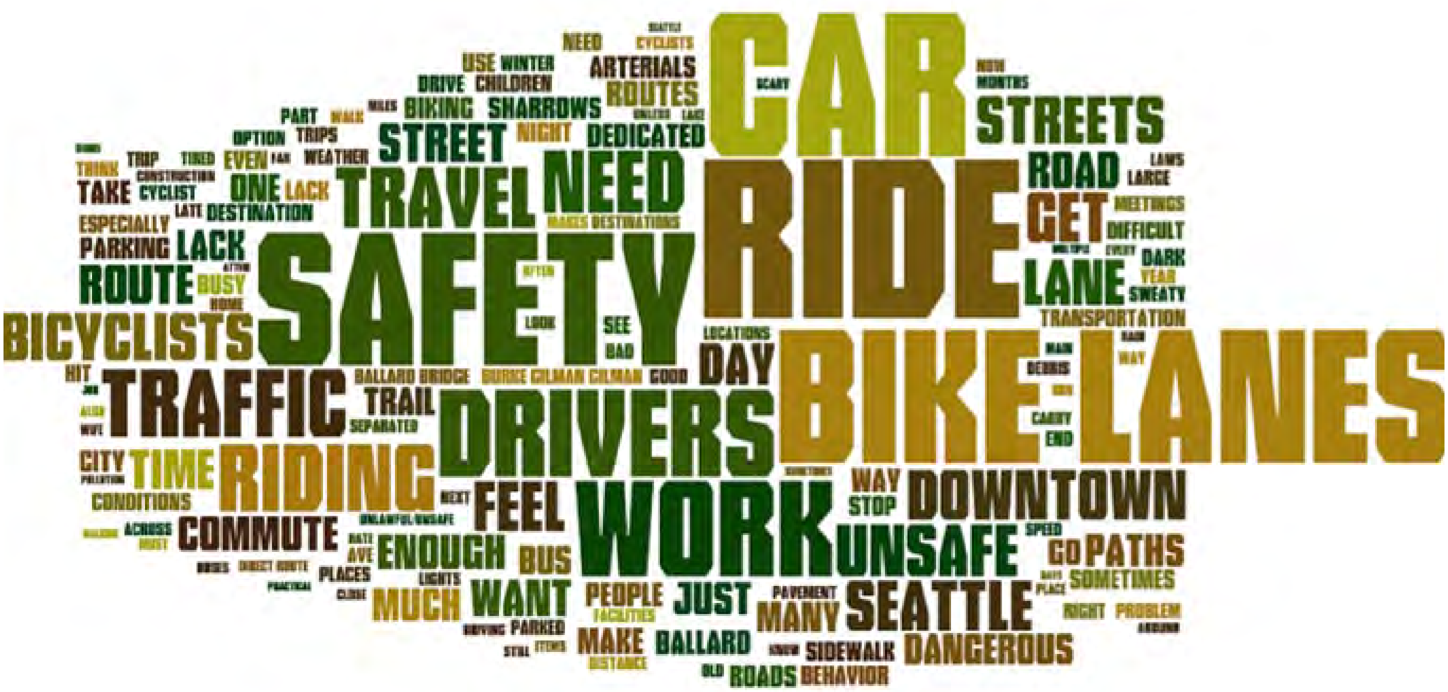
A complete list of the most frequently selected roadways are shown below.

Online Mapping Tool: Best streets to ride

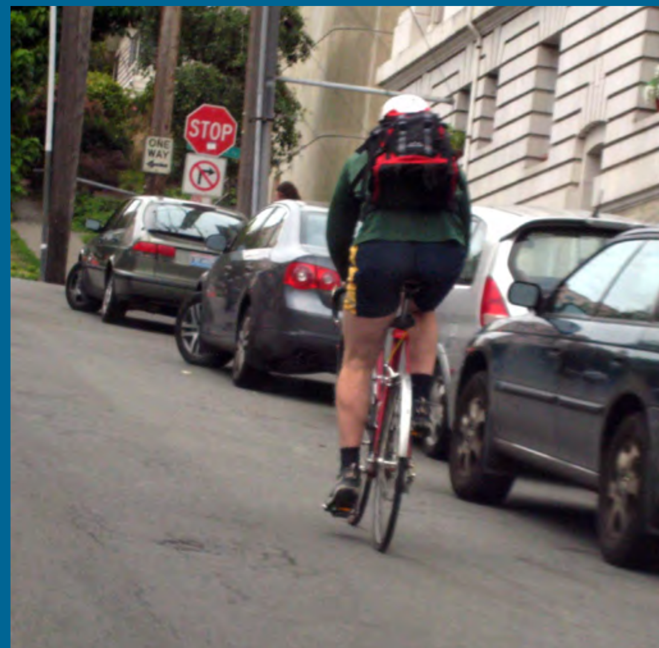
Street Name
DEXTER AVE N
NE RAVENNA BLVD
8TH AVE NW
FREMONT AVE N
PHINNEY AVE N
12TH AVE
BURKE GILMAN TRL
GREENWOOD AVE N
STONE WAY N
LAKE WASHINGTON BLVD S
GALER ST
ROOSEVELT WAY NE
WESTLAKE AVE N
ALOHA ST
CROCKETT ST
M L KING JR WAY S
VALLEY ST
NE 65TH ST
6TH AVE NW
GARFIELD ST
EASTLAKE AVE E
DENNY WAY
E PINE ST
BROAD ST

BARRIERS to riding a bicycle

For many people, the decision to ride a bicycle depends on a number of factors including the weather, time of day, trip purpose, and whether there is a good route to get where they need to go. Some of these themes emerged throughout the public engagement process. For example, the world cloud below was generated directly from the words and phrases that people used the most in the BMP online survey when asked about the reasons they may not ride a bicycle. Safety is the primary issue that people mentioned. Safety concerns included wanting improved safety in interactions with other road users, the desire to travel with children, poor pavement conditions, challenging connections to and within Downtown Seattle, concern about the safety of sharrows and bicycle lanes in the door zone, and specific locations such as the Ballard Bridge and Rainier Avenue. Some people also mentioned other types of barriers to riding a bike, such as the lack of end-of-trip facilities (showers and lockers for changing before work), weather conditions, or the need to travel quickly to their destination.



When asked to choose among several specific options, BMP online survey respondents listed weather, travel time, unsafe motorist behavior, and having too many things to carry as some of the top barriers to riding a bike, although other issues were not far behind (See page 26). These results are similar to what the phone survey found. Although the phone survey had fewer options, the top barrier was also weather, followed closely by “Don’t feel safe riding”, “Not that interested in riding more often” and “The hilly terrain”.



Online survey response: Barriers to bicycling

Weather	55%
Travel time/distance to my destination	46%
Unlawful/unsafe motorist behavior	36%
I have too many things to carry	35%
Inadequate bicycle facilities/gaps in the bicycle network	32%
Street pavement conditions	30%
Hills (topography)	28%
I do not feel safe riding a bike	26%
Lack of availabilty of end-of-trip facilities (secure bicycle parking, showers/changing rooms at my destination)	20%
Less convenient than other options	18%
Other, please specify	14%
Difficult connections to transit, not enough bicycle racks on buses, no room for my bicycle on the train	13%
I travel with small children	11%
Crime	5%

There were some differences in how people rated these barriers depending on their characteristics. For example women were more likely than men to rank “Hills” and “Do not feel safe riding a bike” as barriers. Riders who described themselves as “interested, but concerned” listed “Do not feel safe riding a bike” as the number one barrier to cycling and another safety barrier, “Unlawful/unsafe motorist behavior” as the third most important barrier. These cyclists listed weather and hills as the second and fourth most important barriers, respectively. People who do not currently ride at all said that convenience was the number one barrier, though weather, hills, and safety were also top responses.

PROBLEM locations

Other barriers to riding a bike exist where the current bicycle network is inadequate, missing, or lacking connectivity. SDOT heard comments from people who live all over the city about the most problematic locations in their neighborhood or bicycling experience. The online mapping tool asked people to show exactly where they think the worst places to ride a bike are – both along the roadway and at specific intersections and crossings.

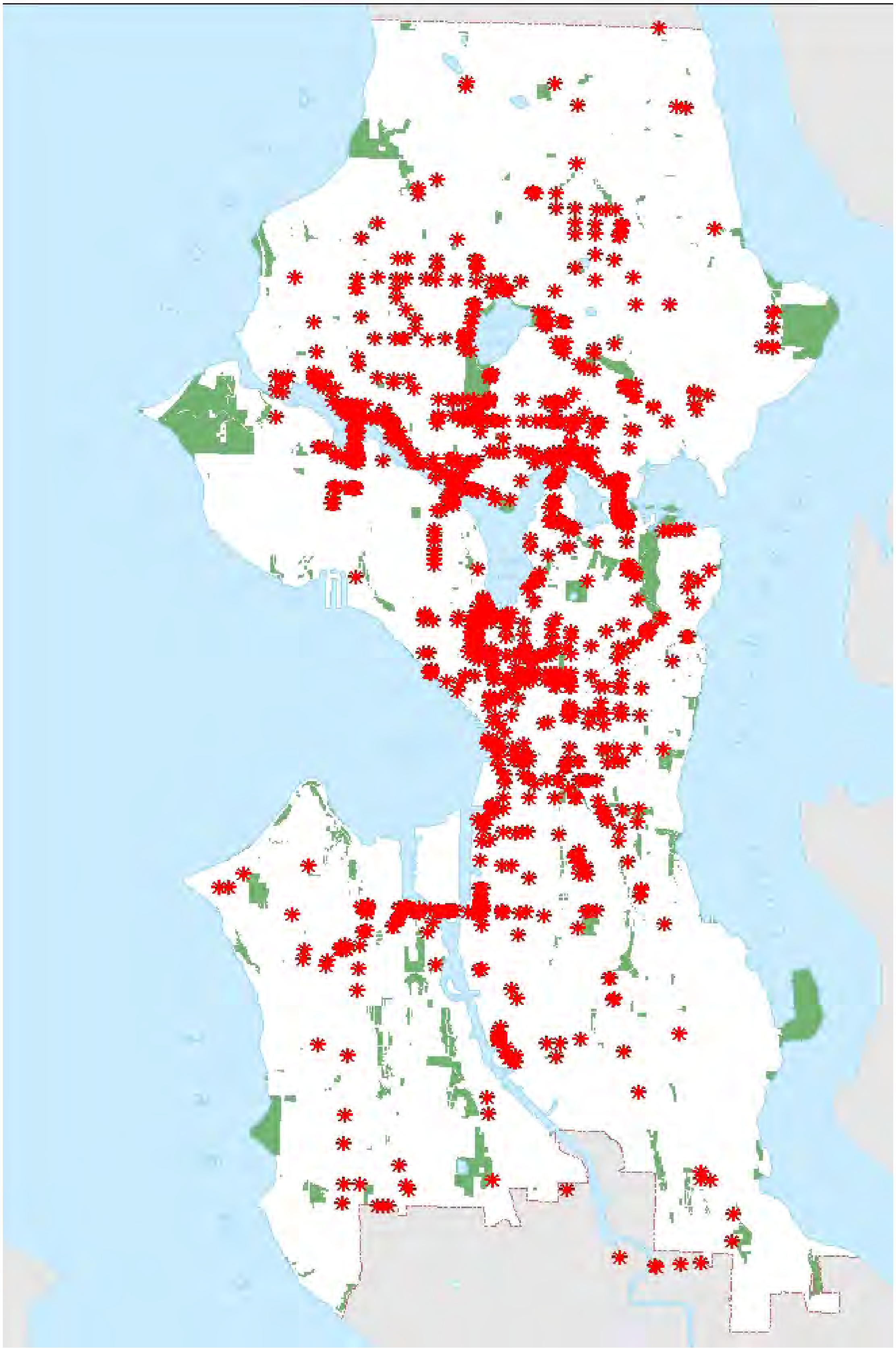
The top locations identified in the online mapping tool are shown on page 28. The top crossing location barrier was the Ballard Bridge, which was also referenced in numerous comments. Other key locations identified for crossing improvements included:

- Broad St & Valley St
- Stone Way N and N 34th St (where the Burke-Gilman Trail crosses Stone Way N)
- Montlake Boulevard E (where SR-520 crosses Montlake Boulevard)
- 24th Ave NW & NW Market St
- Eastlake Ave E & Fuhrman Ave E (South end of the University Bridge)
- Eastlake Ave E & Harvard Ave E
- 12th Ave & E Madison
- 12th Ave & E Jefferson St

“Seattle has done an excellent job of improving conditions for cyclists in the last 10 years. GREAT WORK! I urge city officials to please concentrate efforts to close the small gaps that exist many places, where a bike lane suddenly ends on a busy arterial, and to please fix the pavement defects in bike lanes where they present more hazard than elsewhere.”

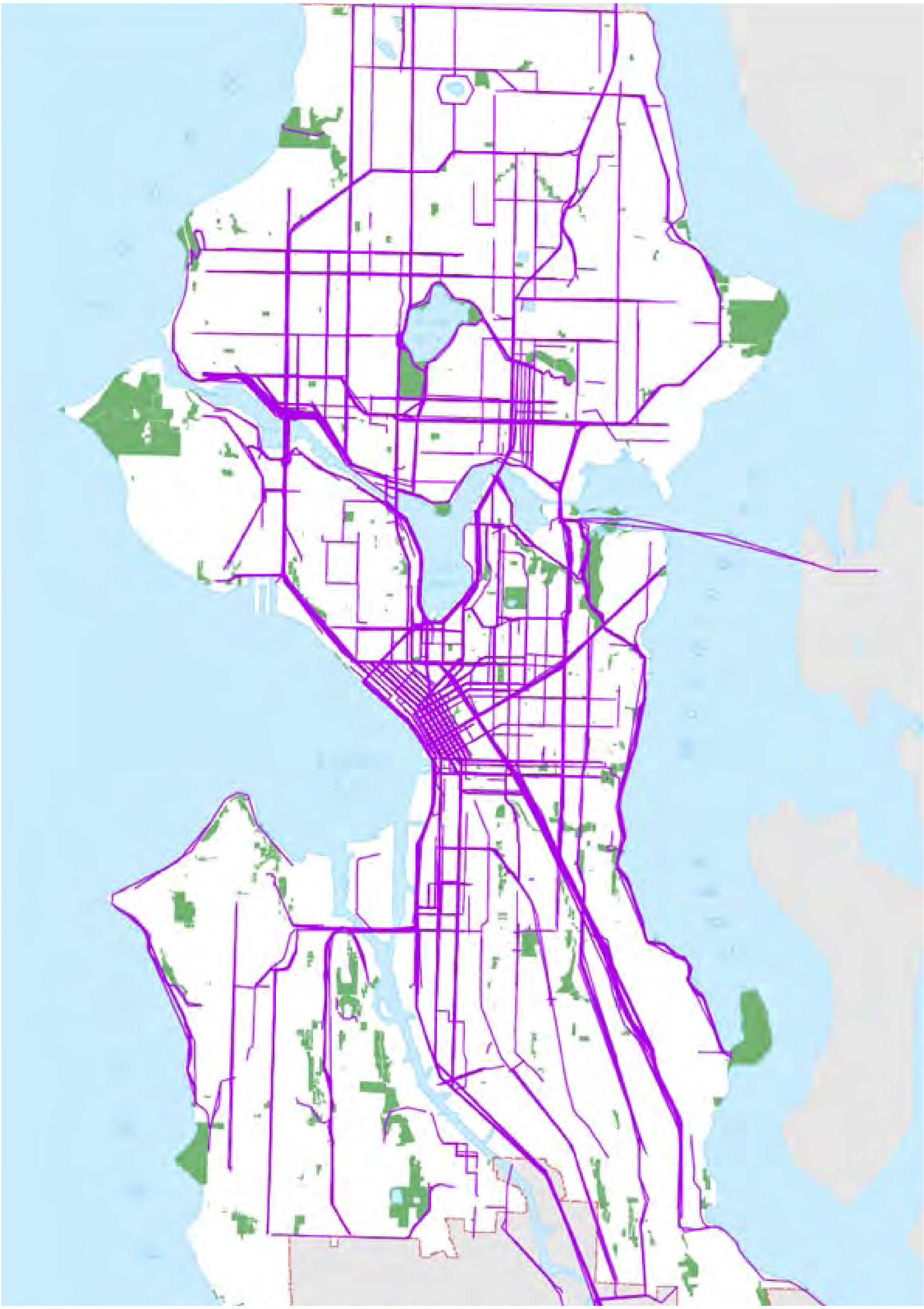
- BMP Update online survey comment

Online Mapping Tool Response: Crossing Improvements



Another question in the online mapping tool asked where the worst streets to ride a bike are. The thick purple lines show that several corridors were frequently rated as bad places to ride:

Online Mapping Tool Response: Map of worst streets to ride



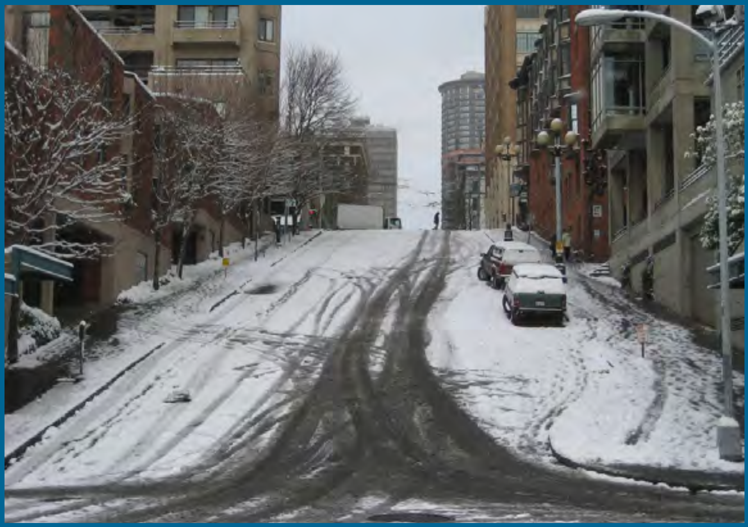
This information does highlight some of the most challenging connections around the city. Many of the lines in this map show the difficulty in moving across town on a bicycle. Rainier Avenue South had the most responses, but other cross-town connections also ranked highly. Many of the comments SDOT received at public events and meetings highlighted these same locations as areas that should be a high priority for safe bicycle facilities in the future.

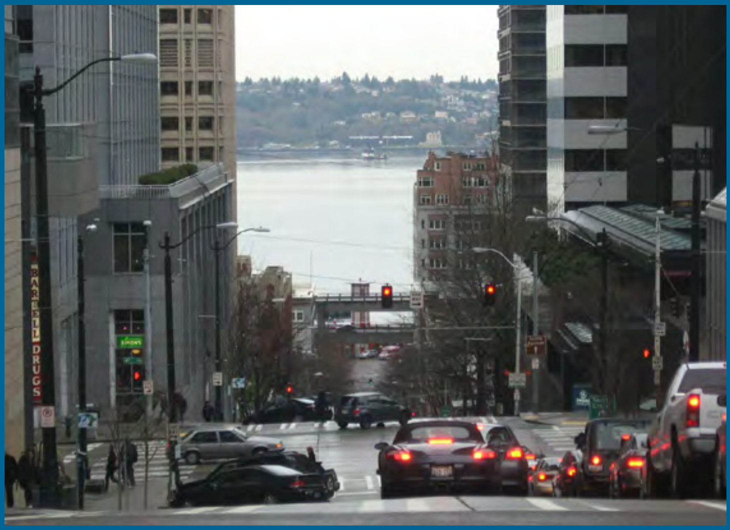
Online Mapping Tool Response: Worst streets to ride

Street Name
RAINIER AVE S
15TH AVE NW
DENNY WAY
NE 45TH ST
SHILSHOLE AVE NW
2ND AVE
15TH AVE W
NW MARKET ST
3RD AVE NW
E MADISON ST
M L KING JR WAY S
S JACKSON ST
EASTLAKE AVE E
4TH AVE S
WESTLAKE AVE N
ROOSEVELT WAY NE
MADISON ST
STEWART ST
24TH AVE E
BOREN AVE
N 45TH ST
1ST AVE S
4TH AVE
5TH AVE

Some of the findings that emerge from these figures are that poor quality streets for biking include:

- Routes through South/Southeast Seattle including Rainier Ave S and MLK Jr Way S
- Major East/West routes such as NE/N 45th, Denny Way, E Madison, and S Jackson
- Pinch points and crucial connections such as the Ballard Bridge (15th Ave NW/W) and the Missing Link of the Burke-Gilman Trail/Shilshole Ave NW, and Eastlake
- Downtown Seattle
    - North/South streets including 2nd Ave, 4th Ave, and 5th Ave
    - Major connections from Downtown to other neighborhoods including Westlake, Stewart, Boren, 1st Ave S





BARRIERS beyond infrastructure

In addition to information about barriers from an infrastructure perspective, it is clear that Seattle faces some challenging hurdles that are not directly related to the infrastructure, including interaction between modes, steep hills, Pacific Northwest weather, and even access to a working bicycle.

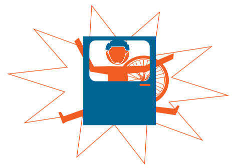
Topography and Weather: Both the BMP online survey and the phone survey found that weather was the number one barrier to bicycling. Seattle has a cold and rainy climate for much of the year – with cool temperatures and wet weather persisting even in summer months. However, some of the countries with the highest cycling rates in the world, like Denmark and the Netherlands, have even colder weather and snowier winters than Seattle does. What they do not have though, is steep hills in addition to a challenging climate.

Seattle is a very hilly city, which means that riding a bike in some parts of the city requires physical ability and, for many people, a bicycle that is equipped with enough gears to handle the hills. Topography ranked especially high as a barrier for people who either do not ride or only ride occasionally. Some potential ways to overcome this issue may include focused planning efforts on finding flat routes or on promotion of electric bicycles. SDOT is currently working on a short paper with ideas for how to surmount the Seattle topography challenge.

Bicycle Access: Another issue that appears quite significant is one of the findings from the phone survey, that over half (60%) of Seattleites do not have access to a working bicycle. Research has shown that, not surprisingly, bicycle access is a key factor in bicycle mode share. The 2012 BMP will need to consider ways to address this issue through partnerships with active non-profit organizations in the region, bike sharing programs, and other innovative solutions.

Safety and Perceived Safety: As mentioned previously, safety was perhaps the most important theme SDOT heard throughout the public engagement process. “Do not feel safe riding a bike” was the second most important barrier to bicycling in the phone survey (behind weather) and the most important factor in the BMP online survey for people who are interested in bicycling but have some concerns. Safety includes components of infrastructure and design, as well as behavior of other roadway users. The comments from the BMP online survey and at meetings highlighted many of the safety concerns people have, including:


Risk of being hit by a car, distracted driving, and other driver behavior


Bicycle lanes that are in the door zone (adjacent to parked cars)


Unclear rules regarding sharing the road & uncertainty surrounding sharrows


Dangerous behavior on the part of bicyclists


Safety concerns about riding a bicycle with children


Pavement condition


Missing pieces of the trail network

Some of the comments included suggestions for how to address these concerns including increased education, outreach, and enforcement as well as different types of facilities that may improve safety. These suggestions and comments are discussed in the following sections.

“Education of all road users, enforcement of road laws, and meaningful consequences to dangerous drivers (loss of license, fines, prison) would create a safer city for all of us.”

- BMP Update online survey comment

WHAT would people like to see in the future?

All barriers aside, SDOT heard many comments indicating that people are excited about making riding a bike in Seattle easier and safer in the future. This section provides an overview of what people hope to see from the updated Bicycle Master Plan, including programs, infrastructure, and specific locations for improvements.

"Great work. Keep it up. Educate more people about the ease of bicycling and provide more education for businesses and residents about how biking really works well to make stronger people and communities."

- BMP Update online survey comment

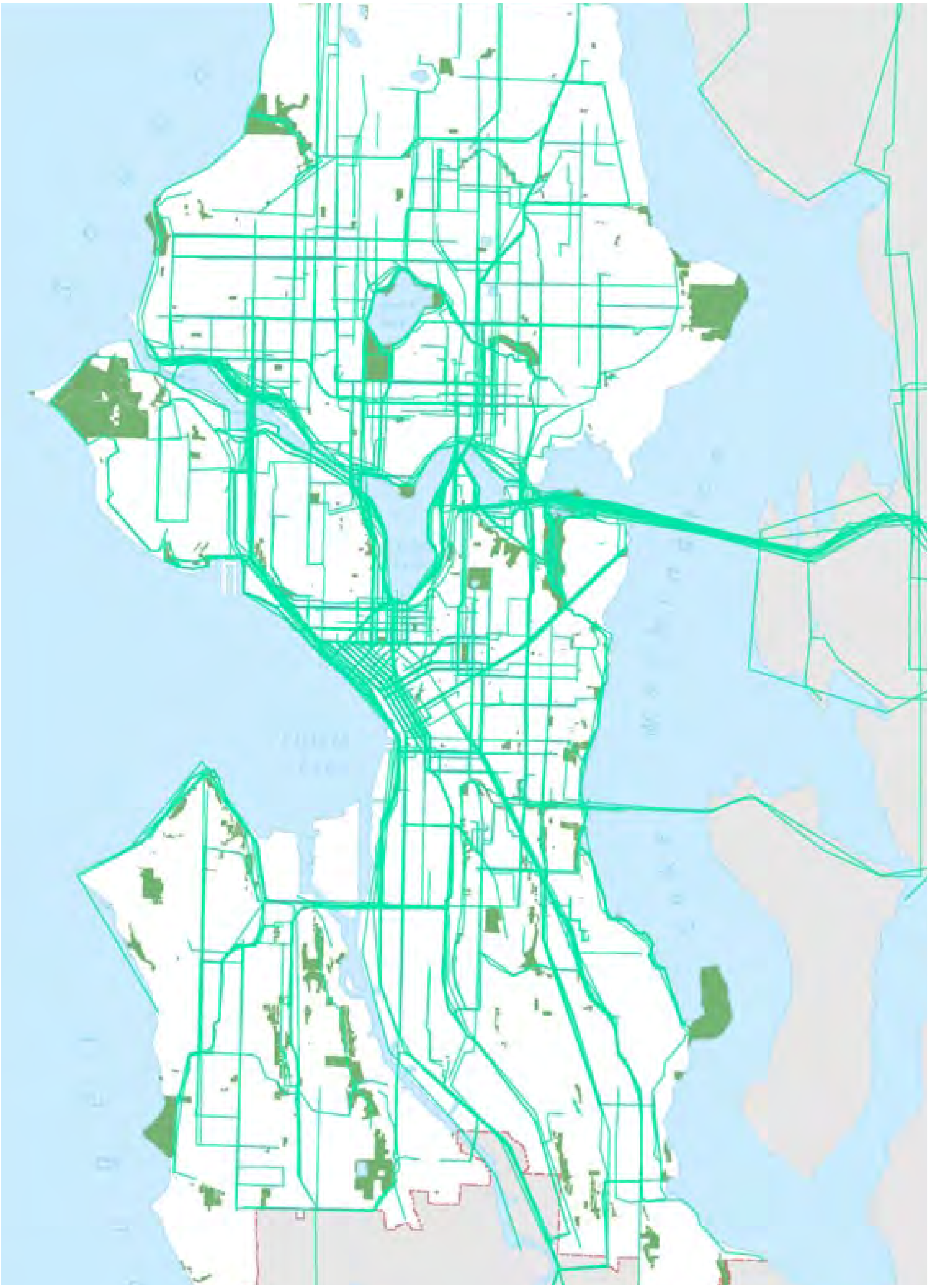
WHERE do people want to ride in the city?

SDOT staff heard many comments at public meetings, events, and through the online survey tools about specific areas and destinations where people would like to ride their bikes. One of the questions in the online mapping tool asked where people would like to ride, but currently do not.

The map, on page 34, is a bit more difficult to interpret than the previous ones – a place that people would like to ride, but currently do not, could be one several types of street. It could be a street that people know or have heard is a great place to ride a bicycle, but they do not live nearby or have occasion to use it. It could also indicate a particular street that people would like to ride on, but do not currently because there is not a bicycle facility, they do not feel safe, the pavement quality is poor, or any number of other issues. A third possibility is that people have different preferences about good streets to ride a bicycle on – for example despite the large number of comments SDOT received about how much people like the new Dexter Ave N facility, there were also some comments from people who do not like it.

The table, on page 35, shows the mixture of responses to this question, as it includes roadways that were mentioned as the best to ride on (Dexter Ave N, Westlake Ave N, Broad St), a number of streets that were on the worst to ride list (Rainier Ave S, MLK Jr Way S, Eastlake, and others), and some that have not yet appeared in any of the other responses, such as Airport Way S and Alaskan Way.

Online Mapping Tool Response: Where would you like to ride, but currently do not?

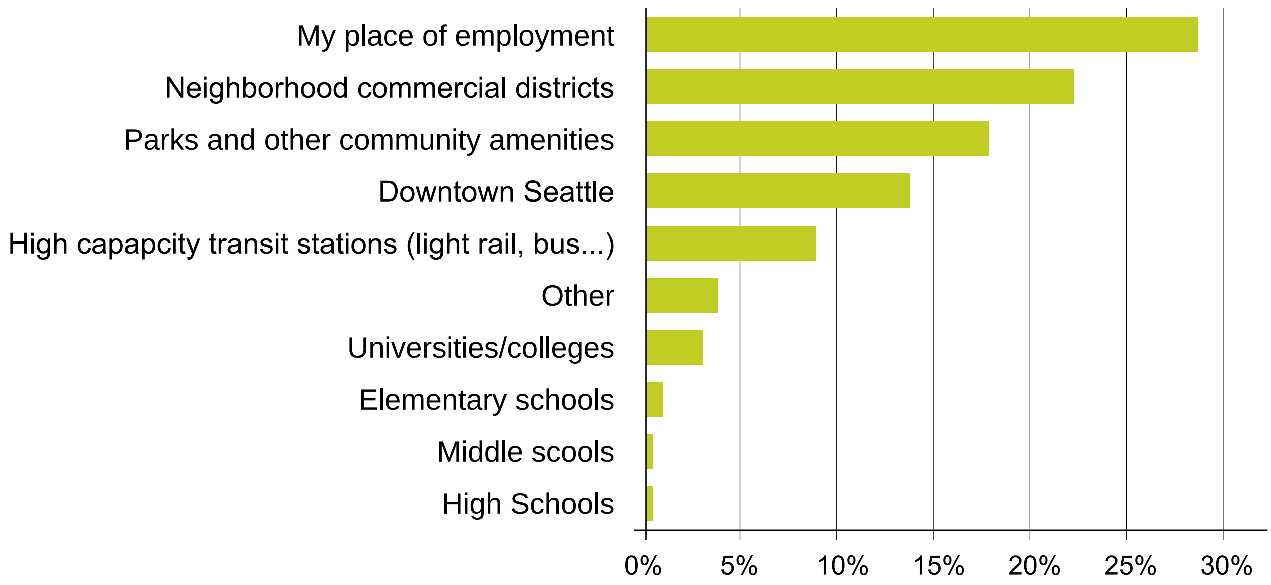


Online Mapping Tool: Streets people would like to, but currently do not ride on

Street Name
RAINIER AVE S
DENNY WAY
WESTLAKE AVE N
M L KING JR WAY S
15TH AVE W
AIRPORT WAY S
15TH AVE NW
E MADISON ST
EASTLAKE AVE E
NE 65TH ST
WESTLAKE EAST RDWY AVE N
SHILSHOLE AVE NW
2ND AVE
MERCER ST
1ST AVE S
ALASKAN WAY
BROAD ST
4TH AVE
FAIRVIEW AVE N
BURKE GILMAN TRL
ROOSEVELT WAY NE
NW MARKET ST
DEXTER AVE N

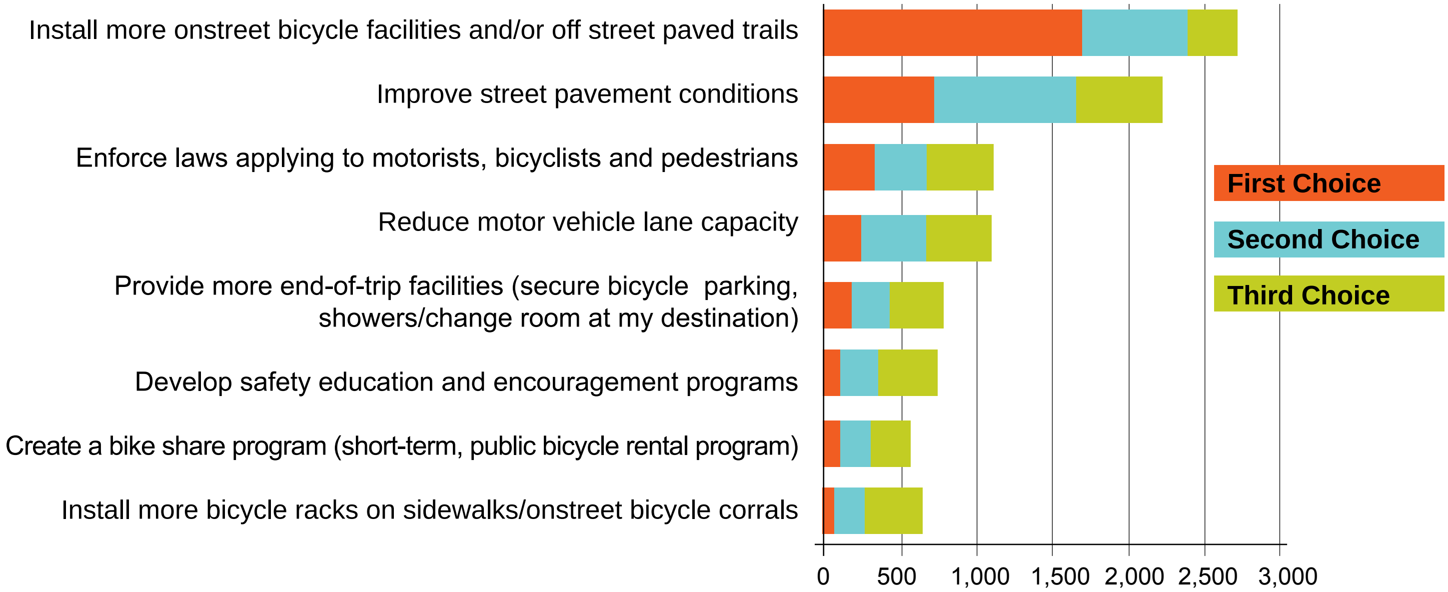
The BMP online survey also asked people to list the destinations that they would most like to bicycle to. These findings should be read carefully, since the BMP online survey response did not include a population that is a diverse as the City of Seattle as a whole, including relatively few young people and few non-cyclists.

Online Survey Response: Top Ranked Destinations



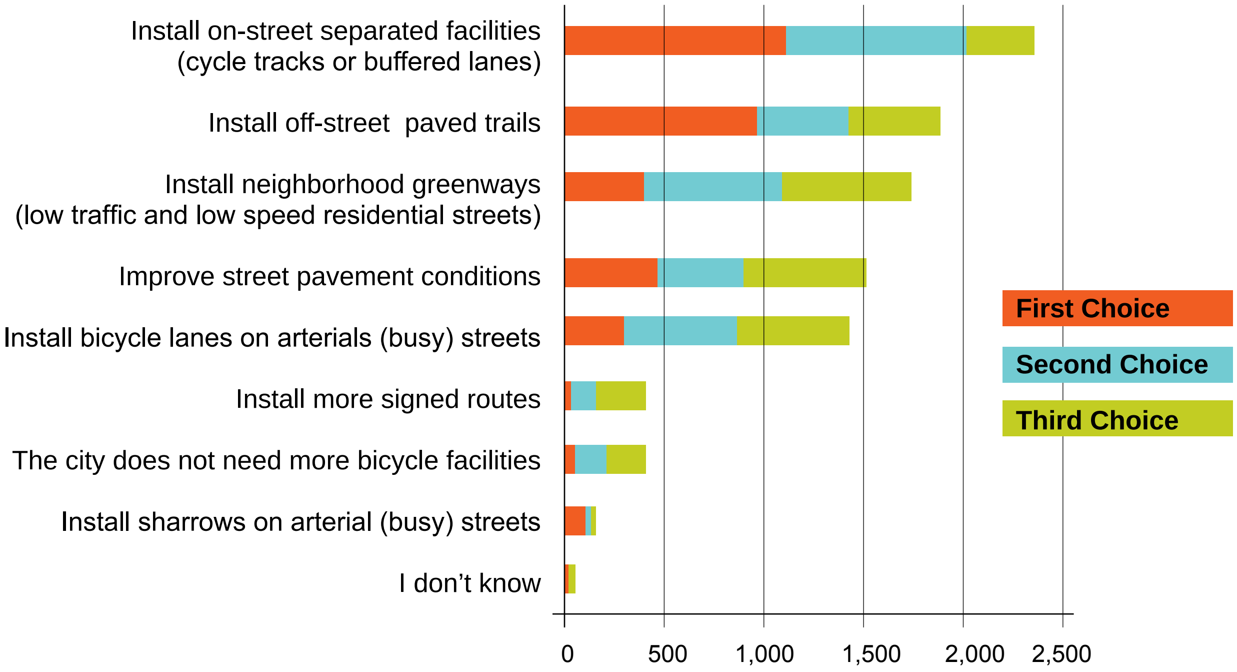
WHAT types of priorities do people want to see from the updated BMP?

The BMP online survey asked people to rank several different types of bicycle-related priorities with respect to what would do the most to encourage bicycling in Seattle. The top priority was “install more on-street bicycle facilities and/or off-street paved trails,” followed by “improve street pavement conditions”, “enforce laws applying to motorists, bicyclists, and pedestrians”, and “reduce vehicle lane capacity”. These priorities align closely with what SDOT staff heard through e-mails and comments throughout the public engagement process.



A similar question asked specifically about the types of infrastructure and bicycle facility types that people would like to see. Again, it is important to remember that these responses do not necessarily reflect the views of all Seattleites, but just of those who took the BMP online survey. Of these, the top ranked facilities for increased investment were on-street separated bicycle facilities (such as cycle tracks or buffered bicycle lanes), and off-street paved trails. Bicycle lanes, pavement conditions, and neighborhood greenways all also ranked highly in the BMP online survey.

Generally speaking, comments throughout the process emphasized the desire for bicycle facilities – of whatever type – that are safe enough for all riders, or prospective riders, from ages 8 to 80 and of all abilities. This could, and likely will, include a combination of neighborhood greenways on residential streets, on-street separated bicycle facilities such as buffered bicycle lanes and cycle tracks, and continued development of the off-street paved trail network.



WHAT are the most important priorities and programs?

In addition to the quantitative results from the BMP online survey, the nearly 1,500 comments from the online survey and comments received by email or at public events addressed a range of issues, from some who feel that Seattle already has too many bicycle facilities, to others who would like to see the city further prioritize bicycling. A sample of some of these comments is provided below:

"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."

"If biking wants to be taken seriously by drivers, the community has to mature to a similar level as the drivers. I tell rogue bikers, "Every biker is an ambassador for all bikers" meaning individual actions become the perception of the group. I love riding, I hate the animosity and hostility between drivers and bikers."

"I'd like to see more refinement and enforcement of the bicycle, traffic, and pedestrian laws for EVERYONE. Coming to a mutual understanding of what is proper etiquette and accepable behavior for all parties in a traffic situation is essential to stopping the infighting and finger-pointing. Fair enforcement or at least educational warning stops of both cars and bikes is also important."

WHAT HAPPENS NEXT

NEXT STEPS

The lessons from the first phase of public engagement for the BMP update will be useful for directing future stages of engagement surrounding the update. For example, analysis of who took the online survey shows that it continues to be challenging to involve people who do not currently ride a bike very often or those who do not ride at all. SDOT will also need to continue efforts to reach out to groups that were underrepresented in the process thus far, including women, youth, people over the age 65, and diverse racial and cultural groups.

The second phase of public involvement will occur in the fall after the project team produces plan update recommendations, including: an update of the policy framework, a draft update of the bicycle network map, and implementation strategies. The engagement period will include city-wide open houses/public meetings gather feedback onthe proposed network.

Lastly, the third and final phase of broad public engagement will consist of public comment on the entire draft plan update. Throughout the update process, project team staff will be attending various events and standing meetings, including monthly SBAB meetings, to update the public on the status of the project, encourage people to provide input, and build understanding about the individual and community benefits of bicycling.

APPENDIX E:
List of Public Outreach Events

APPENDIX A: Survey questions

APPENDIX B: Survey results

APPENDIX C: Response by Zip Code

APPENDIX D: BMP Online Survey Comments

APPENDIX E: List/calendar of outreach events

APPENDIX F: SBAB Bikeability Reports

contact information:
http://www.seattle.gov/transportation/bikemaster.htm

bmpupdate@seattle.gov

SDOT
Seattle Department of Transportation

Appendix 1:

REPORTS

1B: State of Seattle Bicycling Report

State of the Seattle Bicycling Environment Report
October 2012

SDOT
Seattle Department of Transportation

Pike Place Market

TABLE of CONTENTS

What is the purpose of this report?

Since its adoption in 2007, the Seattle Bicycle Master Plan (BMP) has served as the blueprint for making improvements to Seattle's bicycle network. When the 2007 BMP was developed, it focused largely on expanding on-street bicycle facilities and completing the urban bicycle trail system. The BMP has been effective at guiding improvements to the City's bicycle system and significant progress has been made since 2007.

The 2007 Bicycle Master Plan included plans for a 5-year update, which presents the opportunity to include fast-evolving best practices and new thinking in bicycle facilities, safety, and design. The 2012 BMP update will also focus on developing a bicycle network and strategies that make bicycling comfortable and accessible for a wider variety of users and trip types. Ultimately, the BMP update will develop a more connected bicycle network for all Seattle residents.

The State of the Seattle Bicycling Environment Report presents current data and information based on what has been implemented since the BMP was adopted in 2007 and the work occuring now. This report provides a snapshot of Seattle's existing bicycling environment and will help set the stage for developing recommendations in the Bicycle Master Plan Update.

The assessment of the current state of cycling in Seattle will inform efforts to:

- Update the current bicycle network map and incorporate facility types that are not in the existing plan, such as neighborhood greenways and cycle tracks, to help encourage people of all ages and abilities to ride a bike
- Develop a more robust process to identify areas of greatest need and priority for bicycle facilities
- Incorporate updates to bicycle design standards that have been developed since 2007
- Identify education, encouragement, enforcement, and evaluation needs to support investments in bicycle infrastructure and network improvements

The baseline information in this report summarizes progress on the 2007 plan and provides context for new opportunities to take bicycle riding to the next level in Seattle.

Framework for

POLICY & PLANNING

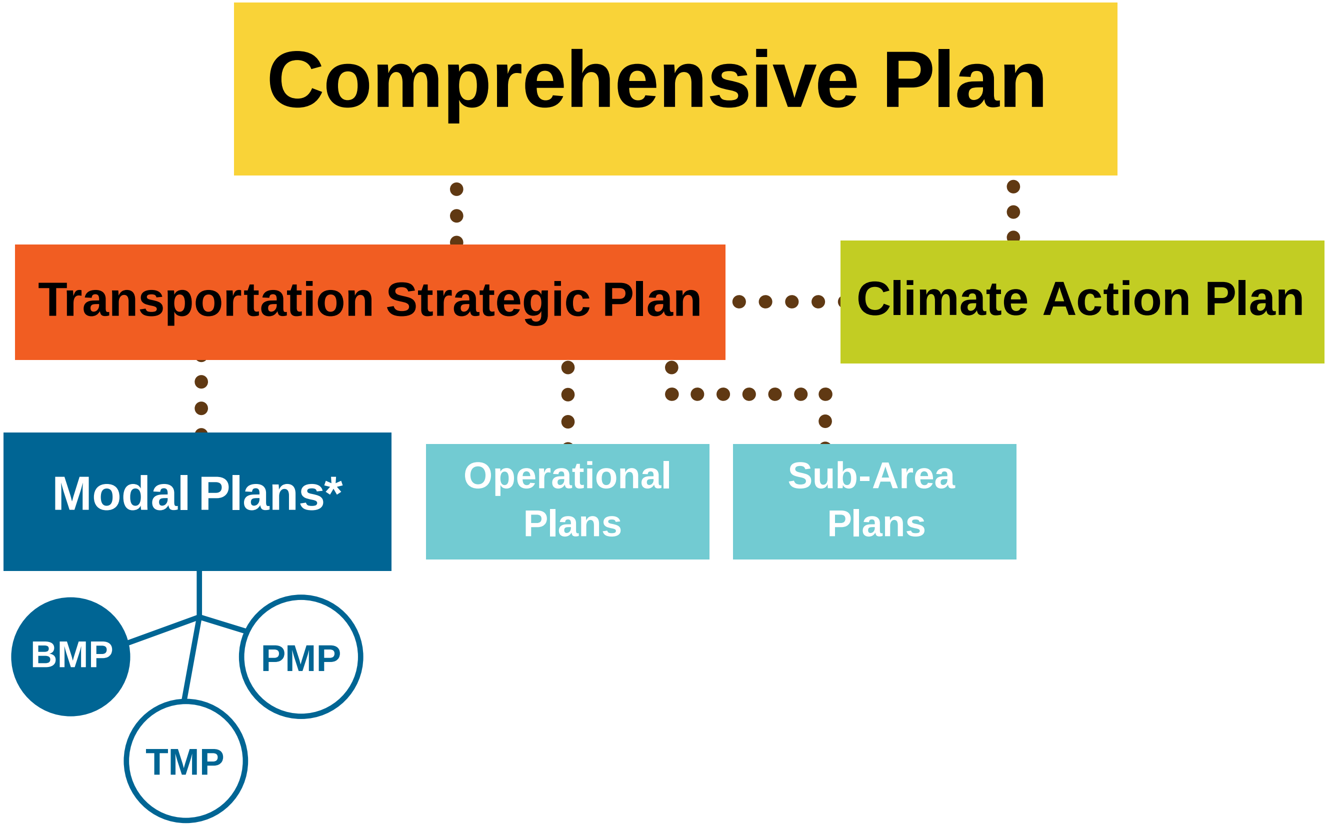
Spokane Street Swing Bridge

The following section outlines the current structure of policies and plans that relate to bicycle projects and programs, including funding sources. The hierarchy of relevant planning documents in Seattle is shown at the bottom of the page.

The City of Seattle's 2005 Comprehensive Plan, *Toward a Sustainable Seattle*, guides high-level land use and transportation policy issues. The Comprehensive Plan is organized around a set of four core values:

- Community
- Environmental Stewardship
- Economic Opportunity and Security
- Social Equity

As required by the Growth Management Act, Seattle's Comprehensive Plan contains a Transportation Element. The Transportation Element is consistent with, and helps implement, the land use vision for the City (articulated in the plan's Land Use Element). Much of the policy direction in the Transportation Element is designed to promote multi-modal transportation options within and between urban centers and villages, which are areas designated for future employment and housing growth.



* Bicycle Master Plan (BMP), Transit Master Plan (TMP), Pedestrian Master Plan (PMP)

Within the Seattle Department of Transportation (SDOT), the overall policy direction in the Transportation Element of the Comprehensive Plan helps frame the more specific goals, policies, and strategies in other documents, including the Transportation Strategic Plan and modal plans such as the Bicycle Master Plan, Pedestrian Master Plan, and Transit Master Plan.

The Bicycle Master Plan, like all of the SDOT modal plans, flows from the guidance of the Transportation Strategic Plan (TSP).

Policy Framework

Comprehensive Plan
There are broad goals and policies in the Transportation Element of the Comprehensive Plan that are specific to bicycling. The main goals are:

TG15 Increase walking and bicycling to help achieve City transportation, environmental, community and public health goals.

TG16 Create and enhance safe, accessible, attractive and convenient street and trail networks that are desirable for walking and bicycling.

T17 Provide, support, and promote programs and strategies aimed at reducing the number of car trips and miles driven (for work and non-work purposes) to increase the efficiency of the transportation system, and reduce greenhouse gas emissions.

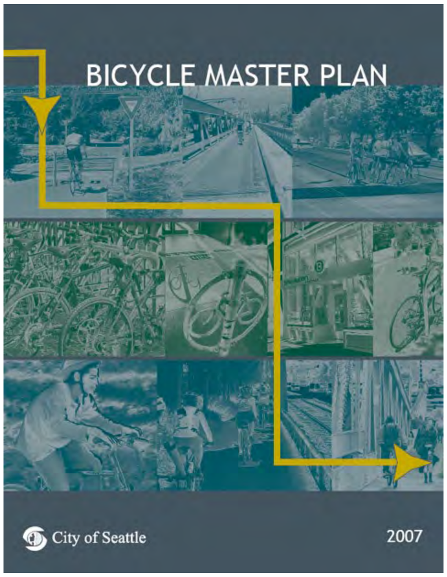
T34 Provide and maintain a direct and comprehensive bicycle network connecting urban centers, urban villages and other key locations. Provide continuous bicycle facilities and work to eliminate system gaps.

Complete Streets
In addition to the goal and policy framework established in various planning documents, the City Council adopted a Complete Streets policy in 2007. The Complete Streets policy encompasses all modes, including bicycles, and helps frame the City's overall commitment to a variety of travel modes. The Complete Streets policy states in part that:

- SDOT will plan for, design and construct all new City transportation improvement projects to provide appropriate accommodation for pedestrians, bicyclists, transit riders, and persons of all abilities, while promoting the safe operation for all users; and

- SDOT will incorporate Complete Streets principles into the Department's Transportation Strategic Plan; Seattle Transit Plan; Pedestrian and Bicycle Master Plans; Intelligent Transportation System Strategic Plan; and other SDOT plans, manual, rules, regulations and programs as appropriate.

2007 Bicycle Master Plan



The 2007 Bicycle Master Plan (BMP) is framed around two broad goals:

> **Goal 1:** Increase use of bicycling in Seattle for all trip purposes. Triple the amount of bicycling in Seattle between 2007 and 2017.
>
> **Goal 2:** Improve the safety of bicycling throughout Seattle. Reduce the rate of bicycle crashes by one third between 2007 and 2017.

The 2007 BMP includes four objectives that build on the two goals:

> **Objective 1:** Develop and maintain a safe, connected, and attractive network of bicycle facilities throughout the city.
>
> **Objective 2:** Provide supporting facilities to make bicycle transportation more convenient.
>
> **Objective 3:** Identify partners to provide bicycle education, enforcement, and encouragement programs.
>
> **Objective 4:** Secure funding and implement bicycle improvements.

BMP Policy Update Considerations

The updated BMP policy framework will continue to emphasize increasing bicycle ridership and improving safety as important policy goals, along with strategies to continue to build successful partnerships, programs, and funding sources for bicycle improvements. The updated plan will also include several new policy themes and revised goal statements in order to improve consistency throughout the modal plans and address the needs of all types of cyclists in the city, including the following topics:

Equity:
Social equity is one of the four main themes of the City's Comprehensive Plan and an important theme throughout all city planning efforts. Inclusion in planning processes and equity in service delivery are key principles of the BMP update.

Connecting to and within urban villages, neighborhoods, and major destinations:
Both the City Comprehensive Plan and The Puget Sound Regional Council's *Vision 2040* plan emphasize accomodating new growth through compact development in urban villages and urban centers. The BMP should have more explicit policy direction to prioritize bicycle connections within and between urban villages and neighborhoods, and to connect to key destinations.

New facility types:
One important priority for the BMP update is to incorporate new types of facilities that feel safe and appeal to a broad range of people. These facilities include neighborhood greenways, which are improvements made to residential streets to optimize biking and walking, and on-street bicycle facilities with a greater degree of separation from motorized traffic, such as buffered bike lanes and cycle tracks. The plan will include goals and policies that reflect community interest and support of these facility types and continued innovation.

Livability:
The BMP update will include a new goal emphasizing the role bicycling as an important component of a livable city, which provides healthy, affordable, and non-polluting transportation options.

Mission/Vision statement:
The current Bicycle Master Plan goals are focused on what could be acheived within the 10-year timeframe of the plan. The plan does not include a broader, longer term vision for what should be accomplished to improve bicycling in the city. A long term vision is important for creating support for the transformational network that is needed to make Seattle a world-class city for biking and will be included in the updated plan.

Bicycle Program and Project Funding

While policy and planning documents guide the strategic implementation of the Bicycle Master Plan, funding is a critical component that determines how much SDOT is able to accomplish each year.

The following chart summarizes annual funding levels for bicycle projects and improvements between the adoption of the BMP in 2007 and the end of 2011. The totals include capital projects and annual programs specific to BMP implementation, as well as trail projects and combined pedestrian/bicycle projects like the Thomas Street overpass and Linden Avenue. The totals do not include larger capital projects that have bicycle elements, but were not part of implementating the 2007 BMP.

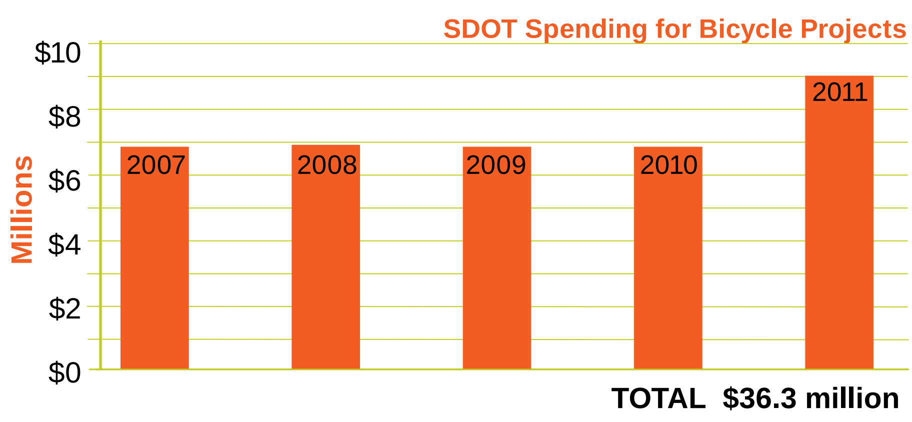
Between 2007 and 2011, SDOT invested $36 million in bicycle improvements guided by the 2007 Bicycle Master Plan. These improvements were funded by a combination of local funds and state and federal grants.

Local Funds

In 2006, Seattle voters passed a nine-year, $365 million levy for transportation maintenance and improvements known as Bridging the Gap (BTG). The levy is complemented by a commercial parking tax.

The nine-year goals of Bridging the Gap are to:

- Reduce the infrastructure maintenance backlog
- Pave and repair Seattle streets
- Make seismic upgrades to the city's most vulnerable bridges
- Improve pedestrian and bicycle safety and create safe routes to schools
- Increase transit speed and reliability



The levy funds many programs and projects to acheive these goals. Funding from Bridging the Gap also supports projects that help implement the Bicycle and Pedestrian Master Plans, creates a Safe Routes to School Program, improves transit connections and helps neighborhoods get larger projects built through the Neighborhood Street Fund large project program.

The BTG levy approved by voters stipulates that certain percentages of the levy revenue be spent on different categories of projects, including the stipulation that no less than 18 percent be spent on pedestrian, bicycle and safety projects. The levy expires in 2015.

State and Federal Grants

SDOT has been successful in obtaining grant funding for bicycle projects, including multi-use trails, a pedestrian and bicycle bridge, and Safe Routes to School infrastructure and education projects. SDOT has been more strategic in recent years about ensuring that grants are submitted for the most competitive projects. It is difficult to determine the exact amount of bicycle-specific grant funding that SDOT has received, as bicycle improvements have historically been included as portions of larger Capital Improvement Projects. Still, since 2008 SDOT received a total of $11 million in grant funding for projects that included bicycle elements. SDOT has the potential to receive an additional $22 million in 2012.

Olympic Sculpture Park

the Seattle Bicycle Facilities Network

RECENT ACCOMPLISHMENTS

The 2007 BMP was created to achieve two goals:

1) **Increase bicycling** in Seattle for all trip purposes

2) **Improve safety** of bicyclists throughout Seattle

N 34th St & Woodlawn Ave N - Essential Baking Company

What has changed for bicycling in 5 years?

This section of the report documents the work that has been done since adoption of the 2007 Bicycle Master Plan (BMP), including how much of the 2007 plan has been implemented and how the Seattle Department of Transportation's progress compares to the performance targets identified in the BMP. This section also describes several pilot projects and innovations that SDOT has developed since the BMP was adopted in 2007.

As mentioned in the previous section, the 2007 plan included four principal objectives. These objectives were supported by specific strategic performance measures that enable the city to monitor progress and evaluate performance over time. The performance measures offer a tool to quantify whether SDOT has acheived the goals and objectives in the plan.

SDOT also has been able to implement several new projects and programs beyond what was originally recommended in the 2007 plan in response to more recent best practices for bicycle facilities and opportunities to leverage other resources. For example, Seattle has now installed several buffered bicycle lanes, green bicycle lanes, and green bicycle boxes. These types of improvements are designed to make bicyclist behavior more predictible and increase safety and comfort for people riding bicycles.

7th and Dearborn

Existing Bicycle Network Implementation Progress:

As of the end of 2011, the City of Seattle has completed 53% of the total network recommended in the 2007 BMP for the 10-year timeframe of the plan. This percentage increases to 68% when bicycle facilities that were installed prior to the 2007 are included in the total amount.

Table 1 summarizes how this progress by facility type. In total, the current network is 307.7 miles, including 72.8 miles of bicycle lanes and climbing lanes, 81.8 miles of shared pavement markings (sharrows), 5.5 miles of neighborhood greenways, 47.2 miles of multi-use trails, 98 miles of signed routes, and 2.4 miles of other on- and off-street bicycle facilities.

The maps on the following pages show the evolution of Seattle's bicycle network over time. Figure 1 shows the bicycle network before the 2007 Bicycle Master Plan. Figure 2 shows the bicycle facilities network completed between 2007 and 2012. Figure 3 shows the existing bicycle facilities network as of 2012.

Table 1: Summary of 2007 BMP Network Completion

FACILITY TYPE	TOTAL MILES RECOMMENDED IN 2007 BMP	EXISTING MILES (Before 2007)	BUILT BETWEEN 2007-2011	PERCENT 2007 NETWORK COMPLETE
Bicycle lanes/Climbing Lanes	143.3	25.5	47.3	51%
Shared Lane Pavement Markings	110.5	0.3	81.5	74%
Neighborhood Greenways (Previously Bicycle Boulevards)*	18.1	0	5.5	30%
Multi-Use Trails	58.2	39.4	7.8	81%
Signed Routes**	75.9	0	98	129%
Other On-Street Bicycle Facilities***	46.1	2.2	0	5%
Other Off-Street Bicycle Facilities****	2.6	0.2	0	8%
TOTAL NETWORK	**454.7**	**67.6**	**240.1**	**68%**

*= Bicycle boulevards were a designated facility in the 2007 BMP. The terminology has changed in 2011 in response to a grassroots community effort to encourage more cycling and walking on residential streets, which was largely modeled off of Portland's evolution from bicycle boulevards to neighborhood greenways. The 18.1 miles of bicycle boulevards in the 2007 BMP recommendations will now be known as neighborhood greenways, with a more robust network of neighborhood greenways to be included in the BMP update process.

** = The 2007 BMP included a 230-mile system of signed bicycle routes, but only 75.9 miles were recommended for the 10-year plan timeframe, 2007-2016.

***= Includes wide outside lanes, edgelines, paved shoulders, and peak hour bus/bicycle only lanes. Also included in this category are those streets identified for "future study"

****= Include sidepaths, one-way bicycle-on-sidewalk pairs, and pedestrian/bike only bridges

Figure 1: Bicycle Facilities Completed Prior to 2007

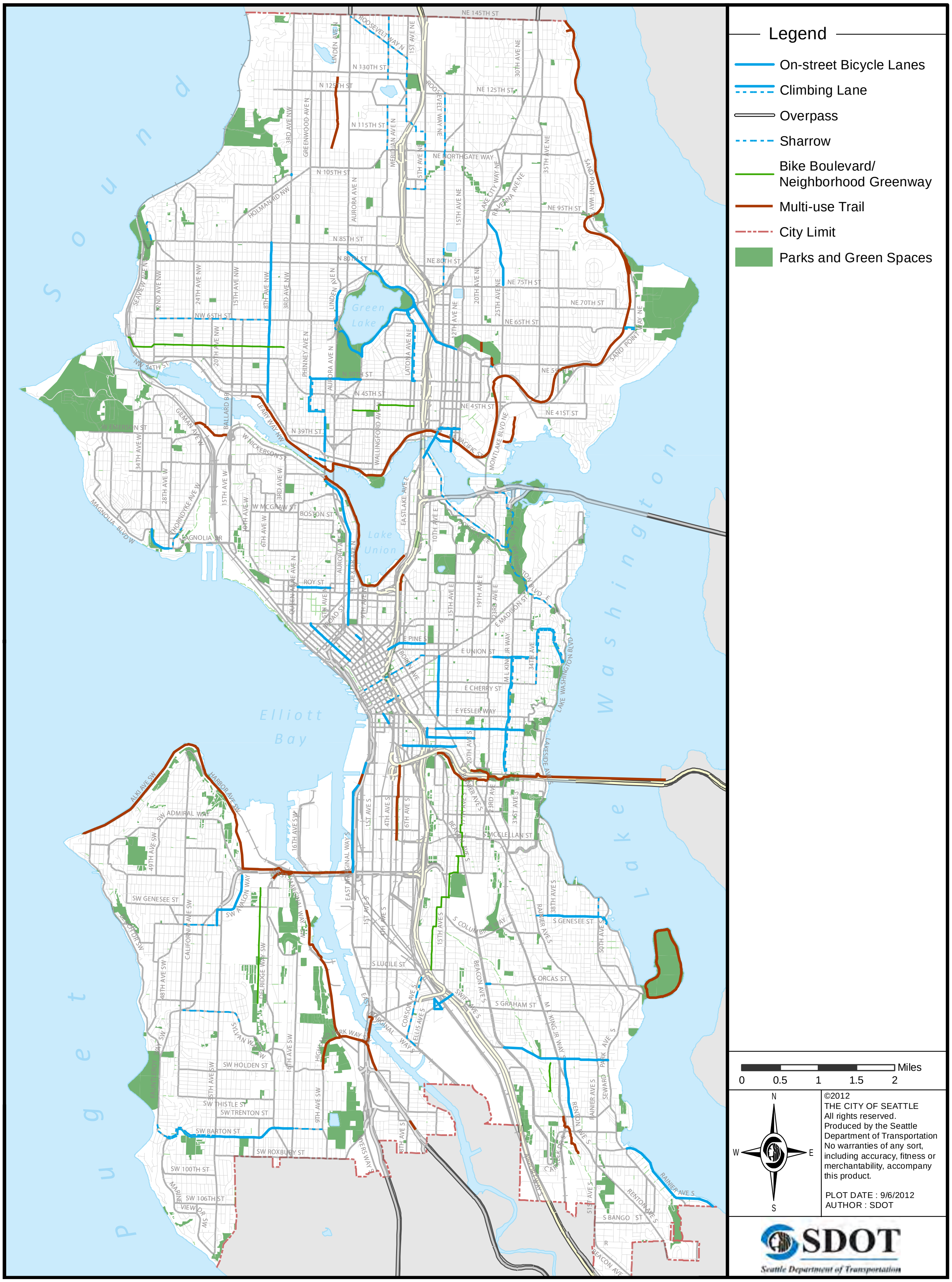


Figure 2: Bicycle Facilities Completed between 2007-2012

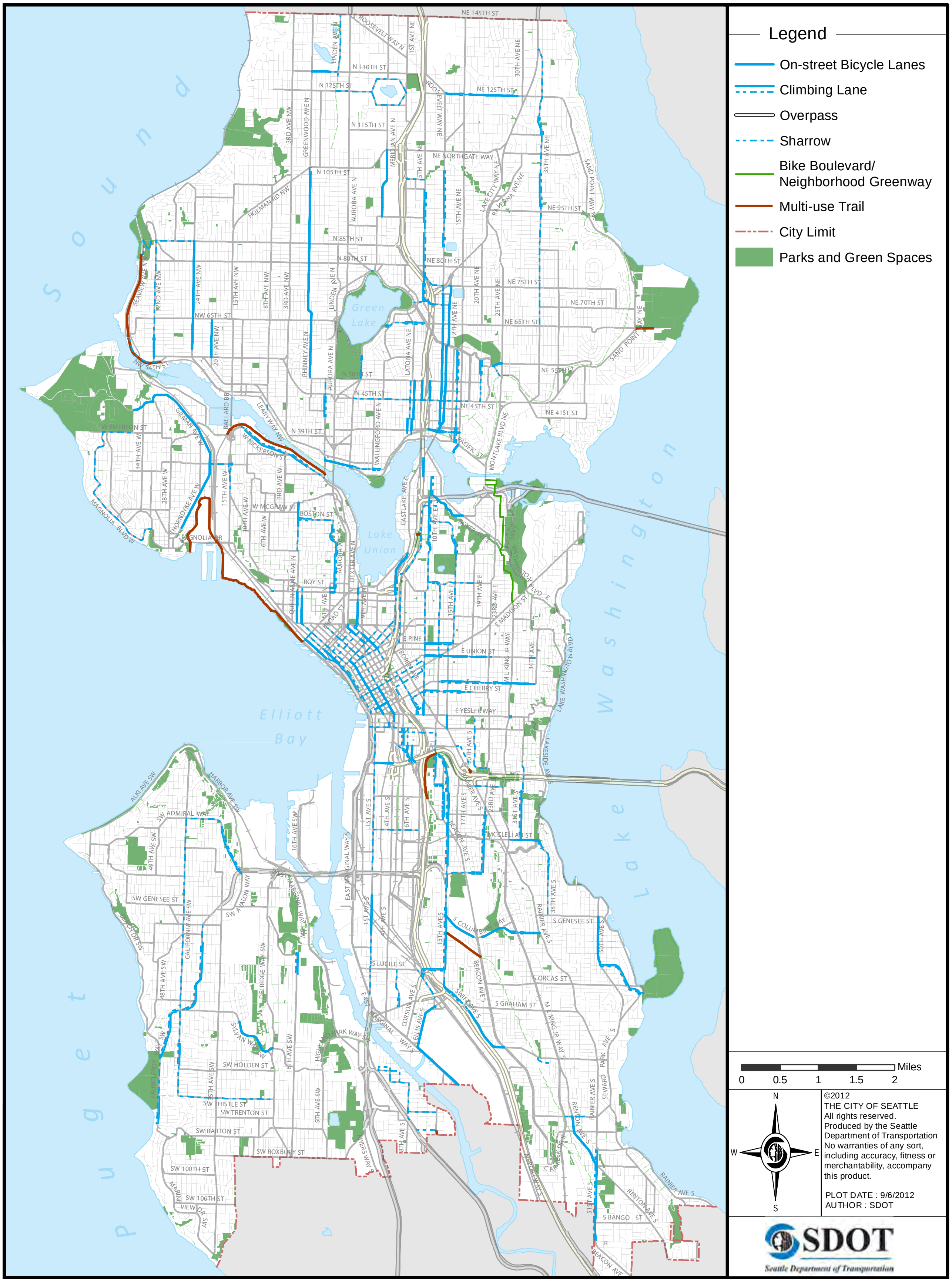
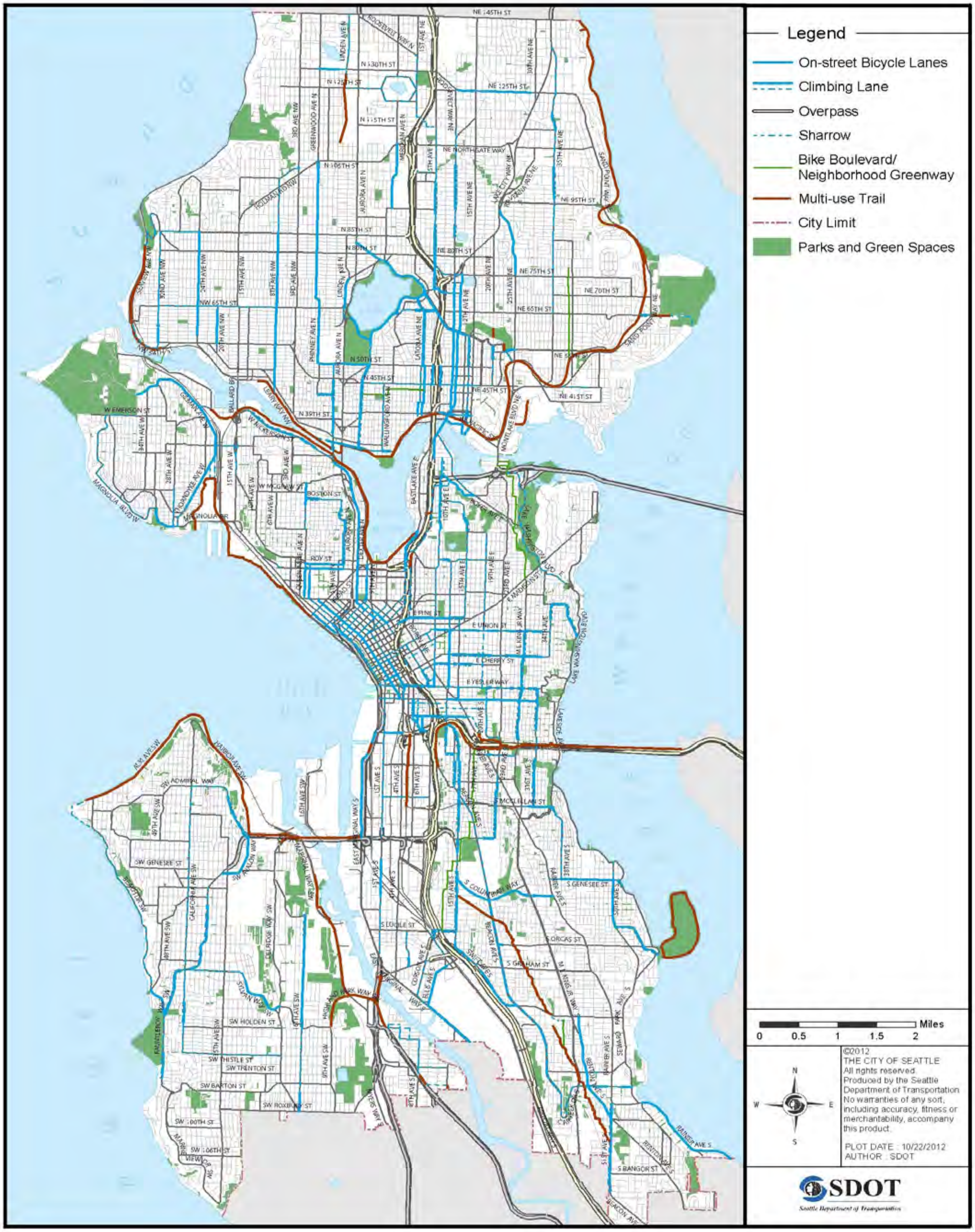


Figure 3: Current Bicycle Facility Network (2012)



Evaluation of 2007 Bicycle Master Plan Performance Measures

Eight performance measures were recommended to gauge the City's progress on meeting goals and objectives in the original Bicycle Master Plan. A full explanation of each performance measure is on the following page, and Table 2 identifies whether SDOT is on track to achieve the 2007 BMP goals and objectives.

Table 2: Bicycle Master Plan Performance Measures (2007 BMP)*

	PERFORMANCE MEASURE	BASELINE MEASUREMENT	PERFORMANCE TARGET	2011 EVALUATION	ON TRACK
GOAL 1	Number of bicyclists observed at counting locations throughout Seattle	2007 counts	Triple number of bicyclists between 2007 & 2017	2007 downtown counts = 2,273 2011 downtown counts = 3,330**	No
GOAL 2	Number of reported bicycle crashes per total number of bicyclists counted and annual traffic volumes	2007 collision rate	Reduce the bicycle crash rate by one third between 2007 & 2017	2007 collision rate = 0.158*** 2011 collision rate = 0.105	Yes
OBJECTIVE 1	Percentage of Bicycle Facility Network Completed	67.6 miles of existing facilties (in 2007)	Implement 450 miles of recommended facilities by 2017 (inlcudes existing)	67.75 with 67.6 miles of existing facilities prior to the adoption of the 2007 BMP (52.8% not including the facilities that were existing prior to 2007)	Yes
OBJECTIVE 2	Number of bicycle racks installed through the SDOT Bicycle Parking Program		Provide 6,000 racks by 2017 (includes existing)	806 bicycle racks installed between 2007 & 2011 + 3,000 existing bicycle racks = 3,806	Yes
OBJECTIVE 3	Number of Seattle Bicycling Guide Maps distributed	23,338 maps distributed in 2005	150,000 bicycle maps to be distributed between 2007 & 2017	Approximately 292,780 maps distributed between 2007 & 2011	Yes
OBJECTIVE 4	Percentage of targeted SDOT staff who participate in training on bicycle issues	Counted in 2007	100% of targeted staff participating in training every year	SDOT has not tracked this metric	Unknown
	Number of bicycle project grant applications applied for and obtained for bicycle programs	Tracked in 2007	At least one grant application for every available funding opportunity	2008 applied for 3 grants & received 2 - 2009 applied for 4 grants & reeived 3 - 2010 applied for 4 grants & received 4 - 2011 applied for none - 2012 - applied for 7, all pending	Yes, except for 2011
	Number of Bicycle Spot Improvements Completed	Counted in 2007	Depends on needs & priorities set for each year	33 on-street spot improvements	Dependent upon each year's needs

* This table does not include the performance measures recommended for consideration by non-city agencies or organizations.
**SDOT did not count at all 29 locations surrounding Downtown in 2011, only locations that were expected to have 50 or more bicycles were counted due to lack of volunteers. For the 15 of 29 locations not counted in 2011, volumes for 2011 were derived by applying the average growth rate at locations with counts.
*** This number is the number of reported bicycle collisions per cyclist counted in the downtown counts.

Explanation of Performance Measures

Goal 1: Triple the number of bicyclists between 2007 and 2017

Methodology: The number of bicyclists observed at counting locations throughout Seattle is difficult to compare from 2007 to 2011 because the counts in 2011 were only done in 14 of the 29 locations used in 2007, due to lack of volunteers.

Therefore, in order to compare the 2007 downtown baseline counts to 2011, SDOT calculated the percent increase in cyclists from the locations with valid counts in both 2010 and 2011. This same increase - 2.4% - was then applied to the 15 locations with 2010 counts only to derive an estimated 2011 count volume.

In 2011, SDOT began to count cyclists more frequently (quarterly on a weekday between 10 AM – noon and between 5 - 7 PM, as well as Saturdays from noon to 2 PM), so the data collected is better and more detailed, including the ability to count cyclists outside of commute hours. This new method will allow SDOT to gain a better understanding of ridership trends, although unlike the old methodology, it does not capture the gender of riders or helmet usage.

ACTION: Using the methodology described above, SDOT calculated a net increase from 2,273 riders in 2007 to 3,330 during the annual downtown counts. According to these count numbers, SDOT is not on track to meet the goal of tripling the number of cyclists by 2017.

Goal 2: Reduce the collision rate by one third between 2007 and 2017

ACTION: SDOT calculated the change in the collision rate using the number of reported bicycle crashes each year per cyclist counted in the downtown counts. Using the 2011 count estimate of 3,330 total cyclists (explained above), the collision rate was reduced from 0.158 per cyclist in 2007 to 0.105 per cyclist in 2011.

Objective 1: Percentage of bicycle facility network completed

ACTION: SDOT is on-track to complete the full network build out of 454.7 miles of bicycle facilities, as 68% of the network has been completed as of end-of-year 2011. However, many of the facilities installed have been the projects that are easier to implement, such as shared lane markings (sharrows). Public outreach for the BMP update also suggest that some projects implemented since 2007 are not appropriate for riders of all ages and abilities.


Fremont Ave N and N 34th St

Objective 2: Number of Bicycle Racks Installed

ACTION: SDOT installed 798 bicycle racks and eight on-street bicycle corrals between 2007 and 2011. Many of these installations are in response to requests from property owners. Generally, the City is on-track to implement the bicycle rack performance target.

Objective 3: Number of Seattle Bicycle Guide Maps Distributed

ACTION: SDOT has printed the annual city-wide bicycle maps to help encourage people on bikes to find their way to destinations. SDOT nearly doubled the amount of bicycle maps that were printed and distributed between 2007 and 2011. In 2012, a web-based city-wide bicycle map was created as a supplement to the paper maps.

Objective 4: Percentage of Targeted SDOT Staff who Participate in Training on Bicycle Issues

ACTION: SDOT encourages staff to attend available webinars to learn about bicycling projects and innovations from other cities and professionals. However, participation has only been tracked for some staff, therefore the increase in the percentage of staff participating in training since 2007 is unknown.

Objective 4: Number of Bicycle Project Grant Applications Applied For and Awarded.

ACTION: SDOT has been successful in applying for and receiving funding to install bicycle facilities. The only year that SDOT did not apply for any bicycle improvement grants was in 2011.

Objective 4: Number of Bicycle Spot Improvements

ACTION: Since 2007, SDOT has completed 33 on-street spot improvement projects. As the performance target specifies, the right number of spot improvements depends on needs and priorities set each year.

TRIPLE THE NUMBER OF BICYCLISTS
FEWER COLLISIONS
NETWORK COMPLETION
MORE BIKE RACKS
INCREASE STAFF TRAINING
INCREASE GRANT FUNDING
MORE SPOT IMPROVEMENTS

Additional Bicycle Facility Accomplishments

Other bicycle improvements that SDOT has made to the bicycling environment between 2007 and 2011 include the following accomplishments, though not all were recommendations in the original BMP:

- Built five new signals specifically for bicycles
- Improved trail crossings at six locations
- Improved pavement at 40 locations along the Burke-Gilman Trail, 16 locations along the Duwamish Trail, and 8 locations along the Ship Canal Trail
- Completed innovative pilot projects including: buffered bike lanes, green bike boxes and lanes, contraflow bike lanes and staircase runnels.

Innovation and Pilot Projects

In the course of implementing the 2007 BMP, SDOT planners and engineers have moved beyond the 2007 recommendations and found ways to create safer bicycle facilities and design projects according to updated standards. By applying the latest best practices and finding opportunities to leverage other SDOT roadway projects, conditions have improved for all users.

The following pages describe examples of innovative bicycle treatments and pilot projects that were not part of the 2007 BMP recommendations, yet have helped Seattle become a more bicycle-friendly city. None of the operational and design standards for the below facility types have been formally adopted by the City of Seattle, although the update of the Bicycle Master Plan provides an opportunity to incorporate these types of facilities into the updated network map and plan document. Full descriptions of each facility type can be found on pages 46-50.

Dexter Ave N

Contraflow Bicycle Lanes:

Contraflow bicycle lanes, such as the one shown above on N 34th Street, provide access for cyclists headed in the opposite direction of motor vehicles on a one-way street where there is no parking. The contraflow bicycle lane is usually separated by delineators and marked with signage.

Contra-flow bicycle lanes have also been installed on 6th Avenue S between S Dearborn Street and Seattle Boulevard S and on NE 40th underneath the University Bridge.

Buffered Bicycle Lanes:

Buffered bicycle lanes provide a painted buffer between people on bicycles and other vehicles. As part of the Dexter Ave N repaving project in 2011, SDOT implemented a Complete Streets approach, which improves conditions for all users of the street – including pedestrians, bicyclists, transit, and those who live on the street. Six-foot bicycle lanes were installed in each direction between the travel lane and parking lane, with a two- to three- foot painted buffer zone (striped cross-hatched area) between the bicycle lane and travel lane. The project also reduced conflicts between buses and bicycles by installing the bicycle lane between the curb and transit islands at 10 out of 12 bus stops in the project area.

Buffered bicycle lanes have also been installed on N 130th Street, E Marginal Way S, Admiral Way SW, and 7th Ave. SDOT has received positive feedback about the comfort and quality of the facilities.

Green Bicycle Lanes and Bicycle Boxes:

Green bicycle lanes highlight areas where bicycles and motorized vehicles cross paths. Green bicycle boxes are an intersection safety design to reduce bicycle and motorist collisions. The box creates space between motor vehicles and the crosswalk, allowing bicyclists to position themselves in front of motor vehicle traffic at a signalized intersections. The main goal of colored pavement applications is to improve safety by increasing awareness and visibility of cyclists and to encourage people riding bikes to make more predictable approaches to and through the intersection.

SDOT has installed green bicycle lanes at 35 locations and green bicycle boxes at six locations. The photo above was taken at N 34th St and Fremont Ave N.

Staircase Runnels:

Because of extreme grade changes and hilly terrain, Seattle has numerous staircases that provide pedestrian access to destinations. SDOT has begun to study the use of staircase runnels to help people on bikes traverse the topography. Runnels are a narrow ledge along the side of a staircase which allow a bicyclist to push their bicycle up or down the stairs. These small staircase design additions have a great impact on making bicycling in the city even more convenient and accessible.

In 2011, SDOT installed a pilot wooden runnel on a stairway connecting the Alki Trail and the West Seattle Bridge Trail. Due to the positive feedback that SDOT received on the wooden runnel, SDOT included a permanent runnel as part of the staircase replacement at SW Spokane St between SW 60th and SW 61st streets.

Cycle Tracks:

The Linden Avenue North Complete Street Project created an opportunity for SDOT to improve roadway conditions and safety for all users of the street. A two-way, one side of the street cycle track will be built to separate bicycle traffic from motorists and pedestrians, using a raised curb or striping and parallel parking as a buffer. This project completes the missing link in the Interurban Trail.

A cycle track will also be implemented along Broadway in conjunction with the First Hill Streetcar project and along portions of Fifth Avenue North and Mercer as part of the Mercer West project.

BMP Evaluation Update Considerations

The update of the Bicycle Master Plan provides an opportunity to emphasize design standards and implementation of facilities that meet the needs of bikers of all ages and abilities. The projects listed in the previous section provide a sense of the progressive direction that SDOT has been moving towards incorporation of new designs and best practices for bicycle projects. It will be important for the update of the BMP to closely align the policy framework with performance measures to ensure that Seattle continues to become a world-class bicycling city for people of all ages and abilities. The BMP update should consider the following issues in order to continue moving forward with implementation of the Bicycle Master Plan:

Evaluate Old and New Performance Measures for Effectiveness

SDOT should reevaluate the performance measures used in the 2007 plan and determine if they will be useful moving forward with the next phase of implementation of the bike plan and consider whether existing and new measures will best allow the city to track its progress towards reaching the plan's vision. Performance measures should relate to the updated policy framework in the plan.

Expand Innovative Facilites

Pilot projects have been successful in meeting the needs of bicyclists in conflict areas. SDOT should formalize use of new types of facilities and continue to explore innovative treatments that improve comfort and safety for all users of the roadway.

Evaluate Existing Facilities

While SDOT is meeting the commitments of facility implementation based on the 2007 performance metrics, the BMP update should evaluate whether new information about facilities should require updates to existing facilities. In addition, the desire to implement facilities that serve all ages and abilities will likely entail defining what an all ages and abilities network actually means and who the riders are, adding new links to the bicyle network and changing some of the facility type recommendations from the 2007 BMP.

Olympic Sculpture Park Plaza

the Seattle Bicycle Facilities Network

BICYCLE SYSTEM GAPS

Gaps in the bicycle network exist in various forms, ranging from short “missing links” on a street or trail, to large geographic areas with very few or no bicycle facilities.

E Greenlake Way N

This section of the report provides a summary of a gap analysis that SDOT conducted to assess progress made in implementing the 2007 BMP. The purpose of the gap analysis is to identify existing network gaps – defined as a project that was recommended in the 2007 BMP, but has not yet been implemented. Additional opportunities for system evolution were identified according to GIS analysis, an equity analysis, and a set of streets defined in the 2007 BMP as “streets commonly used by bicyclists”. Both gaps and opportunities identified through this analysis will help to inform the development of an update to the recommended bicycle network.

Gap Analysis Methodology

By the end of 2011, 68% of the network recommendations from the 2007 plan had been completed. Of the unimplemented projects 23% were bike lanes, 9% were sharrows, 4% were multi-use trails, 4% were greenways (formerly referred to as bicycle boulevards), 46% were signed routes, 14% were other on-street facilities, and 1% were other off-street facilities (see note on page 10 for definitions). Gaps in the bicycle network exist in various forms, ranging from a short “missing link” on a specific street or trail, to large geographic areas with very few or no bicycle facilities. These gaps are classified into three categories: crossing gaps, network gaps and corridor gaps. Each of these types are described more thoroughly below.

- **Crossing gaps** are bicycle-related intersection improvements recommended in the 2007 BMP, but have not been implemented.
- **Network gaps** are “missing links” in the network recommended in the 2007 BMP that are less than ¼ mile in length and were recommended as either bike lanes, climbing lanes, sharrows, bicycle boulevards or multi-use trails, but have not yet been implemented.
- **Corridor gaps** are larger voids in the network (greater than ¼ mile in length). These gaps are most often corridors needed to connect neighborhoods to destinations, giving bicycle riders a variety of travel route options.

The gap analysis also identified opportunities to expand the bicycle network beyond what was recommended in the 2007 plan. These ‘opportunities for system evolution’ highlight areas to expand, improve, or upgrade the network recommended in the 2007 BMP. The gap analysis includes these network-based opportunities, but also notes opportunities based on the desire to create a more equitable and inclusive network for bicycling in Seattle.

Existing System Gaps

Figure 4 shows recommended projects from the 2007 BMP that have not been implemented. These gaps are classified into three categories: crossing gaps, network gaps and corridor gaps.

Crossing gaps:

Of the 113 intersection improvements proposed in the 2007 BMP, 13 crossing improvements have been constructed (7 signal upgrades, 4 median islands and 2 curb extensions). The remaining 100 recommendations that have not been funded require varied facilities, including further study in some cases.

Additionally, 42 intersections have been improved with treatments (i.e., bike boxes or green bike lanes) that were not recommendations from the 2007 plan.

Network gaps:

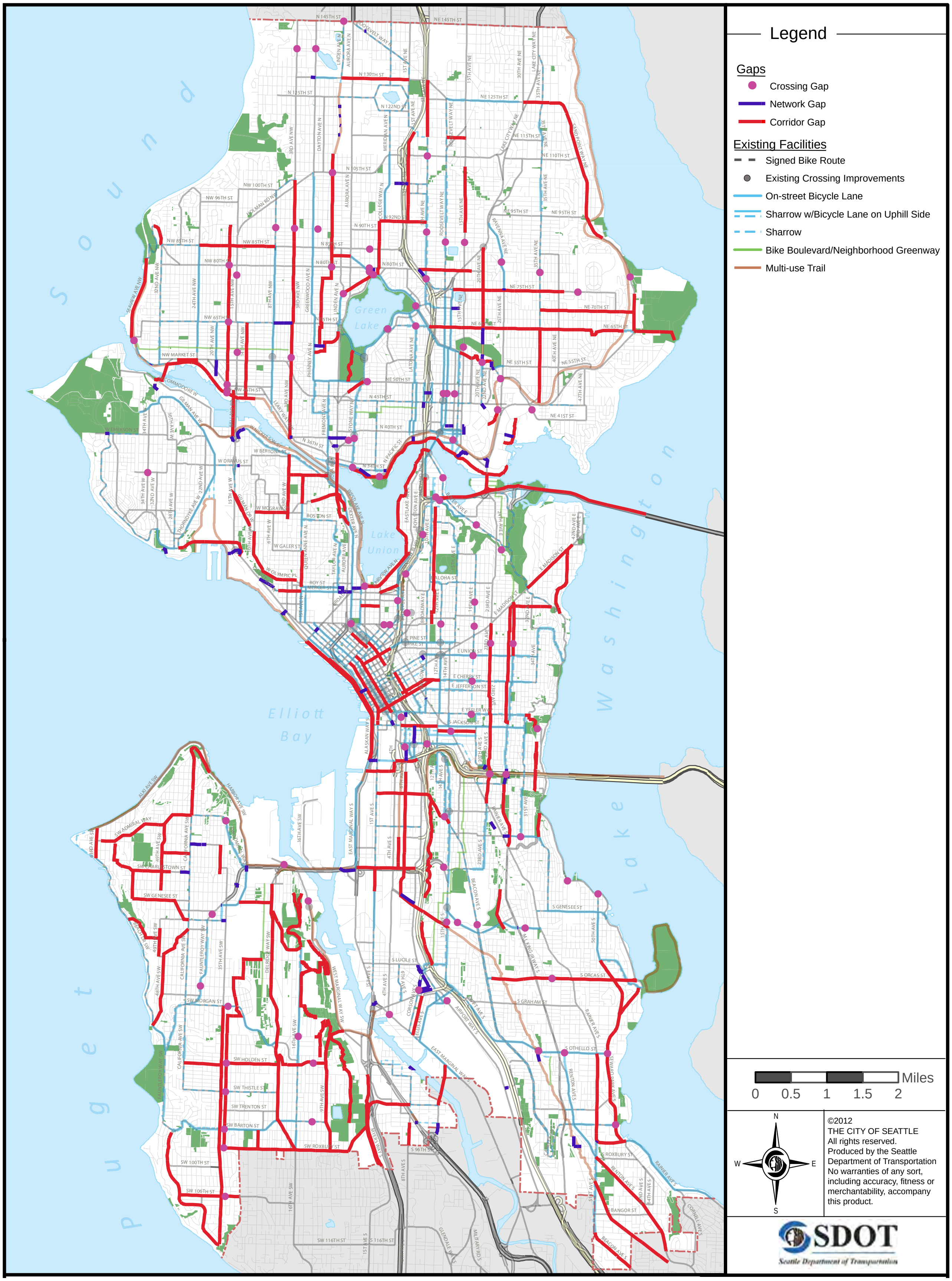
Of the 9 miles of network gaps in the existing system, 2 miles were proposed bicycle lanes or climbing lanes, 3 miles were proposed sharrows, 2.5 miles were proposed multi-use trails and 1 mile was a proposed bicycle boulevard. The average size of a network gap was one tenth of a mile. Network gaps often connect two existing bicycle facilities (i.e., Dexter Ave N to 9th Ave N on Roy St).

Corridor gaps:

Of the 116 miles of corridor gaps, 55 miles were recommended bicycle lanes or climbing lanes, with an average length of more than 1 mile. Over 33 miles of these corridor gaps were recommended as sharrows, with an average length of .75 miles. Approximately 27 miles of the corridor gaps were recommended multi-use trails, with an average length of 1 mile. Bicycle boulevards made up approximately 1 mile. Corridor gaps are often connections that are difficult locations due to any variety of natural or man-made barriers (i.e., Queen Anne hill).

Fremont Ave N and N 34th St

Figure 4: Bicycle System Gaps



Opportunities for System Evolution

In addition to projects recommended in the 2007 plan, this analysis takes into consideration those locations that were identified in the BMP as streets that were "commonly used by bicyclists," such as shared roadways, paved shoulders and wide outside lanes. These streets are included in the analysis since they are potential locations for enhancements to serve riders of all ages and abilities.

Also included in this analysis are those streets and areas that were not included in the 2007 BMP, but would provide system connectivity to parts of the city that have little or no connection currently. Improving connectivity throughout the bicycle system is a priority in the BMP update. The gap analysis classified these locations into four categories, described below.

Crossing opportunities are specific intersections within the existing bicycle system that lack dedicated bicycle crossing markings (cross-bike)or other treatments to accommodate safe, predictable and comfortable bicycle travel. They are primarily intersections where vehicle/bicycle interaction poses a challenge for riders. Examples include bike lanes on a major street "dropping" to make way for right-turn lanes at the intersection, or a lack of intersection crossing treatments for a route or trail as it approaches a major street.

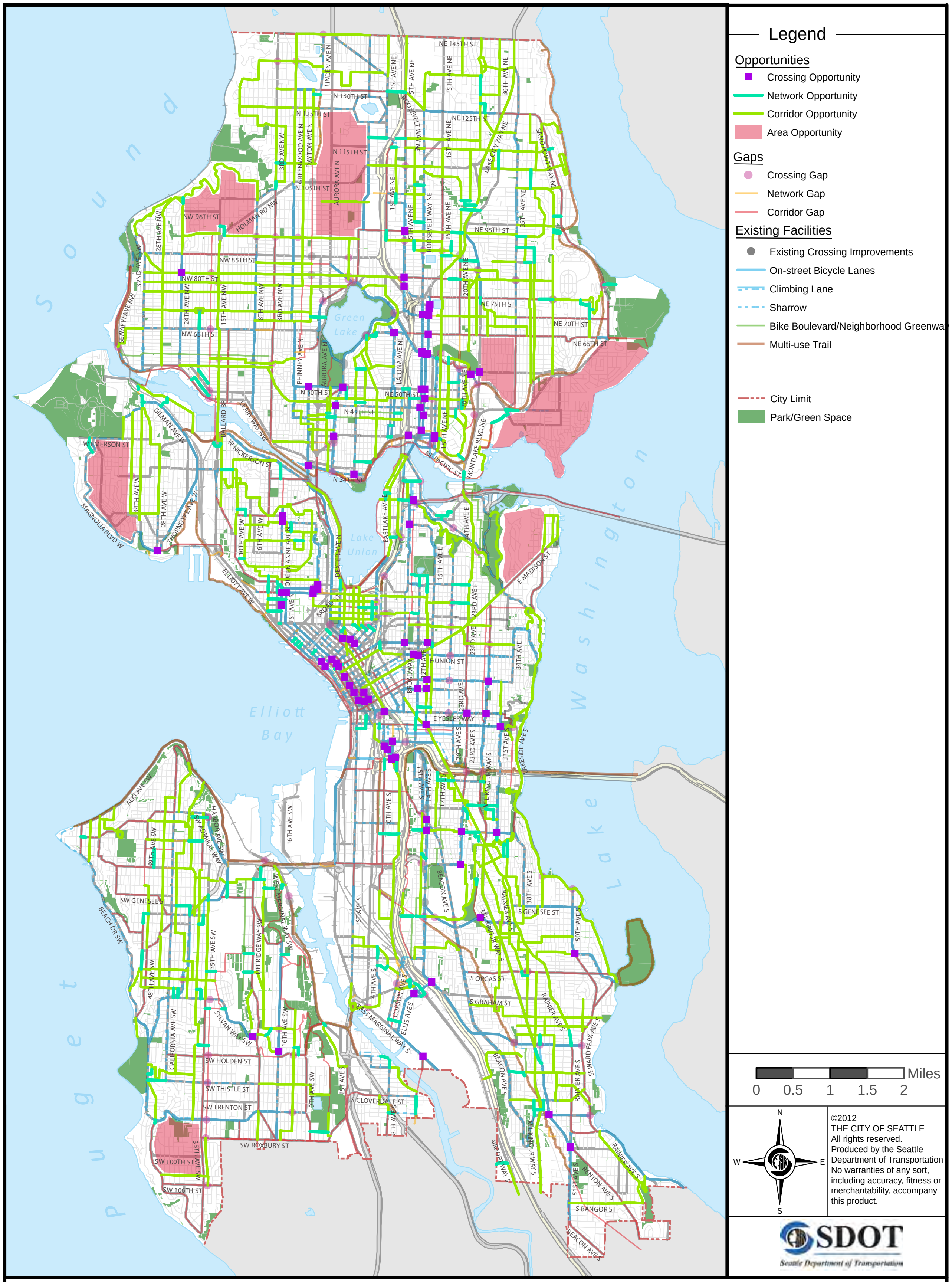
Network opportunities are small (no greater than ¼ mile) segments of the roadway that are not part of the existing or recommended bicycle system, but that could provide new and important connections. They provide the connectivity needed to link corridors, neighborhoods and destinations together.

Corridor opportunities are larger (greater than ¼ mile) portions of the roadway where there are either no existing or planned bicycle facilities. Corridor opportunities include important connections to major destinations, residential streets identified in the 2007 BMP as "streets commonly used by bicycles," as well as locations that were not part of the original network map. The streets identified in this group represent locations that can be challenging to implement due to their characteristics (i.e., narrow pavement width, steep slope, etc.).

Area opportunities are larger geographic areas where few or no bicycle facilities exist or are planned according to the 2007 BMP. These locations include areas that are not within a quarter mile of an existing or planned facility.

4th Ave

Figure 5: Bicycle System Opportunities



Equity Analysis

In addition to identifying areas for improvement in the existing bicycle system, an equity analysis was performed to examine the existing distribution of bicycle facilities compared to the distribution of historically underserved populations. For this analysis indicators include:

- Percentage of non-white population
- Percentage of households within the census tract that are below poverty level (as defined by the U.S. Census Bureau)
- Population distribution of people under 18 years of age
- Population distribution of people 65 years of age and older,
- Percentage of households within the census tract with zero automobile available for daily use

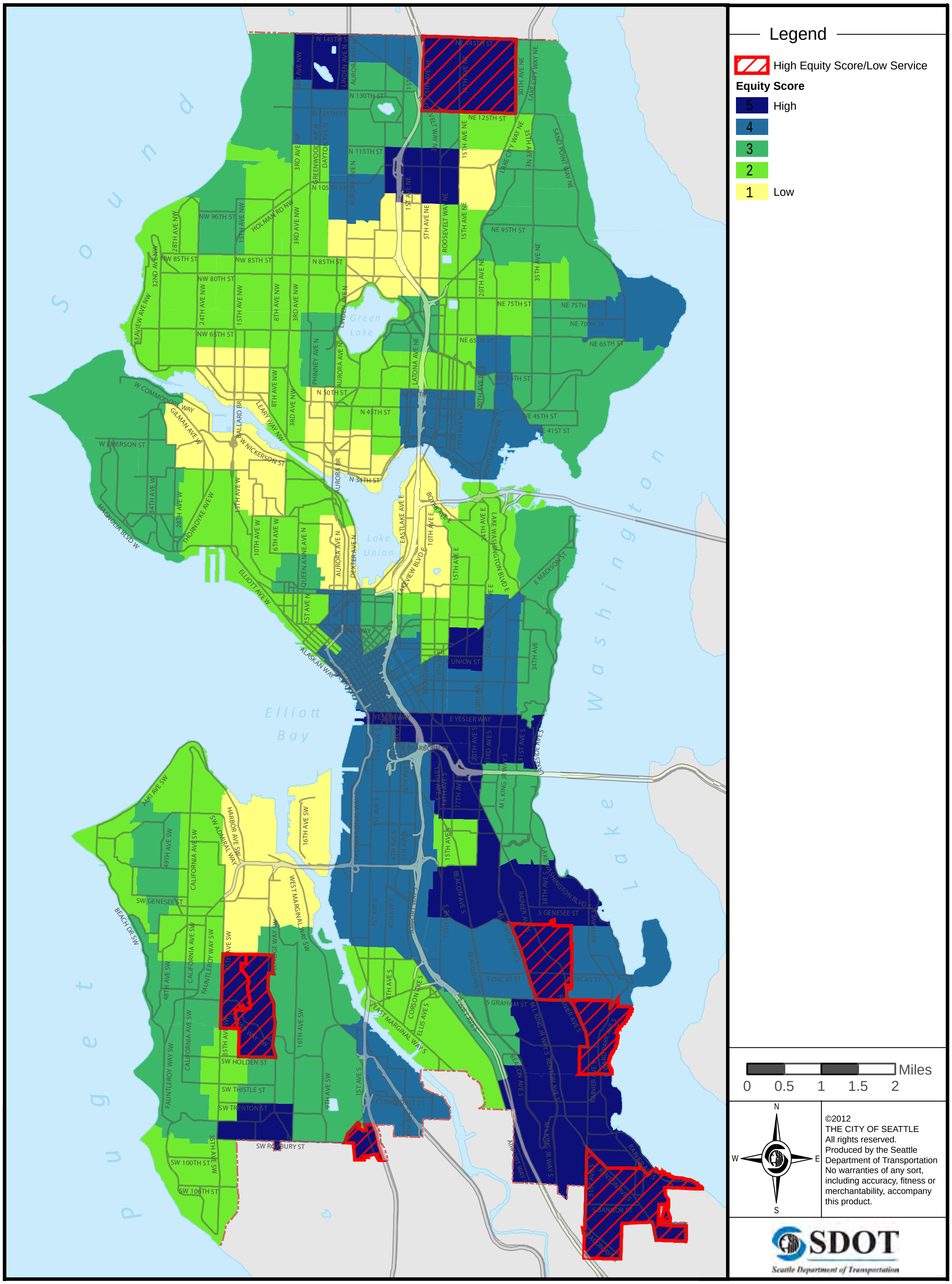
The demographic analysis used the 2010 decentennial census and the American Community Survey's 5-year estimates (2006-2010). The analysis used a threshold for each socio-economic variable, so that those tracts that had a value greater than the mean value for any given variable was given a score of one (1). For example, a tract that had an above average minority population percentage and an above average percentage of households below poverty was given a score of two (2). The maximum score possible was five (5) and the minimum possible score of zero (0). Figure 6 shows the results of the composite equity scores.

The distribution of bicycle facilities or 'level of bicycle service' was calculated by dividing the total mileage of bicycle facilities (bike lanes, shared lane markings, multi-use trails) in a census tract by the number of square miles in the census tract (bicycle facility miles/square mile). For the purposes of this analysis, those census tracts that were in the lowest quartile (lowest 25%) were consider to be 'low service areas'.

In some areas, a high equity score corresponds with a low level of bicycle service provision. Figure 6 illustrates the location of this overlap. The outlined boxes (in red hatch) call out those census blocks with a high equity score (composite of underserved populations) and low service, in terms of bicycle facilities.

The results of the demographic analysis combined with the assessment of existing facilities highlights several areas of Seattle where improvements to the bicycle system would benefit underserved populations. As new segments of the system are completed, the gap analysis can be easily repeated for the updated system, providing the opportunity to understand potential areas of the City that merit additional focus and investment.

Figure 6: Equity Analysis - Population Distribution and Service Provision



System-wide Opportunities

The gaps and opportunities identified in this chapter provide valuable information which, in addition to other information such as roadway characteristics and continued public input, will inform the development of an updated recommended bicycle facility network.

High-quality bicycle facilities, such as cycle tracks, are needed as Seattle expands its bicycle system and attracts new people to make trips by bicycle. To become a world-class bicycling city, the updated bicycle system map must include bicycle facilities and treatments that increase rider predictability and comfort.

Cycle Tracks

A cycle track is physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively used for bicycles and are separated from motor vehicle travel lanes, parking lanes, and sidewalks.

Neighborhood Greenways

Neighborhood greenways are a collection of lower volume, lower speed streets designed to give priority of travel to people riding bicycles and pedestrians. Neighborhood greenways are designed to promote a safer and more comfortable travel option for users of all ages and abilities. Seattle neighborhood greenways groups are active in numerous Seattle neighborhoods and have been working to identify streets appropriate for greenways.


IMPORT
AUTOMOTIVE
SERVICE
TOYOTA
SUBARU
VOLVO
HONDA
ACURA
LEXUS
325-3992
E Spring St
NO PARKING ANY TIME
MOTORS

12th Ave E

Bicycling in Seattle Today

WHO'S RIDING WHERE & WHEN?

The availability of data from multiple count efforts provides a rich source of information from which to develop a snapshot of cycling activity in Seattle today.

Fremont Bridge

As noted previously, ridership is a key performance measure identified in the 2007 BMP. Bicycle counts provide the best information available regarding the number of bicyclists throughout the city. While counts provide a key metric to evaluate progress on the plan, they are also an important component of other analyses that support implementation decisions over time.

Accurate and consistent information on the current use of bicycle facilities serves to help SDOT in the following ways:

- Secure grant funding
- Measure the return on investment of new facilities
- Determine where and when to build new facilities
- Inform agency budgeting decisions
- Better understand bicyclist behavior

This section of the report provides a general overview of bicycle activity patterns and trends in Seattle based on a review of bicycle count data conducted by SDOT and other agencies.

Summary of Existing Counts

Bicycle activity in Seattle has been documented in a variety of forms and by multiple organizations. SDOT has been counting bicycles at access points to downtown since 1992. In 2008, SDOT began conducting counts at other locations around the city. These two count programs are being replaced by a single quarterly count program of 50 locations throughout the city using methodology recommended by the National Bicycle and Pedestrian Documentation Project (NBPD). The quarterly count program began in 2011. Details on the current SDOT count methodology are shown in the box below.

Additional count data has been collected in coordination with the annual Washington State Bicycle and Pedestrian Documentation Project, which includes 25 Seattle locations that have been counted since 2009. These counts are coordinated by the Puget Sound Regional Council (PSRC) and the Cascade Bicycle Club. Periodic counts of bicycles on transit have been conducted by Sound Transit and include bicycles observed on Sound Transit trains and buses, as well as bicycles observed on non-Sound Transit (King County Metro and Community Transit) buses. King County Metro also conducted surveys of bikes on buses in 2002 and 2007.

SDOT Current Bicycle Count Methods:

Quarterly Bicycle Counts

Count Locations: 50 count locations (13 locations came from previous count locations)

Time: weekday (10:00 AM – 12:00 PM and 5:00 - 7:00 PM) and weekend (Saturday: 12:00 PM – 2:00 PM)

Season: quarterly counts (January, May, July, September)

History: quarterly count program follows the National Bicycle and Pedestrian Documentation Project methodology. One year complete (2011); 2012 in progress

Automated Counter

Installed in October 2012 on Fremont Bridge

Figure 7: Summary of Seattle Bicycle Counts

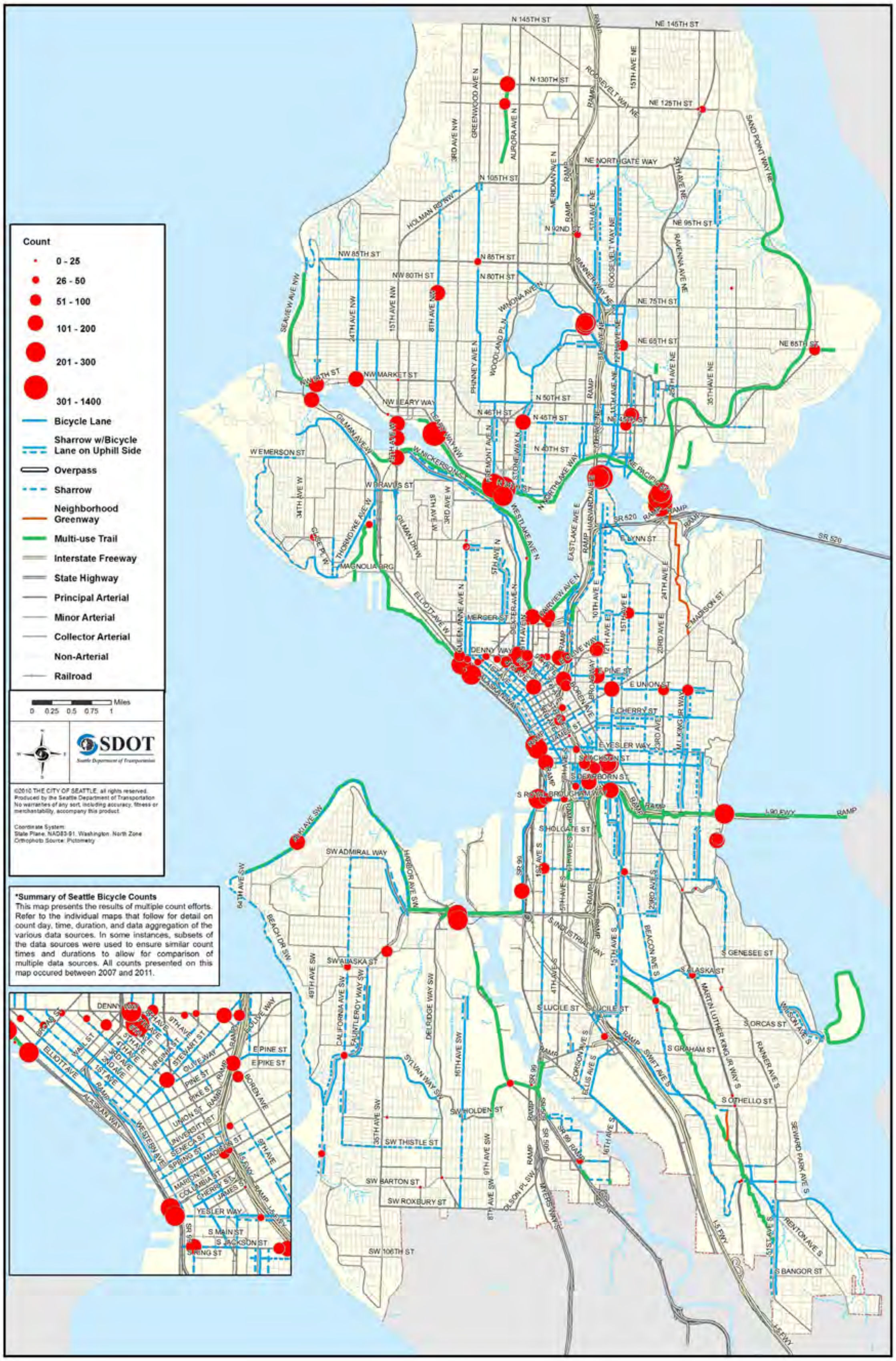


Figure 7 provides an overview of the various count efforts active in Seattle. Summary totals were generated through the use of hourly and seasonal adjustment factors and averaged over multiple years of data when historic counts are available. As indicated on the map, bicycle counts tend to be highest in the north end of Seattle (north of the Ship Canal), in the downtown core, and at 'pinch points' in the transportation network, such as bridges.

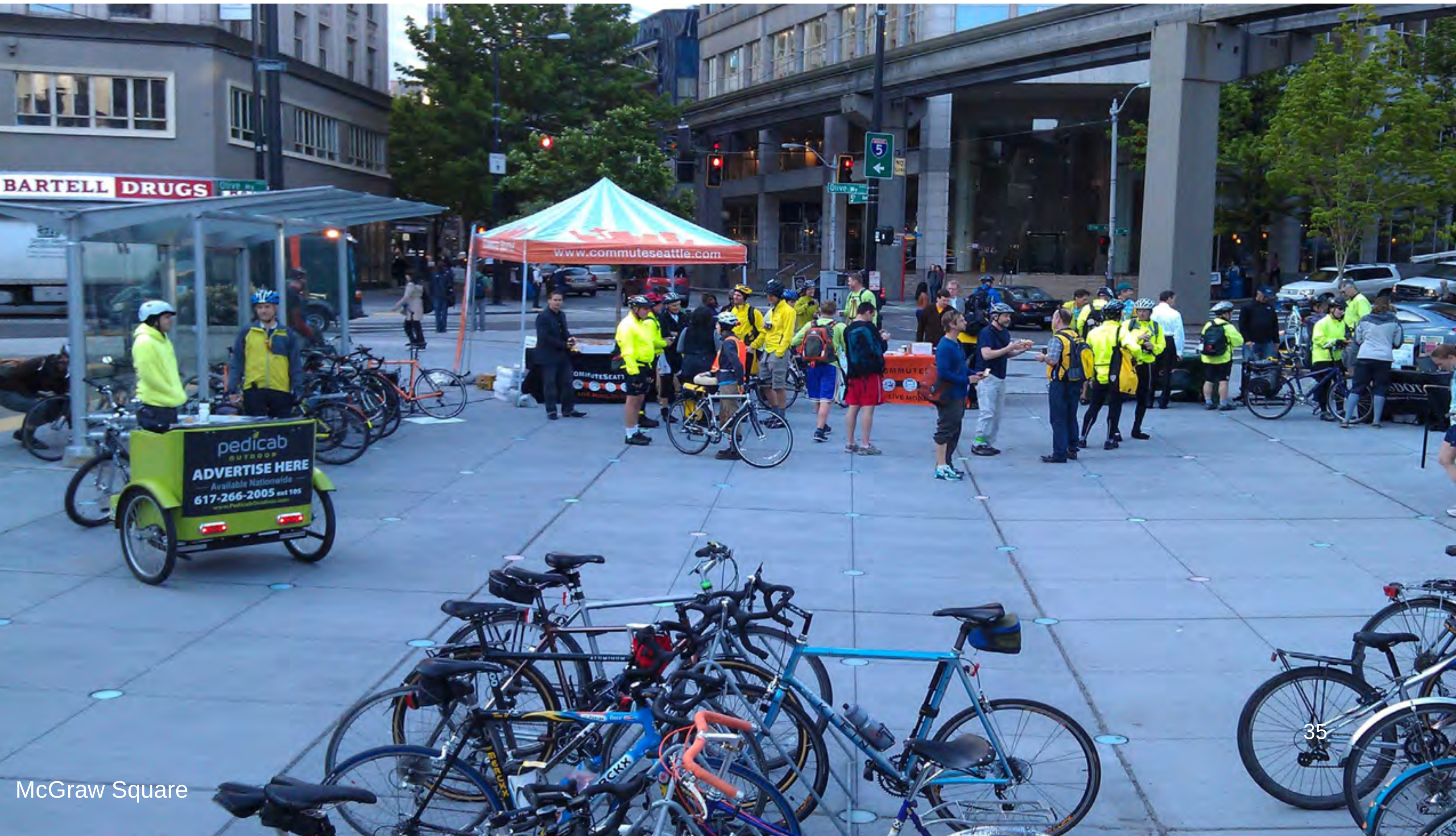
Key Findings

Cycling Activity Varies Throughout the City

Data indicate that the north end of Seattle (north of the Ship Canal) and the downtown core are areas with highest recorded count volumes, while counts are lower south of I-90, on Beacon Hill, and along Martin Luther King Way. Cycling volumes tend to be highest at 'pinch points' such as bridges, where few alternate routes exist. Riding a bike appears to be dramatically higher in North Seattle than South Seattle. There are also several neighborhoods with low documented bicycling activity, including Magnolia, Queen Anne, and all of Southwest and East Seattle.

Fewer bicycles were counted south of I-90, on Beacon Hill, and along Martin Luther King Way, though counts were generally higher in West Seattle. Lower counts in these areas may be the result of more challenging topography and a less robust network. Specific high count locations are described on the following pages.

Figure 8 (next page) shows the bicycle count volumes recorded in summer and fall of 2011 as part of the SDOT quarterly bicycle count program, which uses the methodology recommended by the National Bicycle and Pedestrian Documentation Project. Figure 9 (next page) shows count data from SDOT's older Downtown count program, in 2009 and 2010.



McGraw Square

Figure 8: 2011 SDOT Quarterly Bicycle Counts

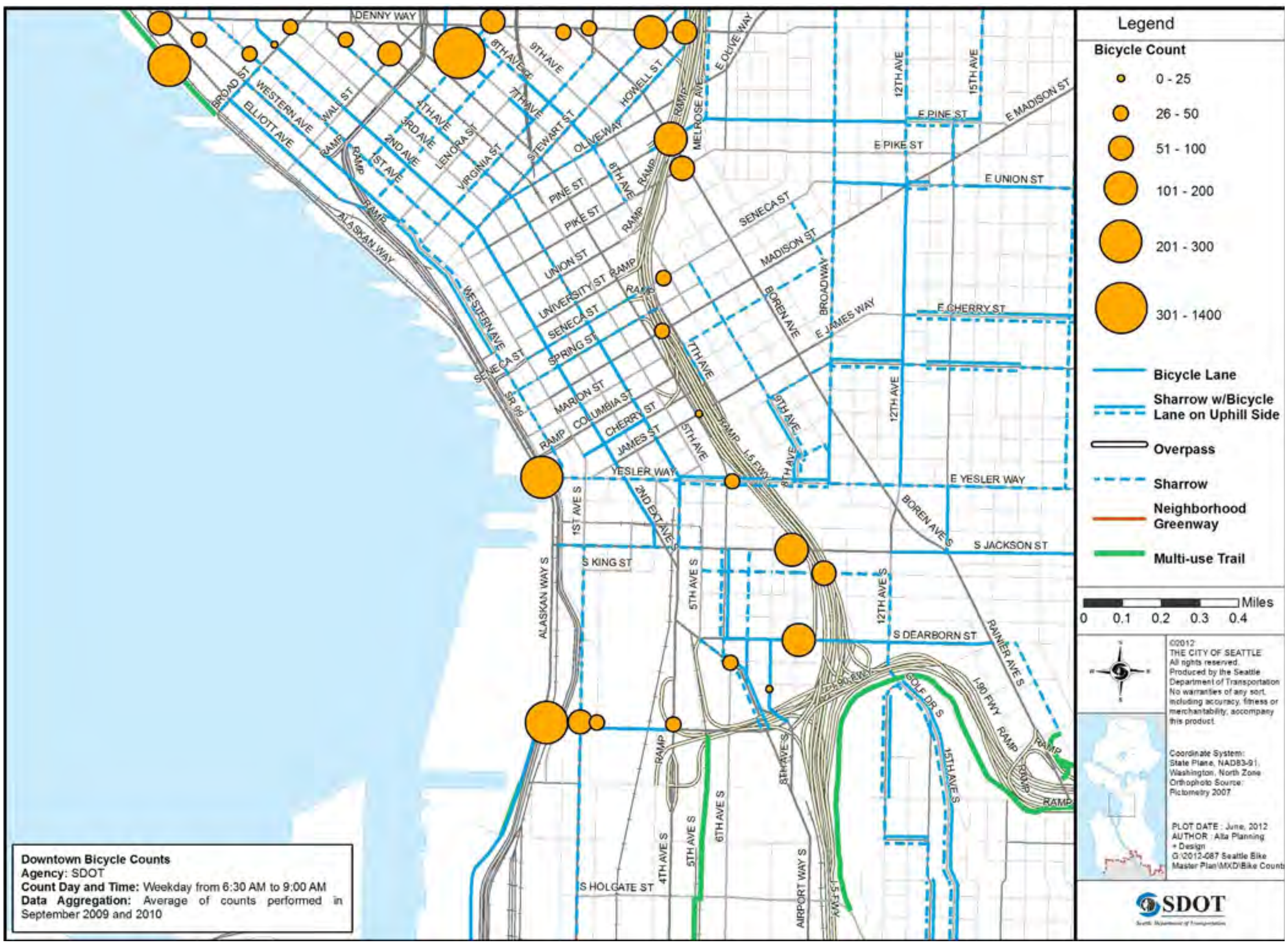
Some of the highest count locations in the transportation network include:

- Fremont Bridge, which is connected to the Burke-Gilman Trail
- University Bridge, which is connected to the Burke-Gilman Trail
- Burke-Gilman Trail between the Fremont Bridge and Aurora Bridge
- Burke-Gilman Trail and 8th Avenue NW
- Montlake Bridge
- Dexter Avenue N and Bell Street

Additional high volume count locations in Seattle include:

- NE Ravenna Boulevard, E Greenlake and Way, N/NE 71st Street
- E Marginal Way S and S Hanford Street
- Westlake Avenue N and Valley Street
- Duwamish Trail and Lower West Seattle Bridge
- I-90 Trail and West Bridge

Figure 9: Downtown Weekday Bicycle Counts (Average of 2009 and 2010)



Bicycle volumes have increased steadily.

In 2011, bicycle volumes in Downtown Seattle were nearly 200% higher than in 1992.

Helmet Use

Helmet use has risen steadily over time, from 71% of cyclists in 1992 to over 90% in 2009.

Female Bicyclists

The share of female riders has increased slightly, from 20% of all cyclists in 1992 to 22% in 2011. This data is based on the counts in Downtown Seattle only. It may be that female cyclists are gravitating towards routes with bicycle facilities, such as multi-use trails, which provide increased separation from motor vehicles.

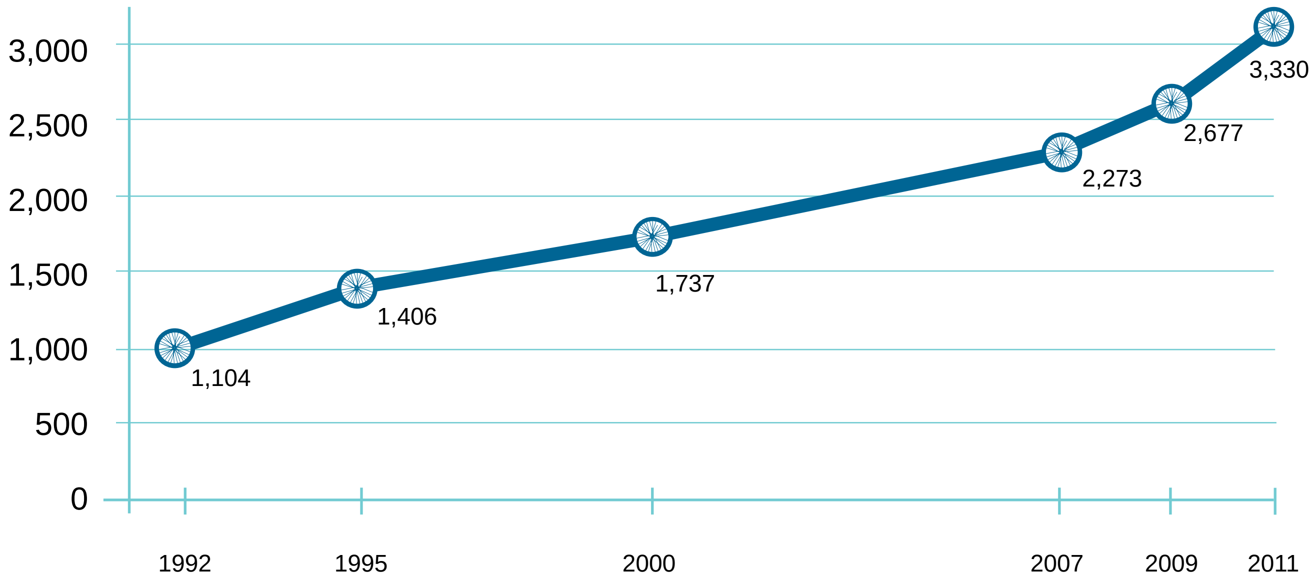
Weekday vs. Weekend

The weekday peak afternoon period generally experiences greater bicycling activity compared with the peak weekend period, indicating a potentially higher proportion of utilitarian (i.e., commute) riding compared with recreational use.

Seasonal trends

Cycling is highest in mid and late summer (July through September) and much lower in winter.

Figure 10: Total Cyclists Change Over Time, Downtown Seattle



Source: 1992-2011 Downtown Seattle Bicycle Counts

Overall Rise in Cycling and Decline in Collision Rate

The downtown count data is the most consistent data available and can be used as a general indicator of an increased trend in bicycling in the City. When reviewed with collision data as shown in Figure 11, while there is a trend towards an increase in bicycling, the overal collision rate is declining.

BMP Update Count Considerations

Discontinuing the Downtown Count program after 2013 will effectively eliminate the ability to compare newer counts to past performance on the 2007 Bicycle Master Plan goal of tripling the number of bicyclists observed at counting locations throughout Seattle by 2017, as the new Quarterly Bicycle Count program began in 2011 while the Downtown Count program dates back to 1992.

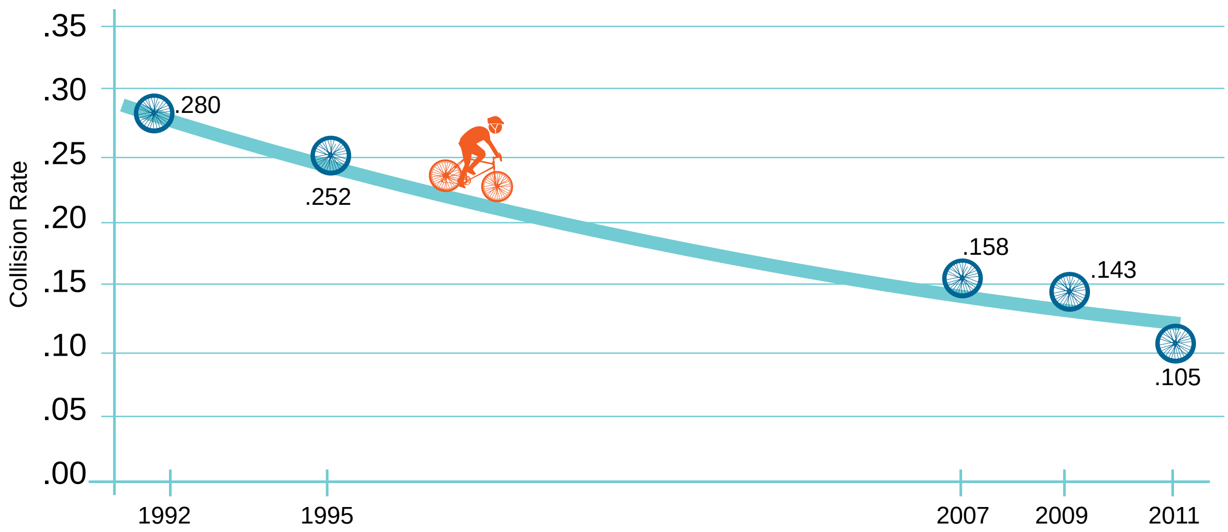
As SDOT updates the performance measures in the BMP, updating the methodology for collecting ridership data will be important to be able to assess progress on increasing ridership as the plan is implemented.

The phasing out of the Downtown and Citywide Bicycle Count programs also eliminates the ability to track gender and helmet use. SDOT should consider how to continue documenting these rider characteristics using the new count methodology or whether to resume the Downtown Count Program in the future. There is a great need in tracking a rider's gender as women riders are commonly known a proxy of perceived safety.

SDOT should also review previous count locations with the highest counts and consider adding them to the new Quarterly Bicycle Count program or installing automatic counters to continue to monitor these locations.

Finally, as one of the goals of the BMP update is to increase bicycling for all trip purposes and new facilities on non-arterial streets, such as greenways are built, SDOT will need to consider whether current count methodology adquately captures non-commute trips and trips on residential streets.

Figure 11: Bicyclist Collision Rate Change Over Time, Downtown Seattle



BICYCLE PROGRAMS

Education, enforcement, and encouragement programs are essential to improving bicycle safety and to encouraging more bicycling throughout the city.

As the bicycle network is built out, programs are important in order to educate bicyclists and motorists about how to safely share the road. Programs are also helpful for promoting cycling as a fun, healthy, flexible, affordable, and viable form of transportation.

This chapter documents and assesses the various education, encouragement, and enforcement programs that have been undertaken by SDOT and other partners since adoption of the 2007 Bicycle Master Plan. These programs are summarized in tables included in the appendix. The needs identified in this task will help inform the development of programmatic recommendations in the BMP update. The assessment also identifies types of programs or coverage needs for future consideration.

Key Programming Resources and Partner Organizations

Within SDOT, the Policy & Planning and Traffic Management divisions devote staff time to education and encouragement programs and to working with the Seattle Police Department (SPD) on enforcement. SDOT has formed partnerships with several local non-profit organizations to develop, operate, and maintain a variety of bicycle programs that will help encourage and increase the amount of bicycle riders.

Example Partner Organizations

- **Cascade Bicycle Club**
  With over 14,000 members, Cascade Bicycle Club is the largest bicycle club in the United States. Cascade has an affiliated 501(c) (3) charitable organization, the Cascade Bicycle Club Education Foundation (CBCEF). CBCEF's mission is "Creating a better community through bicycling." Their education, advocacy and outreach efforts encourage people to ride bikes for transportation, fitness and fun; promote a more bicycle-friendly environment; improve bicyclists' safety; and create more livable communities.

- **The Bicycle Alliance of Washington (BAW)**
  The Bicycle Alliance of Washington is a registered 501(c)3 organization. The BAW supports bicyclists and a bike-friendly Washington by advocating for adequate funding for a complete non-motorized transportation infrastructure, working to increase the percentage of all types of bicycle ridership in Washington by ensuring that bicycles are recognized as a reasonable and mainstream transportation option, and educating communities to become bicycle-friendly and embrace a share the road philosophy.

- **Bike Works**
  Bike Works is a non-profit community bike shop/organization centered on bicycles that combines youth development, community engagement, bicycle recycling, and a social enterprise bike shop to help build a sustainable and healthy community. Bike Works sells affordable recycled bicycles to the greater Seattle community while generating revenue to run youth programs, and helps to get more people riding bikes.

- **Commute Seattle**
  Commute Seattle is a not-for-profit transportation service organization working to provide alternatives to drive-alone commuter trips in an effort to improve access to and mobility through downtown Seattle. Commute Seattle's ambitious goal is to shift to 35,000 daily drive-alone commute trips to transit, cycling, walking and ridesharing by 2015.

Chief Sealth Trail

BMP Update Programmatic Needs

There are three clear needs for bicycle program direction in the BMP update, although others may be identified throughout the project timeline. These needs are:

- Program evaluation
- Programs to reach new or hesitant cyclists, especially among groups that are underrepresented among current cyclists
- Programs and campaigns to reduce conflicts and improve safety between road users

Evaluation

The 2007 BMP did not focus on program evaluation. Therefore, it is difficult to determine what programs have most helped increase the number of people riding bicycles or bicycle safety. The BMP update should consider how to better incorporate evaluation and monitoring into programming efforts to ensure that effective programs are continued and programs that are not effective are either improved or discontinued.

Targeted Audience

Bicycle programs should be targeted to reach specific audiences. As elsewhere in the 2012 update, SDOT is particularly interested in meeting the needs of new cyclists and programmatic efforts that will encourage cycling for those people that may be interested in riding a bike, but are not yet comfortable enough to consider biking as a convenient and viable form of transportation. These people may include the following:

- Women
- Low-income
- Families
- Seniors
- Youth

Summary of Performance

OPERATIONS

SDOT has begun to move beyond the 2007 BMP recommendations to employ a wider range of bicycle facility types to improve safety and create better conditions for riders of all ages and abilities.

E Marginal Way S

This chapter identifies standard facilities and describes SDOT's current operations and design standards for on-street bicycle facilities (bicycle lanes and sharrows), off-street bicycle facilities (multi-use trails), and end-of-trip facilities (location and design requirements for bicycle racks). These are the facilities that were recommended and have been implemented from the 2007 BMP. This chapter also identifies design standards that have been incorporated in recent years, such as buffered bicycle lanes, green bicycle lanes and bicycle boxes, and cycle tracks, which have been, or are currently being, implemented even though they were not included in the 2007 BMP.

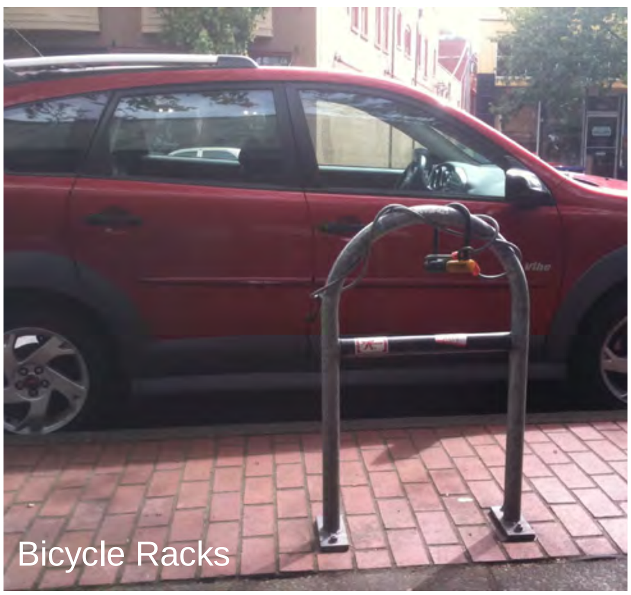
As bicycle project implementation has progressed and research and best practices for bicycle facility design has evolved, SDOT has modified and updated some design standards to further improve safety. However, the design and operational standards of these innovative bicycle treatments have not been officially adopted into any plan. SDOT has utilized best practices and new bicycle facility designs to ensure the operations and design of these facilities are installed correctly. The Bicycle Master Plan Update provides an opportunity to include these standards in the plan, and the plan update will include a new facility/improvements toolkit with operational and design guidance.

Standard Facilities

The following treatments are standard industry tools and facilities that are described and detailed in the 2007 BMP. Seattle will continue to implement these facilities based on existing design guidance.

Bike/Bus Lanes

Bicycle Route Signs


Bicycle Racks


Bicycle Accomodation on Transit


Shared Lane Markings (Sharrows)

Innovative Facilities

The following bicycle facilities either are current pilot projects in Seattle or under consideration for use. Design guidance needs to be updated to include clear standards for implementation.


Dexter Ave N

Crossbikes

In 2011, SDOT started installing intersection crossing markings called crossbikes at spot intersections to improve visibility of bicyclists. SDOT included crossbikes as part of the first neighborhood greenway projects, beginning in 2012. As part of the update to the BMP, SDOT will evaluate the use of crossbikes in the City.


Walingford Neighborhood Greenway

Neighborhood Greenways

Neighborhood Greenway elements include crossing improvements at arterial crossings, sharrows and signing along the greenway route. SDOT will further develop consistent design standards for treatments used on greenways during the BMP update process.


6th Ave

Contraflow Bicycle Lanes

Prior to the 2007 BMP, there was one existing contraflow bike lane in the city. In 2010, SDOT installed a second contraflow bike lane. SDOT will continue to refine internal design guidance and use contraflow lanes on future projects where one-way street corridors could provide an important connection for bicyclists.

7th Ave

Buffered Bicycle Lanes

In 2010, SDOT installed its first buffered bicycle lanes. Three projects were completed that year: N 130th Street, 7th Avenue and Roosevelt Way NE.

SDOT will continue to look for opportunities to install buffered bike lanes and identify clear design guidance and implementation criteria and metrics in the BMP update.

Eastlake Ave E and E Fuhrman St

Green Bicycle Lanes

A colored bike lane is a portion of the bicycle lane used to indicate that motorists should expect to see bicyclists when they cross the bike lane to make a left or right turn. LIkewise, bicyclists should expect to see motorists crossing the colored bike lane.

To date, SDOT has installed 36 colored bike lane locations. SDOT is continuing to experiment with different materials for the best product for both durability and cost. SDOT will continue to install green bike lanes where needed and continue to look for new tools and treatments to use at known conflict points.

E Pine St and 12th Ave E

Green Bicycle Boxes

In 2010, SDOT installed several green bike boxes. Four locations were completed that year by following Portland's examples and designs. Educational signage was created and installed at each location. New design guidance on bicycle boxes was included in the 2010 Urban Bikeway Design Guide from the National Association of City Transportation Officials (NACTO). SDOT will continue to use NACTO as a tool and will look to incorporate recommendations from recent and forthcoming research about bike boxes.

Cycle Tracks

SDOT currently has three cycle track projects planned and designed. Construction should begin in 2012 for the Linden Complete Streets Project and the First Hill Streetcar Project. Both projects include a two-way cycle track as part of larger streetscape redesign. In addition, a cycle track has been included in the Mercer West Project. Construction should begin in 2014.

Seattle looked to other cities that have used this treatment for guidance in their design, such as Portland, Vancouver, BC, and Montreal. The NACTO Urban Bikeway Design Guide also has a section on cycle track design that has been referenced to support Seattle's pilot projects. New guidance in the BMP update should be provided on designs for intersections and driveways, using information from recent research and best practices from other cities in the US and Canada that have installed cycle tracks.

Bicycle Signals

SDOT has a installed bicycle signal in one location (N 34th St and Fermont Ave N for the contraflow bike lane). The BMP update should include recommendations for the use of other signal related facility improvements should be defined and explored in the BMP update, including: bicycle signals (bike-specific signal heads), bicycle access at half signals and other pedestrian crossing signals, and signal timing for bicyclists.

Staircase Runnels

SDOT has improved its stairway design standard to include a bicycle runnel. Starting in 2011 and continuing in 2012, major stairway rehabilitation projects have considered installing a runnel.

As the runnel program matures, it is SDOT's desire to also construct projects that add runnels to existing stairways. The update to the BMP should identify the need to use staircase runnels where possible to provide connectivity.

University Way

On-Street Bicycle Corrals

SDOT has been developing on-street bicycle corrals throughout the City. Current practice includes the installation of on-street corrals (primarily using the Dero-brand 'cycle-stall' prefab module) on a request basis and where perceived demand was high enough to warrant a corral instead of traditional racks.

The BMP update should consider how to prioritize on-street bicycle corrals depending on land use or other factors and taking advantage of spacing where spaces where vehicle parking is not allowed.

BMP Update Operations Needs

SDOT has utilized best practices and new bicycle facility designs to ensure the operations and design of bicycle facilities are installed correctly. In general, standard facilities will continue to be installed based on current design practices.

However, the BMP update also provides the opportunity to review new implementation techniques for some standard facilities. SDOT will continue to be innovative in its approach to improve safety, predictability, and comfort of the bicycle network cyclists of all ages and abilities.

The BMP update will also include new facility types and the respective operational and design guidance for consistency in application, including increased use of the NACTO Urban Bikeway Design Guide.

7th Ave

MOVING FORWARD

The Bicycle Master Plan Update will build upon the significant progress achieved to date and continue the momentum established by the 2007 Master Plan.

University Way

The State of the Seattle Bicycling Environment Report provides a snapshot of Seattle's existing bicycling environment, particularly project and program accomplishments, current policy and implementation guidance, and historic and current bicycling usage trends among Seattle residents. The technical information summarized in this report, in addition to a wealth of stakeholder and public input, establishes the baseline from which the Bicycle Master Plan Update's recommendations will be made.

A more detailed analysis phase of the BMP update effort will set the stage for identifying a bicycle facilities network and program solutions. This includes taking a close look at the existing network and programs to identify where additions or adjustments may be needed and looking to peer communities that are successfully putting best practices into action. SDOT is also examining other important elements, such as equity and demand, to help create a bicycling environment that is appealing and useful for residents of all ages, abilities and backgrounds. Key next steps include updating the bicycle network map, project and program development and prioritization, identification of funding opportunities, creating a clearly defined phasing and implementation plan, and identifying opportunities to enhance SDOT's implementation efforts.

The Bicycle Master Plan Update will include a comprehensive suite of policy, project and programmatic recommendations to take Seattle to the next bicycling level. In charting a course to transform Seattle into a world-class bicycling city, SDOT and other project partners should consider the issues discussed in the following paragraphs, identified from the existing conditions analysis. These and many other considerations will be expanded upon in the forthcoming Bicycle Master Plan Update.

Bicycle Facilities Network

- Develop an objective and data-driven method for identifying appropriate bicycle facility types (e.g., bike lane, neighborhood greenway) on the network based on a variety of factors including street characteristics and land use context.
- Develop seamless bicycle connections with other transportation modes, particularly transit.
- Revisit existing bicycle facilities design practices to determine whether they contribute to a comfortable and safe riding environment for riders of all ages and abilities. Updated design guidelines and standards will be based on national and international best practices.
- Expand the use of emerging and innovative infrastructure treatments (e.g., cycle tracks, green bike lanes) to enhance the riding environment for persons of all ages and abilities.

Education, Encouragement, Enforcement, Evaluation and Outreach

- Conduct a scan of national and international best practices in bicycle education and outreach to identify improvement opportunities for Seattle.
- Work with partner agencies and organizations to streamline existing bicycle education and outreach efforts. For instance, some overlap exists between SDOT's activities and those of partner agencies/organizations.
- Develop methods to improve SDOT's outreach to areas of the community with lower levels of bicycling activity.
- Continue to expand the reach of SDOT's education and outreach activities (e.g., Road Safety Summit, K-12 curriculum, driver education).

Funding

- Challenge of funding new or more expensive types of bicycle facilities
- Streamline the internal process for tracking grant and other funding opportunities.

Implementation

- Be opportunistic with project implementation, such as identifying "quick-win" spot improvements and implementing projects in tandem with other transportation system improvements.
- Determine which performance measures have proven most useful for tracking implementation progress over time and identify new measures as needed. For example, opportunities may exist to streamline current bicycle count procedures to gain a better understanding of usage trends (e.g., better tracking of usage by gender and expanding counts to collect data beyond commuting trends).
- Enhance the process for identifying bicycle network maintenance needs. Examples of elements affecting the user experience include surface quality and condition of pavement markings and signage. SDOT should consider whether current facility condition monitoring practices are sufficient, and identify opportunities for improvement if needed.
- Develop a process for monitoring the effectiveness of programmatic efforts, and put this process into action on a recurring basis.

Conclusion

The Bicycle Master Plan Update will build upon the significant progress achieved to date and continue the momentum established by the 2007 Master Plan. This planning effort provides opportunities to take advantage of emerging and state-of-the-art best practices for bicycle facility design and program implementation, and will set the stage for transforming Seattle into a community where bicycling is a safe, comfortable and viable travel mode for people of all ages and abilities.

Programs Implemented by SDOT, 2007-2012

PROGRAM NAME	PROGRAM TYPE	IMPLEMENTING ORGANIZATIONS	TARGET AUDIENCE	FUNDING SOURCE	STATUS
Way to Go: One Less Car	Encouragement	SDOT	Car owners	General Fund	Current - began 2000
Safe Routes to School	Education & encouragement	SDOT, Bicycle Alliance of Washington, Feet First	Elementary Schools	Bridging the Gap & grant funding	Current - began 2007
Traffic control devices/signage	Education	SDOT	All users of roadways	General Fund & Bridging the Gap	Always in use
Traffic laws	Enforcement	SPD	All users of roadways	General Fund	Daily with occasional increased enforcement
Annual bicycle map	Education & encouragement	SDOT	Cyclists	General Fund & Bridging the Gap	Updated & printed every year
Support efforts to obtain funding	Education & encouragement	SDOT & partners	Cyclists	Grant funded	Pursued when appropriate for project implementation
Bike Smart	Education & encouragement	Cascade Bicycle Club	Cyclists	Bridging the Gap	Program no longer exists
Walk, Bike Ride Challenge	Education & encouragement	SDOT	All residents	General Fund	Current - began 2010
Online Seattle Bicycle Map	Education & encouragement	SDOT	Cyclists	General Fund	Current - began 2012
Bicycle Racks	Encouragement	SDOT	Cyclists	General Fund & Bridging the Gap	Current - began 1981
Videos	Education	SDOT & Art Institute of Seattle	All users of the roadway	Staff coordination time	Partnership exists & produced first video 2012
Website with bicycle information*	Education & encouragement	SDOT	All residents	Staff time	Ongoing
Programs that have not been implemented, but were recommended in the 2007 plan:					
Online bicycle route wayfinding system	Encouragement	N/A	N/A	N/A	Has not been pursued
Display bicycle route system maps Downtown & in Urban Villages	Education & encouragement	N/A	N/A	N/A	Has not been pursued

*See:
http://www.seattle.gov/waytogo/
http://www.seattle.gov/transportation/bikeprogram.htm
http://www.seattle.gov/transportation/saferoutes.htm

Programs Funded and Managed by Other Organizations

PROGRAM NAME	PROGRAM TYPE	IMPLEMENTING ORGANIZATIONS	TARGET AUDIENCE	FUNDING SOURCE	STATUS
Commute Trip Reduction	Encouragement	WA State Law - Large Employers	Employees	Privately funded	Current
Ride SMART safety program/Bike to Work Month*	Education & encouragement	Cascade Bicycle Club & CBCEF	Cyclists	Unkown	Current
Bicycle maintenance classes	Education	REI & Cascade Bicycle Club	Cyclists	Unkown	Current
Cycle tracks - trip mapping	Encouragement	Puget Sound Regional Council (PSRC)	Cyclists	Unkown	Current - began 2012
Bicycle Sundays	Encouragement	Seattle parks & Recreation & Cascade Bicycle Club	Cyclists	Unkown	Program exists on Sundays throughout the summer
Bike Buddy & Go By Bike	Encouragement	Bicycle Alliance of Washington	New bicycle commuters	Unkown	Current (Bike Buddy - currently being reorganized & updated)
Youth Progams**	Encouragement	CBCEF	youth	Unkown	Current
Earn-A-Bike & other programs	Education & encouragement	Bike Works	Cyclists & youth	Unkown	Current
Give 3 Feet campaign	Education	Cascade Bicycle Club & Group Health	All users of the roadway	Unkown	Current
Cascade Bi-annual Bikes & Business meeting	Education	Cascade Bicycle Club	Major employers	Unkown	Current
Bicycle Amenity Inventory Map	Encouragement	Commute Seattle	Cyclists	Unkown	Current
Bicycling Business Events/Forums	Education & encouragement	Commute Seattle	Downtown businesses & employees	Unkown	Current
in Motion	Education & encouragement	KC Metro	All residents	Varies	Current
Bikes in buses	Encouragement	KC Metro	All cyclists	Unkown	Different neighborhoods as funding is found
Bikes on buses, link lIght Rail & Sounder trains	Encouragement	Sound Transit	All cyclists	Unkown	Current
Food & Fitness	Education	KC Public Health	All residents	Unkown	Current
Kidical Mass Rides	Education & encouragemen	Totcycle	Families	Volunteers	Current
Spokespeople Rides	Education & encouragement	Spokespeople (Seattle Neighborhood Greenways Organizers)	All residents	Volunteers	Current
Bike Trains & Bike to School Days	Education & encouragement	Walk.Bike.Schools!	Students & families	Volunteers	Current

* Includes riding, maintenance, and commuter classes, as well as seniors classroom and riding classes

**Includes summer camps for kids, Trips for Kids Seattle, Basics of Bicycling (3-week on-bike course at elementary schools within four school districts), Urban riders (four-hour on-bike safety class for teenagers), and the Major Taylor Project (an after-school youth development program aimed at underserved youth)

website: http://www.seattle.gov/transportation/bikemaster.htm
email: bmpupdate@seattle.gov

SDOT
Seattle Department of Transportation

Appendix 1:

REPORTS

1C: Public Engagement Phase 2

seattle bicycle master plan

Public Engagement Summary Report
PHASE TWO

SDOT
Seattle Department of Transportation

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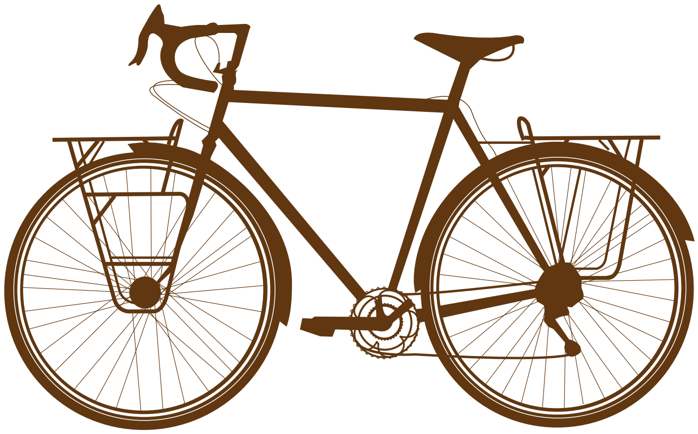


KEY FINDINGS & THEMES

In spring 2012, the Seattle Department of Transportation (SDOT) began an update of the 2007 Bicycle Master Plan (BMP). From the first public comment period, SDOT gained a better understanding of how to create a better bicycling environment from people who responded to the survey and web mapping tool. SDOT used this input to develop draft products for public review.

In November of 2012, SDOT began Public Engagement Phase Two to hear the public's thoughts regarding three main elements of the plan: the draft network plan map, programs and policies, the proposed vision, and goals of the plan. The main findings from the second public comment period are summarized here:

Suggestions for adding to the proposed network:

- Address connectivity gaps
- Focus more on intersections
- Increase the multimodal corridors, specifically around the new streetcar lines
- Add facilities on arterials (eg. Rainier Avenue S)
- Tweak neighborhood greenway routes

Suggestions for removing streets:

- Streets that are too steep or too narrow
- Streets that have transit service
- Street in neighborhood commercial districts, particularly where parking would be lost
- Critical downtown transit streets
- Increase car capacity downtown rather than build bicycle facilities

Comments regarding the facility designation criteria and facility design:

- Interest in seeing criteria for intersection design
- Concern about safety of sharrows, bike lanes, and any facility in the "door zone"
- Concern for downhill cycle tracks and high speeds resulting in unsafe facility design
- Interest in adding more information to the criteria regarding truck volumes, transit classifications and high ridership stop locations, 85th percentile speeds, and slope

- o Suggestions to modify criteria:
    - i. Neighborhood Greenways should be their own generalized classification (not combined in “enhanced street” category with sharrows)
- o Comments that “in street, minor separation” (bike lanes and buffered bike lanes) should not be considered an “all ages and abilities” facility type
- o Comments about deviating from the facility designation criteria to provide an upgraded facility type to improving safety and encouraging more ridership

Multimodal corridors (arterials with a proposed bicycle facility and other important transportation needs, such as Major Truck Streets or Transit Priority Corridors) are a topic of great interest and source of conflicting public comment

- o Concern that the planned network is too ambitious and not realistic
- o Support moving forward with bicycle facilities on these arterials and removing parking or travel lanes to do so
- o Support the utilization of residential streets for bike facilities instead of arterials
- o Removal of lines on the map where both Major Truck Streets and Transit Priority Corridors overlap with planned bike facilities

The policy framework (proposed vision and goals) were generally supported

- Interest in performance measures such as demographics of cyclists, safety measures, and connectivity
- Comments that perceived safety may be even more important than actual safety

Support for a variety for programmatic activities

- Support for researching methods to educate drivers during the driver's education and licensing process
- Excitement for neighborhood rides
- Programs like "Bike to School" and bike clubs in our schools were popular ideas
- Suggestions to market the benefits of bicycling

Other Topics

- Curious about funding strategies and how maintenance of new facilities ties in to the update
- Questions about how to promote electric bicycles
- Negative comments regarding Business Access & Transit (BAT) lanes allowing bikes
- Comments about the challenge of crossing I-5 in different locations
- Feedback regarding the network and legibility of the map, specifically regarding the lack of clarity on how to connect core parts of the city by bike
- Comments about the need for better lighting on the multi-use trails

Context

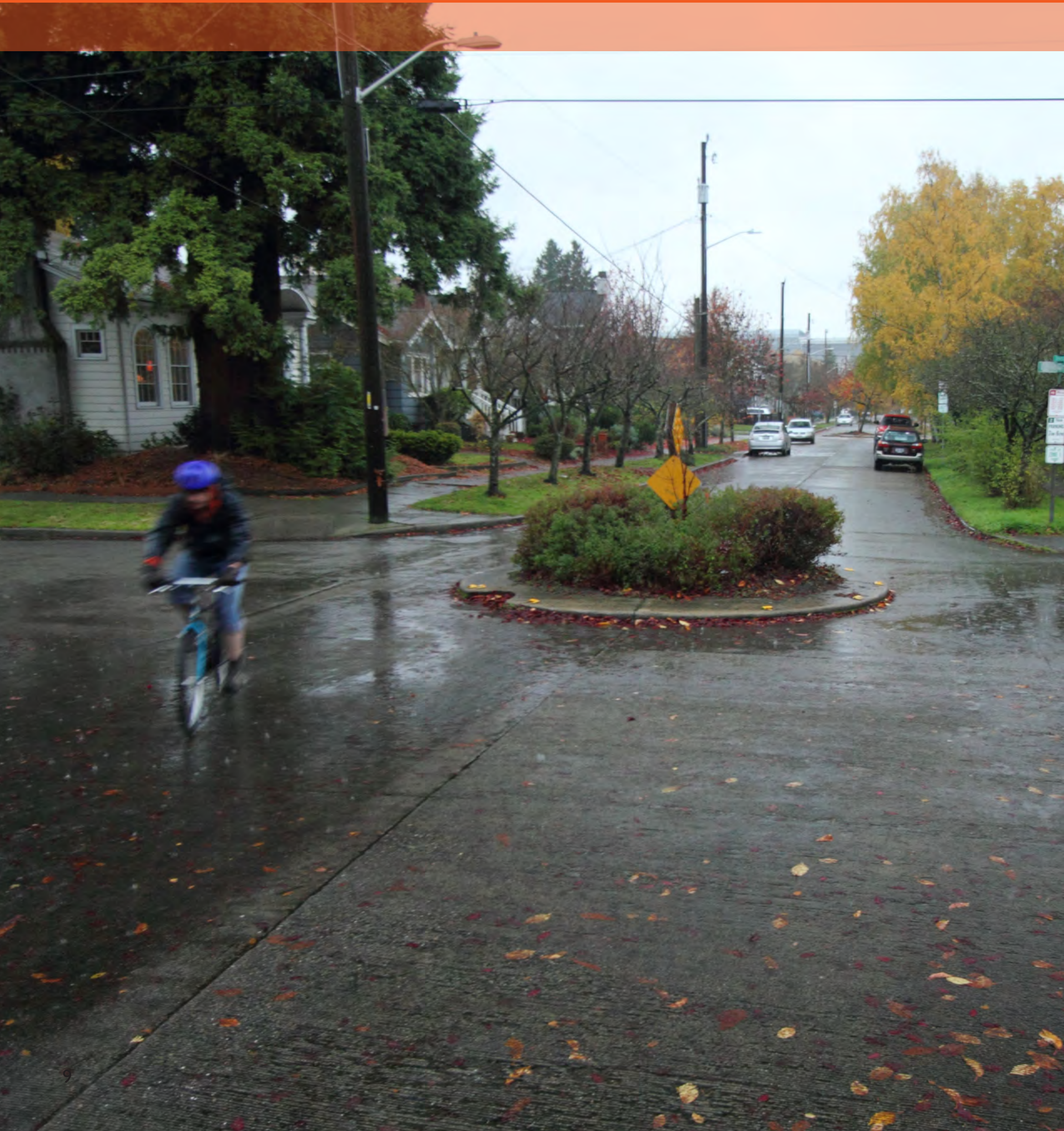
In 2012, SDOT embarked on an update to the BMP. While the current BMP, which was adopted in 2007, has been effective at guiding improvements to the City's bicycle network over the last five years, an update to the plan presents an opportunity to include fast-evolving best practices and new thinking in bicycle facility planning and design. This will result in a connected bicycle network that will appeal to a larger number of bicycle riders in the future.

At the beginning of the planning process SDOT completed the *State of the Seattle Bicycling Environment Report* and identified updated vision, goals, objectives and performance measures for the BMP. SDOT also completed the first phase of public engagement early in the planning process. This included an online survey and mapping tool to gain an understanding of how Seattleites feel about biking currently. In conjunction with a valid phone survey and comments gathered at outreach events and received via email, the following key themes emerged and set the foundation for the BMP Update. SDOT learned that:

- safety is a major concern for current and prospective riders
- facilities need to be built for people all ages and abilities
- existing bicycle lanes and sharrows need to be reevaluated
- maintenance and pavement improvements are needed
- education and enforcement campaigns for all road users should be implemented
- there are significant non-infrastructure related challenges, like weather and topography

Next, SDOT analyzed all potential bicycling corridors and assigned them facility types given their street characteristics. Guiding principles that drove the first draft of the network map include serving people of all ages and abilities and connecting the high bike-demand areas of the city. In the fall of 2012, the first draft of the BMP Update network map, programs & policies, and the bicycle facility toolkit were ready for public review and SDOT began the second period of public comment.

Process



In an effort to engage the community and receive feedback, SDOT attended 23 community/stakeholder meetings, held three open houses specifically for public input, and hosted an online *Lunch & Learn*. In addition, meetings were held with various City advisory boards, other transportation agencies like Sound Transit and King County Metro, as well as numerous bicycle advocacy groups and community organizations from all over the city (a list of meetings and events can be found in Appendix A).

Public Open Houses

SDOT held three open house events in November 2012; City Hall on November 7, New Holly on November 8, and at the University of Washington on November 13. At each open house, a presentation on the progress of the BMP update was given and attendees were encouraged to converse with volunteers from Seattle Bicycle Advisory Board (SBAB) and SDOT about the bicycle facilities displayed in the draft network map, or the programs & poicies and bicycle facility toolkit. The draft network was broken up into six sectors of the city. Each sector had its own table and staff member to lead the discussion and record comments. Images of all the sector maps can be found in Appendix E. The complete network map, as well as display boards with information on programs and the bicycle facility toolkit were set up around the periphery of the space and attendees were encouraged to engage in those aspects of the plan and provide feedback. To see the display boards from the open houses, see Appendix B.

University of Washington public meeting

Comment Sheet

In addition to commenting on the network map and the other materials for review, attendees at the open houses were handed a comment sheet with a list of questions to answer about the draft products. The comment sheet was also made available online.

“Add & Delete” Online Mapping Tool

In an effort to gain a better idea about how the community felt about the draft bicycle network, SDOT put the draft network map online and asked individuals to draw lines where they would add or delete a facility on the map. Including the online comment sheets, over 1,400 comments were submitted, which provided valuable insight into where the community does and does not want bicycle facilities to be built. One thing to note about the online mapping tool is that many users did not understand the exercise completely, so the results were a bit different than intended. Many of the “Add” lines were put on streets that displayed a bicycle facility currently. This could have meant that they either agreed with the line or were proposing to upgrade the facility. Similarly, “Delete” lines were drawn on streets where there was no facility showing; which most likely means that they oppose a bicycle facility being added to the street. SDOT still took feedback from the online mapping tool, however the data was interpreted as “Support vs. Oppose” a facility on a given street, rather than “Add or Delete” a facility from the draft network map.

Emails and Letters

All parties interested in providing feedback were encouraged to send their comments and ideas to the *bmpupdate@seattle.gov* email address. SDOT received over 200 emails from members of the community, all of which were aggregated with the feedback from the open houses and the online comment sheet and mapping tool. In addition, many organizations and stakeholder groups sent letters with their opinions.

Additional Outreach

SDOT attended 23 community/stakeholder meetings between November, 2012 and February, 2013, in addition to the SDOT-hosted open houses. These meetings included various City advisory boards, other transportation agencies like Sound Transit and King County Metro, and bicycle advocacy groups and community organizations from all over the city. Lastly, SDOT hosted an online *Lunch & Learn* for anyone interested in learning more who was unable to attend one of the open houses or one of the community/stakeholder meetings.

Moving forward, SDOT will use the findings from the public comment period to refine the network map, amend programs, and policy framework, as well as define the prioritization and implementation strategies. SDOT will continue to work with the Seattle Bicycle Advisory Board, and the BMP Executive Steering Committee, and the inter-agency technical team, with the goal to release the first draft of the full plan in June.

What SDOT Heard

Open House Attendees by Location

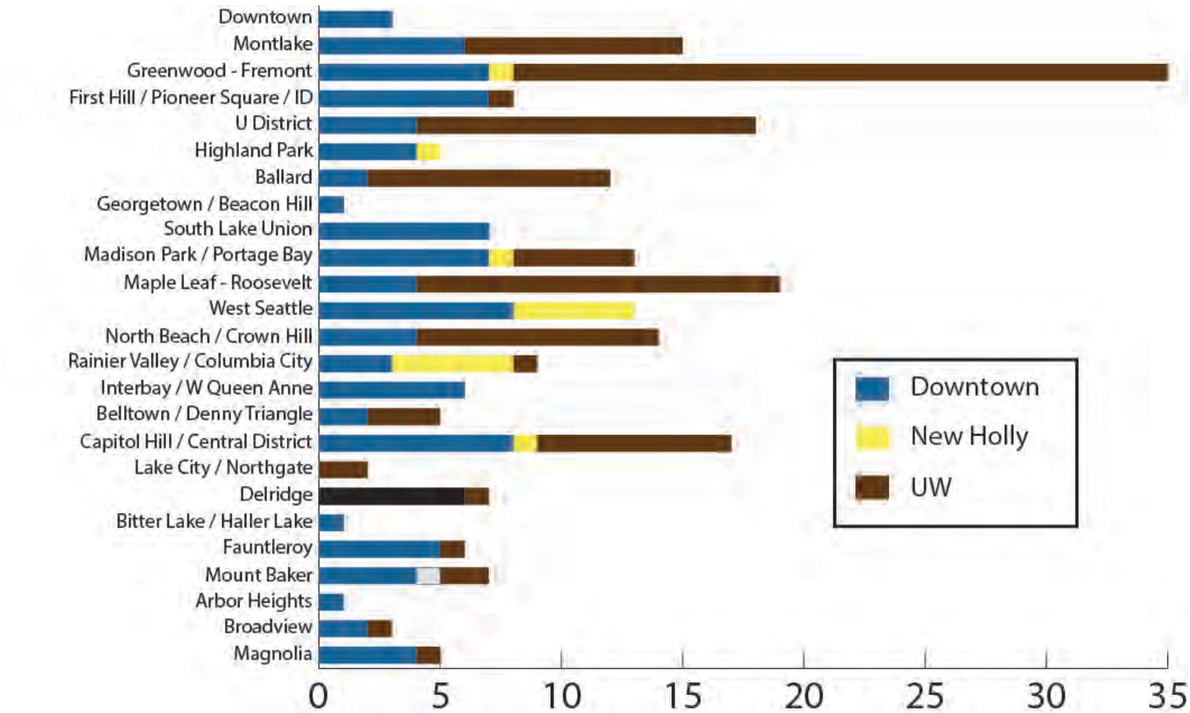


Figure 1: Open House Attendance and Attendees Place of Residence

This section explains some of the feedback SDOT received at the three open houses, the online “Add & Delete” mapping tool, as well as the responses received via email and letter from various individuals and organizations. Almost 300 individuals attended the open houses, which were held at City Hall, New Holly, and the University District. Over 1,400 people used the online mapping tool and comment sheet, and over 200 emails came in with comments and feedback about the various elements of the plan. The graph above represents the neighborhoods that the attendees of the open houses live in.

In an effort to organize the thousands of comments that SDOT received, this chapter categorizes comments based on the topic responded to. The sections are:

- Responses to the NETWORK MAP
- Responses to the PROGRAMS & POLICY FRAMEWORK
- Responses to the BICYCLE FACILITY TOOLKIT & FACILITY DESIGNATION CRITERIA

SDOT aggregated all feedback that contained suggestions for additional bicycle facilities to understand where the community saw gaps in the draft network. The corridors that were in the top 20% of popularity are highlighted to the right, in Figure 2. Considering that many users of the online mapping tool did not use the tool as directed, the corridors highlighted are understood as areas where respondents generally *support a bike facility*. One result of the facilities that the public showed significant support for was an increase in multimodal corridors; SDOT also heard that there were too many miles of multimodal corridors. Decision framework strategies on multimodal corridors are being analyzed and will be included in the draft plan.

Figure 2: Top "Add" Corridors

Similar to the top "*add*" corridors, many users of the online mapping tool drew "*delete*" lines where there was no facility planned; therefore SDOT is interpreting this map (figure 3) as the corridors where respondents do not support a bike facility. One of the main reasons individuals suggested removing facilities was safety concerns: steep grades, narrow right-of-way, car-door zones, high automobile speeds, reckless driving, poor road quality, conflict with streetcar tracks, and railroad train tracks. In some cases, many respondents commented that they would like to see more space allocated for cars on streets rather than install a bicycle facility. This was especially prevalent in downtown and NE 65th St.

Figure 3: Top "Delete" Corridors

Multimodal Corridors

An area of focus during the public comment period was multimodal corridors. A multimodal corridor is identified where a Transit Master Plan priority transit corridor or a Major Truck Street coincide with either an existing bicycle facility or a proposed bicycle facility. These overlaps are largely due to the nature of Seattle's topography and the streets' ability to provide direct connections to destinations.

Many respondents commented that the plan was too ambitious with its quantity of multimodal corridors, and suggested that SDOT consider moving some of the facilities to nearby residential streets. Others commented that they would like to see space on multimodal corridors allocated to bikes, since they are often the best streets for direct access to key destinations. The right-of-way on S Jackson St. was particularly addressed because of the First Hill Streetcar that is being installed. SDOT heard from many respondents that they would have preferred a physical separation from the cars, buses, and streetcar, yet the design that is being implemented is installing shared-lane markings and keeping two travel lanes each direction for transit and cars. Alternatives on nearby residential streets are being studied.

Intersections

Intersection improvements were also a popular topic among the public comments. SDOT heard from respondents that even if a bicycle facility provides sufficient protection from automobiles, a bad intersection becomes a significant barrier and can deter a lot of people from riding. In addition to existing intersection concerns, many individuals had questions about how future facility designs will impact and mitigate intersection crossings. Particularly, many questions were raised around cycle track intersections and the intersection of neighborhood greenways with arterials. Some of the intersections that received a large number of feedback are:

- 39th Ave NE & Burke-Gilman Trail
- Crossings of 23rd Ave E
- Underpass of Aurora at N 46th St.
- Burke-Gilman Trail / 7th Ave NE / NE 40th St.

Address Existing Connectivity Gaps

The public had concerns about existing connectivity gaps that make connections between neighborhoods difficult in Seattle. Physical barriers like I-5 or waterways create bottlenecks at existing crossings and access for bicyclists is often difficult and unsafe. Connectivity gaps that impede bicycle access in Seattle include:

- I-5
- Aurora / SR 99
- Ship Canal / Lake Union / Portage Bay / Montlake Cut
- Duwamish River
- SR-520

Local Knowledge of Neighborhood Greenway Routes

One aspect of the 2013 update to the Bicycle Master Plan is the implementation of a neighborhood greenways network throughout the city. This facility type has proven to be a successful method to navigate bicyclists and pedestrians within their neighborhoods, as well as provide alternatives to arterials that have constrained right-of-way space. 226 miles of "Enhanced Street" facilities were on the draft network map, most of which are planned to be designed as neighborhood greenways. Although SDOT analyzed every street for its feasibility and connectivity, no one knows their neighborhood better than the people that live or work there. Throughout all of the open house events SDOT heard where neighborhood greenway routes could be tweaked to make the best route through each neighborhood.

"36th Ave NE, between the Burke Gilman Trail and NE 70th. This is a much better alternative to 35th Ave NE, as drawn on the map. By comparison, 36th Avenue is a much calmer street, and is already actively being used by many bicyclists..."

BMP Update Respondent

At the open houses, a preliminary list of programs was provided for individuals to comment on, as well as suggest ideas of their own. Each attendee was given dot stickers to place on the programs board, to show which of the ideas they supported. The results are displayed in the table to the right (figure 4). The top programs are described below.

Programs Board

Figure 4: Programs Board Results

Bicycle safety in drivers' education & licensing

The need for bicycle safety education within the WA State drivers' licensing process was the most supported program during the public comment period. With the bicycle facility design field evolving fast, it is difficult to keep those who do not use bicycle facilities aware and informed. SDOT is conducting research on methods that could be introduced into the licensing process to inform drivers of the various types of bicycle facilities on our roads and how to interact with them.

Bicycle-friendly business district program

The second most popular program idea was bicycle-friendly business districts. A bike-friendly business district (BFBD) is a commercial district where merchants encourage customers and employees to bike to the district to shop, dine, and work. Bikes are an integral part of a BFBD's everyday operations, and add to the livability, enjoyment, and activation of the street. In addition, the economic benefit that bicycle infrastructure can provide to a neighborhood business district is little known, but potentially significant. The gap in data prevents SDOT from being able to tell businesses how they may be affected by changes in the right-of-way; research is currently being conducted to better understand this relationship.

Education & enforcement efforts

Even with sufficient education, many roadway users simply do not follow the rules. This includes motorists, bicyclists, and pedestrians. This is particularly dangerous for bicyclists and pedestrians due to their lack of protection from automobiles. Not only was this a popular program at the open houses, but many individuals who wrote letters and submitted online surveys said that they would like to see enforcement on our roads increased – for everyone.

Other Programs

Another popular program that would strengthen the cycling community is starting cyclovias in Seattle. A cyclovia is an event, usually during the weekend on a commercial street, where the road is closed to cars. Bikes, pedestrians, scooters, strollers, and pets fill the streets and make for a safe way to enjoy a whole new part of your neighborhood. Lastly, respondents said they would like to see the benefits of biking marketed more to the public. Bicycling is a great way to save money, stay in shape, and help your community; so we might as well advertise that for anyone who is not already aware.

Policy

In addition to the ideas presented on the display boards, SDOT heard from many individuals about ideas they have and policies they would like to see implemented along with the plan. Lots of respondents were interested in how SDOT plans to measure the performance of the BMP Update. Three areas were highlighted as metrics that should be used to measure success: demographics of cyclists, number of accidents, and connectivity of the network.

RESPONSES TO BICYCLE FACILITY TOOLKIT & FACILITY DESIGNATION CRITERIA

The bicycle facility toolkit, which described each type of facility that is included on the draft network map was presented (see Appendix B). In general, attendees agreed with the facility designs that were proposed in the plan, however SDOT received valuable feedback on areas to provide more detail and tweak the facility designs to adapt to Seattle's unique geography. Below are some of the common responses that emerged:

Bicycle Facility Toolkit

- Need for intersection design criteria;
- Concern about the proximity of bike lanes to the "door zone";
- Downhill cycletracks may not be safe due to speed of cyclists;

Bicycle Facility Designation Criteria

- More detailed information on:
  - Truck volumes,
  - Transit classifications,
  - High ridership stop locations,
  - 85% speeds,
  - Slope;
- Modifications to facilities:
  - Neighborhood greenways – should have its own classification;
  - In street, major separation – ADT threshold should be lower; and
  - In street, minor separation – should not be considered an "All Ages & Abilities" facility.

How SDOT Will Respond

NETWORK MAP

Legibility

Consolidating public comment led SDOT to realize that many individuals were having a difficult time understanding the network map. People commented that the map looked like a “Universe of Possibilities” and did not help them understand how to best get from A to B, and which facilities were going to be the safest route versus the fastest route. In response, SDOT will break the network into two categories: a citywide network and a local connector network. The citywide network will strive to connect areas of high bike-demand with only “All Ages & Abilities” facilities. “All Ages & Abilities” facility types are multi-use trails, cycle tracks, and neighborhood greenways.

Gaps

Many respondents were interested in the plans for their neighborhood, and were quick to identify where gaps existed in the network. SDOT will continually refine the network map before publishing the draft plan. The gaps identified help to inform where to make revisions to the network map.

Multimodal Corridors

Many individuals had concerns about the amount of miles of bicycle facilities that were planned on Transit Priority Corridors or Major Truck Streets. SDOT will respond by refining the network map to reduce conflict with these modes.

Programs

The project team will continue to research programs that were presented during the public comment period. The focus will be on driver's license and education, programs in schools, and changes to our legislation to better promote bicycling. The draft plan will include program recommendations.

Bicycle Facility Toolkit & Facility Designation Criteria

There is desire for more information on how SDOT plans to treat intersections. SDOT has decided to include a list of *Catalyst Projects* in the plan, some of which will be intersection treatments, as well as develop intersection treatments suitable for all potential interesections. Catalyst Projects are improvements that make connections significantly safer for riders. These projects may be given high priority and will be examples of how infrastructure changes can be monumental for the connectivity of the bicycling network. In addition, details about slope and how it relates to the safety of a downhill cycle track will be included in the Bicycle Facility Glossary. This will avoid bicyclists from being "trapped" by a cycle track when they are traveling at high speeds alongside other bicyclists.

"I think the most important thing at this point would be to try to identify future potential cyclists, and see what barriers they perceive..."

BMP Update Respondent

"On steep uphill grades where bicycle and motor vehicle speeds might be very different and where cyclists may meander as they work to climb the grade, a separated facility may be more important."

BMP Update Respondent

Next Steps

In the final months before the release of the draft plan, SDOT will focus on refining the draft network map, developing a prioritization framework and implementation strategy, and recommend end-of-trip facilities. The draft plan will be released for public comment in June 2013. The final plan is expected to be adopted in late 2013. Thank you for providing feedback to the Bicycle Master Plan update, and stay tuned for the release of the draft plan!

APPENDICES

APPENDIX A: List of Events

APPENDIX B: Display Boards from Open Houses

APPENDIX C: Comment Sheet

APPENDIX D: Presentation

APPENDIX E: Network Map (by sector)

Appendix A: LIST OF EVENTS

November, 2012 meetings:

- 7: Open House – City Hall
- 8: Open House – New Holly
- 13: Open House – University District (Gould Hall - UW)
- 15: Online Lunch & Learn
- 16: downtown Employer Transportation Coordinators
- 20: Seattle Freight Advisory Board
- 26: City Neighborhood Council
- 28: Southeast District Council
- 29: Downtown Seattle Association bike event

December, 2012 meetings:

- 5: Seattle Youth Commission
- 5: Seattle Bicycle Advisory Board
- 10: Sound Transit
- 11: Neighborhood Greenways Organizers
- 12: Chief Sealth High School / Major Taylor Project
- 12: Seattle Pedestrian Advisory Board
- 13: West Seattle Bike Connections
- 18: Cascade Bicycle Club - Bikes & Business Forum

January, 2013 Meetings:

8: University of Washington

14: Laurelhurst Community Club

15: Seattle Freight Advisory Board

15: Magnolia Community Club

16: Morgan Community Association

16: Delridge Neighborhood District Council

22: North Seattle Industrial Association

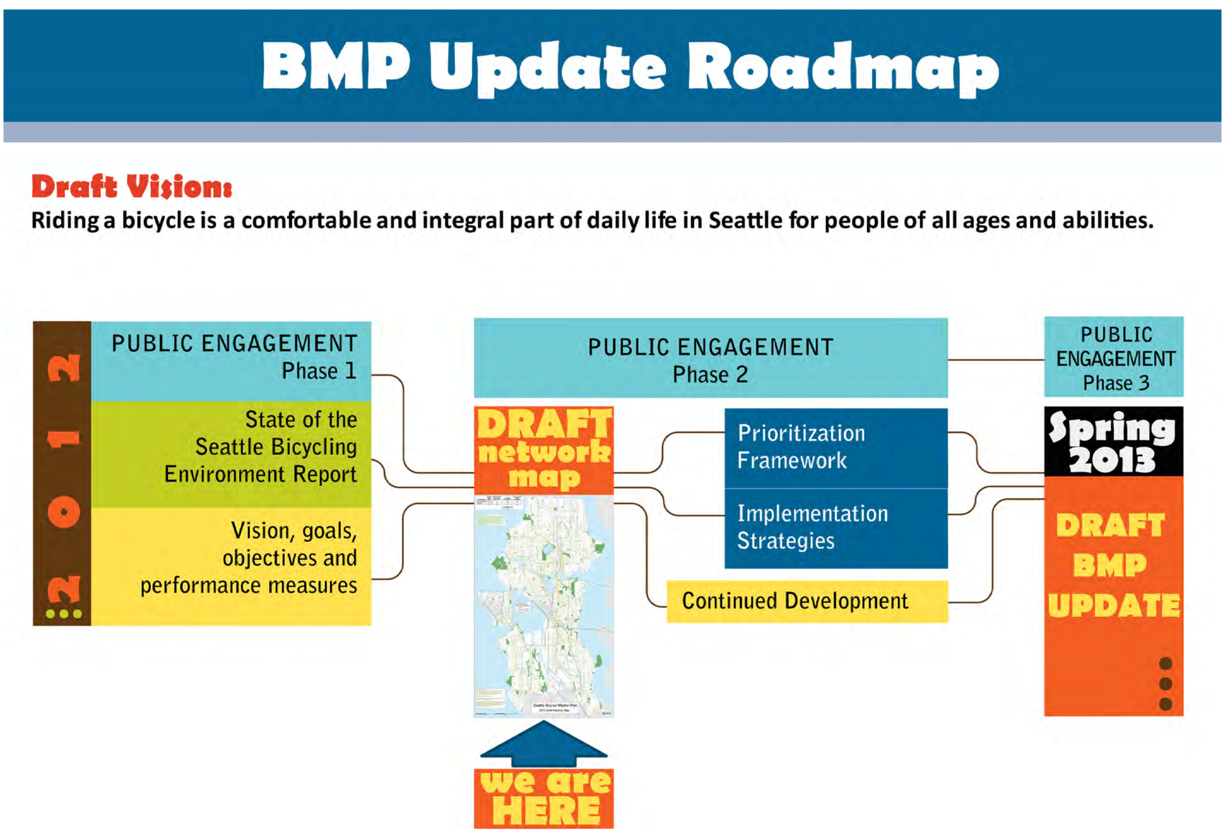
23: American Institute of Architects (AIA) Seattle

25: King County Metro

25: Port of Seattle

WELCOME
Visit the following stations as you move around the meeting tonight and learn more about the Bicycle Master Plan Update.
1. Vision—Review the vision for bike riding in Seattle and see the process for completing the Bike Master Plan Update
2. Goals—Consider the five goals of the Bike Master Plan Update and share your thoughts
3. What We've Heard—Learn what we've heard to date and how we're addressing your input
4. Draft Citywide Bike Network Map—See where we are recommending facilities and share your thoughts
5. Bike Facilities Toolkit—See examples of Neighborhood Greenways, Cycle Tracks, intersection treatments and more innovative facilities that may be built
6. Programs—Share ideas and help prioritize programs to encourage more bike riding
7. Creative Corner—"Seattle: best scene from a bike." Help us illustrate why biking is a great way to travel around Seattle
8. Be Super Safe— Be a part of Seattle's awareness campaign to increase road safety
9. Bike Share—Find out how this innovative project will be part of Seattle's urban transportation network providing on-demand bikes for short trips

seattle bicycle master plan update goals •••
1. Ridership – Increase the amount and mode share of bicycle riding in Seattle for all trip purposes
2. Safety – Improve safety for bicycle riders
3. Connectivity – Create a bicycle network that connects to places people want to go and provides a time-efficient travel option
4. Equity – Provide equal cycling access for all through public engagement, program delivery, and capital investments
5. Livability – Build vibrant and healthy communities by creating a welcoming environment for bicycle riding
SDOT



BMP Update Roadmap
Draft Vision:
Riding a bicycle is a comfortable and integral part of daily life in Seattle for people of all ages and abilities.
2012
PUBLIC ENGAGEMENT Phase 1
State of the Seattle Bicycling Environment Report
Vision, goals, objectives and performance measures
DRAFT network map
PUBLIC ENGAGEMENT Phase 2
Prioritization Framework
Implementation Strategies
Continued Development
PUBLIC ENGAGEMENT Phase 3
Spring 2013
DRAFT BMP UPDATE
we are HERE


what we've heard ...
Maintenance—Poor pavement conditions, faded paint, debris and construction impacts
Safety—Dangerous behavior by all road users and the quality of existing bicycle facilities and routes
Facilities—Lack of facilities that work for bicycle riders of all ages and abilities
Education and enforcement—General lack of knowledge and compliance with rules of the road
Non-infrastructure challenges—Weather and hills are barriers, as is limited bicycle ownership/access
SDOT


how we're responding ...
Safety—Implement 'Be Super Safe, Seattle' neighborhood toolkits, consider bicycle-specific safety education programs and campaigns, and update bicycle facility types and design standards.
Maintenance—Update maintenance implementation and funding strategies and pilot different types of road striping paint
Facilities—Add new all ages and abilities facilities to the network map, update design standards for exisiting facilities and establish new facility designation thresholds
Education and enforcement—Develop programs and campaigns to educate all users of the roadway about bicycle facilities and improvements, market bike-friendly business districts and enforce illegal behavior
Non-infrastructure challenges—Research hill climb assistance techniques, begin Puget Sound Bike Share program, and update city policies for use of abandonded bikes.
SDOT


Programs
The BMP is about more than concrete and paint!
Please use your dots to indicate which programs you think will help achieve the BMP's vision of making Seattle a place where riding a bicycle is a comfortable and integral part of daily life for people of all ages and abilities, and suggest your own ideas in the space below!
BMP Goals
PROPOSED PROGRAMS
(See handout for descriptions)
Ridership
1. Marketing campaign
I BIKE
2. Workplace promotion of bike commuting
EVERYONE IS DOING IT
3. Family ride nights
Safety
4. Bike safety in drivers' education & licensing
5. School-based safety programs
6. Education & enforcement efforts
Connectivity
7. Promotion of new bicycle facilities
8. Promotion of bike & transit connections
9. Marketing strategies for hills and weather
HILLS
Equity
10. Neighborhood & residential campaigns
IN MOTION
11. Youth employment programs in bike-related fields
12. Outreach & promotion of biking to seniors
SENIOR CYCLING
Livability
13. Bicycle Sundays continuation & expansion
14. Bike-friendly business district program
BIKE LB
15. Outreach to untraditional partners
Suggest your own!


bicycle facility toolkit •••
In street, minor separation
NE Pacific St.
Conventional Bike Lane
Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and flows in the same direction as motor vehicle traffic.
Buffered Bike Lane
Buffered bike 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.
Dexter Ave N
In street, major separation
Vancouver, BC
Portland, OR
Cycle Track
A cycle track is an exclusive bike facility physically separated from motor traffic and distinct from the sidewalk. Cycle tracks have different forms but all share common elements – the space provided is exclusively for bicycles, and they are physically separated from motor vehicle lanes, parking lanes, and sidewalks
SDOT


bicycle facility toolkit •••
Enhanced street (non-arterial)
N 43rd St
Neighborhood Greenway
Neighborhood Greenways are streets with low motorized traffic volumes and speeds, designated and designed to give people who walk and bike priority. Neighborhood Greenways use signs, pavement markings, and other measures to discourage through trips by motor vehicles and create safe, convenient bicycle and pedestrian crossings of busy arterial streets.
Enhanced street (arterial)
Shared Lane Marking
Shared Lane Markings (SLMs), or "sharrows," are road markings used to indicate a shared lane environment for bicycles and automobiles. Although shared lane markings are not a facility type, they do provide a variety of uses and support a complete bicycle network.
S Jackson St
Off-Street
Burke-Gilman Trail
Multi-use trail
A multi-use trail allows for two-way, off-street bicycle use and also 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.
SDOT


bicycle facility toolkit •••
Sample Intersection Treatments
Pine & 12th
Green Bike Box
A bike box is an safe and visible area for bicyclists to queue in front of motor vehicle traffic at signalized intersections.
Dexter Ave N
Intersection Crossing Markings
Bicycle pavement markings through intersections guide bicyclists and indicate the intended path of through an intersection or across a driveway or ramp to motor vehicles.
Portland, OR
Two-Stage Turn Box
Two-stage turn queue boxes facilitate safe turning movements by providing a designated space in the direction of traffic for bicyclists to pull into before crossing the roadway perpendicularly.
Fremont Ave N & N 34th St
Fremont Ave
Bicycle Signal
Bicycle detection at traffic signals uses either push-buttons or automated detection to alert the signal controller of the presence of a waiting cyclist.
Vancouver, WA
Median Refuge Island
Median refuge islands are protected spaces in the middle of the street to facilitate bicycle and pedestrian crossings.

Bicycle Master Plan

Public Meeting Comment Sheet

TODAY'S DATE:

Thanks for attending the Bicycle Master Plan (BMP) Update public meeting. Please fill out this comment sheet to help make riding a bike more safe, comfortable and convenient in Seattle.

Proposed Citywide Bicycle Network Map

Review the proposed citywide bicycle network map and answer the questions below.

1. Are there any streets missing a bike facility and why should it be **added**?

2. Are there any streets where a bike facility should be **removed** or relocated and why?

3. Refer to the handout on **facility designation criteria.** Do the criteria make sense? Why or why not?

4. Some bike facilities are located on **multi-modal corridors**. Adding facilities to these corridors could require trade-offs such as on-street parking removal or motor vehicle lane reduction. Do you have comments or concerns about these corridors?

POLICY FRAMEWORK

Refer to the plan **policy framework handout**. Do you have comments on the goals, or recommended changes? Based on the five plan goals, what do you think are the most important things to measure (e.g., number of bicycle riders, decrease in serious injuries, increase in number of bike riders in different demographic groups, percentage of households within ¼ mile of bike facility, etc.) to ensure that we are achieving the goals in the future?

PROGRAMS

Refer to the handout on **potential programs**. Which of these programs do you think would be most effective in achieving the five plan goals? Do you have other ideas?

WHAT ELSE?

Do you have any comments on the draft goals, facility toolkits, or any other information presented tonight?

Need more time to respond to comments? Would you like your friends, neighbors and local businesses to provide input? Visit **www.seattle.gov/transportation/bikemaster.htm** to comment on our online citywide bicycle network map available starting November 15 or email comments to **bmpupdate@seattle.gov**.

Comments must be received by **December 17, 2012**. SDOT will incorporate feedback in the draft Bicycle Master Plan Update which will be released for public review in spring 2013.

AGENDA

- Overview of the 2007 Bicycle Master Plan (BMP)
- BMP update roadmap
- What we've been hearing
- State of the Seattle Bicycling Environment report
- Proposed policy framework
- Draft programs
- Draft network map development
- Next steps

2

What is the Bicycle Master Plan?

- A blueprint for making improvements to Seattle's bicycle network since adoption in 2007
- Two goals:
  - Triple the amount of bicycling between 2007-2017
  - Reduce the rate of bicycle collisions by one-third between 2007-2017
- Focused on completing the urban bicycle trail system and expanding on-street bicycle facilities

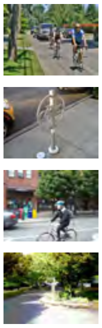
3

Bicycle Master Plan Accomplishments

- Significant Accomplishments Since 2007
  - Installed 129 miles of on-street facilities, including bike lanes and sharrows (shared lane markings)
  - Added nearly 8 new miles of multi-use trail improvements
  - Implemented 98 miles of signed bicycle routes
  - Installed over 2,200 bicycle parking spaces

4

Why update the BMP?



- The plan assumed an update after five years (timeline of the plan is 2007-2017)
- Fast-evolving best practices in safety and design
- Opportunity to include new bicycle facilities
  - Focus on a more dense, intra-neighborhood bike network (neighborhood greenways)
  - On-street separated bicycle facilities (cycle tracks)
- Interest in a more data-driven method to identify facility needs and priorities (similar to Pedestrian Master Plan)

5

BMP Update Roadmap

4

What We've Been Hearing

Summary of public comments to date:

- Safety
- Facilities
  - Concerns about some existing facilities
  - Future: design for all ages and abilities
- Maintenance
- Education and enforcement
  - Understanding the rules of the road for all users
- Non-infrastructure challenges
  - Weather and hills

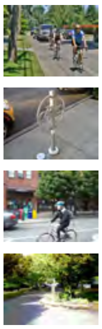
7

State of the Seattle Bicycling Environment Report

- Presents data and information on what has been implemented since the BMP was adopted in 2007
- Helps set the stage for developing recommendations in the Bicycle Master Plan Update

8

Why update the BMP?



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5

BMP Update Roadmap

4

What We've Been Hearing

Summary of public comments to date:

- Safety
- Facilities
  - Concerns about some existing facilities
  - Future: design for all ages and abilities
- Maintenance
- Education and enforcement
  - Understanding the rules of the road for all users
- Non-infrastructure challenges
  - Weather and hills

7

State of the Seattle Bicycling Environment Report

- Presents data and information on what has been implemented since the BMP was adopted in 2007
- Helps set the stage for developing recommendations in the Bicycle Master Plan Update

8

Draft programmatic categories

Programs to help achieve the goals: ridership, safety, connectivity, equity, livability

13

Draft Network Map Development

Purpose: to update the bicycle network map in a manner that is consistent with updated plan vision, goals and objectives

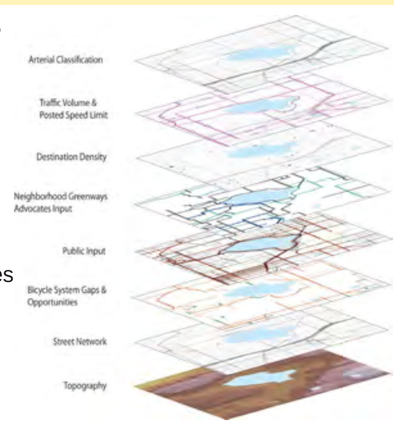
- Principles:
  - Consider land use (destinations and demand rankings)
  - Emphasize network connectivity
  - Improve conditions for bicyclists of all ages and abilities

14

Draft Network Map Development

Network map update approach

- Step 1:
  - Data and inputs:
    - 2007 BMP recommendations
    - Gap analysis
    - Identified opportunities
    - Demand/land use destinations
    - Topography
    - Public input
    - Policy framework

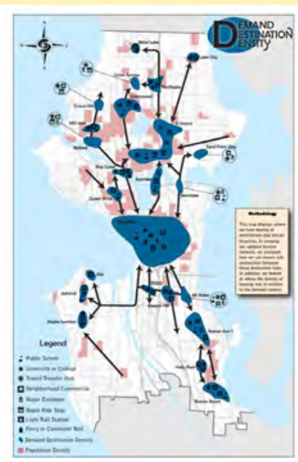


15

Draft Network Map Development

Network map update approach

- Demand/land use destinations – connect people to places they want to go



Draft Network Map Development

Network map update approach

- Step 2:
  - Developed a draft network representing the 'universe of possibilities' based on step 1
    - Have a bicycle facility within a quarter-mile of every household

Draft Network Map Development

Network map update approach

- Step 3:
  - Recommend facility types
    - Update facility types (bicycle facility toolkit):
      - Condense the legend in updated network plan map (current legend is very complex and too directive)
      - Include of neighborhood greenways
      - Include in-street, minor and major separation designations
    - Proposing a tiered facility approach
      - Encourages facilities that will work for bicycle riders of all ages and abilities
      - Allows for some design flexibility based on local conditions and changes to design standards

18

Draft Bicycle Facility Toolkit

- Enhanced street – neighborhood greenways

- In street, minor separation – bike lanes and buffered bike lanes

- In street, major separation – cycle tracks

19

Draft Network Map Development

Preliminary Draft Bicycle Facility Designation Criteria

Generalized Bicycle Facility Designation	Detailed Bicycle Facility Designation	Speed Limit (mph)	ADT (vehicles per day)	Street Classification
Enhanced street	Neighborhood Greenway	25 or less	1,500 or less	Non-arterial
	Shared lane pavement marking	25	To be used due to ROW constraints or downhill	Non-arterial and Collector/minor arterials
In street, minor separation	Bicycle lane	25-30	8,000 or less	Collector arterials
	Buffered bicycle lane	25-30	15,000 or less	Collector/minor arterials
In street, major separation	Cycle track (raised or with barrier)	30 and greater	15,000 and above	Minor/principal arterials
Off-street	Multi-use trail	N/A	N/A	N/A

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Draft Network Map Development

Preliminary Draft Bicycle Facility Designation Criteria

"Enhanced Street"

- Most are proposed to be neighborhood greenways
- The specific location of a neighborhood greenway may change based on more detailed analysis and design work
- Map is intended to show corridors where a greenway would be an appropriate connection


21

Draft Network Map Development




Multi-Modal Corridors – (highlighted in yellow)

The map designates some areas as multi-modal corridors, based on:

- Priority transit corridors identified in the City's Transit Master Plan (TMP)
- Major Truck Streets (key freight routes)
- Will require more analysis about potential to build a bicycle facility on that street, or a parallel street

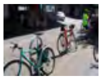
22

Draft Network Map Development

Street Designation	Total Miles on Network Map	Existing Facilities that Meet/Exceed Recommendations	New Facilities Recommendations	Upgrade to Existing Facility Recommended	Facilities to build
Enhanced Street	226	15	211	0	211
In Street, Minor Separation	200	43	109	48	157
In Street, Major Separation	137	0	80	57	137
Off-Street	64	46	18	0	18

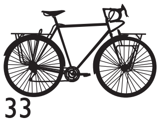
Key Questions on Draft Network Map






1. Are there streets that are missing a bicycle facility that should have one ADDED and why?
2. Are there any proposed streets that do have a proposed bicycle facility that should be REMOVED and why?
3. Does the proposed facility designation criteria make sense?
4. Are there any concerns about the multi-modal corridor approach and the potential trade-offs that could arise?

24



BMP Update Next Steps

- The comment period on the draft map and other draft materials is open until Monday, December 17.
- Find the draft materials here: http://www.seattle.gov/transportation/bikemaster_materials.htm

25

BMP Update Next Steps

Thank you for attending!
Please give us your input.

Project Website:
www.seattle.gov/transportation/bikemaster.htm

Project email address: bmpupdate@seattle.gov

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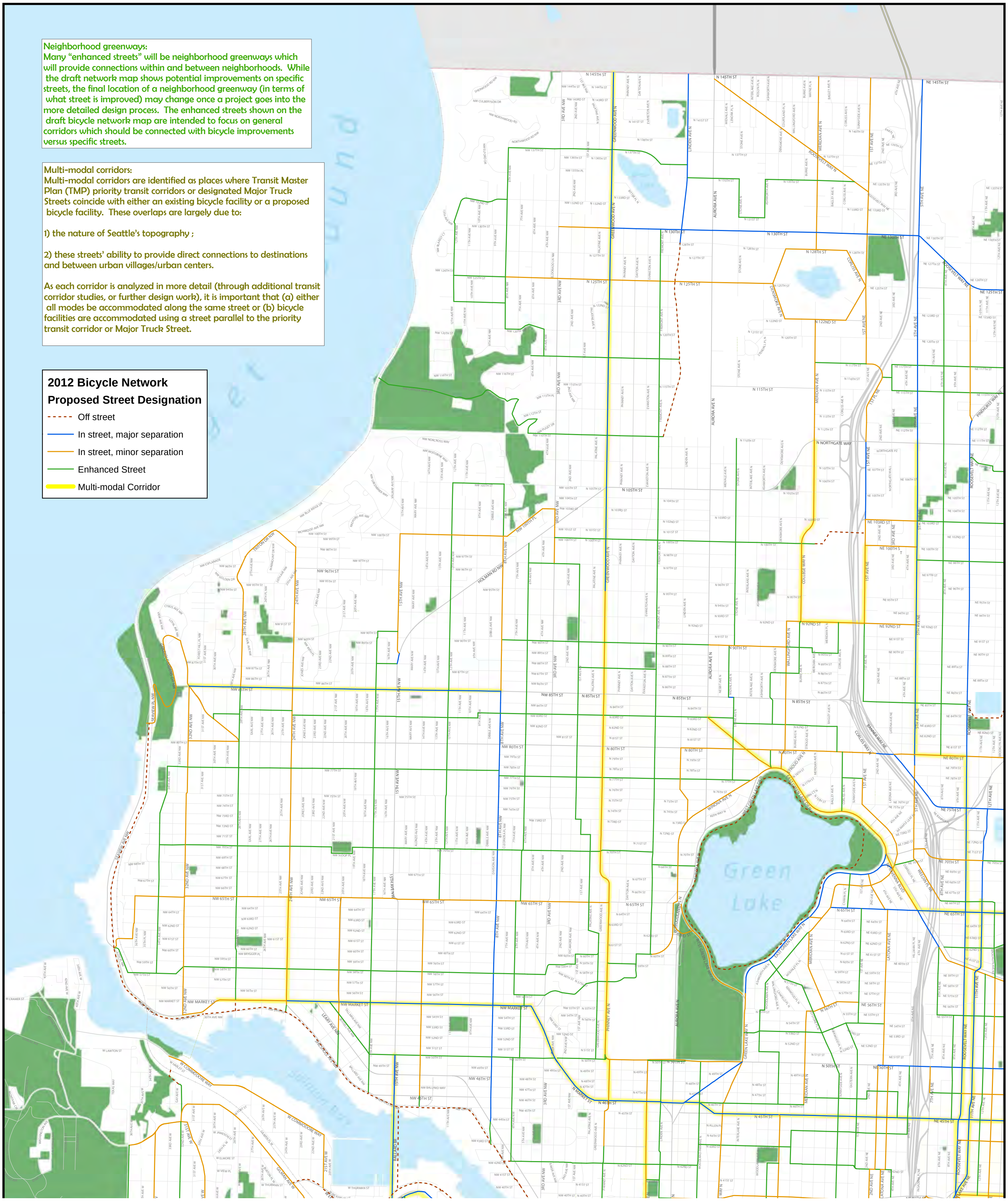
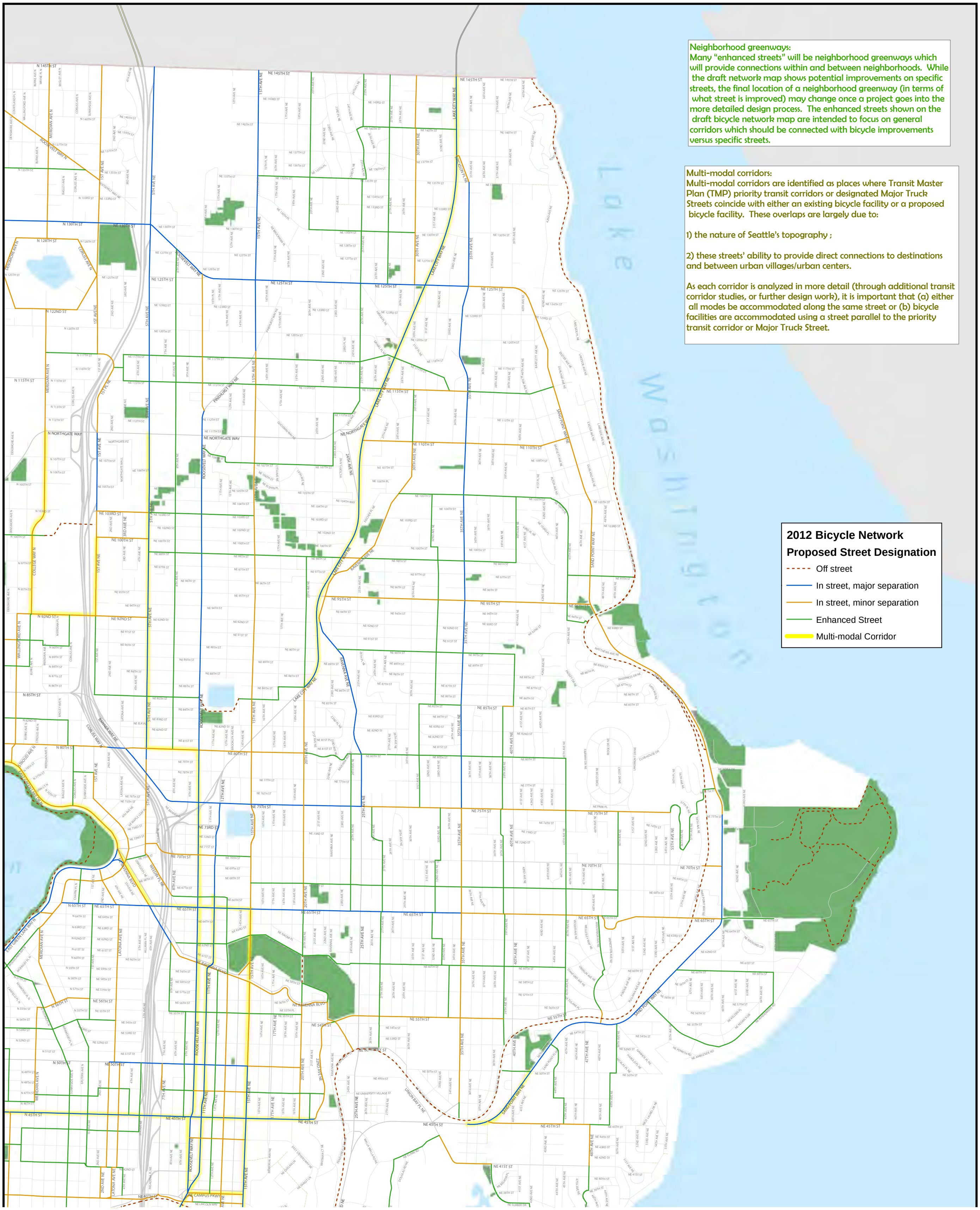
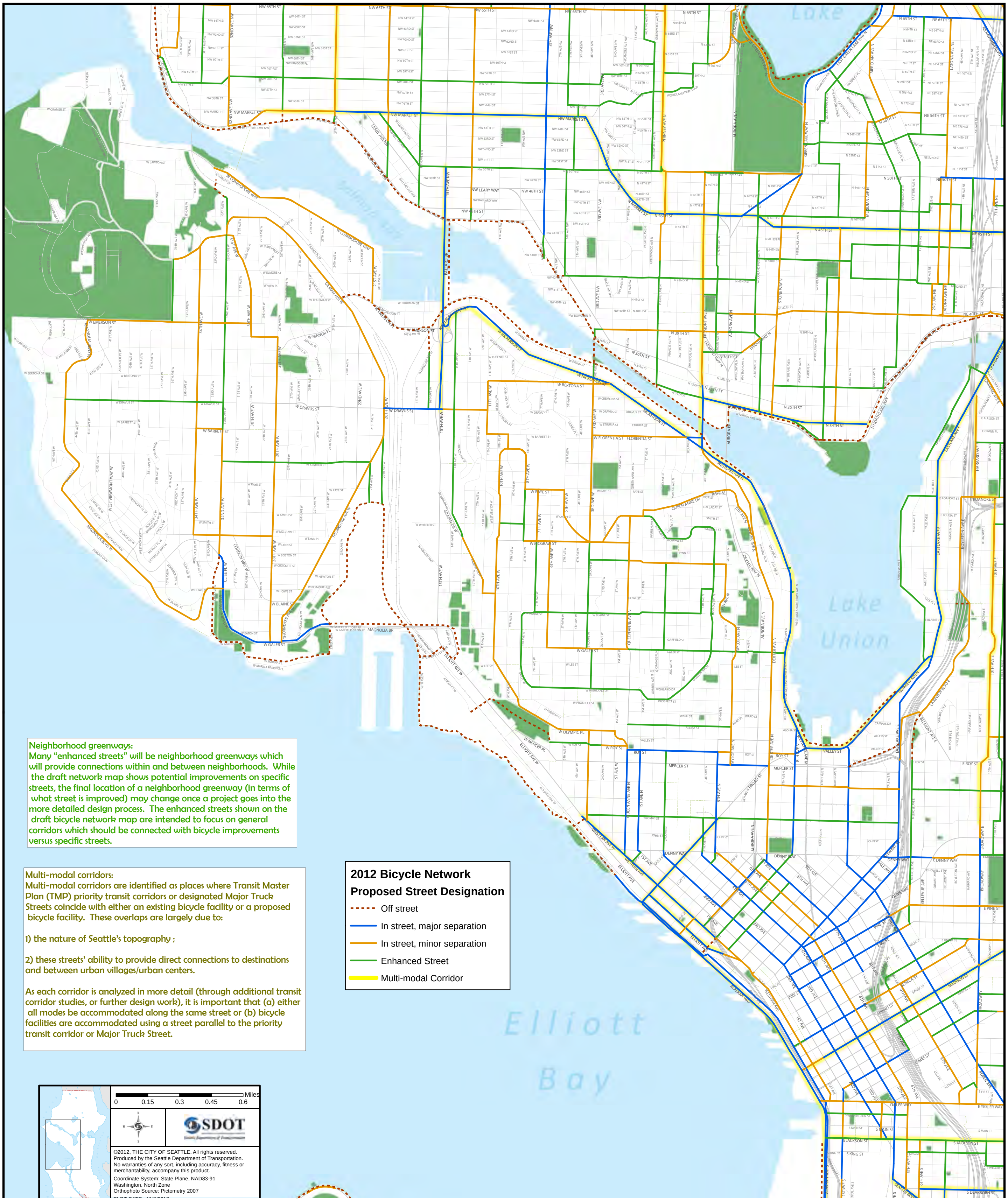
Appendix E: DRAFT NETWORK MAP (NW)



Appendix E: DRAFT NETWORK MAP (NE)



Appendix E: DRAFT NETWORK MAP (W)



Neighborhood greenways:
Many "enhanced streets" will be neighborhood greenways which will provide connections within and between neighborhoods. While the draft network map shows potential improvements on specific streets, the final location of a neighborhood greenway (in terms of what street is improved) may change once a project goes into the more detailed design process. The enhanced streets shown on the draft bicycle network map are intended to focus on general corridors which should be connected with bicycle improvements versus specific streets.

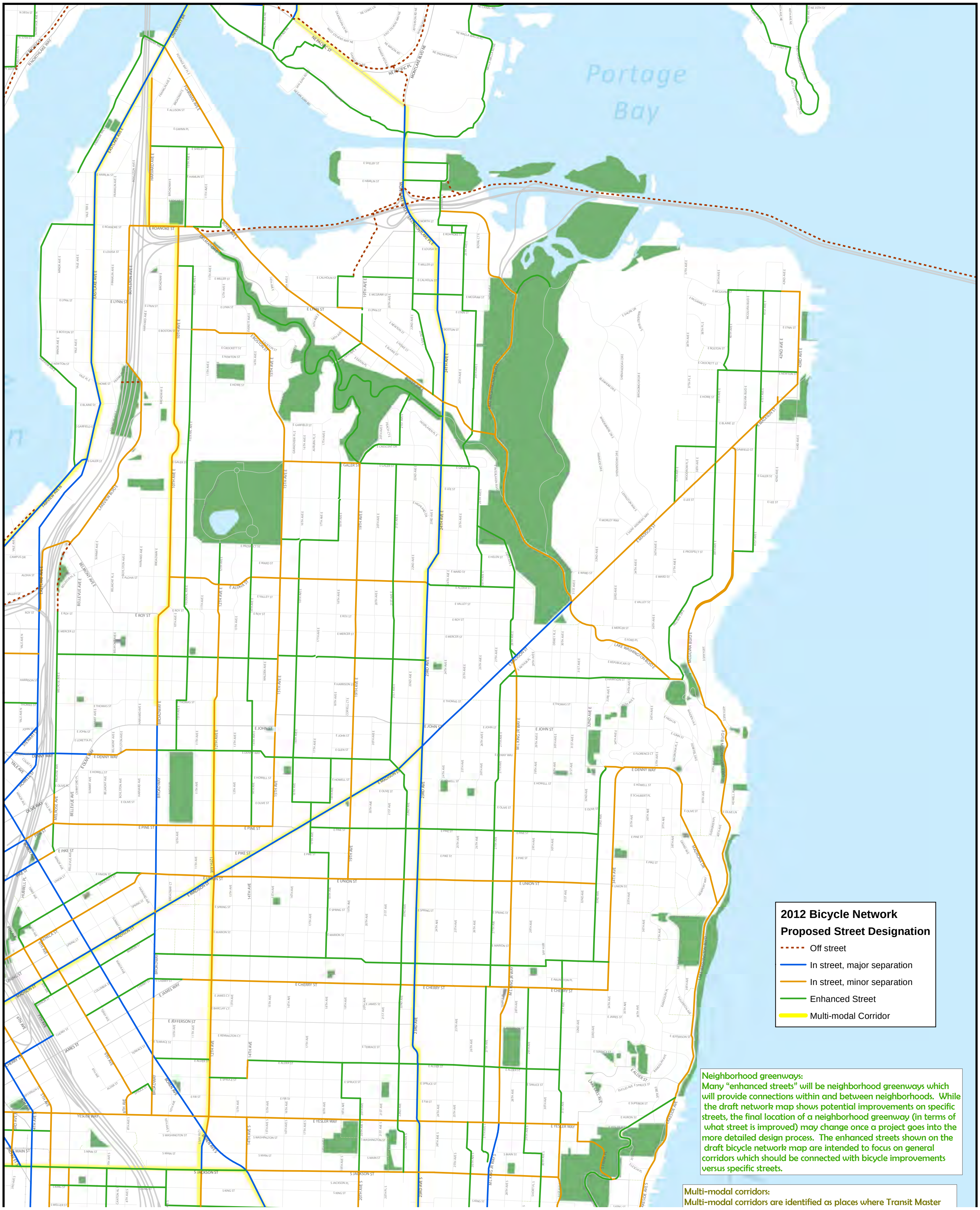
Multi-modal corridors:
Multi-modal corridors are identified as places where Transit Master Plan (TMP) priority transit corridors or designated Major Truck Streets coincide with either an existing bicycle facility or a proposed bicycle facility. These overlaps are largely due to:

1) the nature of Seattle's topography ;

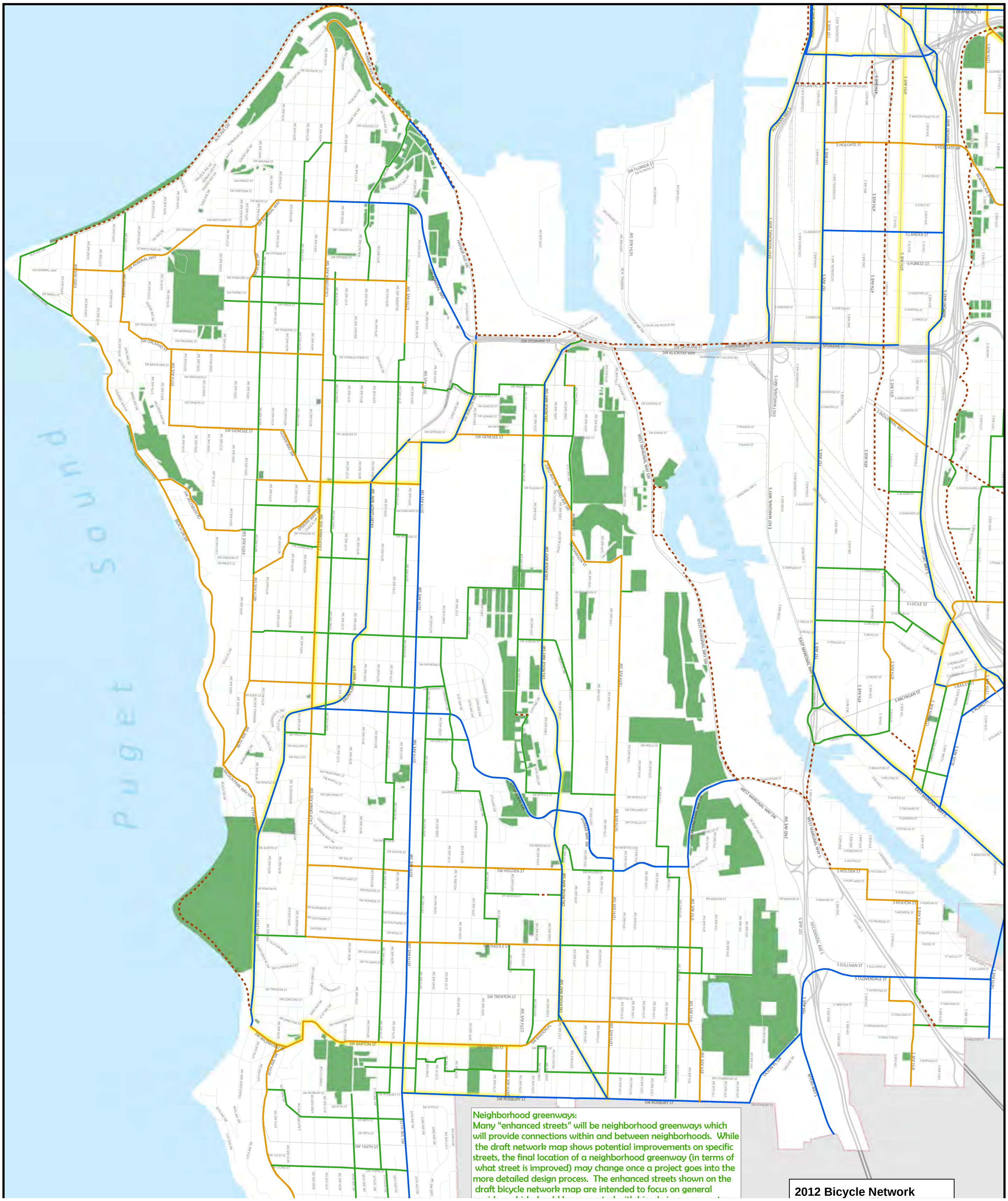
2) these streets' ability to provide direct connections to destinations and between urban villages/urban centers.

As each corridor is analyzed in more detail (through additional transit corridor studies, or further design work), it is important that (a) either all modes be accommodated along the same street or (b) bicycle facilities are accommodated using a street parallel to the priority transit corridor or Major Truck Street.

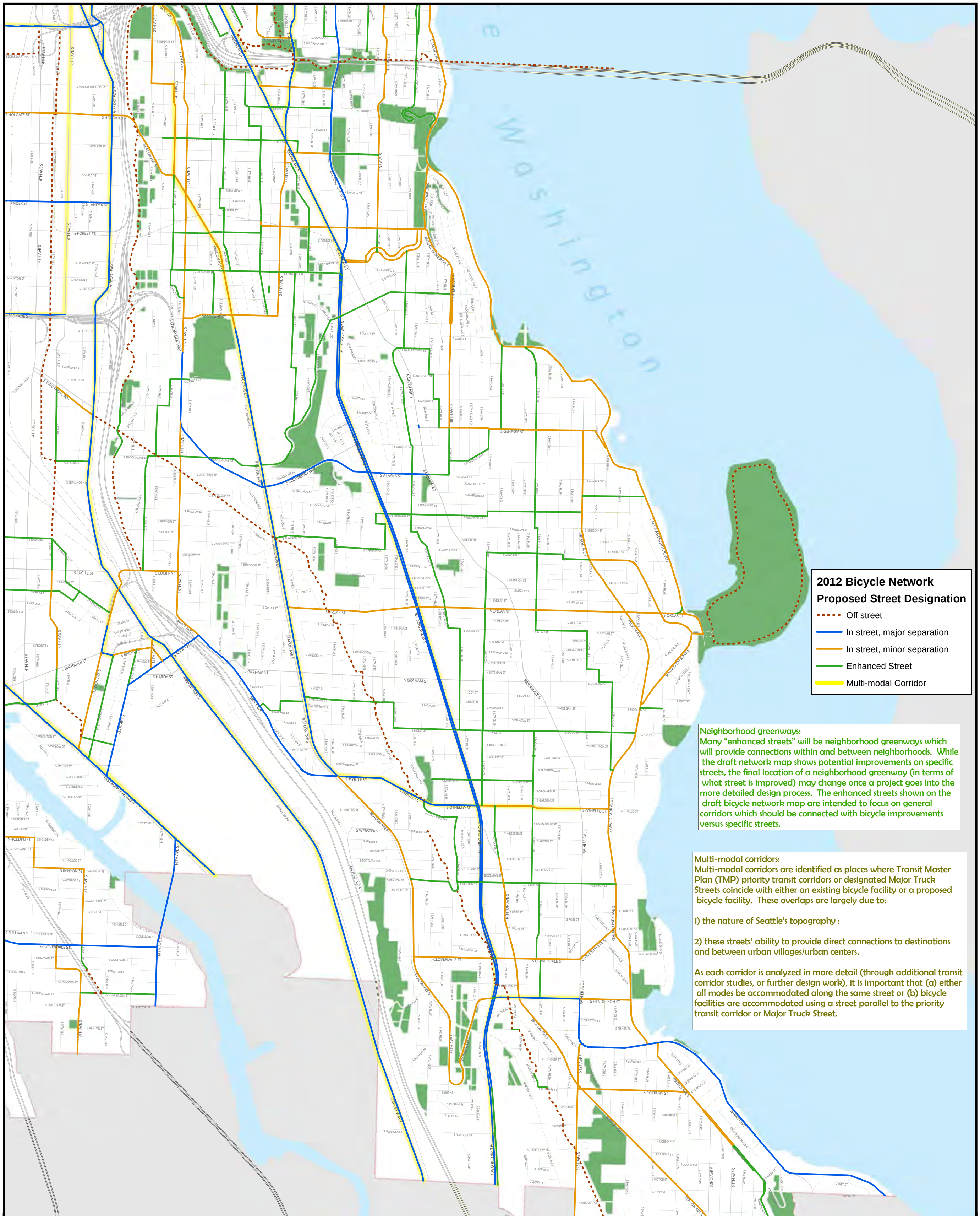
Appendix E: DRAFT NETWORK MAP (E)



Appendix E: DRAFT NETWORK MAP (SW)



Appendix E: DRAFT NETWORK MAP (SE)



contact information:
http://www.seattle.gov/transportation/bikemaster.htm

bmpupdate@seattle.gov

SDOT
Seattle Department of Transportation

Appendix 2: BEST PRACTICES

WHITE PAPERS

2A: All Ages and Abilities

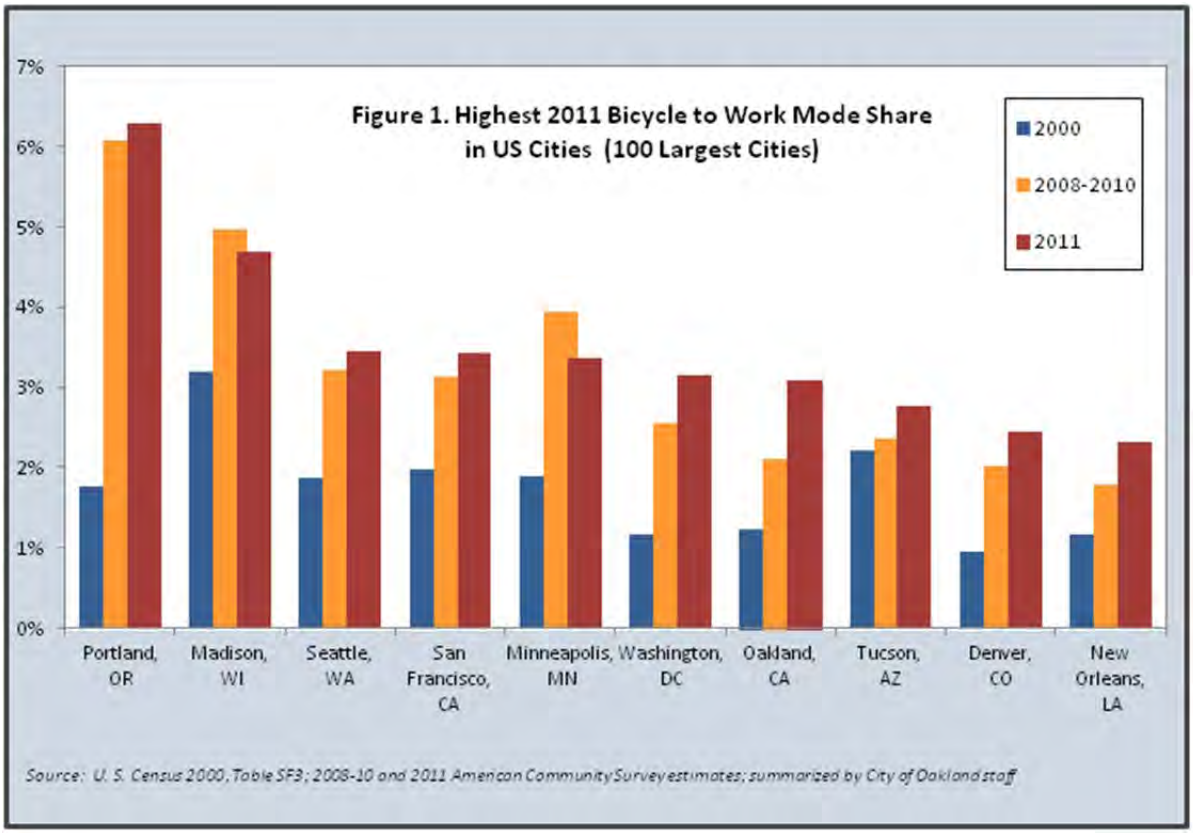
March, 2013

All Ages and Abilities White Paper

Seattle Bicycle Master Plan Update

1 Introduction

Cycling is on the rise in cities throughout the United States. Though still a small fraction of the US population[1], the number of people using bikes for commuting has grown dramatically in major cities during the last ten years (Figure 1). Seattle's mode share nearly doubled between 2000 and 2011, ranking third overall; in 2011, bicycle volumes in downtown Seattle were nearly 200% higher than in 1992. This is likely due to a variety of factors, including the recession, concerns about overall health and activity level, and greater awareness of cycling as a transportation option. However, much credit can also be given to the surge in bicycle facility installation since the late 1990's, when federal transportation law began to provide more support for non-motorized transportation. From paved shoulders on state routes to bike lanes in urban centers, increased on-road accommodation has increased cycling—and helped legitimize it as a way to get around.



[1] The 2010 American Community Survey, which measures work trips, calls the share .5 percent. However, the survey design has been critiqued as underestimating the extent to which people use bicycles for transportation.

Despite these improvements, the cycling mode share in U.S. communities lags behind international peers, such as Copenhagen, Denmark and Bogotá, Colombia, where facilities that minimize cyclist exposure to vehicular traffic have been major catalysts for change.

For example, in Seville, Spain a steep increase in bicycle mode share from 0.6% to 6.6% in three years has been credited in large part to the installation of 120 km of cycle tracks, which provide physical separation between cyclists and motor vehicles. Neighborhood greenways, residential corridors converted to bicycle priority routes, also attract a broad range of users. By providing a greater sense of protection than bike lanes and signed routes, low stress cycling facilities attract people who are more diverse in age, gender, ability, background, and travel needs—in other words, anyone who needs to move from points A to B and for reasons Y to Z.

Although on-street bicycle facilities and improvements have attracted more people to cycling, there are many who feel discomfort riding near motorized vehicles. Comfort thresholds vary greatly by person and context, especially when it comes to traffic tolerance. A college student with books in a rear basket might be more willing to use a bike lane next to parked cars and heavy traffic than a parent with a baby in a bike seat. For cycling to grow in U.S. cities, it needs to be a safe, pleasant, convenient option for the broadest array of people, often described as "8-80 years old" or of "all ages and abilities."

This paper seeks to answer the following questions:

- What does research say about mode choice and different types of cyclists?
- What are the limitations of bike lanes?
- What does a bicycle facility constructed for all ages and abilities (AAA) look like?
- How do peer cities plan for AAA riders?

We cannot continue to deceive ourselves, thinking that to paint a little line on a road is a bike way. A bicycle way that is not safe for an 8-year old is not a bicycle way.

--Enrique Peñalosa, former mayor of Bogotá, Columbia.

2 Needs and Preferences of "Interested, but Concerned" Potential Cyclists

Communities around the world are working to reverse the trend of decreasing bicycle mode share with varying degrees of success. One of the challenges facing U.S. urban areas is figuring out what potential cyclists need. In 2005, Roger Geller, Portland's bicycle coordinator, proposed four categories to help identify and understand the needs of those who do not regularly choose cycling as a transportation option (Figure 2). Reaching that potential market is necessary to achieving significant bicycling mode shift. The categories, first based on his own and colleagues' observations about behavior and attitudes in Portland, have since been tested and found to be sound by academic researchers[2]:

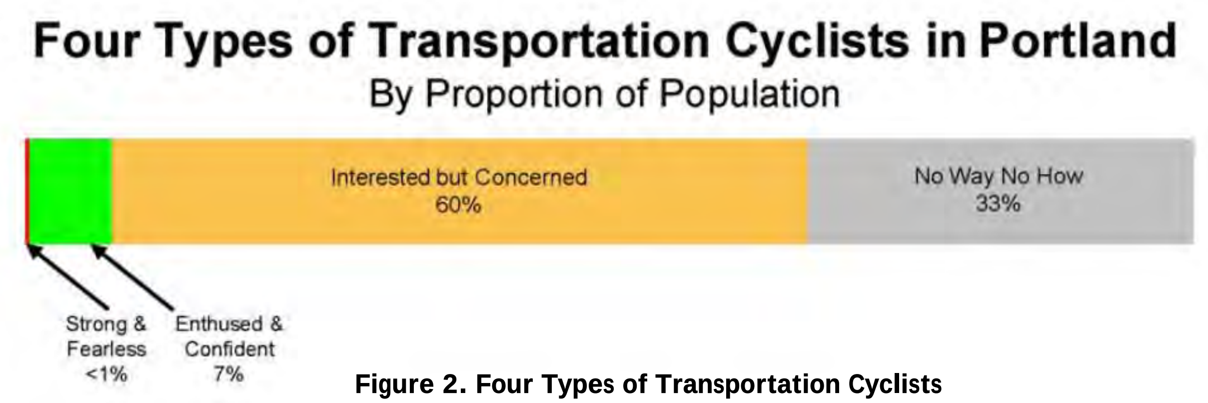


Figure 2. Four Types of Transportation Cyclists
Source: Geller, Portland Bureau of Transportation

Strong and Fearless: The less than one percent of the population who will ride anywhere, in any conditions, whether or not there are designated bicycle facilities. This number is common to urban areas, regardless of their level of bicycle planning and implementation.

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[2] Dill, Jill., McNeil, Nathan "Four Types of Cyclists: Testing a Typology to Better Understand Bicycling Behavior and Potential." Portland State University, 2012.

Enthused and Confident: The seven percent (7%) who ride frequently, but prefer designated facilities and are more sensitive to context. Although bicycle friendly improvements have encouraged them to ride, intimidating gaps in the bicycle (and road) network affect their travel decisions about when, where and with whom to ride. For example, a parent might commute to work, but not be comfortable riding his child to school.

Interested, but Concerned: At 60%, this is the largest group. They may not ride now, but would be more likely to if conditions were improved to address fears such as travelling along and across busy streets. They may not have the confidence and/or skills to ride next to cars and trucks with just a line of paint as "protection," and are uncomfortable navigating busy intersections, especially those with turn lanes.

No Way, No How: The 33% who are not interested, or cannot overcome fears of on-street cycling—at least not at this stage in our transportation culture.

No person should have to be "brave" to ride a bicycle. . . .
There are many cities in modern, industrialized nations around the world with a high bicycle mode split. They have achieved these high levels of bicycle use through adherence to various cycling-promoting policies and practices. But, one thing they share in common is they have substantially removed the element of fear associated with bicycling in an urban environment. They have created transportation systems in which bicycling is often the most logical, enjoyable and attainable choice for trips of a certain length for a wide swath—if not the majority—of their populace. For residents of these cities, concern about personal safety associated with bicycling is rarely a consideration, and certainly not to the levels we experience here.
In these "fearless" cities septuagenarians are able to ride alongside seven-year-olds safely, comfortably, and with confidence throughout the breadth of the cities.

--Roger Geller, Portland Bureau of Transportation

Geller's framework suggests there is great potential to encourage more people to ride. The success and popularity of cycle tracks and neighborhood greenways, here and abroad, suggest they can play key roles in reaching this untapped market.

Additional research provides insight into variables that influence mode choice, and facility preferences. Bike paths, cycle tracks and neighborhood greenways are consistently cited as the most preferred routes, with travelers willing to somewhat increase trip distance to use them instead of more direct alternatives. [3]A study of utilitarian trips of 50 randomly selected regular and occasional cyclists in the Metro Vancouver, BC area revealed a willingness to detour, on average, 400 meters; however, three quarters of the trips were less than 10% longer than the most direct option, suggesting limits to detour tolerance. Route choices were most affected by presence of bicycle facilities. To significantly increase bicycle mode share, the study recommends spacing bicycle facilities in urban areas no greater than 500 meters. [4]

[3] Multiple sources included data suggesting preferences for physically separated facilities (trails and cycle tracks) and residential streets, including neighborhood greenways. They are footnoted throughout this document.
[4] Cycling in Cities Research Team: Research Brief: How Far Out of the Way will we Travel?" University of British Columbia, undated.

In "Theory of Routine Mode Choice Decisions: An Operational Framework to Increase Sustainable Transportation,"[5] Robert J. Schneider proposes five major categories for understanding mode choice for a given trip, leaving room to reflect socioeconomic factors that can influence decisions (Figure 3). Awareness and availability are pre-conditions of any mode selection. For example, bike share stations in the public right of way build awareness of cycling as a transportation option while making bikes available to more people and for more trips. But a bike in hand does not automatically lead to rubber on the road. Schneider identifies three situational tradeoffs that travelers consider when deciding how to make a journey.

Within this framework, cycle tracks and neighborhood greenways are both attractive options; both are generally perceived as safe, with cycle tracks perhaps having an edge on convenience, and neighborhood greenways offering more in terms of enjoyment, depending on what the rider values.

Looking at this model through Geller's "Four Cyclists" lens, the "Interested, but Concerned" group is likely most sensitive to safety, security, and enjoyment considerations, which underscores the value of low stress bicycle facilities.

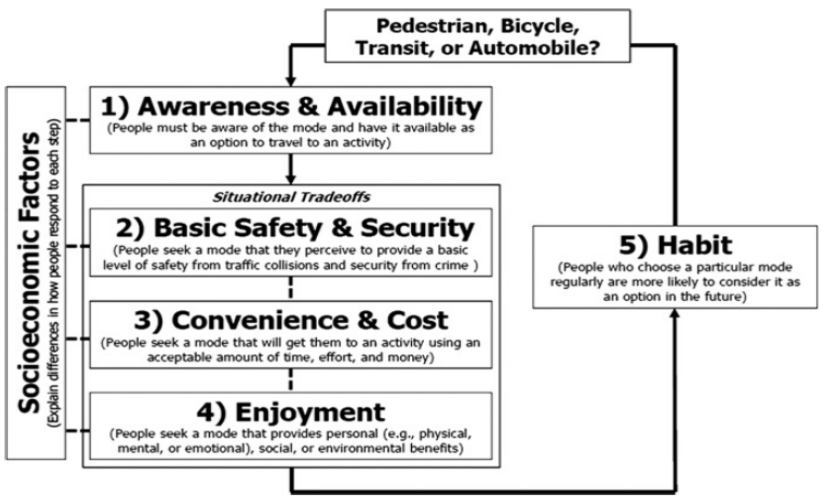


Figure 3: Proposed Theory for Routine Mode Choice Decisions

[5] Schneider, Robert J. "Theory of Routine Mode Choice Decisions: An Operational Framework to Increase Sustainable Transportation." Transp. Policy 2013; 25: 128-137.

3 The Limits of Bike Lanes

The street network provides the overall basis for much of the bicycle network. Even the most intimidating arterials have bicycle traffic, as they tend to serve major destinations. Early design manuals, such as Bikeways State of the Art, authored by the Federal Highway Administration in 1974, recognized the need for bicycle facilities on collector and arterial roadways, where cyclists are most vulnerable to traffic. At that time, four-foot bike lanes and eight-foot shared use paths were recommended as standard best practice. Facility types included separated lanes (bike lanes), separated pathways and shared roadways marked with bike route signs.

In recent decades, bike lane installation has been a key strategy for developing bicycle networks in cities such as Portland, Seattle, San Francisco and Chicago. Painted lanes delineate a space of at least five feet between motorized traffic and parked cars or the curb, usually on collector streets that have lower Average Daily Traffic (ADT) and slower travel speeds than major arterials, but better options for crossing major streets and other barriers than residential streets. These are often the routes that experienced and confident cyclists already use; adding a bike lane helps organize traffic and parked cars to maximize passing room, encourage cyclists to select safer and more comfortable routes than major arterials, and remind drivers that cyclists have the right to be on the road. They are often less expensive than other roadway treatments, especially when done as part of a resurfacing project, and generally do not significantly change the roadway's cross section, except when part of a road diet.

A recent evolution in bike lanes across the United States is the addition of a two to three foot painted buffer between the bike and travel lanes. These buffered bike lanes are described in detail in the National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide. They appeal to a wider cross section of bicycle users by increasing separation from motor vehicles and, in turn, the perception of safety[6]). They also provide additional space for cyclists to pass one another. Bicycle networks also typically sign, or at least map, lower volume and speed streets--often residential--that provide alternatives to and connections

[6] Dill, Jennifer. Monsere, Christopher. McNeil, Nathan. Evaluation of Bike Boxes at Signalized Intersections. OTREC. 2010.

between busier corridors. Signs that include miles and minutes to neighborhoods and destinations help with navigation and promotion, especially when biking travel times are competitive with other modes of travel.

Bicyclists ascending hills tend to lose momentum, especially on longer street segments with continuous uphill grades. This speed reduction creates greater speed differentials between bicyclists and motorists, creating uncomfortable and potentially unsafe riding conditions. By separating vehicle and bicycle traffic, uphill bike lanes (also known as “climbing lanes”) enable motorists to safely pass slower-speed bicyclists, thereby improving conditions for both travel modes. Uphill bike lanes can be combined with shared lane markings in the downhill direction, where bicyclists can match prevailing traffic speeds. Seattle has multiple locations with uphill bikes lanes and will continue to use them where appropriate.

Although bike lanes have contributed to mode share increases, when implemented on busy arterials, they are generally not suitable for people of all ages and abilities. Riding on them requires not just traffic tolerance, but also quick reaction times and the ability to safely enter the driving lane to avoid hazards or double-parked vehicles. They also typically do not allow for side by side or close riding, which is often needed for those travelling with children on bikes.

Despite these limitations, bike lanes still play a role in the bicycling network. Design enhancements, such as street markings that provide in lane and intersection positioning, can increase comfort and attractiveness. On minor arterials with moderate to low speed traffic, lanes can be sufficient for providing a low stress cycling environment.[7]

Bike lanes can exhibit the full range of traffic stress. Where they have ample width and are positioned on a road whose traffic is slow and simple (a single lane per direction), they can offer cyclists a low-stress riding environment. However, bike lanes can also present a high-stress environment when positioned on roads with highway speeds or turbulent traffic, or next to high-turnover parking lanes without adequate clearance.

--Mineta Transportation Institute

In many cities, bike lanes already exist, and this dedicated space should be retained for bicyclist use. In some cases, construction of a facility that provides more cyclist separation is not possible in the short term because of funding limitations or political reasons. In these cases, reserving space through striping of bike lanes or buffered bike lanes provides a means to provide incremental upgrades to the quality of the bikeway network-- a practice currently used in both Portland and Vancouver, BC.

[7] Maaza C. Mekuria, Ph.D., P.E., PTOE, Peter G. Furth, Ph.D. and Hilary Nixon, Ph.D. “Low-Stress Bicycling and Network Connectivity.” Mineta Transportation Institute, 2012.

4 Cycle tracks and Neighborhood Greenways

Bicycle paths, multi-use trails, neighborhood greenways and cycle tracks are the main types of facilities that serve people of all ages and abilities (AAA). Although quite different in design, they can provide environments where a broad range of people feel safe and comfortable.

Key components of AAA facilities are:

- Separation from high speed and volume motorized traffic (via physical barriers or speed and volume reduction).
- Easy to navigate intersections, especially at major arterials.
- Visual cues about presence and function.
- Convenient access to key community destinations.

Cycle tracks

Cycle tracks, also known as protected bike lanes (PBLs), are similar to bike lanes in that they serve critical bicycle travel needs on collectors and arterials. The main difference is that they provide a physical barrier, such as flexible bollards, jersey barriers, planters or vertical separation, and at least a three-foot painted buffer between cyclists and the motor vehicle travel lane. The most common configurations are:

- **One way with parking:** The cycle track, at least five feet, is situated between the curb and parked cars, with a minimum three foot buffer and physical barrier--essentially flipping the traditional bike lane/parking lane relationship to the curb.
- **One way without parking:** Similar to the above, but with the buffer and barrier between the cycling and driving lanes.
- **Two way:** With a minimum width of eight feet, these are sometimes used when curbside activities, transit, intersection configurations or other variables make it difficult to install a cycle track on both sides of the street. They can also be used on streets with one way motor vehicle traffic.

Preliminary data from U.S cities suggests that cycle tracks attract new and current riders, and are generally preferred to traditional bicycle lanes. After the installation of Chicago's first cycle track on Kinzie Street, ridership increased by 55% and 86%, compared to 17% in traditional bike lanes. Preliminary data also suggests a well-designed cycle track can benefit all roadway users. Since New York City installed a cycle track on 9th Avenue, the reported injuries on the street have fallen by 56 percent, with a 29 percent reduction for pedestrians and a 57 percent reduction for bicyclists[8].

These statistics are well documented and evidenced in cities such as Copenhagen, which has a longer history of cycle track implementation. They also help raise the visibility of cycling and increase comfort for motorists who fear passing too close to a cyclist.

[8] Hernandez, Adolfo. "Protected Bike Lanes Spur Ridership." Mode Shift. Vol. 11, No. 2. Active Transportation Alliance. Web.

Challenges: Although cycle tracks have proven to increase comfort and safety for a wider range of users than traditional bicycle lanes, they are not without challenges, such as:

- Business owner buy-in
- Intersections
- Maintenance and snow removal
- Conflicting curb side uses
- Pedestrian / transit interplay
- Hard to ride side by side or pass another cyclist
- Right-of-way (ROW) constraints
- Parking removal

Sometimes buffered bike lanes are used as a compromise or as an interim measure. Like traditional bicycle lanes, they are positioned between parked cars and the travel lanes. This helps address issues such as predictability and sight lines at intersections. They can be easier to implement because they are a less dramatic change to the streetscape. Like cycle tracks, buffered bike lanes provide a three foot painted buffer between the car and bike travelways. However, although this provides traffic separation, the lack of a physical barrier decreases comfort for some riders. It also retains the door zone concern.

Neighborhood Greenways

Neighborhood greenways, also known as bicycle boulevards, transform residential streets into comfortable cycling corridors that are generally very suitable for people of all ages and abilities. Although these routes do involve mingling with car traffic, the speed of the street is set for and by cyclists. Traffic calming strategies, such as bicycle-friendly speed humps, chicanes, and pavement markings, help keep the speeds lower than 20 mph. Traffic volumes are kept low via intersection strategies, such as diverters that allow cyclists to cross but force drivers to turn onto busier streets. Just as cycle tracks flip the position of the parking and bike lanes, neighborhood greenways invert the intersection hierarchy to give cyclists the right of way.

Other positives

Other positive attributes are associated with neighborhood greenways as well. These include: increased shade coverage, less noise/exhaust, the opportunity for side by side riding, pleasant views, increased real estate values of homes, better overall conditions for residents of the street (street becomes more multi-purpose). This is supported by Cycling in Cities

research conducted in Vancouver that reveals top reasons for riding on neighborhood greenways, such as freedom from motor vehicle noise and air pollution, beautiful scenery, and the ability to ride side-by-side.[9]

Challenges

Neighborhood greenways also present implementation challenges.

- Neighbor buy-in, as their street will become more challenging to access via a car. However, neighbors are typically the ones who enjoy the redesign the most.
- Concerns from emergency responders. Road configurations need to allow for quick access of large vehicles.
- Intersection treatments at arterials can be costly.

[9] Brauer, Michael. Cole, Christe. Cycling, air pollution exposure & health. An overview of research findings." VeleCity 2012. Web. Also see: Cycling in Cities Research Team, "Opinion Survey on Route Preferences and Motivations." University of British Columbia, 2006.

Reaching the Sixty Percent

As noted previously, Professor Dill's research at Portland State University supports Roger Geller's initial thoughts about the breakdown of Portland's types of cyclists and their willingness to bicycle given different roadway conditions. It also sheds light on the types of facilities preferred by those who are "interested but concerned." Using a comfort level scale of 1-4, with four being most comfortable, people who fall into that category were asked to rate a variety of road configurations for cycling. Bike paths and neighborhood greenways were most preferred, followed closely by residential streets below 25mph. The next highest level of comfort was for major streets with physically separated bicycle facilities. All of those options rated at least a three. Of particular note is the transformative effect of physical separation on major roads: comfort jumps from 1.4 and 1.3 to 3.2 and 3.0 on major arterials. Although striped bike lanes alone did not rank as highly, they were deemed preferable to no striping, especially on two lane commercial roads with speeds under 30mph, where comfort increased from 1.9 to 2.7. These rankings indicate preferences for facilities that provide physical traffic separation or traffic calming, while also acknowledging that even bike lanes can help increase comfort level, especially on lower stress arterials.

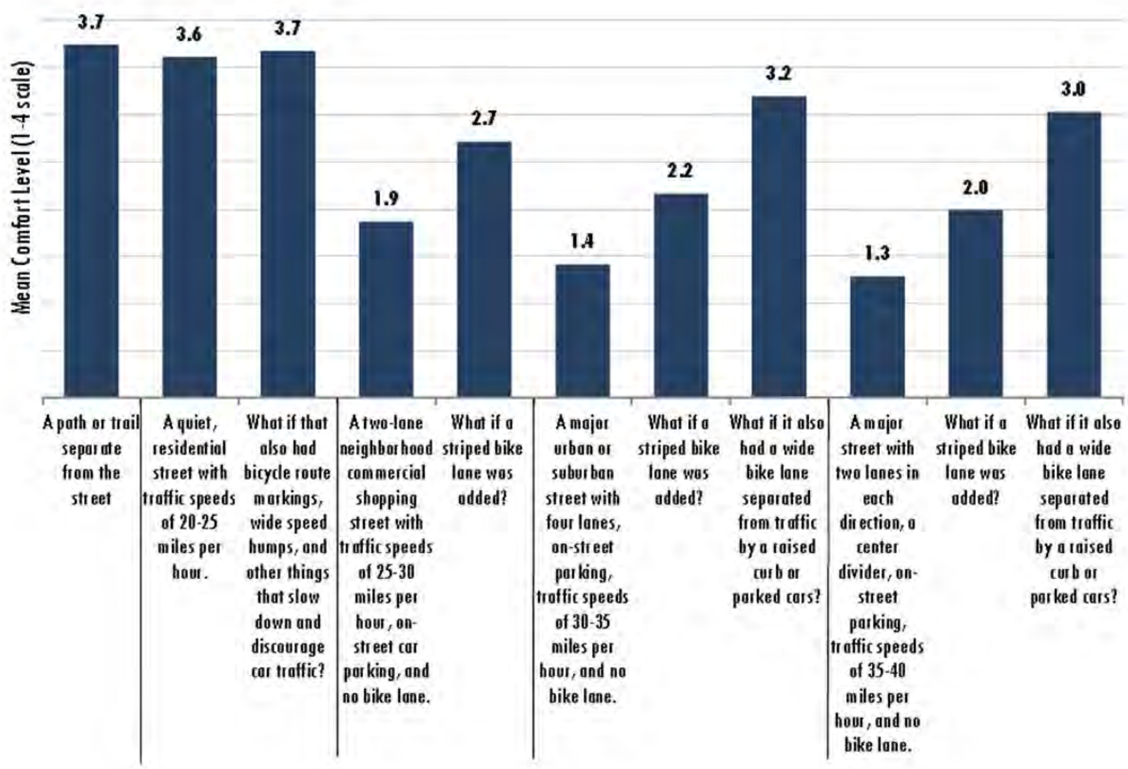


Figure 4. Level of comfort cyclists identifying as Interested but Concerned feel given different roadway conditions. Source: Dill, 2012

Planning and Implementation

Case Study - City of Portland - Retrofit on NE Multnomah Street

Portland is opportunistically pursuing roadway retrofits to develop a protected on-street bike routes through the Lloyd District, a central eastside neighborhood district characterized by arterial and collector roadways, several stadiums, the Rose Quarter Transit center and I-84. The roadway was reduced from five to three motor vehicle travel lanes and features wide bike lanes protected by a beige colored buffer and raised planters. The project was accomplished through coordination and support of key local business interests. Through discussion and partnership, the Portland Bureau of Transportation (PBOT), business owners and real estate developers were able to settle on a final design that converted unnecessary roadway capacity measured as average daily traffic (ADT) into protected bicycle lanes and new paid parking spaces. Roger Geller, Portland's bicycle coordinator, referred to the facility as a "poor person's cycle track" during a recent panel discussion at the 2012 NACTO Designing Cities conference. This project is a representative of Portland's commitment to incremental, opportunistic change (including retrofitting existing facilities) and points to an effective solution to improvement of the current cycling environment given a limited budget.

Figure 1. Physically separated bikeways on NE Multnomah St. Source PBOT

All Ages and Abilities Peer City Questions: Chicago

Alta conducted an interview with Mike Amsden, AICP, CDOT Bike Program Consultant Project Manager for Chicago, Illinois to understand how the city plans for bicyclists of all ages and abilities.

What does an all ages and abilities facility mean for your city?

It's safe, comfortable, sociable and useful for young and old, men and women, cycling novice and expert—regardless of ability or background. It provides low traffic volume and speed or separation from higher speed vehicles; easy to navigate intersections; and an overall pleasant, sometimes unique, experience. For example, a neighborhood greenway allows for side by side riding, and offers shade cover in the summer. A cycle track provides access to commercial destinations, while creating a physical (and, in turn, psychological) barrier to motorized traffic.

How do you plan for people of all ages and abilities? How were these types of connections considered when laying out and upgrading your bike network?

For all routes in the plan, the highest level of treatment is considered first—neighborhood greenways for residential routes and protected bike lanes for busier streets. When those treatments are not feasible, the next best options are explored, such as route signage through neighborhoods and buffered bike lanes on collectors.

Multiple variables went into route selection for the network, such as access to key destinations, safety, potential to attract new cyclists, and equitable coverage. But a major consideration throughout was feasibility. Some of the routes have been criticized because they are not straight shots. However, these are the streets that have the most potential to be transformed in the near future.

This is only an 8 year plan; quick wins are essential to building the cultural and political support needed for long term and/or more challenging projects.

What types of facilities do you consider to be all ages and abilities?

Trails (with the exception of Chicago's lake front path when it's most congested), neighborhood greenways, and protected bike lanes are the most accommodating to all ages and abilities, in that order. There are not yet many truly on-street all ages and abilities facilities in the US. In Chicago, the two-way Dearborn cycle track comes closest.

Key variables include speed, separation from cars, and intersection design. Curb side uses, such as alleys, loading zones, driveways, transit stops, and shared turn lanes can complicate the function of protected bike lanes, which reduces their suitability for all ages and abilities. In fact, in some cases buffered bike lanes are preferred because of better sight lines and separation from challenging curb side uses.

Another consideration is user behavior. Regardless of configuration, everyone needs to comply with the rules of the road for cycle tracks to really work.

What evidence have you seen, if any, that usage on all ages facilities is increasing?

Because those kinds of facilities (except trails) have been installed in the last 18 months, there is not yet a lot of "real" data. Monthly counts are conducted, so more data will be available in the future. However, according to counts and surveys taken before and after the Kinzie cycle track installation (Chicago's first), ridership increased by 55%; 86% felt safe or very safe in a PBL vs. 17% in traditional bike lanes; and 49% considered driver behavior safer. Also, at meetings, reluctant riders are expressing more interest and willingness to try biking in the city.

Is construction or development of all ages and abilities facilities prioritized in any way?

About 50% of projects piggy back on larger maintenance or reconstruction projects, which helps reduce costs. Other projects are initiated to address safety needs or community demand.

What is the public perception of all ages and abilities facilities?

It is improving. There has not been as much media backlash as in other cities. There has been much positive feedback from both current cyclists and those who would like to start.

Do you have programs or other 'soft' investments (e.g., a Sunday Parkways event) that are used to market all ages and abilities facilities?

Several aldermen have led neighborhood tours highlighting new facilities. Our Safe Routes Ambassadors help educate the public about existing facilities and offer tips for using them. They also partner with the police department to conduct targeted enforcement which is usually focused more on educating cyclists and drivers about correct behavior than giving tickets. Education, enforcement and incentives are all critical.

Have you heard or seen any reports of actual and perceived safety of all ages and abilities facilities?

See above.

Vancouver British Columbia - A Network of Bike Boulevards

Development of Vancouver's bike boulevard network began in the late 1980's. Concerns about right-of-way restrictions on arterials led cycling advocates and academics to discuss development of an offset grid network of residential streets with the City Council and relevant transportation officials. Initially, the key improvements on this network included signalized intersections to facilitate bicyclist crossing. Although initially contentious, the development of a neighborhood greenway and the accompanying traffic calming treatments have become welcome to residents of designated boulevards.

One acknowledged gap in the bike boulevard network was the downtown 'gap', which the city has started to fill in recent years by installing cycle tracks on Hornsby and Dunsmuir. This network of protected facilities helps to contribute to Vancouver's increasing bicycle mode share and reputation as a great biking city.

At the most basic level, the answer to this challenge is simple: plan a bicycling network that makes every user feel safe and comfortable. At the same time, a city or municipality must continue to meet the needs of other roadway users; in some situations it may not be feasible to construct a bicycle facility that provides complete separation from motor vehicle traffic.

AAA Facilities in Seattle

In Seattle, staff, members of the public and decision makers have expressed the desire to make cycling an activity that appeals to both current and potential cyclists of all ages and abilities. This desire and direction is consistent with international peer cities that have a high bicycle mode share and other U.S. cities seeking to promote livability, health and affordability. Seattle has taken the first steps down this path by planning a network of high-quality connected bicycle facilities for citywide trips while simultaneously planning for intra-neighborhood trips. While neighborhood greenways, trails and cycle tracks appeal to the broadest spectrum of users, bike lanes and buffered bike lanes still contribute to bicyclist safety and comfort and still have a place in the transportation planning toolkit. Seattle will continue to increase bicycle mode share and the improve the bicycling experience for all users by focusing on connections, constructing new facilities with attention to detail (e.g., at intersections), while opportunistically upgrading existing facilities and promoting both incremental and wholesale change.

Appendix 2: BEST PRACTICES

WHITE PAPERS

2B: Hill Solutions

February 2013

Best Practices White Paper #3: Bicycling Solutions for Hilly Cities

Seattle Bicycle Master Plan Update

Introduction

Seattle's challenging topography is a barrier to some current and potential bicyclists. In past and recent outreach efforts in Seattle, many residents cite hilly terrain as a barrier to riding a bike. In order to navigate between neighborhoods and in and out of downtown Seattle, bicyclists will encounter significant topographical changes throughout the city. Hilly terrain can be particularly challenging for less experienced riders, seniors and families. People riding bikes may note challenges with the following:

- Cycling skills – concerns about maintaining control on steep terrain
- Level of fitness – concerns that the steep terrain will make cycling too challenging or uncomfortable
- Appearance/ Perspiration – concerns about appearance and wearing professional attire for commuting, etc.
- Motorists' skills – concerns about unsafe conditions from motorist inattention or lack of control on hills

Developing facilities that minimize the challenges posed by the existing terrain will support increased bicycling in Seattle. This white paper identifies potential solutions for minimizing the negative impact of hills on people riding bikes. The paper is organized with a brief problem statement and solution, which is then followed by case studies and examples of specific solutions from other communities.

Prioritize Connections and Routes without Hills

Seattle's hills are one of its defining characteristics, and pose a significant challenge to anyone commuting with their own two legs. This unique geography naturally creates high-demand arterials beside waterways and at the base of valleys. Historically, major arterials are routed on some of the straightest and flattest corridors in the city. There may be no good alternative for a bicycling route that does not require significant hills or out of direction travel. Building safe facilities on these corridors can be difficult with the competition from other modes.

In some cases, requiring bicyclists to cover hilly terrain is inevitable. However, it is important that bicyclists and pedestrians are given the highest priority on the flattest routes.

Solution:

Prioritize bicycle connections that minimize elevation changes and provide direct connections. If the only alternative to a busy arterial is a very steep grade, then the arterial should be treated aggressively to allow comfortable and safe cycling on the most desirable route.

Route prioritization is a high level policy decision and should guide network development. In Seattle, route development must address the grade of the street wherever possible, and consider the impacts that grade has on automobiles versus bikes and pedestrians.

RETROFITTING ARTERIALS Chicago, Illinois

The City of Chicago has embarked on an ambitious plan to provide improved bikeways on arterial streets. In the last year the City has established buffered and/or protected bike lanes on eight major streets.

While many of these corridors were 'low hanging fruit' with relatively low traffic volumes and right-of-way available, the investment in infrastructure is having immediate impacts.

Kinzie Street, the City's first new projected bike lane project, features three main elements: a marked lane adjacent to the curb in each direction along Kinzie; a buffered area with flexible marker posts, and a parking lane for automobiles. Green paint and pavement markings depicting a bicycle help further define the lane. Further the project included custom-fitted plates that cover the Kinzie Bridge's open-grate deck to create a smooth riding surface. This last piece of the project greatly improved a pinch point for cyclists.

The new lane proved popular with bicyclists almost immediately. The initial bike mode share in the corridor was around 22% of peak traffic. About a month after completion of the facility bicycles accounted for 48% of peak traffic.

The City now will tackle some of its more challenging corridors where limited space will require significant trade-offs.

SELECTING THE FLAT ROUTE
Fell Street - San Francisco, California

Fell Street is a one-way arterial, 48’9” wide that serves as the westbound leg of a couplet with Oak Street. Fell Street has three full time westbound lanes with a 4-6PM tow-away lane along the south curb. The street carries approximately 38,000 vehicles per day (2002 count), including 2 express bus lines during the PM peak.

Despite the high volumes of traffic, the higher speeds, and the lack of bicycle facilities, cyclists find this street a desirable alternative to existing bike routes in the area due to its flat, direct connections to other primary bike facilities such as the ‘Wiggle’ and the Panhandle Path. Existing routes in this corridor are less ideal with steeper grades and less direct connections to the Panhandle Path.

In 2002, Fell Street was resurfaced and restriped so that the tow-away lane along the south curb was widened from 10’9” to 12’. During non-PM peak hours, this widening provided cyclists with 5’ of space next to a 7’ wide parking lane. For the 10 hours a week that the tow-away was in effect, cyclists shared the 12’ wide south lane or 10’9” wide north lane with motorists.

While this was a slight improvement it did not provide the level of service for bicycles needed in the corridor. Over half of the cyclists counted during a PM peak survey opted instead to illegally use the sidewalks along Fell Street.

Since 2002 a number of proposals to improve the street for bicycles have been suggested. Given that this route is a vital connection for multiple modes, the San Francisco Municipal Transportation Agency (SFMTA) has developed a design that includes overall streetscape improvements that will support pedestrians, bicycles and transit.

Proposed project elements include:

- Cycle tracks that are separate from motor vehicle traffic
- Corner bulbouts to shorten narrow the roadway
- Neighborhood greening – street trees etc.
- Curb ramp upgrades
- Crosswalk enhancements
- “Day lighting” intersections to improve visibility of pedestrians
- Traffic signal enhancements for pedestrians and cyclists
- Bicycle parking
- Bus stop consolidation to improve muni efficiency

Additional information about the project available at:
http://www.sfmta.com/cms/bproj/OakandFellBikeways.htm

Help People Avoid Hills

While out of direction travel is typically not the first choice of cyclists, routing to avoid steep grades can be desirable. A low elevation gain route supports cyclists with a wide range of abilities. For example, families and new cyclists will be more likely to take a slightly longer route to avoid steep grades, and these routes may also serve stronger riders when carrying cargo.

Solution:

Develop user maps and wayfinding to help residents and visitors choose lower-hill routes if that is a priority for them. Seattle is already showing information about steep grades on existing user maps and information materials. This can be expanded to provide suggested route maps for lower elevation gain routes and on roadway wayfinding.

'THE WIGGLE'
San Francisco, California

The Wiggle is a one-mile, zig-zagging bicycle route from Market Street to Golden Gate Park in San Francisco, California, which minimizes hilly inclines for bicycle riders. Rising 120 feet (37 m), the Wiggle inclines average 3% and never exceed 6%.

Bicyclists can travel the Wiggle between major eastern and central neighborhoods (such as Downtown, SoMa, The Mission District, The Castro) and major western neighborhoods (including the Panhandle, the Haight, Golden Gate Park, and the Richmond and Sunset Districts).

The Wiggle was never planned as a specific route, but rather is a combination of a few routes that were stitched together over time by cyclists. There are now wayfinding signs and maps that show the route of 'the wiggle,' and it has become a source of city pride along with the city's iconic hilly topography.

Build the Right Facilities for Hills

While it is a worthy pursuit to try to minimize hills, it is not possible to avoid them altogether in Seattle. Facilities should address cyclist behavior and needs on hills. Behaviors and conditions to address include the following:

- Speed differential – between different cyclists and between cyclists and motorized vehicles in the uphill direction. Cyclists may travel at speeds equal to motorized vehicles in the downhill direction.
- Weaving – steep grades may require more space for cyclists to travel in a weaving, or switch-back, pattern.
- Passing – traveling uphill and downhill segregate riders by their speeds more so than flat terrain, resulting in a higher demand for passing lanes.
- Starting on an uphill – cyclists often have to stop at a light in the middle of a hill climb, resulting in an uncomfortable start once the light turns green. Providing sufficient space for cyclists to begin biking again at these intersections is key.

Seattle currently uses a paired uphill climbing lane and downhill shared lane markings (described on the following page) to minimize the impact of slope on cycling. Seattle's current guidance recommends that a climbing lane be employed when roadway grades exceed 4 percent for at least 300 feet.

Solutions:

Wider Bike Lanes

Wider and expanded uphill bikeways can accommodate both weaving and speed differentials between cyclists of varying abilities. A standard bike lane is 5 to 6 feet wide. This is safe for operation of a single bicycle, and leaves a bit of a buffer to maneuver around road debris, stationary obstacles, or motorized vehicles infringing on bike lanes. While the space required for a bicycle is consistent for most users, the speed preference is highly variable between users.

Two solutions for a wide bike lane include the following:

Bicycle Passing Lanes: Second bike lane added adjacent to the first to provide ample space for passing.

Buffered Bike Lanes: Bicycle lane with a buffer to increase the space between the bicycle lane and auto travel lane or

SDOT is already experimenting with standard and buffered bike lanes in uphill locations parking.

Uphill Bike Lanes

The right-of-way or curb-to-curb width on some streets may only provide enough space to stripe a bike lane on one side without removing travel lanes and/or on-street parking. Under these conditions, bicycle lane striping could be added to the uphill side of the street only.

Bicyclists ascending hills tend to lose momentum, especially on longer street segments with continuous uphill grades. This speed reduction creates greater speed differentials between bicyclists and motorists, creating uncomfortable and potentially unsafe riding conditions. By separating vehicle and bicycle traffic, uphill bike lanes (also known as “climbing lanes”) enable motorists to safely pass slower-speed bicyclists, thereby improving conditions for both travel modes. Uphill bike lanes can be combined with shared lane markings in the downhill direction, where bicyclists can match prevailing traffic speeds. Seattle has multiple locations with uphill bikes lanes and will continue to use them where appropriate.

Slower Auto Speeds

Reducing the overall speed differential on hills can make cycling more comfortable in both the uphill and downhill direction. Where routes must include steep grades, a reduced speed limit for motorized vehicles can reduce the speed differential. In general, a speed differential between motor vehicles and bicyclists of 15 mph or less is desirable to reduce turning conflicts, number of passing events, and severity of collisions.

Bike passing lane on the Hawthorne Bridge in Portland, OR

BICYCLE PASSING LANE
Portland, Oregon

The Hawthorne Bridge is a primary crossing of the Willamette River that connects the east side residential areas to downtown Portland. It carries upwards of 8,000 cyclists per day. From the east side, there is one primary entrance to the bridge that includes an uphill approach.

With a significant volume of cyclists and notable speed differential between cyclists on the incline, the typical lane width of 5 feet was inadequate. Higher speed cyclists were forced to stack up behind slower moving riders or move out into the travel lane with motorized vehicles to pass.

The solution to the problem was a short segment of bicycle passing lane where a second lane was added to the left to allow for passing. The side-by-side lanes last until the crest of the grade.

The Portland Bicycle Plan for 2030 gives high level guidance for when to consider the development of a bike passing lane.

Summary of Facility Solutions:

Uphill Bicycle Climbing Lane

Description
Uphill bike lanes (also known as “climbing lanes”) enable motorists to safely pass slower-speed bicyclists, thereby improving conditions for both travel modes.

Guidance
Uphill bike lanes should be 6-7 feet wide (wider lanes are preferred because extra maneuvering room on steep grades can benefit bicyclists).

Can be combined with Shared Lane Markings for downhill bicyclists who can more closely match prevailing traffic speeds.

Discussion
This treatment is typically found on retrofit projects as newly constructed roads should provide adequate space for bicycle lanes in both directions of travel. Accommodating an uphill bicycle lane often includes delineating on-street parking (if provided), narrowing travel lanes and/or shifting the centerline if necessary.

Example Seattle locations: Stone Way N between N 50th Street and N 34th Street and Yesler Way between Broadway and 4th Ave

Bicycle Passing Lane

Description
Adding a second bike lane adjacent to a first to provide space for passing

Guidance
Allow adequate space for two bicyclists to pass without encroaching into the travel lane. Minimum passing lane width of 5 feet adjacent to a 5-foot bike lane.

Skip striping between the two bike lanes and double bike symbols mitigates concerns of motorists mistaking the area for a travel lane.

Discussion
This treatment is helpful where the following conditions are present:

- Large number of cyclists
- Wide range of cyclist travel speeds
- Uphill roadway

The use of the passing lane reduces the length of bicycle platoons in congested areas and reduces number of faster bicyclists that merge with auto traffic to pass slower cyclists.

Buffered Bike Lane

Description
Conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent travel lane and/or parking lane.

Guidance
Where bicyclist volumes are high or where bicyclist speed differentials are significant, the desired bicycle travel area width is 7 feet. Buffers should be at least 2 feet wide. If 3 feet or wider, mark with diagonal or chevron hatching.

Discussion
Buffered bike lanes are designed to increase the space between the bike lane and the travel lane or parked cars. Frequency of right turns by motor vehicles at major intersections should determine whether continuous or truncated buffer striping should be used approaching the intersection. Commonly configured as a buffer between the bicycle lane and motor vehicle travel lane, a parking side buffer may also be provided to help bicyclists avoid the ‘door zone’ of parked cars.

Help People Get up Hills

In some areas of the City the slope may be too steep to cycle or people simply want an alternative. A comprehensive approach to addressing hills should include opportunities to combine cycling with other modes and utilize design and technology to minimize the impact of the slope.

Solutions:

Transit Integration

In addition to helping cyclists overcome hills, bicycle/transit integration can overcome other obstacles to bicycling, including distance, riding on busy streets, night riding, inclement weather, and breakdowns.

Key elements for successful integration include the following:

- Provide direct and convenient access to transit stations and stops from the bicycle network.
- Provide safe and secure long term parking at transit hubs.
- Provide maps at major stops and stations showing nearby bicycle routes.
- Provide wayfinding signage and pavement markings from the bicycle network to transit stations.

Folding Bicycles

A folding bicycle is a bicycle designed to fold into a compact form, facilitating transport and storage. When folded, the bikes can be more easily carried into buildings and workplaces or on public transportation. Folding bikes become a viable hill solution for bicyclists when combined with other modes.

The compact size gives folding bicycles distinct advantages over conventional bicycles for multi-mode commuting. For example, most conventional bus bike racks can carry two to three bikes at a time. At peak periods, racks can be full, requiring riders to wait for an empty space on the next bus or choose an alternative. The ability to consistently bring the bicycle on board provides consistency and improves reliability for commuters.

Given the benefits of combining transit and bicycles, many transit agencies, including King County Metro, have officially welcomed the use of folding bikes. Transit agencies in communities such as San Francisco, Pittsburgh (Allegheny County), and Los Angeles County have established policies that explicitly allow folding bikes aboard buses, trains and streetcars.

FOLDING BIKE IMPLEMENTATION PLAN
Los Angeles County, California

Los Angeles County realized the potential for folding bikes to help transit users with the last mile problem on both ends of their trip. In an effort to support folding bikes, the County worked with a consultant to develop a conceptual planning document that summarizes key issues for using folding bikes for transit integration.

A component of the project included a market analysis to understand the perceptions of and interest in folding bikes from existing transit users.

Key findings include:

- Public survey results indicate that offering a cash buy down on the purchase price of a folding bicycle is likely to be the most effective incentive for end users.
- Portability is the most important attribute of a folding bike when used in conjunction with transit.
- It is important that bikes are available for purchase from local vendors to ensure a high level of service and support
- Residential density, the level and quality of nearby public transit, and the level of bicycle friendliness are effective indicators for determining levels of bicycle usage in a given community
- The majority of surveyed transit riders are generally aware of folding bicycles but do not fully recognize their value given that few would pay more than $200 to purchase one. In order to effectively stimulate the folding bike market, early cash incentives should bring down the purchase price to users' expectations

The complete implementation plan document is available at:
http://www.calstart.org/Libraries/Publications/Folding_Bike_Implementation_Plan.sflb.ashx

Electric Bicycles

While electric bicycles are not as likely to combine with other modes, the technology makes it easier for cyclists of all abilities to overcome hills. Electric or e-bikes are bicycles that have an electric motor that assists, but does not replace, the power provided by the rider. They are not motorbikes, the rider still needs to pedal with the motor providing extra help that can be useful when starting from a stop and going up hills. Some qualitative research on the use of e-bikes indicates that older adults and riders with some physical limitations may find them an attractive option.

In the past e-bikes have not had broad appeal in the US. Past models on the market resembled mopeds and were not always easy to purchase or service. Distribution channels of electric bicycles are not as developed and the majority of bike shops do not sell electric bikes. In addition, e-bikes in general are a relatively immature technology with lingering concerns about reliability and ease of use.

However, newer products in the market are attractive, look more like regular bikes, are easy to operate, simple to maintain, and feature high quality components. More retailers are stocking e-bikes and making it a significant feature of their shop. With an increased presence of e-bikes, it is also easier to get service and maintain the bike.

New research and pilot projects are exploring the potential of this new generation of e-bikes. As technology and availability of e-bikes improves their use by a broader population will likely increase.

CYCLEUSHARE
University of Tennessee-Knoxville, Tennessee

CycleUshare is a pilot program to test the merging of two technologies, e-bikes and bicycle sharing. The program is available to 125 students, faculty and staff on the large and hilly UTK campus. Currently, there are two station locations; each station has the capacity for ten bicycles, including seven e-bikes and three regular bikes. In the first year of study, it was found that walking was the most commonly replaced mode and 22% of users accounted for 81% of trips.

http://www.cycleushare.com/
http://cycleushare.blogspot.com/

EVALUATION OF ELECTRIC BIKE USE IN PORTLAND METRO REGION
Portland State University, Oregon

Researchers at Portland State University are currently undergoing a research project on e-bike use in the region. The research project has two primary objectives: (1) Understand people's perceptions and attitudes of e-bikes; and (2) Evaluate the use of e-bikes by potential users to determine if these bikes could encourage new bike users. It is anticipated that this research may provide valuable insight into the potential market, user characteristics and barriers to adoption. The results of this research will be available in late 2013.

http://otrec.us/project/564

Bicycle Stairway Runnels, Channels and Elevators
A bicycle stairway is a pedestrian stairway which also has a channel alongside or in the middle to facilitate walking a bicycle up or down the stairway. Although many names exist for this facility, in Seattle, it is referred to as a runnel. The runnel is intended to guide a variety of bicycle tires without binding or causing damage. Cross-section shapes of the runnel vary, but are usually either nearly rectangular or V- or U-shaped.

Since 2007, SDOT has improved their stairway standard to include a bike runnel. Starting in 2011 and continuing in 2012, major stairway rehabilitation projects have considered installing runnels. Five runnels have been installed through June 2012, with up to three additional runnels installed by the end of 2012.

Careful attention should be paid to design of bicycle runnels. Accessibility requirements for handrails can conflict with bicycle stairways, as handrails may obstruct or decrease the control of the bicycle.

Bike Sharing
Public bike sharing systems are comprehensive mobility systems that use a fleet of bicycles and stations spread over an area to provide inexpensive and accessible transportation to primarily urban communities. They are well-suited to short trips, typically 2-3 miles or less.

Bike sharing has the potential to support people in taking additional trips by bicycle. The option of one way trips without the need for bicycle storage provides flexibility to combine bicycling with transit or other modes to avoid or minimize major hills in Seattle. Placement of stations and system balancing can be strategic to allow riding in the downhill direction and transit or another mode in the uphill direction. Puget Sound Bike Share, a non-profit, will launch a bike sharing system in Seattle spring 2014.

CAPITAL BIKESHARE
Washington, DC

Capital Bikeshare current has a fleet of 1670+ bicycles with 175+ stations across Washington, D.C. and Arlington, VA.

There is evidence that bike share users tend to use the system more often in the downhill direction. System operators keep an ongoing record of those stations where more bicycles are checked out by users than returned by users. These stations are 'net senders' meaning that operators must continuously rebalance that station since the station loses bikes over time.

Of the top 10 stations that send more bikes than they receive, nine are at the top of hills. The one station that is not at the top of a hill in a recent analysis the top 25 'net sender 'stations were in the higher elevation areas of the city.

Capital Bikeshare is widely used to access to transit. In a recent survey, more than half of all respondents used Capital Bikeshare to get to or from a Metrorail station. In addition about two in ten used Bikeshare to access a bus stop.

VISIONARY HILL SOLUTIONS
Oregon Health and Science University – Portland, Oregon

Aerial Tram

The Portland Aerial Tram carries commuters between the city's South Waterfront district and the main Oregon Health & Science University (OHSU) campus, located in the Marquam Hill neighborhood. The tram travels a horizontal distance of 3,300 feet and a vertical distance of 500 feet in a ride that lasts three minutes. The alternative to riding the tram is roadways that require a 1.9-mile route with numerous stoplights and large intersections. The route includes a short stretch of busy U.S. Route 26, as well as winding Sam Jackson Park Road, which ascends the side of the Tualatin Mountains to the OHSU campus.

Packed bike parking at the base of the tram

The steep hill climb on a street with significant traffic volumes is a major barrier to cycling for hospital and university staff and students. Within a year and a half of opening, the tram hit one million riders. The base of the tram initially had around 300 spaces for bike parking. It was quickly determined that there was significant demand beyond those spaces.

OHSU added a high capacity valet parking system that created an additional 200 spaces and allowed expansion of the self-parking area. There are now approximately 550 spaces that are 90% full during peak use periods on Tuesday through Thursday. An additional 130 spaces are located in less visible areas in parking garages and buildings near the tram. These lower visibility parking areas are approximately 50% full during peak use periods.

The current racks are held down by gravity and the valet is capable of quickly adjusting their setup, so capacity can vary. While the tram is a somewhat extreme example of bicycle and transit mixed mode commuting – it provides a visionary solution to the challenge of hills and connectivity.

Gibbs Street Bridge Elevator

The Gibbs Street Pedestrian Bridge, more formally known as the *US Congresswoman Darlene Hooley Pedestrian Bridge at Gibbs Street*, is a 700-foot pedestrian/bicycle bridge which opened in July 2012. It connects the Lair Hill neighborhood with the South Waterfront area just south of downtown Portland.

To compensate for the 70-foot elevation difference at the ends of the bridge, an extra wide elevator cab with front and back doors was installed as well as a stairway with a bicycle ‘channel’ to serve the five-story height. The 132-step stairway includes rest areas. The design of the bicycle runnel has not been well received by cyclists. Accessibility requirements for handrails can conflict with bicycle stairways, as handrails may obstruct or decrease the control of a bicyclist using the channel. In addition, the current design lacks a typical V or U shaped channel which helps bicyclists in directing their bicycle wheel when using the channel.

While neither the elevator nor the tram was constructed to serve cyclists specifically – the design and additional accommodations are benefiting cyclists. These two projects in the South Waterfront area are dramatic examples of advanced solutions to that overcome hill and elevation barriers.

Embrace the Hills

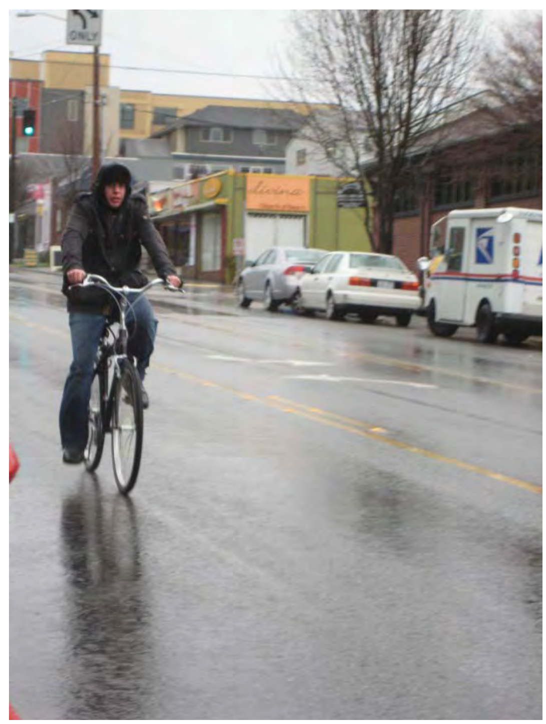
The hilly terrain and waterways of Seattle are part of the pride and culture of the city. Two of the nation's top five large cycling cities, Seattle and San Francisco, are also among the hilliest.

Solution:

There are examples from around the country and globe of communities that have made the case for celebrating the hills and actively promoting creative solutions.

The Wiggle is a marketing tool for San Francisco. In Pittsburgh the local advocacy group Bike Pittsburgh embraces the hilly terrain with promotional stickers. Current rides, races and hill climbing events in Seattle and the Puget Sound region revel in the hilly terrain.

While hills are a real physical barrier to cycling, promotion and encouragement can work in combination with infrastructure solutions to overcome the psychological barrier. Seattle is already known for its active population, recreating in the multiple mountain ranges and waterways around the city; promoting hill climbing on bikes should be no problem.



Neither rain, sleet or hills has stopped Seattle residents from turning to the bicycle for transportation in greater numbers

Hills can be promoted and embraced as part of the city's approach to wellness. Hill workouts are touted for building fitness for everyone from professional cyclists to senior walking groups.

CASE STUDY FOR A COMPREHENSIVE APPROACH TO HILLS

Lausanne, Switzerland

Lausanne is the fourth largest city in Switzerland, with 130,000 residents in the city and 300,000 in greater Lausanne. Situated on the shores of Lake Geneva, the City rises sharply from the lake at about 400 meters to 900 meters, a difference in elevation of about 500 meters (1,640 ft.) between the lakeshore at Ouchy and its northern edge bordering Le Mont-sur-Lausanne and Epalinge.

The city has gone to great lengths to plan for and encourage cycling despite the challenging topography. The city has identified specific actions to improve options for cycling in four key areas:

- Bicycle supportive transportation and land use planning
- Appropriate infrastructure
- Combined solutions (transit and bike share)
- Encouragement and promotion

Specific examples of actions to support cycling throughout the city include the following:

- Bike and Ride planning for transit integration (bike parking, bikes on trains and buses, bike share)
- Moderated vehicle speeds in identified areas
- Lane width redistribution according to the scope, reconfigures travel lanes to allow for an uphill bike lane on one side
- Contra flow bike lanes based on slope direction, developed to avoid steep inclines
- New bicycle/pedestrian bridge to connect two high points in the city
- Three new elevators to connect two levels of the city center
- Bike lanes and bus lanes on sloping streets (Cycle track in the uphill direction and shared bike/bus lane in the downhill direction)
- Bike sharing
- Educational materials promoting the use of folding bikes on transit
- Cycling map that highlights steep slopes and bike connections to transit

Summary presentation from Velo City available at:

http://shoploppen.dk/Velo-city_presentations/Jean-Christophe%20Boillat.pdf

Key Recommendations and Opportunities

Seattle has steep terrain and significant natural barriers that make bicycle route connectivity challenging. In order to make the bicycle network safe and comfortable for a wide variety of cyclists, SDOT will need to make overcoming hills a significant focus of network development, facility design, education and encouragement.

No single method for addressing hills will overcome the challenges. A comprehensive approach will be necessary to overcome hills as an impediment to increased cycling among residents of Seattle. This discussion highlights four specific strategies drawn from solutions introduced in this white paper. The strategies should be used in combination and inform the master plan process:

Support Development of the Best Routes and Facilities through Policy

SDOT should be clear in their intent to minimize the hills as a barrier to cycling through strategic and thoughtful placement of routes and appropriate facilities. In some cases there are existing somewhat flat and connected arterial routes that will need advanced and potentially expensive solutions. Minimizing the impact of hills should be a key strategy of bicycle network development and connectivity. SDOT should consider defined objectives in the master plan to support project development on low grade roadways in the future.

Continue Innovative Infrastructure Solutions

SDOT should continue to advance innovative infrastructure solutions throughout the city. Consider buffered bike lanes, passing lanes, uphill bike lanes, and contra flow lanes as specific options for hill routes. Hill direction should be a key consideration of facility selection and design. Continue the expansion of stair runnels/channels and elevators where needed.

Coordinate with Transit Providers and Puget Sound Bike Share

Work closely with transit and Puget Sound Bike Share to support clear connections to the bicycle network and adequate end-of-trip facilities. During network development for the BMP consider access to transit with hill direction in mind.

Provide Education and Encouragement

Develop programs and information to help people avoid hills. Continue to partner with transit agencies to promote bicycle transit integration. Celebrate hills as a source of city pride.

Appendix 2: BEST PRACTICES

WHITE PAPERS

2C: Road User Behavior

September, 2012

Best Practices White Paper: Road User Behavior Change Campaigns

Seattle Bicycle Master Plan Update

alta
PLANNING + DESIGN

Introduction

Bicycle ridership in Seattle is increasing quickly. With more bicycles on the road come more opportunities for drivers and bicyclists to interact. This rapid cultural shift may cause anxiety for some road users. This situation is not unusual; Seattle joins many US cities experiencing a rapid shift to the bicycle mode and a resulting focus on bicycle rider/driver interactions.

We know (from survey response and public comments) that there is some tension between Seattle road users in response to these growing pains. **The purpose of this white paper is to examine traffic safety campaigns undertaken by North American cities aimed at changing bicyclist and motorist behaviors that compromise road user safety or contributes to tension between motorists and cyclists.**

A Note on Evaluation

There is a body of research on the effectiveness of crash reduction strategies. The majority of the studies cited relate to the physical environment (e.g. geometric design or signalization), but some address behavioral countermeasures.

At the City's direction, the following sources were reviewed. The listed studies relevant to the campaign models considered in this white paper have been included.

- Federal Highway Administration – Crash Modification Factors Clearinghouse
- Evaluation of Pedestrian Safety Educational Program for Elementary and Middle School Children – Gates, Datta, Savolainen, and Buck[1]
- Effects of a driver enforcement program on yielding to pedestrians – Van Houten and Malenfant[2]

Additionally, we contacted the organizations responsible for each campaign to discuss whether they had any quantitative or qualitative evaluation of the campaign's effectiveness. In all cases where we received information, that has also been noted. We found that most organizations were tracking *outputs* (e.g. number of bicycle lights distributed) rather than *outcomes* (e.g. percentage of bicyclists using lights at night).

[1] http://trb.metapress.com/content/y663r1g03172wn83/?genre=article&id=doi%3a10.3141%2f2140-13
[2] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1284509/

A Note about Public Perception

Seattle is not alone in experiencing an increase in public debate around conflicts between motorists and cyclists. Most American cities with similar rates of bicycle mode shift are confronting the same trend of increased dialogue about cyclist courtesy, safety, rights and responsibilities. The remainder of this memorandum considers approaches that directly address dangerous and discourteous behavior between cyclists and motorists. However, a number of external factors should also be considered.

One issue for discussion is the degree to which the **perception** of discourteous cyclists is commensurate with actual **observed** behavior. An objective observation of cyclist behavior may well reveal that most cyclists are law-abiding and courteous most of the time. Yet drivers may remember the small percentage of instances when they do witness bad behavior and attribute that behavior to far more cyclists than is warranted. Drivers in this case do not realize that their memories and impressions are skewed, but they are influenced by confirmation bias[3] and the human tendency to remember situations with emotional content (such as a close call while driving).

It is certainly true that some cyclists and some drivers behave badly. The City of Seattle should be a leader in educating all road users about expectations and laws, but should also **communicate a fair and data-driven message about road user safety and behavior.** One way to accomplish this is to design umbrella "Share the Road" or "Respect" campaigns that address all road users, with specific targeted submessages that address each constituent group's particular issues. An alternative way to address this issue is to develop a simple series of factual talking points that educate the public, and the media, about the big picture of road user behavior. These talking points can be used in a media campaign and interwoven in standard city and advocacy outreach efforts.

Another issue to consider is that of driver comfort around bicyclists. Most bicyclists have experience driving, while many drivers may not have cycled in an urban environment. For this reason, **cyclist behavior that is reasonable or even necessary for safety may be misunderstood by drivers as illegal, discourteous, or dangerous** (such as taking the lane if there is not enough room to share the lane, swerving to avoid obstacles, bicycling outside of the door zone, running a red light if signal actuation does not register bicycles, or refusing to proceed without the right-of-way when drivers attempt to wave them on). Directly educating motorists about these issues is important – but the most effective way to create more empathy and

[3] According to the Oxford Dictionaries, confirmation bias is "the tendency to interpret new evidence as confirmation of one's existing beliefs or theories."

understanding on the part of drivers is to encourage them to give bicycling a try themselves.

A final factor is the question of **who is bicycling, and how those demographics affect attitudes and behaviors.** While Seattle has a more diverse mix of people who are bicycling than many American cities, cycling still attracts primarily young, fit men – U.S. young men are known to take greater risks than women and older people. As Seattle develops the bikeway network and achieves cultural shift, an ever-more diverse demographic range of cyclists will develop. This more diverse group may be more likely to be responsible, risk-averse road users no matter what mode they select for any given trip. City efforts to attract a more diverse user group will indirectly result in more courteous, safe cyclist behavior.

Problem Behaviors

Key dangerous and discourteous actions on the part of cyclists include the following:

- Running red lights and stop signs
- Wrong-way riding
- Lack of lights/reflectors at night
- Sidewalk riding[4]
- Riding under the influence of drugs or alcohol
- Failure to yield to pedestrians, and/or failure to give audible warning when passing pedestrians[5]

Key dangerous and discourteous actions on the part of motorists include the following:

- Not looking for cyclists when executing turns or merging
- Dooring[6]
- Passing too closely
- Harassing cyclists (e.g., throwing objects at bicyclists, shouting with the intent of startling a rider, or passing closely on purpose)

[4] While operating a bicycle on a sidewalk is not prohibited in the City of Seattle, there are regulations associated with sidewalk riding that, when not adhered to, can create dangerous conditions for all road users. Specifically, bicyclists on sidewalks are required yield to pedestrians, give audible signals when passing, obey traffic control devices, and “operate in a careful and prudent manner and a rate of speed no greater than is reasonable and proper under the conditions existing at the point of operation, taking into account the amount and character of pedestrian traffic, grade and width of sidewalk…and condition of surface.”

[5] Failure to wear a helmet has not been included in this list. While wearing a helmet is an effective way to reduce individual risk of injury, it has not been demonstrated to be a causal factor in causing crashes with other road users, and thus is a lower priority for education and enforcement.

[6] “Dooring” is defined as striking or nearly striking a passing bicyclist by suddenly opening a vehicular door.

- Speeding
- Driving under the influence of drugs or alcohol
- Parking/driving in bike lanes

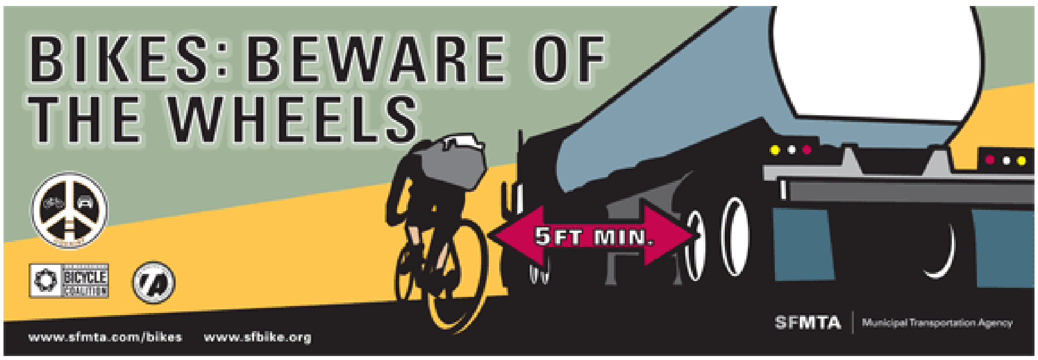
Campaign Concepts

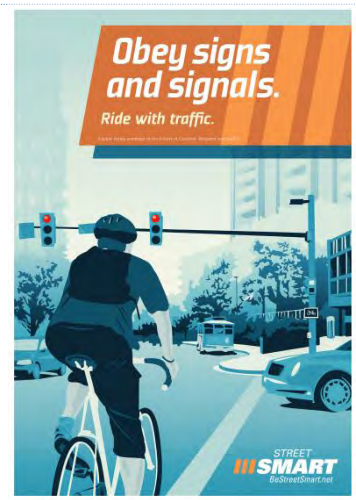
The following section describes best practice campaigns from around North America that address the target behaviors listed above. Each campaign summary lists the city or state where the campaign was implemented, the implementing agency or organization, the purpose of the campaign, a description of the campaign elements, and a link to more information. In addition, we have included any effectiveness data or results collected by the implementing groups, which Seattle BMP goals are addressed, and a rating of resource needs. Programs are organized by target audience: all road users, bicyclists, and motorists. A matrix summarizing the behaviors addressed follows the detailed campaign summaries.

General Road Safety Campaigns

“Eye to Eye” Campaign	
Location:	Portland, Oregon
Agency/ Organization:	Bicycle Transportation Alliance (BTA)
Purpose:	Foster a sense of mutual respect and responsibility between all road users.
Description:	The campaign includes print ads and public service announcements, community events (including trainings and giveaways, like bike bells and lights), and a pledge, quiz, and video. As the BTA puts it, the broader message is, “no matter what mode of transportation we’re using, let’s all give each other some room to breathe.” The campaign also, of course, asks road users to make eye contact with other road users to increase safety for everyone. 
Link:	http://btaoregon.org/2009/06/eye-to-eye-summer-kick-off/
Effectiveness:	Primary output tracked was attendance at events. “Share the Road” campaigns have not been shown to have a clear crash reduction effect, according to the NHTSA “Countermeasures that Work” report; this campaign has some, but not all, attributes in common with a “Share the Road” campaign.
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Moderate [primarily in campaign creation phase] Materials resources: Moderate [primarily in printed materials] Other resources: Media placement costs, though these may be subsidized or waived

"Street Smarts" Campaign	
Location:	San Francisco Bay Area, California
Agency/ Organization:	Various partners and implementing agencies
Purpose:	Address traffic safety issues by educating motorists, bicyclists, and pedestrians.
Description:	Street Smarts reaches motorists, bicyclists, and pedestrians and combines a variety of education programs and outreach campaigns in different communities, including youth poster and video contests, rewards programs for high school students, outdoor media, community outreach, and community-based traffic calming and traffic safety campaign resources. The program was specifically designed to be licensed to other communities for easy implementation. 
Links:	http://www.street-smarts.com/ http://streetsmartsmarin.org/
Effectiveness:	Two rounds of surveys were completed in 2009 and 2011, using the National Safe Routes to School survey format. The data are still being analyzed. "Share the Road" campaigns have not been shown to have a clear crash reduction effect, according to the NHTSA "Countermeasures that Work" report; this campaign has some, but not all, attributes in common with a "Share the Road" campaign.
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Low [because campaign is already created] Materials resources: High [primarily in printed materials and banners/ads] Other resources: Media placement costs, though these may be subsidized or waived

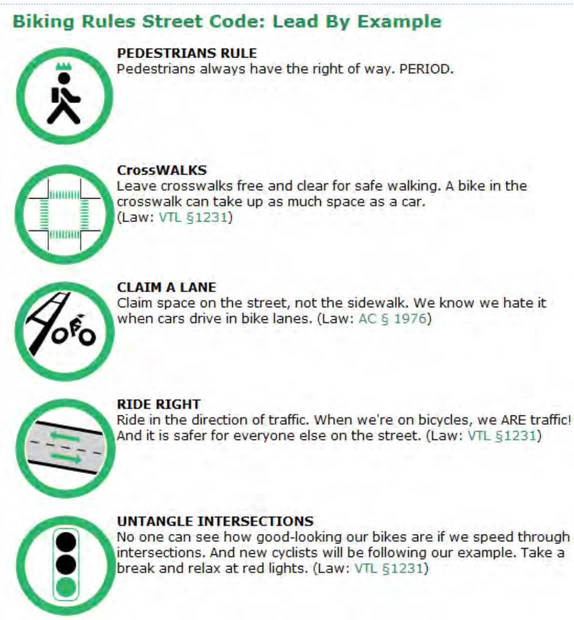
"Coexist" Campaign	
Location:	San Francisco, California
Agency/ Organization:	San Francisco Municipal Transportation Agency (SFMTA)
Purpose:	Inform both cyclists and drivers of large vehicles of ways to safely share street space, and remind cyclists to install and use headlights and rear lights on their bicycles to improve visibility and safety.
Description:	A partnership between the San Francisco Department of Parking and Traffic and the San Francisco Bicycle Coalition, this campaign disseminated messages throughout San Francisco, including Muni bus posters, transit shelter ads, and several hundred permanent signs communicating the California Vehicle Code section that states that bicycles are allowed use of the full lane. 
Link:	http://www.sfmta.com/cms/bsafe/3828.html
Effectiveness:	No information was provided by SFMTA. "Share the Road" campaigns have not been shown to have a clear crash reduction effect, according to the NHTSA "Countermeasures that Work" report; this campaign has some, but not all, attributes in common with a "Share the Road" campaign.
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Moderate [primarily in campaign creation phase] Materials resources: High [primarily in printed materials and banners/ads] Other resources: Media placement costs, though these may be subsidized or waived

"Be Street Smart" Campaign	
Location:	Washington, DC region
Agency/ Organization:	• District of Columbia Department of Transportation (DDOT) • Maryland Motor Vehicle Administration • Metropolitan Washington Council of Governments • Virginia Highway Safety Office • Washington Metropolitan Area Transit Authority
Purpose:	The goals of the campaign are to change motorist and pedestrian behavior, and reduce pedestrian and bicyclist deaths and injuries, by raising awareness of and compliance with laws, and by increasing enforcement activities related to bicycle and pedestrian safety. The campaign is designed to be replicable in other jurisdictions.
Description:	Street Smart is an annual public education, awareness and behavioral change campaign in the Washington, DC, suburban Maryland and northern Virginia area. Its goal is to reduce pedestrian and bicyclist deaths and injuries. Since its beginning in 2002, the campaign has used radio, newspaper, and transit advertising, public awareness efforts, and added law enforcement to respond to the challenges of pedestrian and bicyclist safety. Annual kickoff events that feature elected officials and agency leaders together with local pedestrians and bicyclists, as well as law enforcement professionals, have raised the profile of the campaign. 
Link:	http://bestreetsmart.net/
Effectiveness:	Pre- and post-campaign surveys of drivers, bicyclists, and pedestrians in the DC region have been performed annually since 2002, with a particular focus on 18- to 34-year-old males, who have an elevated statistical likelihood of being involved in a crash. For the 2012 campaign, survey respondents have demonstrated a 10% increase in awareness of enforcement activities, a 7% increase in awareness of the campaign, and a strong retention of the pedestrian enforcement message. "Share the Road" campaigns have not been shown to have a clear crash reduction effect, according to the NHTSA "Countermeasures that Work" report; this campaign has some, but not all, attributes in common with a "Share the Road" campaign.
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: High [creating and deploying campaign messages, organizing events, and law enforcement time] Materials resources: High [primarily in printed materials and banners/ads] Other resources: Media placement costs, though these may be subsidized or waived

Diversion Class	
Location:	Marin County, California
Agency/ Organization:	Marin County Bicycle Coalition
Purpose:	Provide targeted education (in lieu of citations) to road users who participate in unsafe behaviors.
Description:	Marin County's bicycle safety class is tailored to first-time offenders of certain bicycle-related traffic violations, including running a stop sign/light. In lieu of citations, cyclists and motorists can take the class instead. Interested citizens can also take the class, even if they did not receive a ticket. 
Link:	http://www.marinbike.org/Campaigns/ShareTheRoad/Index.shtml#StreetSkills
Effectiveness:	Qualitative data: Class participants report that they valued the class and learned new information that relates to safer road user behaviors. No quantitative analysis has been performed. "Share the Road" campaigns have not been shown to have a clear crash reduction effect, according to the NHTSA "Countermeasures that Work" report; this campaign has some, but not all, attributes in common with a "Share the Road" campaign.
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Moderate [greatest as program is being designed; lower during ongoing implementation phase] Materials resources: Low

Bicycle Behavior Change Campaigns

“Bike Smart” Campaign	
Location:	New York, New York
Agency/ Organization:	New York City Department of Transportation (NYCDOT)
Purpose:	Encourage law-abiding cyclist behavior by asking people to sign a pledge to follow laws (e.g., yield to pedestrians, stay off the sidewalk, ride with traffic).
Description:	The campaign includes animations of key problem behaviors, as well as information in English, Spanish, and Chinese. The NYCDOT has further developed a series of posters for commercial cyclists (e.g., messengers) in English, Mandarin Chinese, Haitian Creole, Italian, Korean, Russian, and Spanish. 
Link:	http://www.nyc.gov/html/dot/html/bicyclists/bikesmartpledge.shtml
Effectiveness:	No information was provided by NYCDOT
BMP Goals Addressed:	Safety, Equity, Livability
Resource Needs:	Staff resources: Low [creating and distributing materials] Materials resources: Low [primarily in printed materials]

“Biking Rules”	
Location:	New York, New York
Agency/ Organization:	Transportation Alternatives
Purpose:	Engage bicyclists to commit to a code of conduct as responsible road users.
Description:	“Biking Rules” is a clear, simple bicycling code of conduct intended to foster a sense of responsibility among bicyclists. The code aims to have bicyclists lead others by example by pledging to always yield to pedestrians, follow traffic laws, avoid riding in pedestrian spaces such as crosswalks, and other safe, legal behavior. 
Link:	http://bikingrules.org/ Related Video: “Pirates of Broadway: Salmon”: http://vimeo.com/9748648
Effectiveness:	Many variables have changed in cycling in NYC (including changes in infrastructure, more cyclists on the road, and other campaigns) since the program began, so it is difficult to isolate the effectiveness of any individual variable. Biking Rules is one tool in the broad goal of educating and activating cyclists to use the streets safely in NYC. 2012 outputs include: - 22,640 Biking Rules booklets distributed to NYC Cyclists - 322 local businesses distribute Biking Rules to their customers - 17 public schools or community centers distribute Biking Rules - 4 NYPD precincts use Biking Rules as part of their officer training
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Moderate [creating and distributing materials] Materials resources: Low [primarily in printed materials]

"Don't Be a Jerk" Campaign	
Location:	New York, New York
Agency/ Organization:	New York City Department of Transportation (NYCDOT)
Purpose:	Discourage three of the most dangerous cyclist behaviors: failure to yield to pedestrians, riding on the sidewalk, and riding against traffic.
Description:	This humorous video series features well-known New Yorkers - Mario Batali, John Leguizamo, and Paulina Porizkova - demonstrating how *not* to ride a bicycle courteously, in an effort to curb wrong-way riding, sidewalk riding, and cutting off pedestrians.
Link:	http://www.nyc.gov/html/dot/html/bicyclists/dontbeajerk.shtml
Effectiveness:	No information was provided by NYCDOT
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: High [skilled in video campaign creation] Materials resources: Low [as video is distributed primarily online]

<table>
<tr><th colspan="2">“How We Roll” Campaign</th></tr>
<tr><td>Location:</td><td>Columbus, Ohio</td></tr>
<tr><td>Agency/ Organization:</td><td>Yay Bikes!</td></tr>
<tr><td>Purpose:</td><td>Reduce bicycle/vehicle crashes near Ohio State University and elsewhere.</td></tr>
<tr><td>Description:</td><td>
The campaign features attractive media, local outreach, free swag, and free bicycle tours of Columbus, during which experienced student bicyclists share “how they roll” with fellow students. The campaign focuses on discouraging behaviors that lead to crashes: riding on sidewalks, failing to stop at red lights and stop signs, and not equipping bicycles with lights at night. Free lights are installed on bikes as part of the campaign.

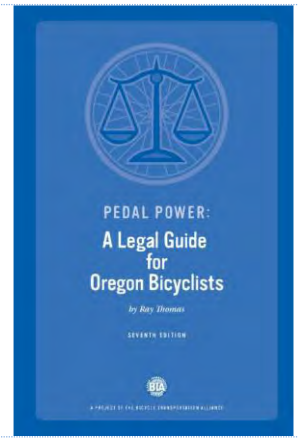
The bicycle tour takes riders to several local businesses for samples, socializing, and conversations about bicycling. Riding the tour increased participants’ reported levels of confidence with 1) maneuvering a bicycle, 2) fitting a bicycle to their body, 3) understanding bicycle-related traffic laws and 4) riding on streets.

How We Roll has been “packaged” and is now available for a fee for other communities and universities.


</td></tr>
<tr><td>Link:</td><td>http://yaybikes.com/portfolio/917/</td></tr>
<tr><td>Effectiveness:</td><td>Qualitative evaluation of the program indicates that participants find it valuable, particularly in the area of learning new skills that translate to safety. Program organizers have found it challenging to attract new participants, however.</td></tr>
<tr><td>BMP Goals Addressed:</td><td>Safety, Livability</td></tr>
<tr><td>Resource Needs:</td><td>Staff resources: Moderate [creating and distributing materials; organizing events]
Materials resources: Moderate [primarily in printed materials, giveaways, and lights]</td></tr>
</table>

"Make Way" Campaign	
Location:	Champaign County, Illinois
Agency/ Organization:	Champaign County Bikes
Purpose:	Educate bicyclists (and motorists) on safe bicycling behavior.
Description:	A series of cohesive, attractive safety messages address common unsafe behaviors, including riding on sidewalks, riding against traffic, not using lights at night, and running stop signs or lights. 
Link:	http://expsychlab.com/2012/02/13/make-way-bicycle-education-campaign/
Effectiveness:	No information was provided by Champaign County Bikes
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Low [creating and distributing materials] Materials resources: Low [primarily in printed materials]

“Get Lit” Campaign	
Location:	Chicago, Illinois
Agency/ Organization:	N/A
Purpose:	Educate cyclists that they are legally obligated to have lights at night, and distribute lights to riders who need them.
Description:	At events or along bikeways, bike lights are distributed and installed on bikes for free, along with educational materials about laws requiring lights and the importance of using them. 
Link:	http://www.uselightsatnight.info/
Effectiveness:	People who receive lights are grateful and report that they will use them. No quantitative studies have been performed. According to the NHTSA “Countermeasures that Work” report, increasing “active lighting and rider conspicuity” is a proven tactic to reduce crashes. However, no data are available to determine the effectiveness of campaigns intended to increase use of active lighting and wearing of visible/reflective clothing by cyclists.
BMP Goals Addressed:	Safety, Equity, Livability
Resource Needs:	Staff resources: Low [creating and distributing materials; distributing lights] Materials resources: Moderate [printed materials and lights – costs scales quite a bit depending on how many lights are distributed]

Bicyclist Legal Clinic and Guide	
Location:	Portland, Oregon
Agency/ Organization:	Bicycle Transportation Alliance (BTA)
Purpose:	Ensure that cyclists know their rights and responsibilities as roadway operators.
Description:	Taught by a local lawyer who specializes in bicycling and is very active in the bicycling community, these free 60-minute legal clinics educate cyclists about their rights and responsibilities. The clinics cover state bicycle and pedestrian laws, insurance information, and what to do if involved in a crash. Participants receive a free copy of “Pedal Power, a Legal Guide for Oregon Cyclists,” written by instructor Ray Thomas and published by the BTA. 
Link:	http://btaoregon.org/resources/
Effectiveness:	Quantitative effectiveness is difficult to measure. Clinics are popular and participants report that they learned new information.
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Low [creating and updating legal guide; organizing clinics – note that legal content was created by a volunteer lawyer] Materials resources: Low [printed guides]

Motorist Behavior Change Campaigns

“PRECAUCIÓN: Tu Familia También Usa La Bicicleta” (Caution: Your family also rides a bike)	
Location:	Los Angeles, California
Agency/ Organization:	Los Angeles County Bicycle Coalition (LACBC), City of Lights, day laborers, City of Los Angeles
Purpose:	Foster respect and responsibility among motorists towards bicyclists; engage day laborers in the development of a Spanish-language PSA.
Description:	The campaign includes posters and videos in Spanish and English, demonstrating the title message. In the video (distributed both in English and Spanish versions), a family is getting ready in the morning. The father leaves for work in his truck and is distracted and negligent on the road, putting bicyclists in danger. The final bicyclist, who almost gets struck by the father’s driver’s side door as he opens it abruptly, is his daughter. She scolds him and rides off, and he is left surprised and concerned. This campaign was created based on a collaboration with the City of Lights/Ciudad de Luces program and with input from day laborers and other organizations that serve Latino/Hispanic residents. 
Link:	http://la.streetsblog.org/2012/04/06/precaucion-a-tu-familia-spanish-psa-inspired-by-day-laborers-goes-up-in-bus-shelters-across-the-city/ Related videos: http://vimeo.com/37971012, https://vimeo.com/41059886
Effectiveness:	No information was provided by LACBC
BMP Goals Addressed:	Safety, Equity, Livability
Resource Needs:	Staff resources: Moderate [primarily in campaign creation phase] Materials resources: High [primarily in printed materials and banners/ads] Other resources: Media placement costs, though these may be subsidized or waived

Professional Driver Education	
Location:	San Francisco, California
Agency/ Organization:	San Francisco Bicycle Coalition (SFBC)
Purpose:	Ensure that professional drivers know about laws related to cycling, and understand safe vehicle operation around bicycles.
Description:	For taxi cab drivers, this campaign includes flyers, letters for new drivers, and test questions (as part of mandatory testing) for new drivers. For commercial and big rig drivers, this campaign features outreach to businesses with professional drivers, such as FedEx, UPS, and the USPS, in the form of educational flyers and newsletter articles. The campaign also includes posters depicting safe bicycle and commercial vehicle interaction (as described for the "Coexist" campaign above). 
Link:	http://www.sfbike.org/?drivertraining
Effectiveness:	No information was provided by SFBC
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Moderate [creating and distributing materials; working with businesses such as taxi companies] Materials resources: Low [primarily in printed materials]

"Give Me 3" Campaign	
Location:	Los Angeles, California
Agency/ Organization:	Los Angeles County Bicycle Coalition, Los Angeles Department of Transportation, Los Angeles Police Department, and Midnight Ridazz
Purpose:	Encourage drivers to give bicyclists sufficient space when passing.
Description:	There are many variations on this campaign model throughout the U.S., particularly with the proliferation of 3-foot passing laws in the last five years. A particularly sophisticated campaign from Los Angeles, called "Give Me 3," encourages drivers to give 3 feet of room to cyclists when passing. The slogan was developed through a community contest, and a professional graphic designer produced the posters. Posters were mounted in bus shelters throughout Los Angeles. 
Link:	http://lacbc.wordpress.com/2010/08/24/give-me-3-bike-safety-posters-unveiled-by-mayor-villaraigosa/
Effectiveness:	No information was provided by LACBC
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Moderate [primarily in campaign creation phase] Materials resources: Moderate [primarily in printed ads] Other resources: Media placement costs, though these may be subsidized or waived

"Watch for Bikes!"	
Location:	Fort Collins, Colorado
Agency/ Organization:	Fort Collins Bicycle Co-Op
Purpose:	Remind drivers to look for bicyclists before opening the driver's side door.
Description:	The Fort Collins Bicycle Collective produced a series of stickers designed to be affixed to the driver's side rearview mirror reminding drivers to look for bikes. They distributed them to the City's motor pool, the Colorado State University motor pool and police department, and the County motor pool, and also made them available upon request to community members. They successfully distributed 10,000 stickers. 
Link:	http://fcbikecoop.org/blog/2011/10/bike-co-op%E2%80%99s-%E2%80%9Cwatch-for-bikes%E2%80%9D-campaign-takes-off/
Effectiveness:	The impact of the program is difficult to measure, but those who take stickers do generally use them.
BMP Goals Addressed:	Safety, Livability
Resource Needs:	Staff resources: Low [creating and distributing sticker] Materials resources: Low

Summary Matrix

The following matrix summarizes the behaviors addressed by the safety campaigns described in this white paper.

	Location	Running red lights/stop signs	Wrong-way riding	Lack of lights	Sidewalk riding	Riding under the influence	Failure to yield to pedestrians	Failure to look when turning	Dooring	Passing too closely	Harassment	Speeding	Driving under the influence	Parking/driving in bike lanes
General Road Safety Campaigns		Bicycle Behaviors						Motorist Behaviors						
Eye to Eye	Portland, OR			x			x	x	x	x	x			x
Street Smarts	Bay Area, CA	x	x	x	x		x	x	x	x		x		
Coexist	San Francisco, CA	x	x	x				x	x	x				x
Same Roads, Same Rules	Massachusetts	x	x	x			x	x	x	x	x			x
Diversion Class	Marin County, CA	x	x	x	x	x	x	x	x	x				x
Bicyclist Behavior Change Campaigns		Bicycle Behaviors						Motorist Behaviors						
Bike Smart	New York, NY	x	x	x	x		x							
Ride Safe	Bend, OR		x	x		x								
Biking Rules	New York, NY	x	x	x	x		x							
Don’t Be a Jerk	New York, NY	x	x		x		x							
How We Roll	Columbus, OH	x	x	x	x									
Make Way	Champaign Co., IL	x	x	x	x				x					
Get Lit	Chicago, IL			x										
Legal Clinic	Portland, OR	x	x	x	x	x	x	x	x	x	x	x	x	x
Motorist Behavior Change Campaigns		Bicycle Behaviors						Motorist Behaviors						
PRECAUCIÓN video	Los Angeles, CA							x	x		x			
Watch for Bikes (Taxi Cab)	Toronto, ON								x					
Professional Driver Education	San Francisco, CA							x	x	x				x
Give Me 3	Los Angeles, CA									x				
Watch for Bikes!	Fort Collins, CO								x					

Targeted Enforcement Campaigns

Many of the behaviors under discussion are appropriate for targeted enforcement actions as a strategy to support a media education campaign. The most common types of enforcement actions target the following behaviors:

- Running red lights (both drivers and cyclists; red light running cameras are an effective permanent countermeasure for motorists)
- Speeding countermeasures (enforcement actions, speed radar trailers, automated ticketing, etc.)
- Lack of lights at night (often coupled with warnings, information distribution, and/or bike light installation, as noted for Lights-On campaigns, above)
- Failure to yield to pedestrians (both drivers and cyclists; commonly handled as a sting operation)
- Parking in bike lanes (can be handled through parking enforcement requests)
- Driving in bike lanes (can be handled as a sting)
- Bicycling on sidewalks in downtown (ticketing for this can be perceived as heavy-handed, particularly for people who are bicycling on sidewalks because they are too intimidated to bicycle on the street in downtown traffic; warnings or educational outreach through downtown “ambassadors” may be a better strategy).

Conclusion

There are numerous examples of campaigns from around the country that aim to change known problem behaviors on the part of bicyclists, motorists, or both parties. These campaigns use a variety of strategies and media, ranging from posters, videos/PSAs, press conferences, websites, pledge forms, classes and workshops, and stickers to communicate their core messages. If Seattle pursues a road user behavior change campaign, SDOT could make a contribution to the national understanding about the effectiveness of media and outreach campaigns by performing a detailed before-and-after evaluation study.

Appendix 2: BEST PRACTICES

WHITE PAPERS

2D: Prioritization

Best Practice White Paper #2: Prioritization

Seattle Bicycle Master Plan Update

FINAL

March 2013

Submitted to
Seattle Department of Transportation

NELSON
NYGAARD

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INTRODUCTION

As part of Seattle's Bicycle Master Plan Update, the City will develop a project prioritization framework based on the Plan's updated goals and objectives framework. By developing and implementing a prioritization framework, Seattle can develop a prioritized list of critical and strategic bicycle improvements that will be incorporated into the City's annual work programs and Capital Improvement Program. These capital improvements will ultimately enable funding to be allocated to specific projects. This white paper presents a range of common prioritization criteria, key considerations for Seattle (both formally adopted and informally practiced), and prioritization methodologies to help inform the development of the Seattle's future bikeway prioritization methodology and process. Best practices are drawn from several of Seattle's peer cities, including Portland, Minneapolis, and Vancouver, B.C., as well as global leaders in cycling network development like Copenhagen and London. These cities take different approaches, yet similar themes emerge across all peer cities. The focus of this paper is on how cities prioritize capital facilities (not programs or other actions).

WHY IS BICYCLE PROJECT PRIORITIZATION NEEDED IN SEATTLE?

Like many cities and regions across the nation, Seattle faces difficult transportation investment tradeoffs in the current economic climate—both across modes and within bicycling alone. The reality of Seattle's constrained city budget necessitates cost-effective and strategic investments in bicycling infrastructure. This will certainly require prioritizing bicycle infrastructure investments across facility types, cyclist markets, geographies, and a range of other different variables that might impact project prioritization. Key issues that Seattle seeks to address include:

- What are common project evaluation criteria use to prioritize identified bikeway improvements?
- What prioritization methodologies are being employed for bicycle projects and other modal projects?
- How should funds be allocated between new facilities and upgrades to existing facilities?
- How should Seattle prioritize funding between citywide and neighborhood-scale projects, geographies, and populations?

Leading bicycling cities across North America and Europe employ a variety of methodologies and guidelines that address these challenges and inform plan implementation.

PROJECT PRIORITIZATION METHODOLOGIES

There is no one size fits all prioritization framework. Prioritization processes and their underlying methods must reflect the community's unique vision, goals, and objectives of its bicycle network (as one layered component of the city's transportation system), as well as the role of bicycling in the city's multimodal transportation strategy. Understanding these guiding principles can help determine how a prioritization framework can be structured to help identify projects that address the community's vision. The goals of Seattle's Plan—including increasing ridership, safety, connectivity, equity, and livability— and their underlying objectives should shape the prioritization methodology.

In addition to this basic tenet of project prioritization, other key factors that require consideration when creating a prioritization framework include:

- Do prioritization criteria reflect community goals for bicycling? Any city that establishes prioritization criteria and criteria weighting should clearly define desired outcomes and reflect these outcomes.
- Have other programs and strategies (like safe routes to school or transit enhancements) been identified that inherently direct project prioritization?
- Is the prioritization framework desired to be more objective, subjective, or a mixture of both?
- Are there factors that could impact the speed of implementation? Common factors include grant availability, near-term street repaving/reconstruction programming, political backing, or specific projects that achieve key Plan goals like equity or safety.
- Is data available for objective analysis? If not, how long will data collection take and at what cost?

The following sections highlight some successful prioritization tools, methods, and criteria used in a range of modal project types, including transit and pedestrian prioritization processes.

Methodologies developed for the Puget Sound region

The 2007 King County Healthscape project, led by Urban Design 4 Health, developed the King County Transportation Programming Tool (TPT) as a way to compare benefits across projects and prioritize non-motorized projects according to community objectives. The TPT is a spreadsheet methodology that prioritizes active transportation improvements by evaluating topic areas such as project type (e.g., pathway, barrier elimination, spot improvement, traffic calming, or bikeway corridor improvement), safety, proximity to transit, new connections, accessibility, and potential demand. Each topic area undergoes a micro-evaluation using a set of outcome-based criteria, which are listed in Figure 1.[1]

The ability to prioritize between different facility or project types is important as it reflects the relative value a community might place on different types of facilities and score them according to their goals and objectives for bicycling. For example, a community that seeks to increase trips made by less confident cyclists that ride sparingly might place a higher weight on projects that emphasize separated facilities, aggressive intersection treatments, and traffic calming. Another benefit of this tool is that, in addition to conventional network improvement prioritization and project-by-project prioritization, the TPT tool can examine short segments within the same corridor to determine implementation phasing, if funding is limited. This methodology was recently applied in Federal Way's draft Bicycle and Pedestrian Master Plan.

[1] Note: These primary criteria, particularly the sub-criteria within the Safety and Equity primary criteria, tend to score facilities that offer greater separation from motorized traffic.

Figure 1 Primary Outcome Criteria for the HealthScape King County Transportation Programming Tool

Primary outcome criteria	Transportation			Environment		Health		Safety		Equity
Factors affecting primary criteria/ secondary criteria	Increase in bike/walk trips	Increase in transit trips	Decrease in vehicle trips	Decrease in per capita emissions	Decrease in per capita GHGs	Increase in physical activity	Decrease in obesity	Decrease in vehicle conflicts	Decrease in ped/bike-vehicle conflicts	Benefits to youths, elderly, persons with disability

Source: Urban Design 4 Health, HealthScape 2007

Common project evaluation criteria

Several of Seattle's peer cities, including Portland, Minneapolis, and Vancouver, B.C., use similar criteria for prioritizing bicycle projects. These are presented in Figure 2. Numerous recurring themes appear in each of these cities' prioritization criteria, including equity; community support; connectivity, access, and barrier reduction; innovation; leverage; travel demand; and return on investment. Some cities include unique criteria, such as the ability of a project to extend the visibility of bicycling, inclusion in an adopted plan, timeliness, impact on parking, and project cost.

Minneapolis' project selection criteria (Figure 2) were developed for use in the implementation of their 2011 Bicycle Master Plan. The Bicycle Advisory Committee assists the City in annually reviewing and selecting projects for inclusion in the 5-year Capital Improvement Plan. To date, the prioritization criteria are used in a narrative manner and are not assigned scores or weights.

Portland's Bike Plan for 2030 sets a policy framework of building out a network of low-stress bikeways proximate to 80% of residents, including mostly bike boulevards (neighborhood greenways), off-street paths, and separated cycle-tracks. Considering the environment of limited funding, Portland focuses resources on building out more miles of inexpensive neighborhood greenways and only dedicates funding to a few significant trail projects in the near term. The BMP does not prescribe the order of implementation of bikeway projects. Similar to Minneapolis, Portland does not use prioritization criteria quantitatively, but rather qualitatively assesses projects as funding opportunities arise.

The criteria presented in Figure 2 for Vancouver, B.C. was used to develop the project priorities set in the work program, *Cycling in Vancouver: Looking Forward to 2010 and 2011*. Vancouver initially used a criteria matrix and weighting scheme to prioritize bicycle projects. The weighting scheme assigned the highest importance to safety improvements; the potential to increase bicycling trips and the potential for cost sharing and coordination with other agencies came next. The rest of the criteria were assigned lower weighting values that placed them on a secondary level.

However, Vancouver has since stepped back from that method as they are now focusing investment on improvements to existing facilities rather than new facility construction. Since Vancouver has a strong bicycle network backbone, the emphasis of their bicycle program has shifted to upgrading existing facilities to entice new cyclists in areas with low cyclist volumes. The City's Active Transportation Program recognized the need to adopt a more nimble, adaptive approach to be able to take advantage of new information and opportunities as they arise. The

City now establishes priority projects and annually revisits the plan in light of changes in the built environment and community needs and priorities.

How can this be applied in Seattle?

While Seattle is still in the phase of updating and building out its bicycle facility network, it can look to Vancouver as an example of how to use prioritization during near-term network build out and future phases when the bicycle network is extensive and more mature. Likewise, community support will be an important factor in the development of the bicycle network, considering the nature of Seattle's strong neighborhood involvement. Similarly, Seattle's topography plays a major role in the choice to bike. This is a criteria area that is seldom, if ever, used, but is highly applicable to Seattle's context. Based on the Bicycle Master Plan Update's goals to increase ridership, connectivity, and livability and objectives to apply a context sensitive approach and build leading-edge bicycle facilities, projects that aim to improve bicycle mobility through Seattle's hillier neighborhoods (through the use of climbing lanes, buffering to provide more comfort, etc.) could be considered a higher priority.

Perhaps most important is the ability to leverage opportunity. A flexible approach to bikeway prioritization that allows for opportunistic action can speed the pace of implementation and reduce implementation costs. Likewise, understanding the competing modal needs of a corridor should be integrated into any future evaluation framework. In deciding which criteria to use and in what way, Seattle should consider a two-tiered approach:

STEP 1. Develop and adopt a formal qualitative, policy-based prioritization methodology for bikeway development with the intent of identifying the **types** of projects appropriate for implementation in specific phases based on a variety of policy needs. This initial step in the evaluation framework should be directly tied to the plan goals and objectives, in addition to considering facility types, market types, and implementation timeframe. As sub-step of this could include guidance on when to establish a mainline versus parallel bikeway along multimodal corridors with competing demands for space.

STEP 2. Establish a finer-grained quantitative project prioritization mechanism that prioritizes individual projects. The City should ensure all criteria are measurable and should determine what methods for data collection and analysis will be necessary to apply the criteria during the prioritization process. SDOT must weigh the cost, effort, and quality of data needed to ensure project prioritization uses reliable data inputs. Potential criteria may include:

1. Safety
2. Connectivity
3. Equity
4. Access (reduces or eliminates a barrier)
5. Leverage (e.g., does the project help leverage an existing investment?)
6. Travel demand

Figure 2 Bicycle project evaluation criteria of leading North American bicycling cities

Criterion	Minneapolis	Portland	Vancouver, B.C.
Equity	▪ Geographic equity: does the project supplement the existing bicycle system by removing barriers and closing system gaps? ▪ Demographic equity: does the project serve populations with lower than average rates of bicycling, considering race/ethnicity, class, gender, and age?	▪ How well does the project serve areas that are both deficient in low-stress bicycle facilities and high in the indicators of disadvantage, as informed by the Equity Gap Analysis? ▪ Is there geographic equity in the overall selection of projects for any given time period?	N/A
Safety	▪ Does the project provide a safer and more appealing alternative to what currently exists in a given corridor?	N/A	▪ Degree to which facility addresses known or perceived safety concerns. (Weighting: 7)
Community Support	▪ Has there been or is there public outreach planned for the project? What is the level of community support for the project?	▪ Is the project supported as a priority for the neighborhood, coalition, business association, or other stakeholders?	N/A
Connectivity, Access, and Barrier Reduction	▪ Does the proposed project supplement the existing bicycle system by removing barriers and closing system gaps? ▪ Does the project connect Minneapolis to surrounding communities and facilitate the ability to take longer trips by bicycle? ▪ Does the project provide bicycle access to popular destinations such as schools, parks, and public spaces?	▪ Does the project address a significant barrier? ▪ Will the treatment make the facility usable by the interested but concerned? ▪ Does the project close a significant gap in the connectivity of the bikeway network? ▪ Does the project facilitate access to key destinations? ▪ Does the treatment mesh with deficiencies the Portland Bureau of Transportation identified in its Cycle Zone Analysis?	▪ Existing bicycle volume; considers whether proposed facility is already on a "desire line." (Weighting: 1) ▪ Proximity to parallel cycling facilities of same or higher level of service; reflects desire for a connected grid of bicycle routes. (Weighting: 2) ▪ Degree to which facility will overcome gap, barrier, or bottleneck in cycling network. (Weighting: 3)
Innovation	▪ Does the project allow the City to pilot a new approach or design element to improve safety, comfort, and/or accessibility that is not currently used in Minneapolis? ▪ Does the project incorporate a successful approach that has been tried in other cities but not used in Minneapolis?	▪ Is the proposed treatment type innovative? ▪ Will it highlight a new type of design and in doing so provide needed information about the performance of the design? ▪ Will the project advance public acceptance of new design types?	N/A

Criterion	Minneapolis	Portland	Vancouver, B.C.
Visibility of Bicycling	N/A	▪ Does the project add to the overall visibility of bicycling as a primary means of transportation?	N/A
Leverage	▪ Does the project leverage funding from external sources?	▪ Will the project leverage other investments? ▪ Does the project enhance existing investments made in the bikeway network?	▪ Potential for cost sharing and coordination with other agencies; opportunities to implement bike facilities as part of other infrastructure projects would generate efficiencies. (Weighting: 4)
Travel Demand	▪ Is the project expected to increase the number of people bicycling and/or the number of trips taken by bicycle? ▪ Does the project meet or help create a demand for bicycling in population and employment concentrations, with a focus on high trip generation areas? Is the project anticipated to serve travel needs in all seasons?	▪ What is the expected return in terms of increased ridership, based on the potential for bicycling as identified in the Cycle Zone Analysis?	▪ Potential for generating new bicycle trips, considering type of facility, end-of-trip facilities nearby, destinations along the route, connections to transit, topography of corridor. (Weighting: 5)
Return on Investment	▪ How much will each project cost, how many users will benefit, and what level of safety and convenience benefit will it provide to users? ▪ Are operations and maintenance responsibilities defined? ▪ Are there differences between projects in the ability to maintain the facility over time?	▪ Is the project affordable with available funding? ▪ Will implementation of the project preclude implementation of other projects? ▪ What is the expected return in terms of increased ridership, based on the potential for bicycling as identified in the Cycle Zone Analysis?	N/A
Adopted Plan	▪ Is the project part of an approved regional, city, agency, or neighborhood plan?	N/A	N/A
Timeliness	▪ Is the project timely and will it be ready for construction in the funding cycle?	N/A	N/A
Cost	N/A	N/A	▪ Cost per kilometre. (Weighting: 2)
Parking impact	N/A	N/A	▪ Potential impact on on-street parking and loading; considers impacts on supply of curbside for parking and loading and on City revenues. (Weighting: 1)

Case Study:

Bikeway prioritization in Copenhagen

Image from Nelson\Nygaard

As one of the most bicycle-friendly cities in the world, Copenhagen's existing network of bicycle infrastructure and cycling rates are far more advanced than that of any city in the U.S. However, Seattle can learn from the approach they have used to prioritize network development and promote cycling in order to become the world's premier cycling city.

Copenhagen's most recent strategic cycling plan, *Good, Better, Best – The City of Copenhagen's Bicycle Strategy, 2011-2025*, sets long-term guidelines and priorities to reach the goal of becoming the best bicycle city in the world. Project priorities are based on political and community goals that focus on getting more people to cycle; retaining existing cyclists; ensuring a favorable cost-benefit ratio for investments; and developing a coherent bikeway network of high-quality facilities supported by target social marketing campaigns (including newcomers and children). Specific indicators that are assessed include the effect on travel time, comfort, perceived safety, statistical safety, and ability to leverage implementation from new development projects and other multimodal transportation improvements.

In addition to evaluating these effects, Copenhagen uses a variety of qualitative and quantitative methods, recognizing that prioritizing bicycle projects is not a science but rather an art. Their approach includes gathering stakeholder input through focus groups with cyclists and non-cyclists, before and after studies of projects (both interviews and data collection), estimated travel time benefits for all modes (not only cyclists), comfort level, and safety.

The City also developed the *Cycle Track Priority Plan, 2006-2016* to plan for 70 kilometers of new cycle tracks and cycle lanes. Similar to the *Good, Better, Best – The City of Copenhagen's Bicycle Strategy, 2011-2025*, the cycle track priority plan emphasizes travel time, perceived safety and comfort, and improving access to cycle tracks by expanding capacity on existing cycle tracks or parallel corridors and developing new cycle tracks. The decision to construct a new cycle track or use neighborhood traffic calming methods is made on a case-by-case basis.

While the City utilizes multiple methods to determine and prioritize bicycle projects, they also employ an open public process that informs when data can provide a solid basis for a decision and when City and community expertise should form the decision.

Source: Personal Interview with Andreas Rohl, City of Copenhagen Bicycle Coordinator

LEARNING FROM OTHER MODAL PRIORITIZATION EFFORTS

Multiple Account Evaluation

Multiple Account Evaluation (MAE) is an approach that assesses tradeoffs between corridor alternatives and/or different corridors based on identified desired outcomes. Quantitative and qualitative criteria for each outcome, or account, are used to foster discussion about priorities and tradeoffs. The MAE does not prescribe a specific right answer but rather can be used as a discussion tool to better inform decision-makers.

Key goals are established and assessment criteria for each account are determined, using both qualitative and quantitative measures depending on the information available. Scoring for each criterion is typically based on a seven point scale that follows natural data breaks: significant benefit, moderate benefit, slight benefit, neutral, slightly adverse, moderately adverse, and significantly adverse. The MAE methodology sums scores within each account and does not create one composite score for each alternative, encouraging the consideration of how measurable outcomes relate to broader values and to one another.

How can this methodology be used for bicycle planning and implementation?

This approach was developed in the United Kingdom for evaluation of major transportation projects (typically transit corridor projects) and can be useful for many applications, including bicycle corridor development and prioritization. The difference between other methodologies is that MAE prioritizes improvements based on corridor outcomes rather than bicycle suitability scoring.

The MAE was recently used in the corridor alternatives analysis for the Seattle Transit Master Plan (TMP). The MAE process helped the City better understand how criteria/measures are used as trade-off discussion points, as well as various corridor improvements' relative ability to meet TMP goals.

Other cost-benefit tools that could be used as inputs to an MAE corridor prioritization process are readily available online. These include the Health Economic Assessment Tool (HEAT) for Bicycling and Walking, New Zealand Transportation Agency's (NZTA) Economic Evaluation Manual, and the Pedestrian and Bicycle Information Center's Benefit-Cost Analysis of Bicycle Facilities Online Tool, which uses a methodology from NCHRP Report 552.

Enhancing past prioritization efforts in Seattle

Seattle's Pedestrian Master Plan (PMP) process employed a GIS-based prioritization framework methodology to identify pedestrian network deficiencies and assign priorities for improving the pedestrian infrastructure. This prioritization framework evaluates the relationship of key criteria including existing and latent demand, equity (using socioeconomic and health characteristics), and pedestrian quality indicators for links (along the roadway) and nodes (crossing locations). This method is particularly useful because it clearly defines varying levels of deficiency and need and is a methodology already being used within SDOT—making expansion and enhancement of the methodology more palatable. Seattle could further enhance this process by either:

1. Developing a composite scoring system that merges the PMP prioritization framework with multiple account evaluation criteria and methods

OR

2. Integrating corridor segments that with detrimental cycling environments into the MAE process as *one* criterion for alternatives analysis.

How can this be applied in Seattle?

As described above, the MAE was developed as a discussion tool for assessing corridors and modes with regard to key outcomes. The MAE approach is a more robust and fine-grained evaluation methodology that can expose potential corridor benefits with greater accuracy. Seattle can use the MAE during the BMP update prioritization process to facilitate important discussions regarding which areas or corridors should take precedence and which priority bicycle facilities would best serve those areas, in terms of important goals like equity, safety, and increased ridership.

Additionally, a method Seattle could use to determine priority areas is the Cycle Zone Analysis, which was developed for the *Portland Bicycle Plan for 2030*. This methodology considers characteristics of each geographic zone—including road and bicycle network density and connectivity, land use, slope, barriers, and bikeway quality—to identify areas that will capture large numbers of bicycle trips. This methodology could demonstrate which areas are best suited for near-term investments and which areas are in need of innovative facility treatments.

KEY CONSIDERATIONS

SDOT will need to develop clear criteria for prioritizing bikeway improvements during implementation of the BMP Update. Key challenges and trade-offs that have been addressed in other emerging bicycling cities are highlighted in the following sections.

How can Seattle prioritize between new facilities vs. upgrades?

SDOT must balance the competing needs for bicycle network expansion with upgrading existing facilities to higher safety standards or to allow for greater comfort and capacity. Generally, cities have yet to develop specific criteria that prioritize a new facility over an upgraded facility, or vice versa.[2] Instead, many cities establish policy guidance and prioritization frameworks that direct plan implementation and bicycle investments. This allows cities to remain opportunistic as grant funding, roadway reconstruction projects, and other implementation mechanisms become available—as opposed to being tied to strict implementation standards or prioritization criteria.

According to the recently updated AASHTO Guide for the Development of Bicycle Facilities 4th Ed. (2012) roadway retrofits for bicycle facilities are best accomplished as part of a repaving or reconstruction project because installation is cleaner and costs are reduced. Seattle should consider this as a criterion when prioritizing an upgrade over a new facility

[2] Note: The City of Minneapolis uses a prioritization criterion that indirectly favors bikeway expansion at the expense of retrofit opportunities (e.g., "Does the proposed project *supplement* the existing bicycle system by removing barriers and closing system gaps?" [*emphasis added*])

One example Seattle can look to for guidance is the recently adopted Santa Monica Bike Action Plan. As part of the Plan's implementation strategy, the City developed a series of phased improvements demonstrating inherent priorities (see Figure 3). In the near term, the plan focuses on developing the backbone of neighborhood bikeways, elevating them from signed bicycle routes. New low cost neighborhood bikeways are the top priority, a few high cost, catalytic projects are a second priority, and limited bikeway safety retrofits are the lowest priority. In the long term, the plan aims to reach a high rate of cycling by investing in transformative projects. At this stage, high quality retrofits will be considered, yet still as a third priority below new infrastructure that fill important gaps in the system.

Figure 3 Santa Monica Bike Action Plan project prioritization framework

General Priorities	Near Term Goal: Develop backbone of new neighborhood bikeways and catalytic projects	Long Term Goal: Implement highly visible, transformative, and visionary improvements that will see massive influx of cycling	One-Year Update
High Priority	Low cost, neighborhood bikeways with limited separation	Gap closure projects that are high cost and/or present major modal trade-offs	High priority neighborhoods are near full implementation
Medium Priority	Catalytic projects – limited number of high cost, high quality, low stress, high visibility, catalytic projects	Infill effort of higher cost, higher quality infrastructure	Critical east-west neighborhood greenway and north-south cycle track are in planning phase
Low Priority	Bikeway retrofits – only if existing bikeway is of low quality or presents hazards such as bike lanes along high turnover parking corridors	High quality retrofit enhancements (e.g. expand capacity to double bike lanes in high demand corridors) and basic retrofits (bikeways that were recently striped)	Several commercial corridor bikeways have been retrofitted (conventional bike lane to buffered bike lane conversion)

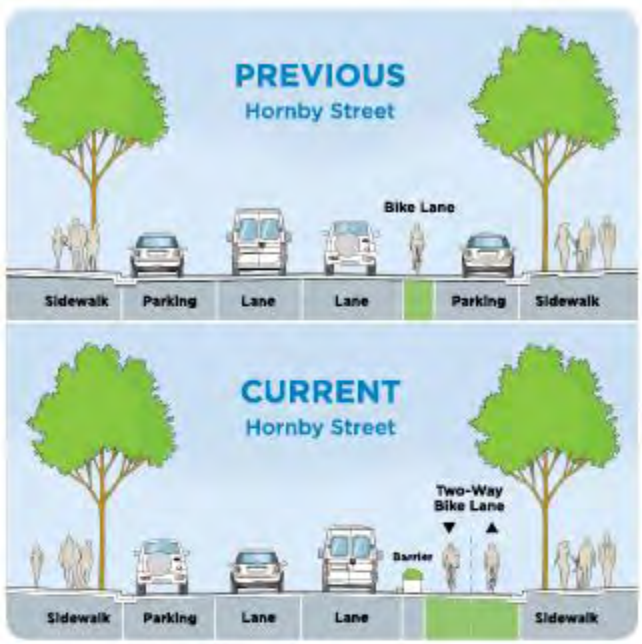
As mentioned in the *Common project evaluation criteria* section, Vancouver B.C. initially employed a criteria and weighting-based priority scheme to index bicycle projects that emphasized new facility construction. However, because Vancouver has implemented a large portion of its planned bikeway network (including full build out of its network backbone), funding has shifted to upgrading existing facilities to entice new cyclists in areas with low cyclist volumes. This is the case with several of Vancouver's high profile downtown cycle track projects. Hornby Street (Figure 4) was a street converted from a high stress bike lane to a high quality, low stress separated facility.

Ultimately the decision to prioritize expansion of the bikeway network versus upgrading existing facilities should depend on:

- Community goals for cycling numbers, target cycling markets, bikeway equity, safety, etc.
- Level of network build out (i.e. is the bikeway network extensive enough to serve existing cyclists and expand ridership beyond the regular cyclist market?)
- Opportunities to retrofit existing bikeways through programmed roadway projects, land development requirements, or as specific safety-related funding become available (regardless of its priority ranking)
- A Complete Streets policy (which Seattle has) or, in the case of the Seattle Bicycle Master Plan update, complete Mobility Corridors as a mechanism for opportunistic bikeway implementation

- Ability to capitalize on other transportation projects to ensure seamless bicycle connections (e.g., bridge retrofits and major capital projects like the Alaskan Way Viaduct removal)

Figure 4 Bike facility upgrade example in Vancouver BC



Hornby Street bike lane to cycle track conversion in Vancouver BC
Source: City of Vancouver, BC

How should Seattle balance resources between citywide and neighborhood-scale projects?

Projects at several scales are necessary to capture the mobility benefits provided by different types of trips, including trips that are regional, downtown and urban village access, and recreational in nature. Citywide and regional projects establish or improve access across a wide geographic range and can provide mobility benefits for long haul commute and recreational trips. Neighborhood-scale projects improve the viability of bicycling for short trips (two miles or less) within or between neighborhoods, to downtown, or even to major transit centers and transportation hubs. Seattle will need to consider the mobility versus destination access tradeoffs between focusing resources on citywide and neighborhood-scale projects.

Citywide. Large-scale projects, while more costly, can provide a high level of mobility within a city and region. For example, the Minneapolis Bicycle Master Plan developed a functional classification for bicycle facilities, including arterial bikeways (regionally significant, high cyclist volumes), collector bikeways (feed into arterial bikeways), and neighborhood bikeways (provide local connections). Minneapolis' strategy includes prioritizing bike paths and arterial bikeways over collector and neighborhood bikeways, and maintaining arterial bikeways at a high level of quality.[3]

This is a similar approach being employed in London, a city experiencing a massive upswing in bicycle use and bicycle infrastructure investment. In order to achieve their bicycle mode share goals (400% increase in trips above 2000 levels by 2025), London is developing a network of Cycle Superhighways through a public-private partnership with Barclays. The spoke and hub system provides access to London's city center from outer London on wide, well-marked lanes with bicycle priority signals. Four Cycle Superhighways are currently operating and an additional eight will open by 2015.[4]

Neighborhood-scale. Depending on the goals and objectives of a bicycle plan, prioritizing the development of inexpensive, low-stress bicycle routes through neighborhoods may be more appropriate. As described in the "Common project evaluation criteria" section, Portland's Bike Plan for 2030 establishes relatively low cost neighborhood greenways as the top priority during the first 5 years of implementation. This strategy was put in place in order to spread available funds widely so that a majority of residents will live close to a low-stress facility in the short term. Limited funds will still be available for trail projects, cycle tracks, and other innovative bicycle facilities on or near major roadways. However, Portland's priority is to increase investment in higher quality arterial and collector bicycle infrastructure in the future by increasing the proportion of residents with access to bicycle facilities in the near term.[5] Since Seattle's goals and objectives focus on increasing cycling for all trip purposes, increasing connectivity, cycling access for all, and building neighborhood greenways, Portland's approach may also be suitable for Seattle.

How can Seattle ensure equity in BMP implementation?

Seattle will need to consider geographic and demographic equity in the prioritization process. Equity analysis will ensure that neighborhoods and populations that have been historically underserved by transportation improvements will be provided with the same level of bicycle facilities as the rest of the city. Analyzing geographic equity can include bicycle facility coverage by neighborhood or other geographic unit. For example, the Minneapolis BMP developed a set of travelsheds for use in prioritization that are based on geographic areas delineated by major barriers (e.g. freeways, waterways, etc.) and that act as channels for bicycle commuters to downtown. The BMP determined that each travelshed should have at least one arterial bikeway in order to form a spoke and hub system with ring arterial bikeways providing access between spokes.

Demographic equity analysis involves evaluating concentrated areas of disadvantaged populations, including non-Caucasian, low-income, youth, and elderly populations, to assess the degree to which these areas are served by the bicycle network. An Equity Gap Analysis informed the Portland Bicycle Plan and included a variety of indicators listed in Figure 5. The Equity Gap Analysis identified areas where disadvantaged populations live and where they need access compared to areas that are poorly served by the existing low-stress bikeway network.[6]

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[3] City of Minneapolis. *Minneapolis Bicycle Master Plan.* June 2011.

[4] Barclays Cycle Superhighways. Retrieved 7/10/2012 from: http://www.tfl.gov.uk/roadusers/cycling/11901.aspx

[5] City of Portland Bureau of Transportation. *Portland Bicycle Plan for 2030: A World Class Bicycling City.* February 2010.

[6] City of Portland Bureau of Transportation. *Portland Bicycle Plan for 2030: A World Class Bicycling City.* February 2010.

Figure 5 Equity Gap Analysis Indicators, Portland Bicycle Plan for 2030

Indicator	Description	Values
Income	High Poverty	> 14.75%
	Medium Poverty	7.04% - 14.75%
	Low Poverty	< 7.04%
Race/ethnicity	Above citywide average percent non-white	> 21.91%
	At or below citywide average percent non-white	<= 21.91%
Age: Youth (1-18)	Above citywide average percent youth	> 20.52%
	At or below citywide average percent youth	<= 20.52%
Age: Youth (65+)	Above citywide average percent older adults	> 11.26%
	At or below citywide average percent older adults	<= 11.26%

Source: Dill, Jennifer and Brendon Haggerty (2009). *Equity Analysis of Portland's Draft Bicycle Master Plan – Findings*, PSU Center for Transportation Studies.

How can Seattle evaluate bicycle programs?

In addition to prioritization of bicycle projects, another important consideration for Seattle during the BMP update is bicycle program prioritization, including education, encouragement, and enforcement. Example programs include Bicycle Sundays, the Walk, Bike, Ride Challenge, bike parking programs, and bicycle helmet safety awareness programs.

Although most cities have not established sophisticated evaluation processes to test the effectiveness of bicycle programs, some cities have begun evaluating the fundamental ability to achieve community or bicycle plan goals. In the Minneapolis Bike Master Plan, non-infrastructure bicycle initiatives are prioritized based on performance criteria that link into the same goals as bicycle projects. The list below provides a basic example of how this could be structured in Seattle:

- Goal #1: Increase bicycle mode share ➔ How many people does the initiative serve/reach?
- Goal #2: Bicycling in Minneapolis is safe and comfortable ➔ Will the initiative result in fewer crashes, injuries, and fatalities?
- Goal #3: Destinations in Minneapolis are reasonably accessible by bicycle ➔ Is the message effective enough to change habits?

How can this be applied in Seattle?

Even though an objective prioritization process is being employed in the Bicycle Master Plan Update, Seattle should clearly define parameters for flexibility in the prioritization methodology. This is seldom done in a coordinated manner in bicycle planning and represents an opportunity for Seattle to establish a best practice in bikeway prioritization and implementation. Prioritization conditions or relaxation factors addressed in the previous sections should form the basis of a formal "Prioritization Flexibility Framework".

Furthermore, Seattle's Racial Equity Impact Analysis Toolkit, required for all department work plans, will inform the implementation of the BMP Update. However, additional indicators of disadvantaged populations, including low-income, youth, and elderly, could be included in the prioritization process. These can even be included in larger evaluation frameworks, such as the Multiple Account Evaluation.

WHAT'S NEXT IN PRIORITIZING BICYCLE PROJECTS?

In addition to commonly used quantitative prioritization criteria detailed in the sections above, additional benefits from bicycling are increasingly considered by communities, including travel time, transportation cost, health, economic, and community benefits. This is an approach replicated in the King County TPT methodology and could be applied to the Multiple Account Evaluation methodology explained above.

Travel Time Benefits. Although bicycle travel represents a relatively small portion of total travel, it is a relatively large portion of travel time (typically 15-30%). Therefore, priority treatments and operational conditions—like switching the direction of stop signs in neighborhood cycle routes and dedicated bicycle signal phases—can improve the bicyclists' travel experience. Seattle can begin quantifying the cumulative bicycle travel time impacts of various corridor projects to determine order of magnitude priorities.

Health Benefits. Studies have linked active transportation to reduced pollution emissions, increased physical activity and fitness, improved mental health, and reduced household expenses and financial stress. Additionally, low-income residents may rely on public transportation, bicycling, and walking as affordable transportation options to access medical facilities and healthy food.[7] Seattle can use the HEAT tool (mentioned in the *Multiple Account Evaluation* section) to quantify the health impacts of various bikeway corridor projects.

In addition, communities are increasingly recognizing the health benefits of active transportation and performing health impact assessments (HIA) when evaluating transportation programs, plans, and projects. For example, Clark County, WA performed an HIA for the 2010 Bicycle and Pedestrian Master Plan in order to maximize health benefits from strategies implemented through the plan. The assessment evaluated the impact of the network development on obesity trends (and related illnesses), access to food, and injuries and fatalities for the County as a whole and disadvantaged groups.[8]

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[7] Litman, Todd. *Evaluating Public Transportation Health Benefits.* Victoria Transport Policy Institute. June 2010.

[8] Clark County Public Health. *Comprehensive Health Impact Assessment: Clark County Bicycle and Pedestrian Master Plan.* December 2010.

Transportation Cost Benefits. Alternative transportation modes, including transit, bicycling, and walking, can reduce the cost of transportation and make Seattle more affordable. The Center for Neighborhood Technology found that transportation costs can range from 15% of household income in compact, accessible neighborhoods to over 28% in areas with an auto-oriented urban form and limited transportation options.[9] Transportation and housing cost measures can be included in the MAE process, using criteria such as the number of households paying 40% or more of household income for housing costs and the average transportation cost for residents within the area or near the corridor.

Economic Benefits. Bicycling can provide additional economic benefits to the community in the form of increased revenue for businesses, sales tax revenue for the City, and job growth. Studies have found that transit users, pedestrians and bicyclists support businesses more than drivers by going to stores in commercial areas more often and spending more money.[10] Research also shows that Complete Streets with bicycle and pedestrian infrastructure can bolster the economy through increased property values and taxes[11] and job growth.[12] Street designs that promote bicycling and walking improve conditions for existing businesses and help to revitalize neighborhoods and attract new development. Bicycle infrastructure projects also create jobs. A study by the Political Economy Research Institute at the University of Massachusetts found that the construction of on-street bicycle lanes generates 14.4 direct, indirect, and induced jobs per $1 million of public investment, and bike boulevards stimulate 11.7 jobs per $1 million.[13] Estimates of economic impact and job growth for different priority facility types can be included in an MAE exercise using tools like New Zealand Transportation Agency's (NZTA) Economic Evaluation Manual or the Pedestrian and Bicycle Information Center's Benefit-Cost Analysis of Bicycle Facilities Online Tool.

KEY OPPORTUNITIES FOR SEATTLE

As Seattle considers its framework for prioritizing improvements to numerous bicycle corridors, it can learn from the methodologies and strategies of other cities in North America and even Europe. This white paper not only reinforces commonly used methods and criteria, but also introduces opportunities to prioritize bicycle corridors that achieve the Bicycle Master Plan Update's goals and objectives—including increasing ridership, safety, connectivity, equity, and livability. When developing the project prioritization plan and evaluation criteria, Seattle should consider integrating the following into the framework:

Consider how priorities might change over time. Seattle should clearly define when it is appropriate to upgrade existing facilities over expanding the network. Potential criteria could include funding opportunities, whether a street is programmed for reconstruction, urgent safety concerns, whether new bikeway implementation in sub-areas or high priority areas are near

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[9] Center for Neighborhood Technology, "$4 per Gallon Gas – Are We Ready?", http://www.cnt.org/repository/Published.Planetizen-$4perGallonGas.pdf

[10] Macdonald, Elizabeth; Sanders, Rebecca; Anderson, Alia. "Performance Measures for Complete, Green Streets: A Proposal for Urban Arterials in California." University of California Transportation Center. 2010

[11] Richard Campbell and Margaret Wittgens, 2004, "The Business Case for Active Transportation: the economic benefits of walking and cycling" (Go for Green: the Active Living and Environment Program), 32.

[12] National Complete Streets Coalition, Local Government Commission. "It's A Safe Decision: Complete Streets in California." February 2012.

[13] Garrett-Peltier, Heidi. *Estimating the Employment Impacts of Pedestrian, Bicycle, and Road Infrastructure.* Political Economy Research Institute University of Massachusetts, Amhurst. December 2012.

completion, and ease of enhancing "low-hanging fruit" bikeways (e.g., requires no parking removal, requires only bike lane restriping without moving the centerline, etc.).

Beyond bicycle network build out, the City could also develop a strategy for prioritizing between "hard" and "soft" infrastructure. As bikeway networks expand in cities around the world, funding allocation tends to shift slightly toward greater encouragement and education efforts. In some cases, this is a function of cities increasing the total funding allocation for bicycle investments; while in others it is a strategic direction to begin leveraging their extensive network investments with marketing and "culture change" promotional efforts.

Look at commonly used transit and pedestrian prioritization frameworks. Seattle has a prime opportunity to enhance typical prioritization methodologies for bikeways (and pedestrian facilities in the case of Seattle's Pedestrian Prioritization Framework developed by SvR Design) by integrating criteria and scoring similar to the Multiple Account Evaluation approach. Because this method was employed in the Seattle Transit Master Plan, much of the data and scoring is already available.

Quantify community benefits. Seattle could expand project evaluation efforts by demonstrating how bicycle projects will improve bicycling conditions and attract latent demand, as well as provide a tangible benefit for non-bicycle users. A key question that bicycle project prioritization should answer is how a project can meet the Bicycle Master Plan Update's livability goals. By quantifying multi-user benefits, SDOT can clearly demonstrate Bicycle Master Plan implementation is a community investment, not just bicycle investment. The criteria described in the "What's next in prioritizing bicycle projects?" section could be used to make this case.

Be opportunistic and adaptable. As is the case of Vancouver B.C., Santa Monica, and many other communities, a flexible approach to bikeway prioritization that allows for opportunistic action can speed the pace of implementation and reduce implementation costs. One prioritization criteria that Seattle might consider is whether a project is located along a corridor that will see massive transformation from a major transit or roadway project. Seattle's Complete Streets ordinance requires bicycles to be accommodated in all routine system improvements. Similarly, the Mobility Corridor policies developed in the Seattle Transit Master Plan (as well as future policy support in the Bicycle Master Plan Update) will further enable opportunistic implementation activity.

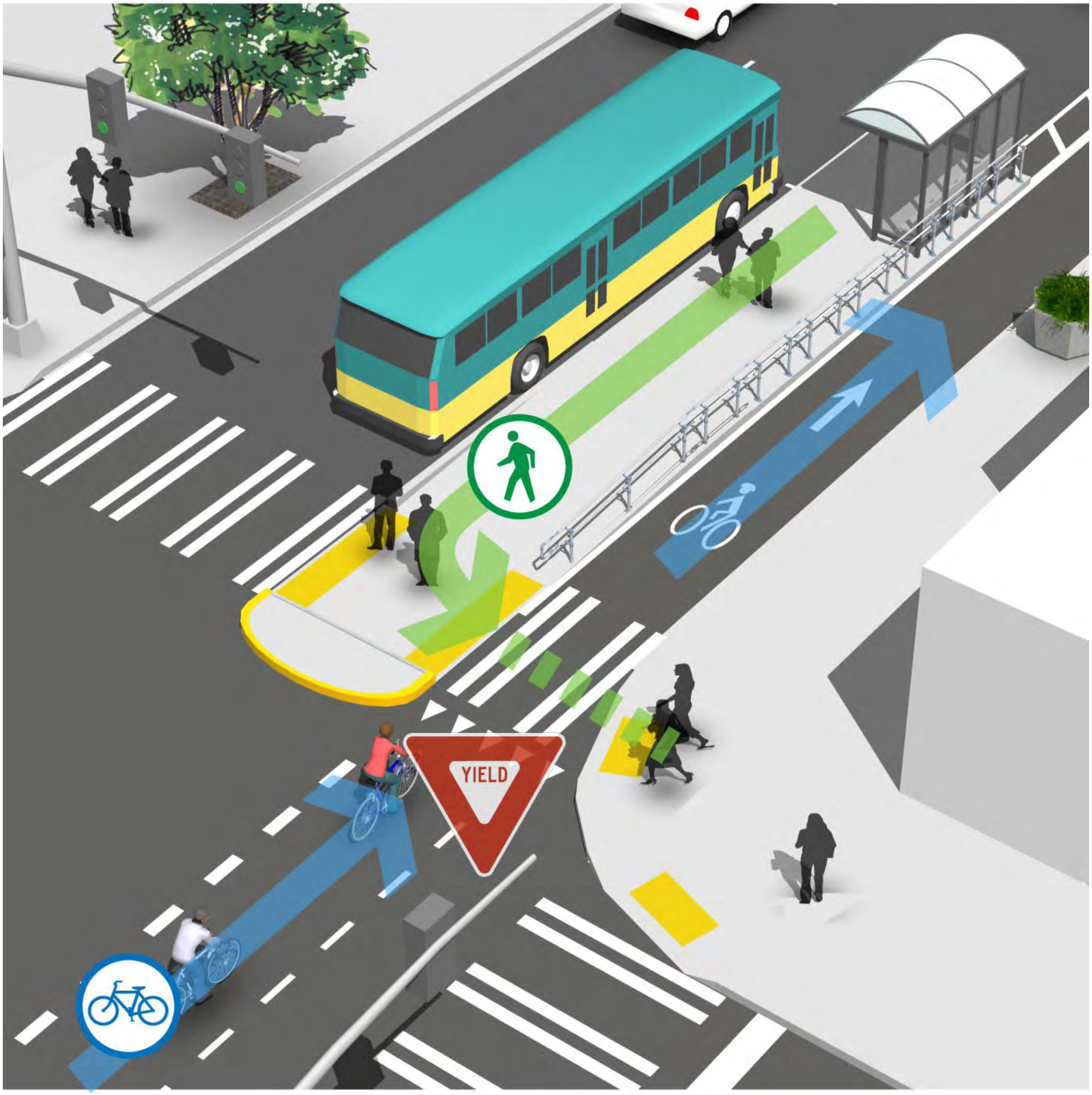
Appendix 3:
VISUAL GUIDES

3A: Education Information Sheets

Chapter Four

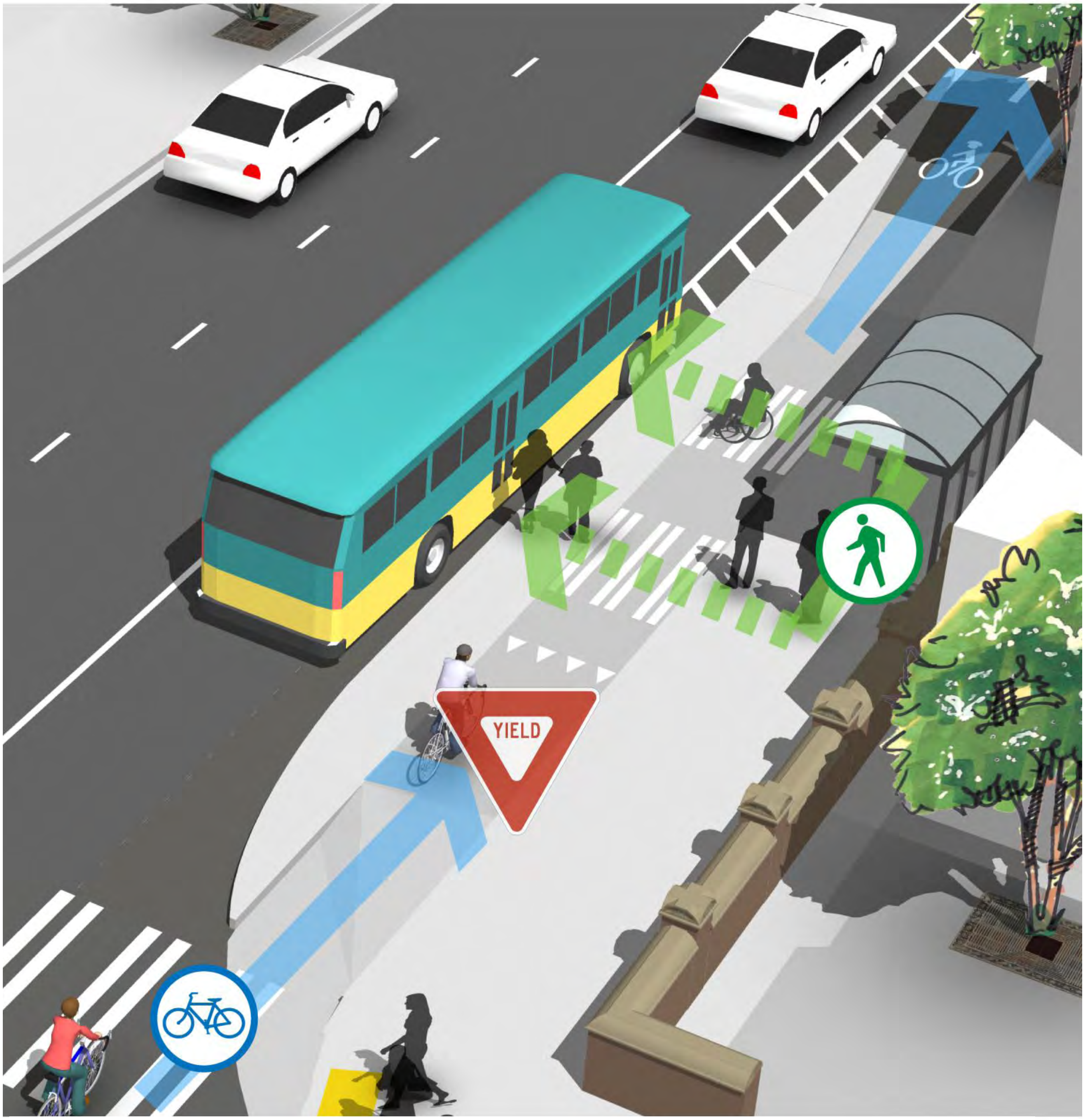
EDUCATIONAL INFORMATION SHEETS

CYCLE TRACKS AT TRANSIT STOPS



Cycle tracks are designed to bypass transit vehicles, but people riding must yield to pedestrians crossing to the transit island.

CYCLE TRACKS AT TRANSIT STOPS



Cycle tracks are designed to bypass transit vehicles, but people riding must yield to pedestrians crossing to board the transit vehicle.

CYCLE TRACKS AT TRANSIT STOPS

Cycle tracks are a key facility type in the Seattle bicycle facility network, and interactions between bicyclists, bus operators and transit riders need to be safe and predictable.

DESCRIPTIONS

Designs for cycle tracks at transit stops are meant to prioritize both bicycling and transit efficiency by reducing conflicts in the roadway. One typical design allows for transit passengers board and alight on a transit island, and cross to the sidewalk at a controlled location across the cycle track. This reduces conflict, and increases predictability for all users.

Another design option raises the cycle track to the same level as the sidewalk. In this configuration, passengers wait in the sidewalk area and may cross the cycle track only when boarding or alighting the transit vehicle.

INSTRUCTIONS ON HOW TO USE CYCLE TRACKS AT TRANSIT STOPS

PEDESTRIANS

- Pay special attention when entering the transit stop island.
- At signalized intersections, obey the pedestrian signal.

BICYCLISTS

- Use caution when traveling past a transit stop island. Transit stops may have high volumes of pedestrians crossing the cycle track.
- Yield for pedestrians crossing to the transit island.

MOTORISTS:

- Do not drive in the cycle track (NOTE: something like this – we have has some confused drivers along Dexter – unsure of where to drive, crazy, I know!)
- If the bus stop requires an in-lane stop, wait behind the bus while the passengers board and alight – do not pass the bus.
- People riding bikes are allowed to opt out of the cycle track and merge into the travel lane.

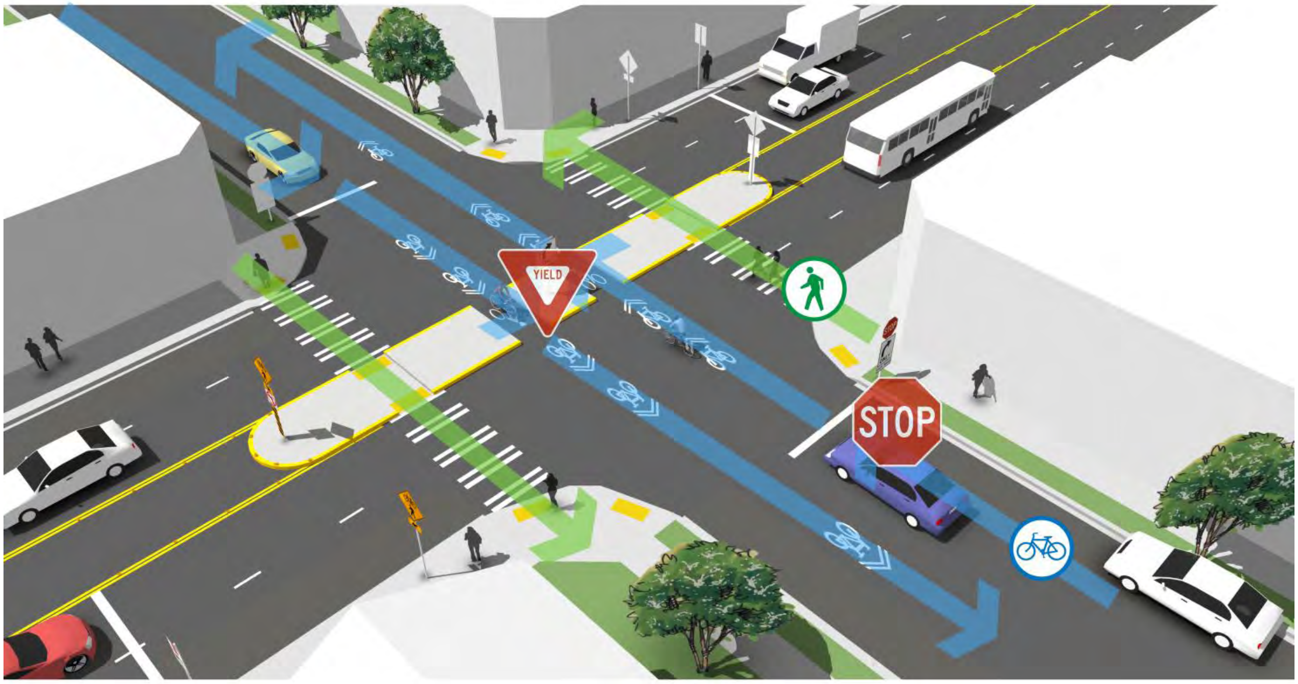
BE SUPER SAFE

The City of Seattle's road safety campaign, Be Super Safe, is an ongoing effort to reach zero traffic fatalities and serious injuries. When driving, walking and bicycling we ask that you Be Super Safe and follow the rules of the road.

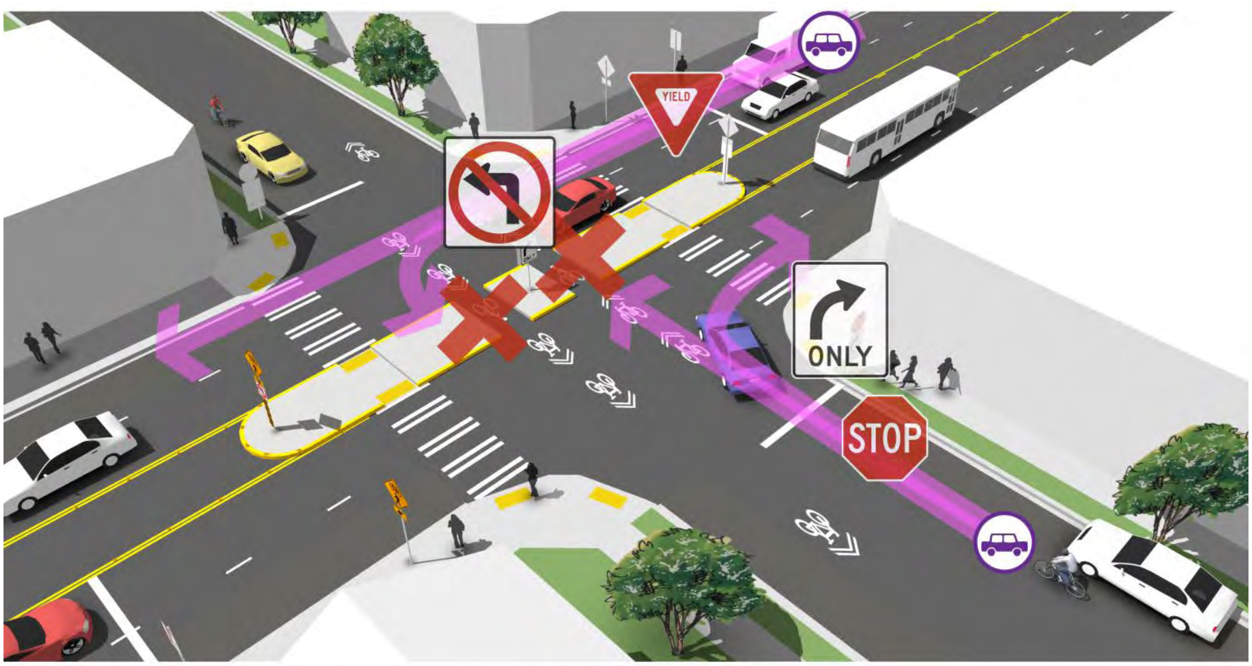
LOCAL, NATIONAL AND INTERNATIONAL DESIGN GUIDELINES

The 2013 Seattle Bicycle Master Plan guides the development of a citywide bicycling network, programs to encourage more bike riding, and activities and tools to measure our progress. The National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide is also a primary source for Seattle's new bike designs. This document was created out of an extensive worldwide literature search from design guidelines and real-life experience; as well as the input of a panel of urban bicycle planning professionals from NACTO member cities, traffic engineers, planners, and academics.

MEDIAN REFUGE ISLAND



Bicyclists and pedestrians can cross in two-stages, simplifying the process to cross busy streets.



Median island configurations limit traffic maneuvers by motor vehicles, preventing left turns and street crossings.

MEDIAN REFUGE ISLAND

Crossing busy streets can be one of the most stressful parts of a bicycle trip. Intersection treatments can help create low stress conditions by shortening crossings, reducing exposure to motor vehicles, and communicating priority for crossing bicyclists.

This intersection treatment may be used in conjunction with *neighborhood greenways.*

DESCRIPTIONS

Median refuge islands are protected spaces placed in the center of the street to facilitate bicycle and pedestrian crossings. Crossings of two-way streets are facilitated by allowing bicyclists and pedestrians to navigate only one direction of traffic at a time. When possible, the median island should be wide and long enough to allow for different types and shapes of bicycles.

INSTRUCTIONS ON HOW TO USE MEDIAN REFUGE ISLANDS

PEDESTRIANS

Median refuge island help pedestrians cross the street in the same way they help bicyclists cross.

- Wait at the marked crosswalk for cars to stop.
- When it is safe to do so, proceed across the intersection to the median refuge island.
- Wait in the protected area for the other direction of traffic to stop.
- Proceed when safe.

BICYCLISTS

- Wait in the roadway at the stop sign.
- When a gap in traffic is available in the first half of the roadway, proceed to the protected space in the refuge island.
- Wait in the protected area for a gap in traffic on the other half of the roadway.
- Proceed when safe.

Note: Median refuge islands are typically designed for standard size bicycles, and may not completely protect long bicycles, or bicyclists with trailers. If you have a long bicycle configuration, exercise extra caution when crossing.

Motorists are obligated to yield to bicyclists waiting in crosswalks, but not those waiting at stop signs. Always exercise caution when crossing.

MOTORISTS ON THE MAJOR STREET

- If you are traveling on the major street, watch for pedestrians and bicyclists attempting to cross.
- If a pedestrian is at the crosswalk, you must stop and remain stopped to allow the pedestrian to cross your half of the roadway.

- If you are traveling on the major street and see a car stopped in an adjacent lane, they may be stopping for a crossing pedestrian. You must stop as well.
- Left turns are prohibited at these locations.

MOTORISTS ON THE MINOR STREET

- Stop at the stop sign.
- Through or left turn movements are prohibited at these locations.
- Turn right when safe, yield to pedestrians or bicyclists that may be crossing.

Motorists are obligated to yield to bicyclists and pedestrians waiting in crosswalks.

BE SUPER SAFE

The City of Seattle's road safety campaign, Be Super Safe, is an ongoing effort to reach zero traffic fatalities and serious injuries. When driving, walking and bicycling we ask that you Be Super Safe and follow the rules of the road.

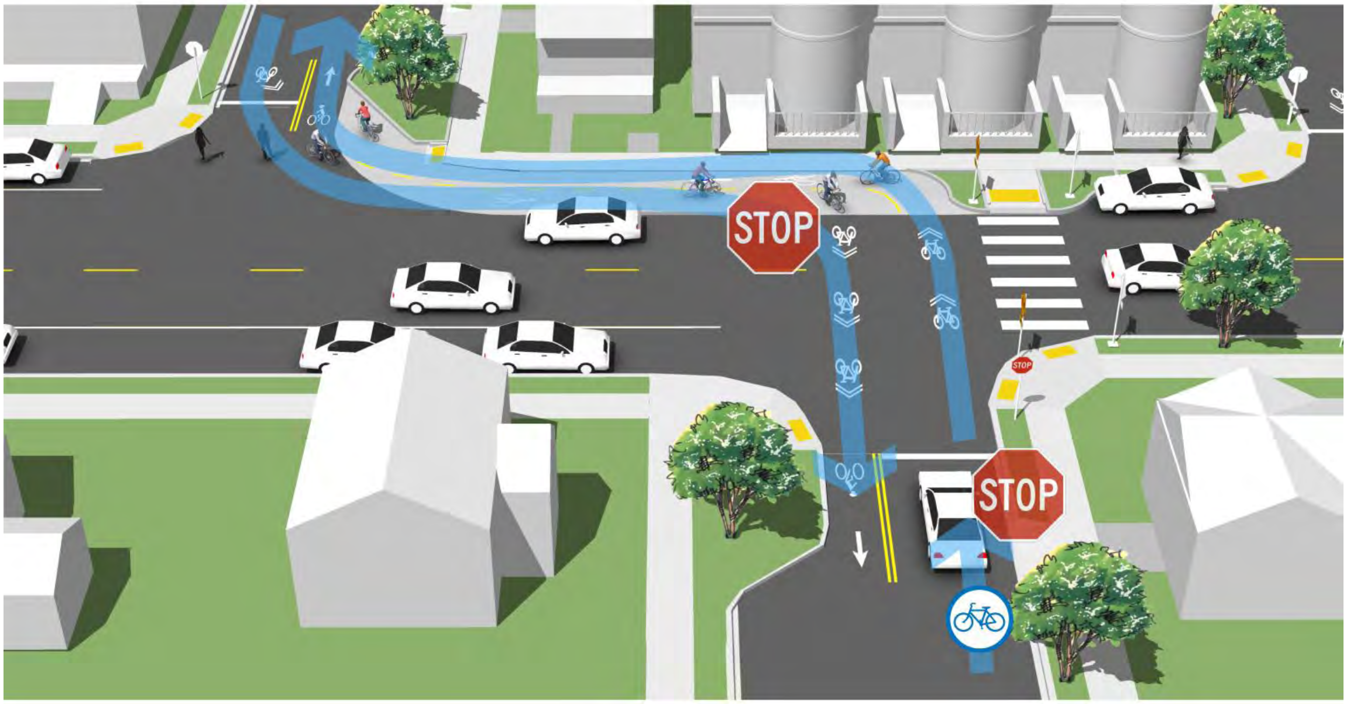
LOCAL, NATIONAL AND INTERNATIONAL DESIGN GUIDELINES

The Seattle Bicycle Master Plan guides the development of a citywide bicycling network, programs to encourage more bike riding, and activities and tools to measure our progress. The National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide is also a primary source for Seattle's new bicycle facility designs. This document was created out of an extensive worldwide literature search from design guidelines and real-life experience; as well as the input of a panel of urban bikeway planning professionals from NACTO member cities, traffic engineers, planners, and academics.

OFFSET STREET CONNECTION

Bike lane can direct bicyclists across an offset intersection, outside of the path of moving traffic.

A bike center turn lane helps bicyclists cross busy streets one half at a time, simplifying the crossing.



Two-way cycle track can direct bicyclists in both directions to cross at one preferred location.

OFFSET STREET CONNECTION

Neighborhood greenway routes are designed to overcome the barriers formed by major streets to provide a low-stress ride for your entire bicycle trip. Locations where intersections are offset use special treatments to simplify the crossing and create safe and predictable conditions for all users.

DESCRIPTION

Offset intersections can be challenging for bicyclists who are required to briefly travel along major streets in order to continue along the neighborhood greenway. Various treatments are used to help bicyclists cross, and designs depend on the direction of the offset and the traffic volumes and speeds of the major street.

All designs aim to simplify crossings by keeping bicyclists out of the way of fast moving traffic, increasing opportunities to cross, and creating a structured path from one street to the other.

INSTRUCTIONS ON HOW TO USE OFFSET STREET CONNECTIONS

Not all offset street connection designs function equally. People should follow all directions for use as indicated by pavement markings and signs.

PEDESTRIANS

- Some designs bring bicyclists next to the sidewalk and riding close to pedestrians.

- Look for bicycle symbols and lane markings, and avoid entering the bicycle space.
- Cross the street at legal crosswalks, and use caution if it is necessary to cross the bicycle facility.

BICYCLISTS

- Not all designs are the same. Pay attention to all signs and markings indicating proper use of the facility.
- Always ride in the area and direction indicated by bicycle lane markings.

MOTORISTS

- Offset street crossings may use traffic calming to control movements onto and off of the Neighborhood Greenway. Pay attention to all signs indicating access regulations.
- Look for pedestrians and bicyclists attempting to cross and yield to them.

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TWO-STAGE TURN BOX

Two-stage turn boxes take the stress out of making a left turn by providing a protected space to wait for the cross street signal.

TWO-STAGE TURN BOX

Bicycle facilities need to connect from where people are to where they want to go, and getting around needs to be as easy and safe by bike as it is by car, bus or on foot.

On busy streets, one of the most stressful maneuvers a person on a bike needs to make is a left turn. Crossing multiple lanes and waiting in the left turn lane is impractical or uncomfortable for many people. A two-stage turn box formalizes an alternative maneuver to merging into the left turn lane, and transforms a potentially stressful turn into a structured maneuver anyone can comfortably do.

Additionally, cycle track bike facilities may prohibit conventional left-turn maneuvers. A two-stage turn box provides safe and easy access from the cycle track to all of the destinations along the facility.

On streets with rail tracks, two-stage turn boxes help people riding bikes orient their tires for a safe crossing.

DESCRIPTIONS

Two-stage turn boxes provide a protected space for bicyclists to wait and reorient their bicycle along the cross street outside of the path of moving motor vehicle, bicycle or pedestrian traffic.

Two-stage turn boxes may also be used at *Offset Street Connections* that jog to the right in order to orient bicyclists directly across from the connecting street.

INSTRUCTIONS ON HOW TO USE TWO-STAGE TURN BOXES

BICYCLISTS

- During the green light, cross to the corner of the cross-street where the box is located and wait in the designated area.
- If necessary, adjust the positioning of your bike to orient along the cross street.
- When the light changes, proceed on the street with the rest of the waiting traffic.

MOTORISTS

- Locations with two-stage turn boxes may have No Turn on Red restrictions to reduce dangers to bicyclists. Do not enter the box or attempt to make a right turn on a red light.
- Depending on the position of the box, bicyclists may occupy the space in front of the travel lane. When the light turns green, you must wait for bicyclists to clear the box before proceeding ahead.

BE SUPER SAFE

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Be Super Safe and follow the rules of the road.

WHAT'S HAPPENING IN OTHER CITIES?

A video by Portland Streetcar Inc instructs riders how to use two-stage turn box to safely turn across streetcar tracks. The narrator refers to the box as a "Bike Box," but the maneuver is the same.

http://www.youtube.com/watch?v=tIRQaNdeS1s&t=1m13s

Salt Lake City shows how to use a "bike turn box" in this short video.

http://www.youtube.com/watch?v=rVswICVFIEQ

LOCAL, NATIONAL AND INTERNATIONAL DESIGN GUIDELINES

The Seattle Bicycle Master Plan guides the development of a citywide bicycling network, programs to encourage more bike riding, and activities and tools to measure our progress. The National Association of City Transportation Officials (NACTO) Urban Bikeway Design Guide is also a primary source for Seattle's new bike designs. This document was created out of an extensive worldwide literature search from design guidelines and real-life experience; as well as the input of a panel of urban bikeway planning professionals from NACTO member cities, traffic engineers, planners, and academics.

Appendix 3:

VISUAL GUIDES

3B: Visual Glossary of Bicycle Facilities

Bicycle Facilities

VISUAL GLOSSARY

Bicycle Facilities Visual Glossary

The proposed bicycle network includes a variety of facility types designed to serve all ages and all abilities. The following section provides brief descriptions and clear graphics to illustrate the "what" and "why" of the facilities recommended in the Plan. This section covers the full range of facilities, including contemporary bicycle facilities such as raised cycle tracks, intersection treatments like median refuge islands, and end-of-trip enhancements such as secure parking facilities.

TABLE OF CONTENTS:

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.

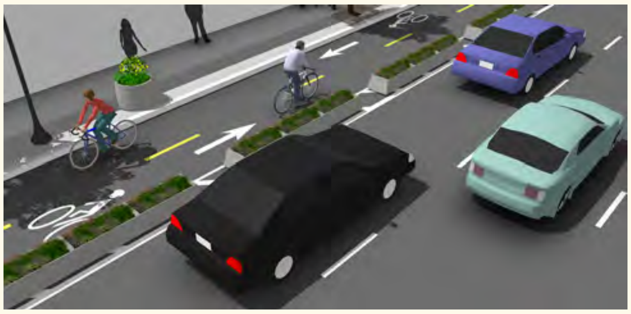
Cycle Tracks (Protected Bicycle Lanes)

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)

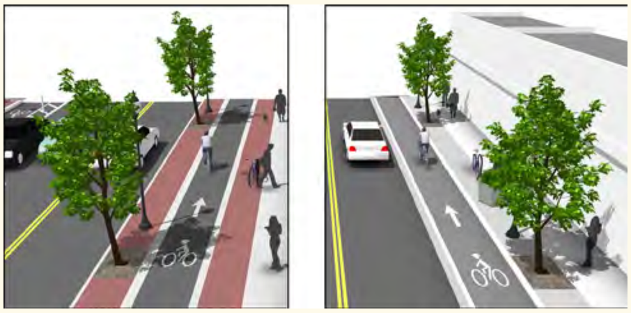
One-way cycle tracks are physically separated from motor vehicle traffic and typically provide bicycle travel in the same direction as motor vehicle traffic. They may be at street level, or distinct from the sidewalk, as a raised cycle track. In situations where on-street parking is allowed, cycle tracks 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.

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.

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.

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

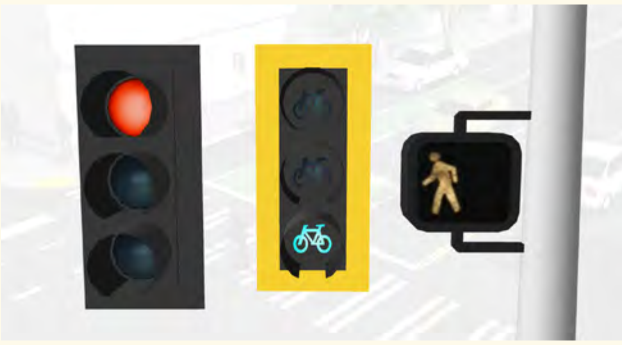
Green wave is a signal timing progression scheme coordinated over a series of traffic signals to allow for continuously flowing bicycle traffic over a long distance. Users traveling at the green wave design speed will encounter a cascade of green lights and not have to stop at intersections.

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.

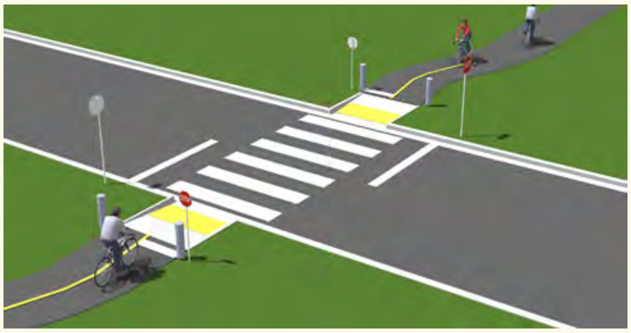
Two-Stage Turn Box

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.

Signing for Bicycle Facilities

Clear, consistent signage is important to encourage appropriate and safe use of bicycle facilities.

Regulatory Signs

Regulatory signs give a direction that must be obeyed, and apply to intersection control, speed, vehicle movement and parking. They are usually rectangular or square with a white background and black, white or colored letters. NO PARKING signs are regulatory signs used to assign and reserve space for bicyclists.

Trail Etiquette Signs

Informing trail users of acceptable trail etiquette is a common issue when multiple user types are anticipated. Yielding the right-of-way is a courtesy and yet a necessary part of a safe trail experience involving multiple trail users.

Warning Signs

Warning signs call attention to unexpected conditions on or adjacent to a street or bicycle facility.

Warning signs may warn users of the bicycle facility of obstructions, detours, unexpected change in path or adverse conditions ahead.

Warning signs may also be used at cross streets to warn drivers to expect and anticipate bicycle crossing activity.

Wayfinding Signs

A bicycle wayfinding system consists of comprehensive signing to guide bicyclists to their destinations along preferred bicycle routes. Signs can help indicate turns, identify routes, and navigate intersections of multiple bicycle facilities.

Bicycle Parking and Access

Bicyclists expect a safe, convenient place to secure their bicycle when they reach their destination. This may be short-term parking on a simple bike rack or long-term parking for employees, students, residents, and commuters.

Additionally, bicycle access to buildings should be considered, including methods to accommodate bicycles on stairs and elevators.

Bike Corral

Bicycle corrals (also known as on-street bicycle parking) consist of bicycle racks grouped together in a common area within the street traditionally used for automobile parking. Bicycle corrals can be implemented by converting one or two on-street motor vehicle parking spaces into on-street bicycle parking. Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.

Bikes on Elevators

Accommodating bicyclists on elevators is one method to overcome steep topography, to provide bicycle access to a street Overpass, or allow bicyclists to enter buildings. The elevator cab should be sized to allow for multiple bikes and trailers or trail-a-bike attachments. Installations with both front and back doors allow bicyclists to enter and exit the elevator easily. Many elevators that bicyclists use in Seattle are not the City of Seattle assets, so ensure that bikes are allowed.

Bike Rack

Bike racks on sidewalks are the simplest form of bike parking, and are well suited for short-term parking needs. Bike racks are meant to accommodate visitors, customers, and others expected to depart within a short period.

Bike Runnels on Stairs

A bike runnel is a narrow ledge along the side of a stairway which allows bicyclists to push bikes up or down the staircase.

Bike Shelter

Bike shelters are structures designed to cover and protect multiple Bike Racks and their users from inclement weather. Although they lack the added security of a Secure Bicycle Parking Facility, the weather protection makes them attractive to meet medium-term parking needs.

Secure Bicycle Parking Facility

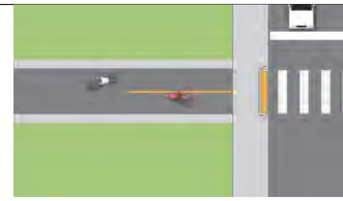
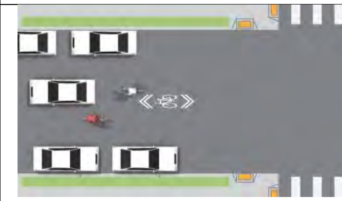
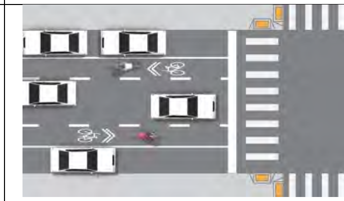
A secure bicycle parking facility (also known as a Bike & Ride when located at transit stations), is a semi-enclosed space that offers a higher level of security than ordinary bike racks. Access is controlled via key-card, combination locks, or keys. Secure bicycle parking facilities provide high-capacity parking for 10 to 100 or more bicycles.

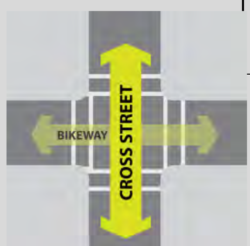
Appendix 4:

INTERSECTIONS

Intersection Treatment Table

Bicycle Facility Intersection Treatment Selection

	Roadway Type:	Off-Street Alignment	Non-arterial		Collector Arterial		Minor Arterial	Principal Arterial
	Auto Volumes:	N/A	< 1,500 ADT	~3,000 ADT	< 8,000 ADT	<15,000 ADT	>15,000 ADT	>15,000 ADT
	Bicycle Facility Types	 **Multi-use Trail****	 **Neighborhood Greenway**	 **Neighborhood Greenway** **Advisory Bike Lane**	 (in street, minor separation) **Advisory Bike Lane**[1] **Conventional Bike Lane**	 (in street, minor separation) **Conventional Bike Lane** **Buffered Bike Lane**	 (in street, minor or major separation) **Buffered Bike Lane** **Cycle track**	 (in street, major separation) **Cycle Track**

	Cross Street Type:	Non-arterial Crossings	Arterial Crossings	Non-arterial Crossings	Arterial Crossings	Trail Crossings	Non-arterial Crossings	Arterial Crossings	Trail Crossings	Non-arterial Crossings	Arterial Crossings	Trail Crossings
	Cross-Street Approach	• Advance Trail Crossing Sign • Trail Sign	• Advance Trail Crossing Sign • Trail Sign	• Stop Signs with Stop Bars • Neighborhood Greenway Sign	• Advance warning signs • Neighborhood greenway sign	• Advance Warning Sign • Advance Warning Marking • Stop Sign • Raised Intersection	• Two-Stage Turn Box	• Two-Stage Turn Box	• Advance Warning Sign • Advance Warning Marking • Stop Sign	• Two-Stage Turn Box	• Two-Stage Turn Box	• Advance Warning Sign • Advance Warning Marking • Stop Sign
	**Intersection Treatment**	• Advance Warning Sign • Advance Warning Marking • Stop Sign • Raised Intersection	• Raised intersection • Active Warning Beacons • Bicycle Signal[2] • Full Signal • Overhead Crossing sign (passive) • Advance Warning Sign • Advance warning Marking • Stop Sign	• Intersection Diverter • Traffic Circle • Pavement marking • No parking signs (at discretion of engineer)	• Curb • Raised Intersection • Active Warning Beacons • Pedestrian Hybrid Beacon • Half Signal • Bicycle Signal[2] • Full Signal • Bike Box2 • Signal Detection[2] • Bicycle Forward Stop Bar • Offset Street Connection • Widen Sidewalk • Partial Closure • Median Diverter Island • Through Bike Lanes • Intersection Crossing Markings	• Advance Trail Crossing Signs • Marked Crosswalk • Raised Intersection • Trail Signs • Stop Sign	• Intersection Crossing Markings	• Intersection Crossing Markings • Median Refuge Island • Active Warning Beacons • Half Signal • Bicycle Signal[2] • Full Signal • Bike Box[2] • Combined Bike Lane/Turn Lane • Two-Stage Turn Box • Through Bike Lanes • Signal Detection[2] • Forward Stop Bar • Offset Street Connection	• Advance trail crossing signs • Jogged Street Multi-use Trail or Widened Sidewalk • Marked Crosswalk • Raised intersection • Active Warning Beacons • Bicycle Signal[2] • Half Signal • Full Signal • Overhead Crossing sign (passive)	• Maintain Raised Cycle Track • Intersection Crossing Markings • Two-Stage Turn Box	• Intersection Crossing Markings • Median Diverter Island • Active Warning Beacons • Hybrid Beacon • Bicycle Signal[2] • Full Signal • Green Bike Box[2] • Combined Bike Lane/Turn Lane • Two-Stage Turn Box • Through Bike Lanes • Signal Detection[2] • Forward Stop Bar • Offset Street Connection	• Advance trail crossing signs • Jogged street multi-use trail or widened sidewalk • Marked Crosswalk • Active Warning Beacons • Bicycle Signal[2] • Half Signal • Full Signal • Overhead Crossing sign (passive)

[1] Advisory Bike Lanes work best on streets below 6,000 ADT
[2] For use at signalized intersections

Appendix 5:

BICYCLE PARKING

5A: Code Review

Bicycle Parking Code Review

The practice of specifying short- and long-term bicycle parking requirements for new construction and redevelopment through municipal bylaws is well established, providing cyclists "somewhere to park" at key destinations. Typically, these codes specify the amount of parking required depending on the land use. Codes sometimes provide guidance on placement and provide incentives. Municipal Code (SMC) 23.49.019 lists off-street bicycle parking requirements for Downtown Seattle and SMC 23.54.015 lists bicycle parking requirements for areas beyond downtown. SMC 23.49.019E/F establishes minimums for off-street bicycle parking for uses specified in Table 23.49.019A.

Table 23.49.019 A

Use	Bicycle Parking Required
Office	1 space per 5,000 square feet of gross floor area of office use
Hotel	.05 spaces per hotel room
Retail use over 10,000 square feet	1 space per 5,000 square feet of gross floor area of retail use
Residential	1 space for every 2 dwelling units

Bicycle parking spaces are required at half the above ratios after the first 50 bicycle racks. The provision of bicycle parking within units, and on balconies does not count toward the minimum requirement. There are no required bicycle parking minimums if the land use does not fall into the above three categories. Buildings with 250,000 square feet of gross office floor area or greater are required to provide shower facilities and clothing storage areas for bicycle commuters at a ratio of one shower per gender for each 250,000 square feet of office use. These facilities must be easily accessible to and from the bicycle parking facility.

SMC 23.49.019 does not specify whether the parking provided must be short-term, long-term or a combination of the two. The Code also requires that bicycle parking be provided in "a safe, accessible and convenient location," that it be installed according to the manufacturer's directions and SDOT Design Criteria, and allow adequate clearance for bicycles and their riders. If covered auto parking is provided, required long-term bike parking must also be covered.

Bicycle parking for residential uses must be located on-site, and bike parking for non-residential uses must be located on the same property or in a shared bicycle parking facility within 100 feet of the property. Shared bike parking facilities are encouraged.

Property owners may forgo these minimum bicycle parking requirements for non-residential uses by paying into the City's bike parking fund (for the purpose of providing public bicycle parking in the right-of-way), if:

- It is determined by the Director that the above minimum requirements could not be met due to "extraordinary physical or financial difficulty"
- The payment is equal in value to the costs of labor, equipment and installation
- The public bicycle parking provided is located so as to meet area demand
- The funds are used within five years of receipt

SMC 23.54.015 establishes off-street short-and long-term bicycle parking minimums for uses specified in the BMP in Table for Section 23.54.015 (below). As with the Downtown code requirements, bicycle parking spaces are required at half the above ratios after the first 50 bicycle racks (except for rail transit facilities, passenger terminals, and park and ride lots). The provision of bicycle parking within units, and on balconies does not count toward the minimum requirement. There are no bicycle parking minimum requirements if the land use does not fall into the categories listed in Table E for Section 23.54.015.

Table E for Section 23.54.015 PARKING FOR BICYCLES (1)

		Bike Parking Requirements	
Use		Long-term	Short-term
A. COMMERCIAL USES			
1.	Eating and drinking establishments	1 per 12,000 sq ft	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO (2)
2.	Entertainment Uses	1 per 12,000 sq ft	1 per 40 seats and 1 per 1000 sq ft of non-seat area; 1 per 20 seats and 1 per 1,000 sq ft of non-seat area in UC/SAO(2)
3.	Lodging Uses	1 per 20 rentable rooms	2
4.	Medical services	1 per 12,000 sq ft	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO (2)
5.	Offices and Laboratories, research and Development	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO (2)	1 per 40,000 sq ft.
6.	Sales and services, general	1 per 12,000 sq ft	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO (2)
7.	Sales and services, heavy	1 per 4,000 sq ft	1 per 40,000 sq ft.
B. INSTITUTIONS			
B.1.	Institutions not listed below	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO (2)	1 per 40,000 sq ft.
B.2.	Child care centers	1 per 4,000 sq ft	1 per 40,000 sq ft.
B.3.	Colleges	A number of spaces equal to ten (10) percent of the maximum students present at peak hour plus five (5) percent of employees.	None
B.4.	Community clubs or centers	1 per 4,000 sq ft.	1 per 4,000 sq ft
B.5.	Hospitals	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO (2)	1 per 40,000 sq ft.
B.6.	Libraries	1 per 4,000 sq ft	1 per 4,000 sq ft; 1 per 2,000 sq ft in UC/SAO (2)
B.7.	Museums	1 per 4,000 sq ft	1 per 4,000 sq ft
B.8.	Religious facilities	1 per 12,000 sq ft	1 per 40 seats or 1 per 1000 sq ft of non-seat area
B.9.	Schools, elementary	1 per classroom	None
B.10.	Schools, secondary (middle and high)	2 per classroom	None
B.11.	Vocational or fine arts schools	A number of spaces equal to ten (10) percent of the maximum students present at peak hour plus five (5) percent of employees.	None
C. MANUFACTURING USES		1 per 4,000 sq ft	None
D. RESIDENTIAL USES			
D.1.	Congregate residences	1 per 20 residents	None
D.2.	Multi-family structures	1 per 4 units	None
E. TRANSPORTATION FACILITIES			
E.1.	Park and ride lots	At least 20 (3)	None
E.2.	Principal use parking except Park and ride lots	1 per 20 auto spaces	None
E.3.	Rail transit facilities and Passenger terminals	At least 20 (3)	None

Notes for Table E:

(1) If a use is not shown on this Table E, there is no minimum bicycle parking requirement.

(2) For the purposes of this table, UC/SAO means urban centers or the Station Area Overlay District.

(3) The Director in consultation with the Director of Transportation may require more bicycle parking spaces based on the following factors: Area topography; pattern and volume of expected bicycle users; nearby residential and employment density; proximity to Urban Trails system and other existing and planned bicycle facilities; projected transit ridership and expected access to transit by bicycle; and, other relevant transportation and land use information.

In general, the code requirement conditions for these uses are essentially identical to the Downtown code requirements with the following exceptions:

1) There are no requirements for shower or clothing storage facilities.

2) Long-term bicycle parking is defined as bicycle parking intended for durations of four hours or more. Short-term bicycle parking is defined as parking intended for durations of less than four hours.

3) Bicycle parking can be provided on a different lot within 100 feet of the building without it having to be a shared facility.

4) An additional conditional requirement for the bicycle parking fund payment is that construction of the bicycle parking funded by the payment must be guaranteed before the development's certificate of occupancy is issued.

SMC 23.54.016 details specific requirements for medical and educational institutions. For medical institutions, the number of bicycle parking spaces required is equal to two percent of the employees (including doctors) present at peak hour. This is different than the requirements listed in SMC 23.54.015, and they should be revised for consistency. For educational institutions, the minimum bicycle parking requirement is equal to ten percent of the maximum students at peak hour plus an additional five percent of employees. Both of these requirements can be modified by the Director if the applicant is able to demonstrate an inability to meet the requirement as a result of specific circumstances.

SMC 23.54.020 outlines allowable bicycle parking quantity exceptions for new or expanding office or manufacturing uses requiring more than 40 auto parking spaces. This allows developers to substitute four covered bicycle parking spaces for every one auto parking space (up to a maximum of five percent of the parking requirement).

Recommendations:

- Seattle Municipal Codes should be revised for consistency, especially since SMC 23.54.015 lists requirements for a much larger range of land use types. Update transit station recommendations to reflect final agreed upon methodology used to estimate demand at transit stations in 4.1 above. The minimums recommended in the 2007 BMP are generally consistent with minimums recommended for urban areas with a higher bicycle mode share. These minimums should be compared against available occupancy data (e.g., Commute Seattle Center City Bicycle Amenity Inventory) to create up-to-date standard minimums.
- Clearly define the term "extraordinary physical or financial difficulty" that a developer must demonstrate to forgo installing required bicycle parking.
- SMC should distinguish between short-term and long-term bicycle parking requirement in table SMC 23.49.019A.
- The requirements for the bicycle parking fund in the downtown should be revised to match the requirements for the bicycle parking fund in areas outside of downtown. Specifically, the funding for bicycle parking should be guaranteed before issuance of the certificate of occupancy.

Appendix 5:

BICYCLE PARKING

5B: Capacity and Demand in the Public Right-of-Way

Bicycle Parking Capacity and Demand in the Public Right-of-Way

Bicycle racks on sidewalks, on-street bicycle corrals, or secured bicycle parking facilities are types of bicycle parking in the public right-of-way. In 2007, there were approximately 3,000 bicycle racks located throughout the city within the public right of way. In 2012, the city reported in the State of the Seattle Bicycling Environment Report that another 2,230 bicycle racks were installed between 2007 and 2011 as shown in Figure 1, leaving a total of 5,770 bicycle racks needed between 2012 and 2017 to reach the 2007 BMP performance measure goal of 11,000 bicycle racks. The key destinations used to determine the demand for 11,000 bicycle racks was estimated based on the following:

1. One bicycle rack per 100 feet of urban arterial roadway block face in all Urban Village Centers
2. Ten bicycle racks per public school
3. Five bicycle racks per private school
4. Five bicycle racks per community center
5. Three bicycle racks per library

The 2007 BMP does not note whether increasing bicycle mode share is considered in this assessment of bicycle parking demand.

Recommended Approach for Estimating Demand for Bicycle Parking in Seattle's Urban Villages

There are numerous demand estimation methodologies in use by agencies in the region with a stake in secure bicycle parking. Predicting demand for the entire city provides a relative assessment of potential demand, but does not provide detailed guidance on how to locate bicycle parking. All methodologies used to estimate bicycle parking demand should be used in conjunction with actual counts and reviewed to account for site or district specific conditions.

Developing an estimate of bicycle parking demand per district can be an efficient way to understand priorities and develop a picture of where the greatest supply deficits exist. In turn, installation of bicycle parking can be prioritized in these areas, which can act as an organizing factor in a rack request program and corral installation program. Analyzing demand by district can also assist in equitably installing parking geographically across the city. Estimates developed through data analysis should be verified with field work using a process similar to the one outlined in the CROW manual (see Appendix 5C for more information). A recommended technical approach is outlined below. Testing and calibration is recommended before applying this method citywide:

1. Gather information and determine inputs. Urban Villages should be used as the unit of analysis or research.
2. Determine potential number of bicycle parking spaces needed for each block face. Within each Urban Village it is likely that each block will ideally have some bicycle parking. A baseline minimum of two racks for each block with active land uses is recommended. It is likely that some blocks will require bicycle parking above the suggested baseline of two racks because adjacent land uses will create a higher demand for bicycle parking. The additional parking should be determined by standard rules of thumb and the estimates of required bicycle parking for a particular land use (e.g., library, etc.). Adding the baseline spaces to the estimated number of spaces required for bicycle attractors will result in a rough estimate of short-term bicycle parking for the entire area that is required to meet user needs as well generalized suggestions for parking placement.
3. Measure existing supply against estimated demand. Understand the potential deficit by comparing the existing bicycle parking inventory to calculated demand and verifying the results through field review.

4. Develop a prioritization scheme. Potential strategies include bringing every block up to baseline, focusing installation in areas with the greatest supply deficit, or focusing on specific land uses (e.g., schools, libraries and other uses identified as attractors), or areas with the greatest concentration of activity centers, as defined by data used in bicycle network development and prioritization.
    a. A recommended prioritization methodology:
        i. Develop a baseline, ensure that at least one rack is located on each block with commercial development
        ii. Review and consider whether a bicycle rack should be located on each block with multi-family housing
        iii. Prioritize locations with a high projected demand and a previous bicycle rack recommendation exists. Consider a bicycle corral in areas with significant amounts of on-street parking and evidence of demand
        iv. Set installation targets based on available funding
5. Partner with local and regional transit agencies and large institutions to coordinate funding, construction, operations and maintenance of long-term, on-demand, secure parking areas (SPAs). Consider universal on-demand access systems (e.g. BikeLink) for bike rooms/SPAs and lockers that rely on a single centralized access control and fee collection system throughout the city/region. These systems have demonstrated reductions in the costs associated with management and operations, while providing convenient and reliable, secure long-term parking options for cyclists.

Appendix 5:

BICYCLE PARKING

5C: Demand Research

Bicycle Parking and Demand Research

Danish Cycling Federation Bicycle Parking Manual

The Danish Cycling Federation Bicycle Parking Manual (2008) recommends estimating an appropriate supply of bicycle parking based on the following land uses:

- Existing developments, squares and market places – based on observations, count data
- Workplaces and institutions – 0.4 bicycle parking spaces for every person plus floor area standard, 0.5 locker per bicycle parking space, 0.2 showers per bicycle parking space, and 1 changing room per shower. In dense urban areas, floor area standards vary from 6 bicycle parking spaces per 1,000 square meters (1.79 bicycle parking spaces/1,000 square feet) to 30 bicycle parking spaces per 1,000 square meters (2.79 bike parking spaces/1,000 square feet). The calculation should also factor the number of employees. Educational institutions vary according to age groups and mode share.
- Public transport terminals - Sheltered bicycle parking spaces for 10% of passengers during peak hours at bus stops and terminals, and 10%-30% of daily passengers at train stations. These figures are based on the number of transit riders who ride to the station as a percentage of total daily passengers. Overlapping peak demand periods require additional spaces. At bus stops the number of bicycle parking spaces depends on stop spacing and the size of the catchment area.
- Shops and pedestrian shopping streets – 1-2 stands in the immediate vicinity of the shop, 1 bicyle parking space for every 100 square meters of floor area (0.93 bike parking spaces/1,000 square feet) at larger shops, supermarkets and shopping centers, and 2 bicycle parking spaces for every 100 square meters of floor area (1.86 bicycle parking spaces/1,000 square feet) at densely populated parts of the capital .
- Residential areas and at blocks of flats (dense multifamily residential) – based on the number of bicycle owners and bicycles owned. The standard is 2-2.5 bicycles for every 100 square meters of floor area (1,076 square feet). At halls of residence – 1 bicycle parking space per resident.
- New buildings – based on land use and activity generation, relation to other buildings and land uses, proximity to transit. These estimates are intended only as starting points since the actual demand depends on the combination and intensity of land uses and transit service at a given site. A general rule of thumb is to provide approximately 25% more stands and space for future expansion. All estimates should take into consideration counts and user surveys as well.

CROW Manual

The Dutch CROW Manual (2007) estimates bicycle parking requirements according to five land use classifications:

- City center areas/station areas
- Older residential areas
- New housing
- Companies and Institutions
- Public transport stops

Each of these categories has a specific methodology. Section 8.2 of the CROW Manual outlines these steps in detail; the steps are summarized below. The CROW manual recommends using an observation based approach to program bicycle parking for district-wide areas, which are analogous to Seattle's Urban Villages. The intent of the process is to provide an 'adequate' amount of bicycle parking; the CROW manual notes that demand for bicycle parking per location seems to change over time, so ongoing monitoring is important to provide balanced supply to meet current demand (this method may not capture latent demand for bicycle parking where none currently exists). The recommended approach is outlined below:

1. Define the research area. It is preferable to define an area that is too large rather than too small, in order to include all destinations in the analysis.
2. Prepare for and conduct counts. Create maps and sections or units. Sections should be

Figure 1: Recommended norms for bicycle parking in relation to function. Page 41 of the Danish Cycling Federation Manual

Function	Bicycle parking norm
Residential buildings and blocks of flats*	2-2.5 parking spaces per 100 sq.m. of living area for blocks of flats. 1.0 parking spaces per student in halls of residence/student flats.
Childcare institutions	0.4 parking spaces per employee and an area reserved for bicycle trailers and special bicycles.
Schools	1.0 parking spaces per pupil from year 4 and 0.4 parking spaces per employee.
Colleges and universities	0.4-0.8 parking spaces per student and 0.4 parking spaces per employee.
Retail trade/shops*	2.0 parking spaces per 100 sq.m. in the capital region and 1.0 parking spaces per 100 sq.m. outside the capital region.
Other urban professions (GPs, dentists etc.)	0.3-0.4 per 100 sq.m. gross floor area + 0.4 parking spaces per employee.
Stations	10-30% of passenger numbers (no. of passengers per day)
Bus stops and terminals	1.0 parking spaces for every 10 passengers in the rush hour (06.00-09.00).
Cinemas and theatres*	0.25 parking spaces per seat + 0.4 parking spaces per employee.
Hotels and restaurants	1.0 parking spaces for every 15 guests + 0.4 parking spaces per employee.
Sports facilities and sports halls	0.6 parking spaces per athlete (on a daily basis) + 0.4 per spectator.
Offices and industry*	0.4 parking spaces per employee.
Recreational areas	1-4 parking spaces for every 10 visitors.

** The norms used are the ones suggested in a memorandum analysing the need for bicycle parking in Copenhagen (Analyse af behov for cykelparkering i København) prepared by Kjærgaard Virksomhedskonsulenter & Thomas Krag Mobility Advice in August 2006. The memorandum was prepared to provide input for the City of Copenhagen's bicycle parking strategy.*

about 150 feet (or one block) in length and may include both sides of the street. Counts should be conducted on a representative day and at the time of peak use. Ideally counts should be conducted April through October.

3. Account for potential new development. If significant residential redevelopment is planned, it is wise to anticipate additional bicyclists who would utilize parking in the area. Analysis of anticipated new visitors to the area should be included, if available. This can be accomplished by calculating the number of new households which will be constructed within 1.5 miles of the research area and multiplying by the number of bicycles owned by a household (e.g., one on average).

4. Process count data. Data can be processed graphically or shown as tables to show existing counts and capacity. If occupancy on a block is 50 to 80 percent, the parking supply is considered balanced. Occupancy greater than 80 percent is considered full and additional bicycle parking spaces should be added. Blocks or sections where bicycles are parked inappropriately (e.g., attached to posts), or where bicycle parking does not exist are candidates for installation of bicycle parking.

APBP Bicycle Parking Guide, 2nd Edition

Appendix B of the APBP Bicycle Parking Guide provides an example of how a building or cluster of buildings can be programmed (see Figure 2). The recommended process identifies user types, their likelihood of bicycling, and expected duration of visit to determine how much long term and short term bicycle parking should be provided. An example is shown in Figure 4. This approach relies on detailed knowledge of the building occupants and anticipated visitors. Gathering this detailed data for a district-wide analysis would require a significant investment of staff time and resources, however, this approach could be used to develop an estimate of anticipated district demand.

Figure 2: Sample Bicycle Programming Worksheet, APBP Bicycle Parking Guide

User Group	#Persons	%Bicycle	#Bicycles	%Long term	#Long term	#Short term
Faculty with office	100	60%	60	50%	30	30
Staff with office	80	50%	40	50%	20	20
Grad students with desk	300	50%	150	30%	45	105
Classroom students	200	70%	140	0%	0	140
Visitors	50	50%	25	0%	0	25
Total	750		415		95	320

Appendix 6:

FUNDING SCAN

LOCAL, REGIONAL, STATE, AND FEDERAL FUNDING SCAN

The BMP contains a number of different facility types (cycle tracks, neighborhood greenways, off-street trails, bike lanes) and world class programs that will require a broad funding strategy. Recently, Seattle has successfully secured project funding through a mix of sources including grant funding. As this strategy is adopted, it is imperative that the City identifies and understand the mix of federal, state, regional, and local funds complemented by private funds, private sponsorship, and user revenues available to fund bicycle projects. The following is a compendium of funding opportunities that the City of Seattle could use to implement the BMP and its funding strategy. The funding breakdown is supported by an overview of Moving Ahead for Progress in the Twenty-First Century (MAP-21) and its potential impact on funding bicycle projects in Seattle.

Federal

Several competitive grant programs are available to fund bicycle projects, larger multimodal roadway projects (e.g., Complete Streets), major capital projects (e.g., bridge enhancements, major transit corridor investments, etc.), and programs like Safe Routes to School. With the most recent federal transportation reauthorization bill comes a series of changes to the federal funding environment. The following section outlines this changing landscape, details the available sources of funding, and suggests strategic positions to make Seattle highly competitive for the maximum amount of federal funding.

A Changing Landscape for Funding Bicycle Projects: MAP-21

Federal funding for all modes of transportation is in flux and under stress. The Highway Trust Fund is being depleted. Gas tax revenue, the primary source of federal surface transportation funding, has leveled off as it fails to keep pace with inflation, the population drives less, and more people move toward car-light urban living. As federal gas tax revenue stagnates, demand for multimodal, walking, biking, and transit projects increases – putting additional pressure on a small pot of resources. Today, funding must be sought through an ever more competitive and constrained process.

MAP-21 at a glance

- MAP-21 decreases guaranteed federal funding for walking and biking:
  - SAFETEA-LU FFY2011 bike and pedestrian spending: $1.2 billion
  - MAP-21 2-year Transportation Alternatives spending: $ 808 million
  - Of $808 million, 50% is distributed by population and 50% by grant program that is state-administered.
- MAP-21 combines the $202 million Safe Routes to School, $928 million Transportation Enhancements and $97 million Recreational Trails programs from SAFETEA-LU into the $808 million Transportation Alternatives program.
- MAP-21 adds Safe Routes for Non-Drivers, reforming the New Freedom programs.
- MAP-21 allows Environmental Mitigation spending for any use.
- MAP-21 removes funding for bicycle and pedestrian education, streetscape improvements, acquisition of scenic or historic sites and transportation museums.
- MAP-21 removes Jobs Access Reverse Commute (JARC) funding.
- MAP-21 increases the Highway Safety Improvement Program (HSIP) and allows HSIP funds to be used on multimodal projects.
- Surface Transportation Program funds eligible for bicycle infrastructure projects.

Projects and programs that shift travel demand from SOV trips to other transportation modes are newly eligible for CMAQ funds.

Moving Ahead for Progress in the Twenty-First Century (MAP-21) is the current iteration of federal surface transportation funding. MAP-21 authorizes funding for federal surface transportation programs including highways, transit, and transportation demand management. There are a number of programs within MAP-21 that are applicable to bicycle projects.

Many important changes have been made since the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act – a Legacy for Users (SAFETEA-LU). The primary changes include less money for bicycle and pedestrian transportation, but increased MPO control of street safety projects and a consolidation of the transportation enhancements (TE), Safe Routes to School (SRTS), and Recreational Trails programs under the new "Transportation Alternatives" catchall fund. While SAFETEA-LU programmed $1.2 billion for TE, SRTS, and Recreational Trails, MAP-21 signifies a substantial cut in active transportation funding with Transportation Alternatives only programmed at $808 million.

However, under MAP-21 funding there are a number of funding streams other than Transportation Alternatives possible to secure bicycle funding. Through the Surface Transportation Program (STP) a wide variety of bicycle improvements are eligible for funding including on-street bicycle facilities, off-street trails, bicycle signals, and bicycle parking. The Transportation Alternatives program is funded as a 10 percent set-aside from the total STP funding. The Highway Safety Improvement Program (HSIP) funds projects and programs that help communities achieve significant reductions in traffic fatalities and serious injuries on public roads and bikeways.

Other Federal Funding Sources

A host of other federal funding sources are available for bicycle infrastructure and programs. These include public health initiatives, Partnership for Sustainable Communities grants, Community Development Block Grants, Land and Water Conservation Fund, Rivers, Trails, and Conservation Assistance Program, and a variety of Department of Energy and Environmental Protection Agency grants.

State control of federal funding

State-level support of bicycle projects and programs include a combination of state and federal sources. The primary Washington State goals for bicycle projects mirror those of Seattle: reduction of crashes and increase in bicycle mode share. MAP-21 funds channeled to Washington State require 50 percent of funds to go to Metropolitan Planning Organizations like PSRC, based on population, and the balance to be distributed at the state's discretion.

Since 2005, the State has contributed to improving walking and bicycling conditions in Washington through the WSDOT Highways & Local Programs' Pedestrian and Bicycle Safety and Safe Routes to School Grant programs. This support is enabled through a combination of federal and state funds. Washington State received $12 million for Transportation Alternatives for FFY13. Between 2013-2015, WSDOT anticipates approximately $26 million in funding for bicycle, pedestrian, and SRTS projects with more than $160 million requested throughout the state. The demand is 615% higher than the available funds. This is a significant increase above previous request levels, for example, less than $20 million was requested in the 2011-2013 period.[1]

Projects funded through WSDOT's Pedestrian and Bicycle Program must meet the following review criteria with preference given to project supported by local match:

- Promote healthy communities; and
- Improve safety by designing major arterial to include features such as dedicated bicycle facilities and medians, environmental protection through mode shift, and the preservation of community character through community participation.

Additional state programs that encourage bicycle and pedestrian transportation include the Commute Trip Reduction (CTR) and the Growth and Transportation Efficiency Centers (GTEC) programs. The 1991 passage of the Commute Trip Reduction law by the Washington State Legislature provides important state-level direction to employers to encourage workers to drive alone less and to offer greater flexibility of work hours and types.

The GTEC program builds upon and helps implement CTR through WSDOT funding that allows more effective delivery of transportation demand management (TDM) programs and incentives to employees and residents. The Seattle GTEC Plan includes a number of financial incentive programs to encourage employees

1 Washington State Department of Transportation (2012). "Washington State Department of Transportation Pedestrian and Bicycle Safety & Safe Routes to School Grant Programs; 2013-2015 Prioritized Project List and Program Update". Accessed: http://www.wsdot.wa.gov/NR/rdonlyres/A4F69DAF-4044-49A3-834F-86036BD5AF20/0/Final201315HLPGrantProgramsReporttoLegislature2012December27.pdf

MAP-21 changes in Washington State

Bicycle projects are eligible for the following programs:

- Surface Transportation Program: $352 million with $176 million for regional project selection and $130 million at the State's discretion.
- Transportation Alternatives: $25 million
- CMAQ Program: $71 million
- Highway Safety Improvement Program: $84 millionMAP-21 adds Safe Routes for Non-Drivers, reforming the New Freedom programs.

and residents in downtown Seattle to commute by modes other than single occupancy vehicles. This state funded program couples with the base CTR program and is met by partnership match by the City of Seattle, King County Metro, and the Downtown Seattle Association.

Regional

Many of the state and federal laws and funds are passed through regional Metropolitan Planning Organizations (MPOs) to apply development appropriately in urbanized areas. In the latest federal transportation reauthorization, Puget Sound Regional Council (PSRC), the MPO in which Seattle is located, received a total of $160 million in federal transportation funding. This money is spread throughout the region and amongst all modes of surface transportation. PSRC prioritizes congestion mitigation, air quality improvements, and bicycle and pedestrian projects through the regional transportation plan, Transportation 2040. Transportation 2040 is implemented through the regional Transportation Improvement Program (TIP) which includes all regionally significant projects and all projects in the regional utilize federal or state funding.

MAP-21 allocated approximately $25 million to Washington State for Transportation Alternatives projects, 50 percent or about $13 million went directly to MPOs, allocated by population. The regional TIP helps guide the distribution of federal funds for bicycle and pedestrian projects from the Transportation Alternatives program as well as direct funding toward bicycle projects from CMAQ, STP, and HSIP programs.

Also, New Freedom activities have been reshaped as Section 5310. This revenue stream prioritizes funding for projects that enhance mobility for seniors and people with disabilities. Newly eligible uses include projects to "improve ['senior and disabled persons'] access to fixed-route transit." There are potential Complete Streets projects that may be eligible for this funding that would improve bicycle access for all users, especially older adults and people with mobility limitations.

Local

Currently, primary sources for funding bicycle transportation are the General Fund, Bridging the Gap and other local taxes, charges, bonds, and grants. Additionally, there are new options that may be employed at the local level to increase funding. These opportunities require leveraging existing budgets to best benefit bicycle projects. By funding projects that unlock wider social and health impacts, the City can better integrating bicycles into multimodal projects it is possible to cast a wider net. Because of the positive neighborhood influence of Complete Streets and traffic calming, especially on the young, older adults, and those with mobility limitations, it is possible to access funds that benefit those most vulnerable.

Bridging the Gap

Bridging the Gap includes specific goals for creating projects that would benefit safer and more comfortable bicycling. Considering non-transportation specific levies may be a way to make more complete neighborhoods. The NSF prioritizes street projects identified by the community as priorities. The NSF is funded by BTG, which expires in 2015 and the third round of projects have already been selected. A new source is needed.

Family and Education Levy

The Family and Education Levy is property tax levy that has been used to prepare children to graduate from school and prepare for college and careers. The levy was used to pay for a number of health investments such as health clinics at schools and mental health services for youth. It may be possible to expand this levy to include Safe Routes to School funding for education and infrastructure that provides increased access to schools.

Neighborhood Matching Fund

Another fund available is the Neighborhood Matching Fund. For over 25 years the Fund has bolstered Seattle's quality of life through neighborhood investments. Using three designations: the Small Sparks fund, Small and Simple Projects fund, and the Large Project fund the Neighborhood Matching Fund awards grants that are matched by neighborhood volunteer labor and donated materials. Small Sparks include small parks and renovated areas for community gathering. Small and Simple Projects include projects up to $25,000 such as the Melrose Promenade Project that improved a pedestrian and bicycle trail through a series of clean-ups and conceptual design improvements. Large Projects include the public information campaign "think outside the car" that reached students and community members, encouraging active transportation.

Neighborhood Park and Street Fund (NPSF)

The NPSF is a $1.2 million neighborhood improvement grant program for street and park improvements. Directed by district councils, this community-driven fund is a potential funding source for neighborhood greenways and bicycle crossing enhancements. NPSF projects are not driven by SDOT, but the fund is an opportunity for integrated neighborhood improvements with multiple livability, mobility, and access benefits. NPSF can fund up to $90,000 in street improvements, including traffic calming treatments and crossing improvements such as marked crosswalks, curb ramps, and pedestrian countdown signals. Because multi-user benefits and projects that qualify for funding from other City funding streams are key project selection criteria, neighborhood greenways may be an attractive project type under this fund.

Integrating Complete Streets into Bridging the Gap and other funding programs

As the nine-year Bridging the Gap (BTG) tax levy comes to a close and a potential new tax levy takes form (BTG2), Seattle has the opportunity to redirect current modal spending allocation to a more holistic, Complete Streets approach that integrates bicycle connectivity, access, and safety as part of all BTG2 projects. By enacting the its Complete Streets policy, the City will be able to remove the existing modal barriers to funding allocation and investment funds on integrative projects with multiple user benefits. Complete Streets projects that are multimodal in nature can be paired with other needs such as neighborhood greenway, cycle track, neighborhood safety, and safe routes to transit (SR2T) projects. Figure 1 shows before and after views of a complete streets project along 15th Avenue South in Seattle.

Figure 1

15th Avenue South: Before

15th Avenue South: After

Corporate and Private Foundations

Corporate and private foundations provide important funding opportunities that complement the City's efforts for expanded bicycle infrastructure and more effective program delivery. There are a host of organizations that enable Complete Street, neighborhood, bicycle infrastructure projects, and program delivery possible. The following is short list of private funding sources and the types of projects or programs that are eligible for funding:

- Bikes Belong (http://www.bikesbelong.org/grants/): Bikes Belong awards grants of up to $10,000 for facility and advocacy projects, for up to 50% of the total project cost. Bikes Belong has also administered SRTS mini-grants which could be a simple way to provide bike parking to satisfy the school district's growing bike storage needs. Using this funding for program support may benefit educational programs and better involve the public in securing funding.
- Robert Wood Johnson Foundation (http://www.rwjf.org): RWJF provides grants for programs that promote active and healthy living through its Call for Proposals process. Public agencies may apply for these funds and many bicycle and pedestrian improvement programs may be eligible.
- Bullitt Foundation (http://bullitt.org/): The program believes that in the resource-constrained world of the future, communities that are built and managed on ecological principles will have important advantages over traditional cities constructed around cheap fossil fuels. Program Objective: To advance policies and practices to create vibrant, affordable, diverse, healthy, and environmentally beneficial communities. The urban ecology program will expand upon the existing leadership that several Northwest cities have displayed in such fields as transit-oriented development, smart growth, green architecture & urban design.
- The ORAM Fund for the Environment and Urban Life (http://enviro-urban.org/): The ORAM Fund mission is to "support projects and programs with promise of significant local or broader-reaching impacts on environmental quality and urban life." In pursuit of this mission the Fund's strategy is to support groups that" implement and/or promote innovative activities that will benefit the environment and urban life." The organization's current focus is on urban development.

There are a number of other private funding opportunities for bicycle transportation funding. Organizations include the SRAM Cycling Fund, Microsoft Corporate Citizen Washington State program, Boeing Washington State Grantmaking Program, the Walmart Foundation, Clif Bar Family Foundation, and REI grants. Many of these groups have deep local roots and may be enthused to support investments in their community.

To win competitive grants from foundations it is necessary to have excellent and fastidious grant writers to position SDOT for maximum grant support. There are a number of limitations that grant funding imparts on a project including additional analysis time, report writing, and surveys to determine the effectiveness of the investments. Grants are not guaranteed sources of revenue and should never be counted on to solely or consistently fund projects.

Appendix 7:

GIS METHODOLOGY

GIS Methodology

Gap Analysis

This analysis included several sources of data to identify the status of implementing the current planned bicycle network. Gaps will be identified through examination of GIS data, aerial photography, staff knowledge and field work (if needed). As of the end of 2011, 52% of the network recommended by the original BMP had been completed. The projects that were part of the original network plan, but unfunded and thus not implemented, are identified as gaps. Also, the original BMP included unmarked streets with wide shoulders, streets commonly used by bicyclists or "shared roadways," and streets identified as "further study needed" as part of the network, but for this analysis many, if not all, of those streets will be identified as enhancement opportunities to promote the development of a more complete network. The proposed methodology was a three step process:

1) Identify gaps in Seattle's existing bicycle network based on the 2007 Bicycle Master Plan
2) Identify areas where additional enhancements may be made to the recommended network
3) Address the need for development of new types of facility networks that were not identified in the original plan (i.e., neighborhood greenways, cycle tracks, etc.)

Gaps

A) Crossing Gaps – Spot locations that were identified for crossing improvements from the 2007 BMP that have not been implemented.

Data Inputs:

- 2007 BMP crossing improvement recommendations
- Existing crossing improvements from 2007 BMP

B) Network Gaps – Small gaps in the existing network. Network gaps are no greater than ¼ mile may include; missing connections to major destinations (see definitions), unfunded recommendations from the 2007 BMP.

Data Inputs:

- Existing bicycle network
- 2007 BMP planned, unfunded network

C) Corridor Gaps – Larger gaps in the existing network greater than ¼ mile from the 2007 BMP facility recommendations.

Data Inputs:

- Existing bicycle network
- 2007 BMP planned, unfunded network

Opportunities

A) Crossing Opportunities –Locations where two existing bicycle lanes drop off at the intersection. This analysis was performed by visually reviewing each intersection where two (or more) streets with bike lanes cross. Those intersections where the bike lanes stop prior to the intersection were identified.

B) Network Opportunities –Small (no greater than ¼ mile) voids in the planned network that may include; missing connections to major destinations (see definitions), connector streets or locations that were not part of the original network map.

Data Inputs:

- 2007 planned bicycle network (existing & planned)
- 2007 BMP connector streets (see definitions)
- 2007 BMP "further study needed" recommendations
- Major destinations
- Choke points (bridges)
- Public Input via Survey Map – Worst streets for biking, where you would you like to ride that you currently do not

C) Corridor Opportunities – Larger (greater than ¼ mile) voids in the planned network that may include; missing connections to major destinations, connector streets or locations that were not part of the original network map.

Data Inputs:

- Major destinations
- 2007 planned bicycle network (existing & planned)
- 2007 BMP connector streets
- 2007 BMP "further study needed" recommendations
- Public Input via Survey Map – Worst streets for biking, where you would you like to ride that you currently do not

D) Area Opportunities – Areas devoid of existing and/or planned facilities.

Data Inputs:

- 2007 planned bicycle network (existing & planned)
- 2007 BMP connector streets
- 2007 BMP "further study needed" recommendations
- Public Input via Survey Map – Worst streets for biking, where you would you like to ride that you currently do not

E) Equitable Implementation Analysis – Review of the distribution of existing and planned bicycle improvements since 2007 as it relates to traditionally underserved populations.

Data Inputs:

- Existing bicycle network
- 2007 planned bicycle network
- Bike rack inventory
- 2010 Census Tract by
  - Minority population (2010 Census)
  - Low car ownership (5-year (2006-2010) American Community Survey (ACS) estimates)
  - Low income (5-year (2006-2010) ACS estimates)
  - Youth (1-18) (2010 Census)
  - Aged (65+) (2010 Census)

Network Development

Initial Filter Process

To initiate the process of developing the bicycle network map for the 2013 Bicycle Master Plan, the lead consultant, ALTA Planning + Design, used several inputs to develop what was deemed the "universe of possibilities" bicycle network. The inputs included:

- Bicycle Network Gaps
- Bicycle Network Opportunities
- Public Engagement Phase 1
- Seattle Neighborhood Greenways
- Average Annualized Weekday Trips (Cars)
- Pavement Width
- Topography

This initial filter process produced an extensive network that consisted of over 520 miles of new facilities to build, including 117 miles of cycle tracks and 211 miles of neighborhood greenways. This version of the network was used in the second phase of public engagement. During the public engagement efforts the network map was presented for review and commented on by the general public. Those comments and suggestions were geared around two questions:

1) What street or streets in the proposed network would you like to add to the map?
2) What street or streets in the proposed network would you like removed from the map?

In addition to the open houses, online surveys with a corresponding interactive map were made available for anyone to comment. The results of the survey were reviewed and georeferenced, if necessary, and the data from the online map were stored in GIS.

Separate from the proposed network map, an analysis was performed to identify where people bike to (destinations). This was done, initially, to illustrate the connections created by the proposed network.

Destination Cluster Development

The goal of this process was to identify areas where popular destinations for people on bicycles are group together in order to aid in the design of the future bicycle network. In lieu of actual travel demand model origin/destination data, this data was used as a proxy for destinations.

Using previous research as a benchmark , several types of land user were identified as being popular among people on bikes. Each destination was given a broad category (high, medium, or low) based on how many bicycle trips the destination generated. Universities and Community Colleges were placed in the high category and received the highest ranking. Generally speaking, the University of Washington and the other universities in the city are regional destinations and generate a large amount of bicycling trips on a daily basis. Minor destinations, like Benaroya Hall or Safeco Field, placed in the low category and given the lowest weighting because they are in operation few hours during the year and thus generate a much smaller amount of bicycle trips (see Table 1).

Destination Cluster GIS Process

The following process was used to develop the Destination Cluster Map:

Assumptions:

- All data must be the same data type (i.e., point, line or polygon).
- For destinations that occupy large areas of land and generate significant bicycle trips, nodes were added to each entrance location to account for the amount of people accessing that specific gateway to the destination (example: have a point at each entrance to the University of Washington).
- Trails are not considered as destinations, even though they generate a lot of bike trips. They are considered facilities used to get to destinations.

Step 1: Build Destination Map

Add all destination types from the destination matrix. Separate each destination into its appropriate category. For ease of management it is recommended that groups be created in the ArcMap table of contents.

Step 2: Create merge shapefiles for each destination category

For each variable (i.e., schools, transit, etc.) add a field to its table, name it something intuitive (score) and assign the appropriate score based on the destination matrix. Note: be careful to name each field exactly the same with the same type (short integer). All other fields should not be included in the merge process (see below).

The result should be three new shapefiles for each the high, medium and low categories. Each feature in each shapefile should also have a score attribute.

Step 3: Make Final Destination Shapefile.

Merge the three destination shapefiles (high, medium, low) into one shapefile with one attribute in the table (score)

Step 4: Kernel Density Analysis

Note: Must have spatial analysis extension to perform this step. This step calculates the density of destination points around each individual point at the prescribed search radius. For this analysis ¼ mile (1320 feet) search radius was used. Each destination was weighted based on its score in the destination matrix (see 4.1.1.2) so that the score was a proportional value based the estimated volume of trips created. So the University of Washington (score: 100) creates four times more trips annually, than the central library. Once complete, this process creates a raster dataset with a resolution of 50 feet. Each cell is assigned a score based on how many destinations (and their weight) are within ¼ mile. Only cells with a value of 2060 or greater were used.

To create the final density cluster shapefile, the raster calculator was used to create a new raster dataset from the kernel analysis results. Then this raster was converted to shapefile and review for logical consistency. Outliers, namely very small clusters, were reviewed and removed as needed.

Network Review Process

Upon completion of the public open houses held during the second public engagement phase, all of the comments collected at each open house, and those submitted by community groups (West Seattle Bike Connections, Seattle Neighborhood Greenways, etc.) were digitized in ArcMap for analysis purposes. That data, coupled with the input generated by the interactive, online map were used to review the draft network. During the review process, several key themes

Table 1: Destination Scoring Matrix

Category	Land-use	Description	Inputs	Weight (by category)	Score
High	University or College	All Universities, Colleges, and Community Colleges within the city limits.	*Type*	1	
			University (UW, SPU, SU)		100
			College (North Sea. CC, South Sea. CC, Central Sea. CC)		95
	Large Employers (CTR Employers)	Washington law requires employers with 100 or more employees to adopt plans and programs that reduce drive-alone commutes.	*Number of Employees*	2	
			400 or more		90
			200-400		85
			100-200		80
	Major Transit Stations	Transit stops that typically generate the largest number of boarding and/or alighting	BRT, Commuter Rail, Ferry Terminals, Light Rail Stations	3	75
	Neighborhood Businesses	NC 1: A small shopping area that provides primarily convenience retail and services to the surrounding residential neighborhood. NC 2: A moderately-sized pedestrian-oriented shopping area that provides a full range of retail and services to the surrounding neighborhood.	Parcels zoned NC 1 or NC 2 (see description for detail)	4	70
	School		*Type*	5	
			Elementary		60
			Middle School/Jr. High School		65
			High School		60
	Neighborhood Park	Smaller parks with less parking capacity	Salmon Bay Park, Sunset Hill Park, etc.	6	55
Medium	Transit Hubs	Locations where bus services converge.	From Transit Communities Report	1	50
	Community Center & Neighborhood Libraries			2	45
	Minor Destinations	Locations that are often frequented by people on bicycles.	bicycle shop, farmers market, coffee shop, post office, movie theater, bakery, swimming pool	3	40
	Large Park	Parks that are larger than 10 acres in size	Discovery Park, Magnuson Park, etc.	4	35
Low	Large Retail		big box or grocery stores not in neighborhood business district	2	30
	Other major entertainment destinations		concert venues, stadiums, central library, courthouse	1	25

became clear. The first and most prevalent message that commenter's provided was that the map lacked clarity. People were not clear on how connections were made to key destinations. A common comment was "I cannot tell, by looking at the map, how to get from X (their origin, usually their residence) to Y (their destination or set of destinations). Secondly, and of equal or potentially greater importance, people were not able to determine how to follow "low stress" facilities (i.e., cycle tracks, greenways or trails) to get to their destinations.

Additionally, SDOT received many comments from local bicycle advocacy groups and other stakeholders about the specific navigation of certain facilities, particularly neighborhood greenways. This input gave SDOT the local knowledge needed to build the smartest neighborhood connections, and was very valuable since these stakeholders ride and understand their streets better than anyone.

Refinement – City-wide Network & Local Connector Network

As a result of the review process, SDOT staff proposed to the executive staff to take a new approach to structuring the network. This approach aimed at identifying key corridors which would facilitate continuous, or as continuous as is feasible, connection throughout the city. Each street in the "City-Wide Network" would be designed for riders of all ages and abilities and provide proximal connection to most, if not all, of the destination clusters previously identified. Cycle tracks and off-street trails were the preferred facility treatment for the city-wide network, but in areas where cycle tracks were not practical or impossible, alternate, parallel residential streets were added to ensure access to all parts of the city.

Facilities not included in the city-wide network became a part of the "Local Connector Network." These facilities are still important to connectivity of the whole city; however they are geared more towards "fearless" riders or to areas that are less dense with destination clusters.

The development of this new approach evolved over the course of a few weeks and was presented to the BMP Executive Steering Committee at the March meeting. Additionally, a workshop with the SBAB was held at the SDOT office in March. By the end of April, the network was handed off to ALTA for further analysis and project development.

Project Development Process

As described previously, the bicycle network is based on Seattle's roadway centerline database. In order to maintain maximum flexibility, the bicycle network was developed on a segment by segment (block-by-block) basis to capture and maintain the unique characteristics that are already attributed to each roadway segment (e.g., speed studies, posted speed limits and roadway width). Within the existing database, each block of roadway is assigned a unique ID number that is used to relate characteristics of the roadway network to the existing and proposed bicycle network and allows easier tracking of these characteristics as they change over time.

In order to implement the Plan, it is necessary to create 'projects,' which are simply continuous segments of roadway or trail that have logical beginning and ending points and will be constructed or upgraded at a single time. Projects extents proposed in this plan are a starting point, but may change over time as implementation progress and more detailed plans for a specific location are developed. It is common for a project to be extended or shortened, or for several projects to be grouped and constructed together. These projects can then be prioritized and measured to understand how they contribute Seattle's bicycling network, based on the criteria and ranking system established through this planning process. The following rules were developed and used as a guide for developing projects:

1. Projects are part of the Citywide network or Local network
2. Project is generally either a new project OR an upgrade
3. In order of descending preference:
    a. Projects filling a gap between two existing bikeways
    b. Arterial to arterial projects
    c. Projects within an activity cluster
4. Neighborhood greenways may be aggregated by neighborhood – e.g. small local network on multiple streets

5. Some projects may include two facilities when the bicycle network is coincident with the multimodal corridor and a parallel bicycle facility is also proposed (e.g., a cycle track is proposed on the multimodal corridor and in addition to a parallel neighborhood greenway).

Prioritization Process

Full implementation of the recommended network (including new facilities and upgrades to existing facilities) will take many years, given the expected funding availability for network development. This makes it necessary to develop a process to select an equitable and realistic set of programmed projects that will provide great returns and fulfill the plan's goals of increased ridership, connectivity, equity, safety and livability while simultaneously providing enough flexibility for Seattle to pursue projects opportunistically.

The purpose of the Prioritization Framework is to provide a flexible process that guides facility implementation in Seattle in the near term and longer term. Project evaluation provides a guide in the ordering of facility construction. The intent is to prioritize projects that bring greatest benefit to be built first, based upon a set of mutually agreed upon quantifiable criteria. The citywide and the local cycling networks will be grouped into three tiers based on natural breaks in the number of points they scored, or number of projects falling into each tier.

Projects will be assessed annually or biannually to understand how they rank against each other and the relative benefit they bring to Seattle's cycling network. A project's score should not preclude completion or further action if opportunity arises. For example, a project scoring in Tier 3 should be implemented regardless of timeframe if a repaving project is scheduled or a project scoring in Tier 2 should be implemented if it is located near a school and Safe Routes to School funding is awarded. Pursuing network development in this opportunistic and ordered fashion can maximize both miles of bicycles network constructed and efficiency of dollars spent. Tables 2-6 show the detailed evaluation criteria for projects.

Data Products

The final plan will include an annotated list of data products used in the GIS analysis. The list will include, but is not limited to the following:

- 2013 Bicycle Facility Network
- Spot Improvements
- Destination Clusters
- Network Gaps
- Network Opportunities
- Equity Analysis Results
- Project Lists
    - Preliminary Prioritized Project List
    - Catalyst Projects

Table 2: Project Evaluation Criteria: Safety

Theme or Category	Definition	Measurement Methodology	Data Source	Notes
Enhance **SAFETY**	Addresses location with bike crash history and emphasis on vulnerable roadway users	An intersection or project where 3 or more crashes have occurred in the last 3 years.	SDOT GIS	Responsive
		A project or intersection with 2 or more crashes in the last 3 years.		
		A project or intersection with a 1 crash in the last 3 years.		
Enhance **SAFETY**	Local roadway factor. Addresses local roadway projects that are located in street environments that are comfortable, low-stress locations for all types of users.	Project crosses or is bounded by at least one major arterial	SDOT GIS	Predictive - points are awarded based on scale of roadway crossings.
		Project crosses or is bounded by at least one minor arterial.		
		Project crosses or is bounded by at least one collector arterial.		
		Project has no arterial crossings.		
Enhance **SAFETY**	Address locations or streets that are associated with greater cyclist stress and more severe cyclist / motorist crashes by considering higher motor vehicle volumes described as Average Daily Traffic (ADT)	Roadway ADT > 15,000	SDOT GIS	Predictive - 10 potential points between speed / ADT metrics.
		Roadway ADT 8,000 - 15000		
		Roadway ADT < 8,000		
Enhance **SAFETY**	Addresses locations / corridors with characteristics with a higher potential for cyclist / motorist crashes of greater severity by considering posted speed.	Roadway is signed equal to or greater than 35 mph	SDOT GIS	Predictive - 10 potential points between speed / ADT metrics.
		Roadway is signed at 30 mph		
		Roadway is signed at 25 mph		

Table 3: Project Evaluation Criteria: Equity

Theme or Category	Definition	Measurement Methodology	Data Source	Notes
Enhance EQUITY by providing a health benefit	The project will provide a health benefit for people in areas with the greatest reported health needs, represented by obesity rates, physical activity rates (self-reported) and diabetes rates.	Project serves a health reporting area (HRA) that falls in the top quartile (25%) of scores in all three health indicators.	King County Community Health Indicators	Data is reported by Health Reporting Areas; Seattle is divided into approximately 15 districts. Most recent data available is 2009 or 2010.
		Project serves a health reporting area (HRA) that falls in the top quartile (25%) of scores in all two health indicators.		
		Project serves a health reporting area (HRA) that falls in the top quartile (25%) of scores in one health indicator.		
		Project does not serve a health reporting area (HRA) that falls in the top quartile (25%) of scores in a health indicator.		
Address EQUITY	Project serves populations that are historically underserved including people of color, households with low income relative to the federal poverty line, people under 18 or over 65, or households without access to an automobile.	Project serves a census tract that falls in the highest quartile (25%) of scores in four or five equity indicators.	Equity analysis developed for the State of Seattle Bicycling Report	
		Project serves a census tract that falls in the highest quartile (25%) of scores in three equity indicators.		
		Project serves a census tract that falls in the highest quartile (25%) of scores in two equity indicators.		
		Project serves a census tract that falls in the highest quartile (25%) of scores in one equity indicator.		

Table 4: Project Evaluation Criteria: Ridership

Theme or Category	Definition	Measurement Methodology	Data Source	Notes
Increase livability and RIDERSHIP	Project provides a bicycle connection to clusters of bicycle friendly destinations as defined in the Bicycle Master Plan.	Area scores in the highest scoring quartile (25%) for connections to clusters of bicycle friendly destinations.	SDOT GIS - Activity node analysis used during bike network development	Considers large employers
		Area scores in the second highest scoring quartile (25%) for connections to clusters of bicycle friendly destinations.		
		Area scores in the third highest scoring quartile (25%) for connections to clusters of bicycle friendly destinations.		
		Area scores in the lowest scoring quartile (25%) for connections to clusters of bicycle friendly destinations.		
Increase Livability and RIDERSHIP	Project provides connections to areas with high population density.	Area scores in the highest scoring quartile (25%) for population density.	2010 Census block level population data	
		Area scores in the second highest scoring quartile (25%) for population density.		
		Area scores in the third highest scoring quartile (25%) for population density.		
		Area scores in the lowest scoring quartile (25%) for population density.		

Table 5: Project Evaluation Criteria: Livability

Theme or Category	Definition	Measurement Methodology	Data Source	Notes
Enhance LIVABILITY by serving the greatest spectrum of riders	The project will reach the greatest number of riders, but recognizes that all bike facilities provide a measureable benefit to at least some bicyclists.	Installation or upgrade of cycle track, neighborhood greenway or trail on the Citywide network.	SDOT GIS	This serves as a proxy for perception of safety.
		Installation or upgrade of cycle track, neighborhood greenway or trail on the local network.		
		Installation of new bike lanes or upgrade from existing shared lane markings.		
		Installation of new shared lane markings.		
Enhance LIVABILITY	The project will distribute high quality facilities across the city so residents can reach all destinations.	Density of bicycle facilities that meet the existing recommended facility quality is in the lowest quartile of census tracts citywide.		The measure is responsive to geographic equity and intended to change over time.
		Density of bicycle facilities that meet the existing recommended facility quality is in the lowest quartile of census tracts citywide.		
		Density of bicycle facilities that meet the existing recommended facility quality is in the second highest quartile of census tracts citywide.		
		Density of bicycle facilities that meet the existing recommended facility quality is in the highest quartile of census tracts citywide.		

Table 6: Project Evaluation Criteria: Connectivity

Theme or Category	Definition	Measurement Methodology	Data Source	Notes
Enhance CONNECTIVITY	The facility will remove a barrier or close a system gap in the bicycling network.	Project is included on the heroic project list AND makes a connection to/on the citywide network	SDOT GIS	
		Project is on the heroic project list OR makes a connection to / on the citywide network		
		Project is NOT on the heroic project list and does not connect to the citywide network		
Enhance CONNECTIVITY	The project will make a new connection immediately extends the current bicycle network.	A link or intersection that connects 2 or more existing bike facilities that meet the recommended facility quality	SDOT GIS	
		A link or intersection that extends an existing bike facility meet the recommended facility quality		
		Project does not extend an existing bike facility		

Appendix 8: TO BE INCLUDED IN

FINAL PLAN

8A: Project Lists

8B: Catalyst Project List

Bicycle Master Plan Project List

Project Number	Street	From	To	Length (miles)
100	10TH AVE E	E BLAINE ST	E ALOHA ST	0.58
101	10TH AVE E	E ROANOKE ST	E SHELBY ST	0.26
102	10TH AVE E	E BLAINE ST	E ROANOKE ST	0.60
103	10TH AVE E\E THOMAS ST\FEDERAL AVE E	E DENNY WAY	E REPUBLICAN ST	0.33
104	10TH AVE S TRAIL	S SNOQUALMIE ST	10TH AVE S	1.56
105	10TH AVE S TRAIL	S SNOQUALMIE ST	10TH AVE S	0.22
106	10TH AVE SW/11TH AVE SW/SW PORTLAND ST	SW ROXBURY	SW HOLDEN ST	1.20
107	10TH AVE W	W HOWE ST	W WHEELER ST	0.33
108	10TH AVE W\OLYMPIC AVE W	W PROSPECT ST	W HOWE ST	0.53
109	11TH AVE NE	NE RAVENNA BLVD	NE 47TH ST	0.60
110	11TH AVE NE/12TH AVE NE	NE RAVENNA BLVD	NE 65TH ST	0.29
111	11TH AVE NE/EASTLAKE AVE NE	NE CAMPUS PKWY	NE 47TH ST	0.51
112	11TH AVE NW/NW 60TH ST	LEARY WAY NW	NW 65TH ST	1.06
113	11TH AVE W/14TH AVE W/GILMAN DR W/W HOWE ST	10TH AVE W	W BARRETT ST	0.83
114	12 AVE SW/17TH AVE SW	SW ROXBURY ST	DELRIDGE WAY SW	0.10
115	12TH AVE E	E DENNY WAY	E PROSPECT ST	0.67
116	12TH AVE NE	NE 65TH ST	NE 75TH ST	0.50
117	12TH AVE NE	NE 47TH ST	NE RAVENNA BLVD	0.58
118	12TH AVE NE	BURKE GILMAN TRAIL	NE 47TH ST	0.59
119	12TH AVE NW	NW 65TH ST	NW 100TH ST	1.77
120	12TH AVE NW/NW 132ND ST	NW 122ND ST	8TH AVE NW	0.73
121	12TH AVE S	S CHARLES ST	E YESLER WAY	0.53
122	12TH AVE S/S MASSACHUSETTS ST	GOLF DR S	13TH AVE S	0.48
123	12TH AVE SW/SW WEBSTER ST/11TH AVE SW	SW HOLDEN ST	SW HOLLY ST	0.66
124	13TH AVE S	S ALBRO PL	AIRPORT WAY S	0.15
125	13TH AVE S	BEACON AVE S	S HILL ST	0.17
126	14TH AVE E/E THOMAS ST	E PINE ST	E PROSPECT ST	0.92
127	14TH AVE NW	NW 58TH ST	NW 65TH ST	0.35
128	14TH AVE NW	BURKE GILMAN TRAIL	NW 58TH ST	0.66
129	14TH AVE S/S HINDS ST	15TH AVE S	BEACON AVE S	0.65
130	14TH AVE W	W NICKERSON ST	8TH AVE W	1.32
131	14TH AVE/E ALDER ST/E SPRUCE ST	12TH AVE	18TH AVE	0.42
132	15TH AVE NE	LAKE CITY WAY NE	NE 90TH ST	0.45

Project Number	Street	From	To	Length (miles)
133	15TH AVE NE	PINEHURST WAY NE	NE 125TH ST	0.34
134	15TH AVE NE	NE 90TH ST	NE 98TH ST	0.44
135	15TH AVE NE	NE 125TH ST	NE 145TH ST	1.00
136	15TH AVE NE	NE RAVENNA BLVD	NE 68TH ST	0.47
137	15TH AVE NE	NE CAMPUS PKWY	NE 47TH ST	0.49
138	15TH AVE NE	NE PACIFIC ST	NE CAMPUS PKWY	0.21
139	15TH AVE NE	NE 68TH ST	NE 80TH ST	0.69
140	15TH AVE NE	NE 47TH ST	NE RAVENNA BLVD	0.53
141	15TH AVE NE	NE 98TH ST	PINEHURST WAY NE	0.98
142	15TH AVE NW/NW 100 ST	NW 90TH ST	8TH AVE NW	0.99
143	15TH AVE S	S SPOKANE ST	S HINDS ST	0.10
144	15TH AVE S	S NEVADA ST	S BRADFORD ST	0.25
145	15TH AVE S	S ORCAS ST	S LUCILE ST	0.15
146	16TH AVE S/14TH AVE S	S DIRECTOR ST	EAST MARGINAL WAY S	0.84
147	16TH AVE SW/DUMAR WAY SW/SW AUSTIN ST/SW ORCHARD ST	16TH AVE SW	DELRIDGE WAY SW	0.44
148	16TH AVE W	W DRAVUS ST	SHIP CANAL TRL	0.38
149	16TH AVE/16TH AVE E/17TH AVE/E OLIVE ST	E ALDER ST	E PROSPECT ST	1.80
150	17TH AVE NW	NW BALLARD WAY	NW 90TH ST	2.24
151	18TH AVE/E OLIVE ST	17TH AVE E	E GALER ST	1.16
152	19TH AVE NE	NE 45TH ST	NE 55TH ST	0.50
153	19TH AVE/20TH AVE/E ALDER ST/E FIR ST	S JACKSON ST	18TH AVE S	0.47
154	19TH AVE/20TH AVE/E ALDER ST/E FIR ST	S WELLER ST	18TH AVE S	0.12
155	1ST AVE	BROAD ST	DENNY WAY	0.18
156	1ST AVE N	W DENNY WAY	ROY ST	0.47
157	1ST AVE N/6TH AVE N/QUEEN ANNE DR/RAYE ST	SMITH ST	DEXTER AVE N	0.70
158	1ST AVE N\BIGELOW AVE N\MCGRAW ST\NOB HILL AVE N\WHEELER ST	BOSTON ST	QUEEN ANNE AVE N	0.62
159	1ST AVE NE	N 92ND ST	NE 103RD ST	0.50
160	1ST AVE NE/KENSINGTON PL N	NE 42ND ST	NE 54TH ST	0.71
161	1ST AVE NE/N 117TH ST	NE 103RD ST	1ST AVE NE	0.83
162	1ST AVE NE/N 65TH ST/SUNNYSIDE AVE N	KEYSTONE PL N	E GREENLAKE WAY N	0.97
163	1ST AVE NE/NE 85TH ST	ROOSEVELT WAY NE	N 92ND ST	0.88
164	1ST AVE NW	N CANAL ST	NW 39TH ST	0.15
165	1ST AVE NW/ N 60TH ST/NW 59TH ST	PHINNEY AVE N	3RD AVE NW	0.39
166	1ST AVE NW/NW 107TH ST	3RD AVE NW	N 130TH ST	1.25
167	1ST AVE NW/NW 41ST ST/2ND AVE NW/NW BOWDOIN PL	NW 39TH ST	NW 42ND ST	0.40
168	20TH AVE NE	NE 68TH ST	NE 86TH ST	0.94

Project Number	Street	From	To	Length (miles)
169	20TH AVE NE	NE RAVENNA BLVD	NE 68TH ST	0.46
170	20TH AVE NE	NE 45TH ST	NE 52ND ST	0.36
171	20TH AVE NW	SHILSHOLE AVE NW	NW MARKET ST	0.31
172	20TH AVE S/21ST AVE S/S PLUM ST/ VALENTINE PL S	S SPOKANE ST	MTS TRAIL CONNECTOR	1.25
173	20TH AVE W	ELLIOTT BAY TRL	W DRAVUS ST	0.45
174	20TH AVE W/GILMAN AVE W	W DRAVUS ST	W EMERSON PL	0.57
175	21ST AVE E TRL	23RD AVE E	E INTERLAKE DR E	0.07
176	21ST AVE E/E CRESCENT DR	E GALER	E INTERLAKEN BLVD	1.22
177	21ST AVE SW	SW MYRTLE ST	SW DAWSON ST	1.26
178	21ST AVE SW	SW DAWSON ST	SW ANDOVER ST	0.62
179	21ST AVE SW	SW DAWSON ST	SW DAWSON ST	0.15
180	21ST AVE W/40TH AVE W/EAST STEVENS WAY NE/W COMMODORE WAY	W EMERSON PL	W LAWTON ST	1.68
181	21ST/24TH/28TH AVE W/W ARMOUR ST/W RAYE ST	ELLIOTT BAY TRL	32ND AVE W	1.07
182	22ND AVE	S JACKSON ST	E UNION ST	0.96
183	22ND AVE E	BOYER AVE E	E MONTLAKE PL E	0.58
184	22ND AVE NE	NE 45TH ST	NE 54TH ST	0.49
185	22ND AVE SW	SW ANDOVER ST	END	0.15
186	22ND AVE/E DENNY WAY	E UNION ST	E DENNY WAY	0.41
187	23RD AVE W	W GARFIELD ST	W MARINA PL	0.12
188	24TH AVE NE	NE 68TH ST	NE 80TH ST	0.63
189	24TH AVE NW	NW 54TH ST	NW 57TH ST	0.16
190	24TH AVE S/25TH AVE S/S COLLEGE ST	S HANFORD ST	S COLLEGE ST	0.58
191	24TH AVE S/S HILL ST	31ST AVE S	18TH AVE S	0.85
192	24TH AVE S/S MORGAN ST/S WARSAW ST	SWIFT AVE S	BEACON AVE S	0.28
193	24TH AVE SW/25TH AVE SW	SW ROXBURY ST	SW THISTLE ST	0.75
194	24TH AVE/24TH PL S/S ANDOVER ST	CHEASTY BLVD S	S HANFORD ST	0.79
195	25TH AVE E/E UNIVERSITY BLVD	E ROANOKE ST	GLENWILDE PL E	0.07
196	25TH AVE NE/NE 130TH ST/20TH AVE NE	NE 115TH ST	NE 145TH ST	1.76
197	25TH AVE NE/NE113TH ST/23RD AVE NE/ NE 107TH ST/NE 108TH ST	NE 115TH ST	ROOSEVELT WAY NE	1.14
198	25TH AVE SW/SW MYRTLE ST	DELRIDGDE WAY SW	24TH AVE SW	0.55
199	26TH AVE E/28TH AVE E/E GALER ST/E PROSPECT ST	E HARRISON ST	MONTLAKE BLVD E	2.23
200	26TH AVE S/S JUDKINS ST	S JUDKINS ST	E YESLER WAY	0.79
201	26TH AVE SW/SW CLOVERDALE ST	24TH AVE SW	SW THISTLE ST	0.25
202	27TH AVE	E CHERRY ST	E PINE ST	0.50
203	27TH AVE NE	NE 125TH ST	NE 145TH ST	1.00
204	27TH AVE NE	NE BLAKELY ST	NE 68TH ST	0.78
205	27TH AVE/27TH AVE E/E ARTHUR PL	E PINE ST	MLK JR WAY E	0.54

Project Number	Street	From	To	Length (miles)
206	27TH AVE/27TH AVE S/S MAIN ST	MLK JR WAY S	E CHERRY ST	0.58
207	28TH AVE NW	NW MARKET ST	NW 83RD ST	1.38
208	28TH AVE NW	BURKE GILMAN TRAIL	NW MARKET ST	0.05
209	28TH AVE S/31ST AVE S/32ND AVE S/S DAWNSON ST/S FERDINAND ST/S HUDSON ST	BEACON AVE S	ML KING JR WAY S	0.86
210	28TH AVE S/S DEARBORN ST	23RD AVE S	31ST AVE S	0.44
211	28TH AVE SW/SWELMGROVE ST/27TH AVE SW	SW THISTLE ST	SW HOLDEN ST	0.44
212	29TH AVE	E UNION ST	E HARRISON ST	0.65
213	29TH AVE	E YESLER WAY	E UNION ST	0.77
214	29TH AVE W/W RUFFNER ST/36TH AVE W	W GALER ST	W GOVERNMENT WAY	2.24
215	2ND AVE	4TH AVE S	UNION ST	0.80
216	2ND AVE	UNION ST	BROAD ST	0.91
217	2ND AVE N	GALER ST	MCGRAW ST	0.53
218	2ND AVE N/HIGHLAND DR	HIGHLAND DR	GALER ST	0.33
219	2ND AVE NE/N 46TH ST/NE 46TH ST/NE 47TH ST	LATONA AVE NE	SUNNYSIDE AVE N	0.28
220	2ND AVE W	W THOMAS ST	W MERCER ST	0.25
221	30TH AVE NE/RAVENNA AVE NE	NE 105TH ST	NE 115TH ST	0.52
222	30TH AVE/E COLUMBIA ST	29TH AVE	33RD AVE	0.23
223	31ST AVE	E YESLER WAY	E COLUMBIA ST	0.53
224	31ST AVE NE/NE 85TH ST/32ND AVE NE/ NE 100TH ST	NE 75TH ST	NE 106TH ST	1.61
225	31ST AVE S	S MT BAKER BLVD	S MCCLELLAN ST	0.12
226	31ST AVE S	S MASSACHUSETTS ST	S NORMAN ST	0.92
227	32ND AVE NE	NE 135TH ST	NE 145TH ST	0.50
228	32ND AVE NE/33RD AVE NE/34TH AVE NE/NE 62ND ST	NE 55TH ST	NE 75TH ST	1.08
229	32ND AVE NW	NW 58TH ST	NW 85TH ST	1.30
230	32ND AVE SW/LANHAM PL SW/31ST AVE SW	SW HOLDEN ST	SW JUNEAU ST	1.27
231	32ND AVE W	W MCGRAW ST	W BARRETT ST	0.50
232	32ND AVE W/CLISE W/MAGNOLIA W/W GARFIELD/W GALER	23RD AVE W	W MCGRAW ST	0.96
233	32ND AVE W/GILMAN AVE W/W GOVERNMENT WAY	W BARRETT ST	32ND AVE W	1.10
234	32ND AVE W/W MARINA PL EXT/W GALER ST/W MARINA PL	23RD AVE W	CLISE PL W	1.00
235	33RD AVE	E CHERRY ST	E DENNY WAY	0.73
236	33RD AVE S/RENTON AVE S	S ALASKA ST	ML KING JR WAY S	0.80
237	33RD AVE W TRAIL	W GOVERNMENT WAY	CHITTENDEN LOCKS TRL	0.33
238	34TH AVE NW	NW 58TH ST	NW 77TH ST	1.11

Project Number	Street	From	To	Length (miles)
239	34TH AVE S	S EDMUNDS ST	S MOUNT BAKER BLVD	1.33
240	34TH AVE SW	SW ROXBURY ST	SW GRAHAM ST	2.01
241	35TH AVE NE	NE 95TH ST	NE 105TH ST	0.51
242	35TH AVE NE	NE 105TH	NE 115TH	0.50
243	35TH AVE NE	NE 115TH ST	NE 125TH ST	0.52
244	35TH AVE NE	NE 80TH ST	NE 95TH ST	0.74
245	35TH AVE NE	NE 68TH ST	NE 80TH ST	0.63
246	35TH AVE NE	BURKE GILMAN TRAIL	NE 65TH ST	0.98
247	35TH AVE SW	SW MORGAN ST	SW AVALON WAY	1.34
248	35TH AVE SW	SW THISTLE ST	SW MORGAN ST	1.13
249	35TH AVE SW	SW ROXBURY ST	SW THISTLE ST	0.75
250	35TH AVE SW	SW 106TH ST	SW ROXBURY ST	0.64
251	35TH AVE SW	MARINE VIEW DR SW	SW 106TH AVE	0.64
252	35TH AVE W	W MCGRAW ST	W RUFFNER ST	0.88
253	36TH AVE SW	SW CHARLESTOWN ST	SW OLGA ST	0.72
254	36TH AVE SW/SW HUDSON ST/37TH AVE SW	SW GRAHAM ST	SW ALASKA ST	1.07
255	36TH AVE SW/SW ROXBURY ST/37TH AVE SW/SW 102ND ST/37TH AVE SW	SW 104TH ST	SW TRENTON ST	1.10
256	37TH AVE E/E GARFIELD ST	39TH AVE E	E MADISON ST	0.31
257	37TH AVE NE/NE 135TH ST	NE 125TH ST	NE 145TH ST	1.02
258	37TH AVE SW/SW TRENTON ST/36TH AVE SW	35TH AVE SW	SW GRAHAM ST	1.72
259	38TH AVE S\S ALASKA ST	S GENESEE ST	RAINIER AVE S	0.33
260	39TH AVE E/40TH AVE E/E NEWTON ST	E HARRISON ST	E MCGILVRA ST	1.37
261	39TH AVE NE/40TH AVE NE/NE 85TH ST	NE 77TH ST	NE 89TH ST	0.67
262	39TH AVE S	S HOLLY ST	S JUNEAU ST	0.50
263	3RD AVE NE/NE 115TH ST/NE 116TH ST	1ST PL NE	8TH AVE NE	0.39
264	3RD AVE NW/N 117TH ST/NW 117TH ST	NW 97TH ST	NW 107TH ST	0.50
265	3RD AVE NW/N 39TH ST/NW 39TH ST	BURKE GILMAN TRAIL	LINDEN AVE N	0.60
266	3RD AVE S	S MAIN ST	YESLER WAY	0.12
267	3RD AVE W	W MCGRAW ST	W BARRETT ST	0.49
268	3RD AVE W	W THOMAS ST	W HARRISON ST	0.08
269	3RD AVE W BRIDGE	SHIP CANAL TRAIL	BURKE GILMAN TRAIL	0.13
270	3RD AVE/W GALER ST	W HIGHLAND DR	W CROCKETT ST	0.51
271	40TH AVE NE	NE 45TH ST	NE 50TH ST	0.25
272	40TH AVE NE/ALTON AVE NE	NE 105TH ST	NE 123RD ST	0.95
273	41ST AVE E	E PROSPECT ST	E MCGILVRA ST	0.89
274	41ST AVE NE/NE 50TH ST	BURKE GILMAN TRAIL	SANDPOINT WAY NE	0.15
275	42ND AVE NE/43RD AVE NE/NE SURBER DR/SURBER DR NE/WEST LAURELHURST DR NE	E LAURELHURST DR NE	NE 41ST ST	0.82

Project Number	Street	From	To	Length (miles)
276	42ND AVE S	S JUNEAU ST	S FERDINAND ST	0.56
277	42ND AVE S	S MYRTLE ST	S HOLLY ST	0.25
278	42ND AVE S/S JUNEAU ST/35TH AVE S/ RENTON AVE S	S HOLLY ST	S EDMUNDS ST	1.37
279	42ND AVE S\S CONOVER WAY	S GENESEE ST	38TH AVE S	0.31
280	42ND AVE SW/SW HOLLY ST	FAUNTLEROY WAY SW	END (NEAR SW HANFORD ST)	2.49
281	43RD AVE E	E MADISON ST	E MCGILVRA ST	0.36
282	43RD AVE S	S GENESEE ST	LAKE WASHINGTON BLVD S	0.42
283	43RD AVE S	S HOLDEN ST	S MYRTLE ST	0.38
284	44TH AVE NE/45TH AVE NE/NE 47TH ST/ NE 52ND ST	WEST LAURELHURST DRIVE	SAND POINT WAY NE	1.08
285	45TH AVE NE	BURKE GILMAN TRAIL	NE 80TH ST	1.25
286	45TH AVE NE/NE 93RD ST/NE 94TH ST	BURKE GILMAN TRAIL	NE 97TH ST	0.32
287	45TH AVE SW	SW CHARLESTON ST	SW ADMIRAL WAY	0.76
288	45TH AVE SW	SW ALASKA ST	SW CHARLESTON ST	0.63
289	45TH AVE SW/SW EDMUNDS ST	48TH AVE SW	SW ALASKA ST	0.31
290	46TH AVE NE	NE 45TH ST	NE 50TH ST	0.25
291	46TH AVE S	S JUNEAU ST	LAKE WASHINGTON BLVD S	1.44
292	46TH AVE S/S CLOVERDALE ST/S KENYON ST	S HENDERSON ST	46TH AVE S	0.63
293	46TH AVE S/S HOLLY ST	S KENYON ST	42ND AVE S	1.02
294	47TH AVE NE/EAST LAURELHURST DR NE/NE 33RD ST/NE 39TH ST/WEST LAURELHURST DR NE	NE 33RD ST	NE 41ST ST	0.47
295	48TH AVE SW	LINCOLN PARK WAY SW	ERSINE WAY SW	0.98
296	48TH AVE SW	ERSKINE WAY SW	SW ADMIRAL WAY	1.79
297	4TH AVE	OLIVE WAY	CEDAR ST	0.83
298	4TH AVE	YESLER WAY	UNION ST	0.84
299	4TH AVE N	NEWTON ST	WHEELER ST	0.29
300	4TH AVE N/DEXTER AVE N	FULTON ST	FREMONT BRIDGE	0.11
301	4TH AVE NE/NE 42ND ST/BURKE AVE N	NE 40TH ST	N 43RD ST	0.71
302	4TH AVE NW/NW 120TH ST	NW 117TH ST	8TH AVE NW	0.33
303	4TH AVE S/AIRPORT WAY S/S DEABORN ST/SEATTLE BLVD S	S ROYAL BROUGHAM WAY	2ND AVE ET S	0.51
304	50TH AVE NE/NE 65TH ST	NE PRINCETON WAY	NE 75TH ST	0.58
305	50TH AVE S	S GENESEE ST	LAKE WASHINGTON BLVD S	0.24
306	520 TRAIL	BOYLSTON AVE E	MONTLAKE BLVD OFF RP	1.00
307	520 TRAIL CONNECTION	520 TRAIL	E HAMLIN ST	0.07

Project Number	Street	From	To	Length (miles)
308	52ND AVE S	SEWARD PARK AVE S	S HOLLY ST	0.20
309	52ND AVES/S GRAHAM ST/51ST AVE S	S HOLLY ST	S DAWSON ST	0.98
310	54TH ST	LATONA AVE NE	1ST AVE NE	0.13
311	55TH AVE NE/55TH PL NE/56TH AVE NE/57TH AVE NE/58TH AVE NE/NE 75TH ST/NE 77TH ST	NE 75TH ST	SANDPOINT WAY NE	0.69
312	55TH AVE S/56TH AVE S/S LEO ST	BEACON AVE S	RENTON AVE S	1.20
313	55TH AVE SW	SW GENESSEE ST	SW CHARLESTOWN ST	0.38
314	59TH AVE SW	SW ADMIRAL WAY	ALKI AVE SW	0.29
315	59TH AVE SW/SW SPOKANE ST/58TH AVE SW/HILLCREST AVE SW/SW ORLEANS ST	55TH AVE SW	SW ADMIRAL WAY	0.57
316	5TH AVE	YESLER WAY	SPRING ST	0.45
317	5TH AVE	SPRING ST	DENNY WAY	1.07
318	5TH AVE N	NEWTON ST	BOSTON ST	0.12
319	5TH AVE N\CEDAR ST	4TH AVE	REPUBLICAN ST	0.38
320	5TH AVE N\TAYLOR AVE N	MERCER ST	ROY ST	0.12
321	5TH AVE NE	NE 130TH ST	NE 145TH ST	0.76
322	5TH AVE NE	NE 71ST ST	NE 70TH ST	0.05
323	5TH AVE NE	NE 40TH ST	NE 47TH ST	0.58
324	5TH AVE NE/NE100TH ST	15TH AVE NE	NE 98TH ST	0.31
325	5TH AVE NW/6TH AVE NW/NW MARKET ST	NW 42ND ST	NW 56TH ST	0.85
326	5TH AVE S	S KING ST	YESLER WAY	0.23
327	5TH AVE S	S DEARBORN ST	S KING ST	0.18
328	61ST AVE SW	SW BEACH DR	ALKI AVE SW	0.55
329	63RD AVE SW	BEACH DR SW	ALKI AVE SW	0.40
330	6TH AVE NW/NW 65TH ST/NW 97TH ST	NW 56TH ST	1ST AVE NW	2.36
331	6TH AVE S	SEATTLE BLVD S	S DEARBORN ST	0.05
332	6TH AVE S	S FRONT ST	S INDUSTRIAL WAY	1.45
333	6TH AVE W/7TH AVE W/W MCGRAW ST	W CROCKETT ST	W RAYE ST	0.43
334	77TH ST	GREENWOOD AVE N	32ND AVE NW	2.01
335	7TH AVE	UNION ST	STEWART ST	0.70
336	7TH AVE S	S DEARBORN ST	S KING ST	0.17
337	7TH AVE S/S ORCAS ST	EAST MARGINAL WAY S	S HOMER ST	0.62
338	7TH AVE S/S TRENTON ST/8TH AVE S	S CAMBRIDGE ST	S CLOVERDALE ST	0.65
339	7TH AVE W\8TH AVE W\W MCGRAW ST	W BLAINE ST	W FULTON ST	0.90
340	7TH AVE/BATTERY ST	WESTERN AVE	DEXTER AVE	0.44
341	8TH AVE NE	NE 75TH ST	NE 85TH ST	0.50
342	8TH AVE NE	NE 85TH ST	ROOSEVELT WAY NE	2.15
343	8TH AVE NE	NE 55TH ST	NE RAVENNA BLVD	0.33
344	8TH AVE NW	NW 100TH ST	NW 105TH ST	0.25

Project Number	Street	From	To	Length (miles)
345	8TH AVE NW	BURKE GILMAN TRAIL	LEARY WAY NW	0.11
346	8TH AVE NW	NW 120TH ST	NW 137TH ST	0.88
347	8TH AVE S	DUWAMISH RIVER TRL	S CLOVERDALE ST	0.12
348	8TH AVE S	S CLOVERDALE ST	S KENYON ST	0.38
349	8TH AVE W\8TH PL W\W BLAINE ST\W HIGHLAND DR	3RD AVE W	W BLAINE ST	1.81
350	9TH AVE N/WESTLAKE AVE N	ROY ST	DEXTER AVE N	1.24
351	9TH AVE N\BELL ST	7TH AVE	WESTLAKE AVE N	0.70
352	9TH AVE NE	NE 62ND ST	NE 64TH ST	0.11
353	9TH AVE NE	NE 47TH ST	NE 55TH ST	0.38
354	9TH AVE/E UNION ST/UNIVERSITY ST	BROADWAY	SENECA ST	0.51
355	AIRPORT WAY S	S FOREST ST	S ROYAL BROUGHAM WAY	1.04
356	AIRPORT WAY S	S INDUSTRIAL WAY	S FOREST ST	0.94
357	AIRPORT WAY S	CORSON AVE S	S INDUSTRIAL WAY	0.90
358	AIRPORT WAY S	S HARDY ST	CORSON AVE S	0.50
359	AIRPORT WAY S	MILITARY RD S	S HARDY ST	1.40
360	AIRPORT WAY S	S BOEING ACCESS ROAD	MILITARY RD S	1.46
361	ALASKAN WAY	VIRGINIA ST	BROAD ST	0.62
362	ALASKAN WAY	S JACKSON ST	VIRGINIA ST	0.84
363	ALASKAN WAY S/EAST MARGINAL WAY S	S STACY ST	S ROYAL BROUGHAM WAY	0.77
364	ALKI AVE SW/BEACH DR SW	63RD AVE SW	64TH PL SW	0.63
365	ANN ARBOR AVE NE/PRINCETON AVE NE/UNIVERSITY CIR NE	SANDPOINT WAY NE	NE 65TH ST	0.55
366	ASHWORTH AVE N/N 131ST ST/N 135TH ST/STONE AVE N	LINDEN AVE N	CORLISS AVE N	1.13
367	ASHWORTH AVE N/N 47TH ST/N 50TH ST/N 55TH ST/WOODLAWN AVE N	INTERLAKE AVE N	KENWOOD PL N	0.84
368	BALLARD BRIDGE	W 15TH AVE	SHILSHOLE AVE NW	0.40
369	BANNER WAY NE/NE 75TH ST	15TH AVE NE	NE 80TH ST	0.72
370	BEACH DR SW	SW OTHELLO ST	SW JACOBSEN RD	1.77
371	BEACH DR SW/SW JACOBSEN RD/SW HUDSON ST	48TH AVE SW	63RD AVE SW	1.59
372	BEACON AVE S	S ALASKA ST	S SPOKANE ST	0.76
373	BEACON AVE S	39TH AVE S	S ALASKA ST	3.00
374	BEACON AVE S	14TH AVE S	S HOLGATE BR	0.35
375	BEACON HILL/ID I5 TRAIL	S ROYAL BROUGHAM WAY	MOUNTAINS TO SOUND TRAIL	0.52
376	BELL ST	ALASKAN WAY	7TH AVE	0.54
377	BELVIDERE AVE SW/SW CHARLESTOWN ST	36TH AVE SW	SW HINDS ST	0.96

Project Number	Street	From	To	Length (miles)
378	BLANCHARD ST	WESTERN AVE	7TH AVE	0.43
379	BNSF TRAIL	S SPOKANE ST	6TH AVE S	0.79
380	BOREN AVE S/RAINIER AVE S	S DEARBORN ST	12TH AVE S	0.44
381	BOYER AVE E	LAKE WASHINGTON BLVD E	E LYNN ST	0.74
382	BOYLSTON AVE E	E NEWTON ST	E ROANOKE ST	1.11
383	BROAD ST	ALASKAN WAY	2ND AVE	0.22
384	BROAD ST/VALLEY ST	FAIRVIEW AVE N	9TH AVE N	0.25
385	BROADWAY E	E ALOHA ST	E DENNY WAY	0.57
386	BROADWAY E/E SHELBY ST/HARVARD AVE E	E ROANOKE ST	EASTLAKE AVE E	0.56
387	BROOKLYN AVE NE	NE RAVENNA BLVD	NE 66TH ST	0.36
388	BROOKLYN AVE NE	NE 47TH ST	NE RAVENNA BLVD	0.56
389	BROOKLYN AVE NE	BURKE GILMAN TRAIL	NE 47TH ST	0.61
390	BURKE AVE N/N 62ND ST	N 42ND ST	8TH AVE NW	1.62
391	BURKE GILMAN MISSING LINK	CHITTENDEN LOCKS TRAIL	BURKE GILMAN TRAIL	1.36
392	BURKE GILMAN TRAIL ACCESS	BURKE GILMAN TRAIL	SANDPOINT WAY NE	0.11
393	CALIFORNIA AVE SW	SW 104TH ST	SW 98TH ST	0.79
394	CALIFORNIA AVE SW/SW BRACE POINT DR/SW WILDWOOD PL	FAUNTLEROY WAY SW	SW BARTON ST	0.38
395	CANAL RD NE/NE CANAL RD/NE CLARK RD/NE WALLA WALLA RD/SHIP CANAL TRL/WALLA WALL RD NE	MONTLAKE BR	MARY GATES MEMORIAL DR NE	1.41
396	CHIEF SEALTH TRAIL EXTENSION	48TH AVE S	CHIEF SEALTH TRL	0.40
397	CHIEF SEALTH TRAIL EXTENSION	S ANGELINE ST	AIPORT WAY S	0.53
398	CHIEF SEALTH TRL	S KENYON ST	S MYRTLE PL	0.44
399	CHITTENDEN LOCKS TRAIL	30TH AVE NW	W COMMODORE WAY	0.34
400	CITYSDIE TRAIL	S ATLANTIC ST	S JACKSON ST	0.62
401	CONVENTION PL\UNION ST	PIKE ST	2ND AVE	0.46
402	CORLISS AVE N	N 130TH ST	N 145TH ST	0.76
403	CORSON AVE S	EAST MARGINAL WAY S	AIRPORT WAY S	0.82
404	COWEN PL NE	15TH AVE NE	NE RAVENNA BLVD	0.10
405	DALLAS AVE S/10TH AVE S/S KENYON ST	8TH AVE S	16TH AVE S	0.57
406	DELETE	DELETE	DELETE	0.01
407	DELETE	DELETE		0.01
408	DELRIDGE WAY SW	SW BRANDON ST	SW SPOKANE ST	1.32
409	DELRIDGE WAY SW	SW ORCHARD ST	SW BRANDON ST	1.11
410	DENSMORE AVE N/N 42ND ST	BURKE GILMAN TRAIL	WALLINGFORD AVE N	0.82
411	DENSMORE AVE N/N 80TH ST	EAST GREEN LAKE DR N	NE 92ND ST	0.86
412	DENVER AVE S/MAYNARD AVE S/S DAWSON ST/S HOMER ST	CORSON AVE S	EAST MARGINAL WAY S	1.04

Project Number	Street	From	To	Length (miles)
413	DEXTER AVE	7TH AVE	MERCER ST	0.45
414	DIAGONAL AVE S/S SPOKANE ST	EAST MARGINAL WAY S	AIRPORT WAY S	0.81
415	DUWAMISH RIVER TRAIL EXTENSION	DUWAMISH RIVER TRL	SW SPOKANE ST BRIDGE	0.53
416	DUWAMISH RIVER TRAIL EXTENSION	S HOLDEN ST	S KENYON ST	0.56
417	E ALDER ST	19TH AVE	31ST AVE	0.70
418	E ALDER ST	12TH AVE	BROADWAY	0.18
419	E CALHOUN ST	22ND AVE E	18TH AVE E	0.24
420	E CHERRY ST	21ST AVE	24TH AVE	0.17
421	E CHERRY ST	32ND AVE	33RD AVE	0.05
422	E CHERRY ST	BROADWAY	13TH AVE	0.25
423	E COLUMBIA ST	29TH AVE	BROADWAY	1.21
424	E DENNY WAY	21ST AVE E	BROADWAY E	0.76
425	E DENNY WAY/MADRONA DR	LAKE WASHINGTON BLVD	33RD AVE	0.69
426	E EDGAR ST/E HAMLIN /FAIRVIEW/YALE AVE/TER E	E ROANOKE ST	EASTLAKE AVE E	0.78
427	E FOSTER ISLAND RD	LAKE WASHINGTON BLVD E	BROADMOOR DR E	0.25
428	E GALER ST	15TH AVE E	19TH AVE E	0.25
429	E GALER ST	26TH AVE E	21ST AVE E	0.24
430	E GALER ST/21ST AVE E	E DENNY WAY	19TH AVE E	1.07
431	E HARRISON ST/LAKE WASHINGTON BLVD E	29TH AVE E	HILLSIDE DR E	0.47
432	E HARRISON ST/LAKE WASHINGTON BLVD E	E HARRISION ST	E ROY ST	0.27
433	E INTERLAKEN BLVD	24TH AVE E	21ST AVE E	0.13
434	E LAKE WASHINGTON BLVD	LAKE WASHINGTON BLVD E	24TH AVE E	0.44
435	E MADISON ST	43RD AVE E	LAKE WASHINGTON BLVD E	0.46
436	E MADISON ST	43RD AVE E	37TH AVE E	0.55
437	E MCGILVRA ST/37TH AVE E	42ND AVE E	37TH AVE E	0.38
438	E MCGRAW ST	22ND AVE E	25TH AVE E	0.16
439	E MILLER ST/HARVARD AVE E	LAKEVIEW BLVD E	10TH AVE E	0.46
440	E NEWTON ST	43RD AVE E	40TH AVE E	0.23
441	E PIKE ST/PIKE ST	BROADWAY	9TH AVE	0.51
442	E PINE ST	17TH AVE	33RD AVE	0.93
443	E PROSPECT ST	15TH AVE E	18TH AVE E	0.18
444	E REPUBLICAN ST	21ST AVE E	MELROSE AVE E	1.09
445	E ROANOKE ST	YALE AVE E	EASTLAKE AVE E	0.06
446	E ROANOKE ST/BOYER AVE E	DEL MAR DR E	BOYER AVE E	0.12

Project Number	Street	From	To	Length (miles)
447	E SHELBY ST	BROADWAY E	BOYER AVE E	0.18
448	E UNION ST	32ND AVE	33RD AVE	0.05
449	E UNION ST	14TH AVE	BROADWAY	0.31
450	E UNION ST	18TH AVE	14TH AVE	0.25
451	E UNION ST	18TH AVE	22ND AVE	0.24
452	E UNION ST	22ND AVE	ML KING JR WAY	0.35
453	E YESLER WAY	21ST AVE	29TH AVE	0.26
454	E YESLER WAY	14TH AVE S	20TH AVE S	0.36
455	E YESLER WAY	I5 OVERPASS	12TH AVE	0.49
456	E3 BUSWAY TRAIL EXTENSION	S SPOKANE ST	S FOREST ST	0.42
457	EAST GREEN LAKE DR N	NE 71ST ST	GREENLAKE DR N	0.75
458	EAST GREEN LAKE WAY N	E GREENLAKE WAY N	NE 71ST ST	0.84
459	EAST GREEN LAKE WAY N/GREEN LAKE WAY N	N 50TH ST	E GREENLAKE WAY N	0.56
460	EAST MARGINAL WAY S	S STACY ST	S NEVADA ST	1.35
461	EAST MARGINAL WAY S	CITY LIMITS	ELLIS AVE S	0.72
462	EAST MARGINAL WAY S	ELLIS AVE S	S RIVER ST	0.54
463	EAST MARGINAL WAY S	S RIVER ST	1ST AVE S	0.40
464	EAST MARGINAL WAY S	1ST AVE S	S SPOKANE ST	1.29
465	EAST MONTLAKE PL/BLVD/BR/CUT	E NORTH ST	NE PACIFIC PL	0.52
466	EASTLAKE AVE E	E ROANOKE ST	FUHRMAN AVE E	0.63
467	EASTLAKE AVE E	E GALER ST	E ROANOKE ST	0.76
468	EASTLAKE AVE E	THOMAS ST	E GALER ST	0.84
469	ELLIS AVE S	S ALBRO PL	D BAILEY ST	0.18
470	ERSKINE WAY SW	48TH AVE SW	CALIFORNIA AVE SW	0.49
471	EVANSTON AVE N/N 59TH ST/N 60TH ST/ WOODLAND PL N	PHINNEY AVE N	N 65TH ST	0.57
472	FAIRMOUNT AVE SW/FAIRMOUNT AVE SW/	WALNUT AVE SW	ALKI TRAIL	0.71
473	FAIRVIEW AVE E	E ROANOAK ST	FAIRVIEW AVE N	0.92
474	FAIRVIEW AVE N	VALLEY ST	EASTLAKE AVE E	0.59
475	FAUNTLEROY WAY SW	SW WEBSTER ST	SW MORGAN ST	0.73
476	FAUNTLEROY WAY SW	SW WILDWOOD PL	SW WEBSTER ST	0.95
477	FAUNTLEROY WAY SW	SW FINDLAY ST	SW ALASKA ST	0.63
478	FAUNTLEROY WAY SW	SW ALASKA ST	SW AVALON WAY	0.27
479	FAUNTLEROY WAY SW	SW MORGAN ST	SW FINDLAY ST	0.64
480	FEDERAL AVE E	E REPUBLICAN ST	10TH AVE E	1.31
481	FLORENTIA ST/W FLORENTIA ST	3RD AVE W	FREMONT BRIDGE	0.51
482	FOSTER ISLAND RD CONNECTOR	38TH AVE E	E FOSTER ISLAND RD	0.40
483	FRANKLIN AVE E	ALOHA ST	FRANKLIN AVE E	1.49
484	FREMONT AVE N	N 42ND ST	N 50TH ST	0.50
485	FREMONT AVE N	N 34TH ST	N 42ND ST	0.56

Project Number	Street	From	To	Length (miles)
486	FREMONT AVE N	N 110TH ST	N 130TH ST	1.00
487	FREMONT AVE N	N 60TH ST	N 83RD ST	1.15
488	FREMONT AVE TRAIL	N 90TH ST	NW 105TH ST	0.75
489	GALER ST	2ND AVE N	BIGELOW AVE N	0.22
490	GARFIELD ST/ELLIOTT AVE W/W GALER ST	ELLIOTT AVE W	23RD AVE W	2.18
491	GEORGETOWN TRAIL	CORSON AVE S	6TH AVE S	0.25
492	GILMAN AVE W/W GOVERNMENT WAY	W EMERSON PL	32ND AVE W	0.74
493	GLENN WAY SW	SW ALASKA ST	SW GENESEE ST	0.28
494	GOLDEN GARDENS DR NW	NW 85TH ST	VIEW AVE NW	0.30
495	GREEN LAKE DR N	EAST GREENLAKE DR IVE N	N 83RD ST	0.39
496	GREENWOOD AVE N	N 77TH ST	N 90TH ST	0.65
497	GREENWOOD AVE N	N 70TH ST	N 77TH ST	0.36
498	GREENWOOD AVE N/PHINNEY AVE N	N 60TH ST	N 70TH ST	0.51
499	HARRISON ST	QUEEN ANNE AVE N	1ST AVE N	0.06
500	HARRISON ST/W HARRISON ST	3RD AVE W	QUEEN ANNE AVE N	0.18
501	HARVARD AVE E	E ROANOKE ST	E SHELBY ST	0.26
502	HENDERSON PL SW/8TH AVE SW	SW ROXBURY ST	SW BARTON ST	0.39
503	HIAWATHA PL S/S DEARBORN ST	S BUSH PL	RAINIER AVE S	0.31
504	HIGH POINT TRAIL	HIGH POINT DR SW	26TH AVE SW	0.14
505	HIGHLAND PARK WAY SW	SW HOLDEN ST	W MARGINAL WAY SW	0.57
506	HIGHLAND PARK WAY SW/9TH AVE SW	SW HENDERSON ST	SW HOLDEN ST	0.78
507	HIGHLAND PARK WAY SW/SW HOLDEN ST	SW AUSTIN ST	HIGHLAND PARK WAY SW	0.45
508	HILL CLIMB ASSISTANCE	BROADWAY E	THOMAS ST	0.58
509	HUBBELL PL	SPRING ST	PIKE ST	0.34
510	INTERBAY TRAIL	W GALER ST	SHIP CANAL TRAIL	1.80
511	INTERLAKE AVE N	N 43RD ST	N 47TH ST	0.80
512	INTERLAKEN DR E	E GALER ST	DELMAR DR E	1.18
513	JUDKINS PARK TRL CONNECTION	MTS DEARBORN CONNECTOR TRL	S WELLER ST	0.47
514	KENWOOD PL N/KEYSTONE PL N/N 57TH ST	N 53RD ST	ASHWORTH AVE N	0.46
515	KEYSTONE PL N/SUNNYSIDE AVE N	N 46TH ST	N 53RD ST	0.33
516	LAKE PARK DR S	S MCCLELLAN ST	LAKE WASHINGTON BLVD S	0.32
517	LAKE WASHINGTON BLVD	MOUNTAINS TO SOUND TRAIL	LAKESIDE AVE S	1.99
518	LAKE WASHINGTON BLVD	LAKESIDE AVE	HOWELL PL	1.06
519	LAKE WASHINGTON BLVD E	E MADISON ST	BOYER AVE E	0.64
520	LAKE WASHINGTON BLVD E	BOYER AVE E	26TH AVE E	0.48
521	LAKE WASHINGTON BLVD E	E HARRISON ST	E MADISON ST	0.44

Project Number	Street	From	To	Length (miles)
522	LAKE WASHINGTON BLVD E	MCGILVRA BLVD E	LAKE WASHINGTON BLVD E	0.21
523	LAKE WASHINGTON BLVD S	S HORTON ST	LAKE PARK DR S	0.80
524	LAKE WASHINGTON BLVD S	46TH AVE S	S HORTON ST	0.30
525	LAKE WASHINGTON BLVD S	S ADAMS ST	46TH AVE S	0.61
526	LAKE WASHINGTON BLVD S	S ANGELINE ST	S ADAMS ST	0.52
527	LAKE WASHINGTON BLVD S	S ORCAS ST	S ANGELINE ST	0.58
528	LAKE WASHINGTON BLVD S/LAKESIDE AVE S	LAKE PARK DR S	S IRVING ST	0.59
529	LAKE WASHINGTON BLVD TRL	LAKE WASHINGTON BLVD E	E FOSTER ISLAND RD	1.14
530	LAKESHORE DR NE/NE 65TH ST	SANDPOINT WAY NE	MAGNUSON PARK	0.96
531	LAKESIDE AVE/LAKESIDE AVE S	S IRVING ST	LAKE WASHINGTON BLVD	0.86
532	LAKEVIEW BLVD E	EASTLAKE AVE E	MELROSE CONNECTOR TRAIL	0.29
533	LATONA AVE NE	NE 40TH ST	NE 40TH ST	0.01
534	LATONA AVE NE	NE 65TH ST	EAST GREENLAKE WAY N	0.19
535	LATONA AVE NE	NE 54TH ST	NE 65TH ST	0.55
536	LATONA AVE NE/NE 50TH ST/ THACKERAY PL NE	NE 42ND ST	NE 54TH ST	0.75
537	LINCOLN PARK TRAIL EXTENSION	END	BEACH DR SW	0.28
538	LINDEN AVE N/N 38TH ST	FREMONT AVE N	N 50TH ST	0.91
539	LONGFELLOW CREEK GREENSPACE TRAIL	26TH AVE SW	24TH AVE SW	0.06
540	LOYAL WAY NW	28TH AVE NW	32ND AVE NW	0.37
541	M L KING JR WAY	E YESLER WAY	E UNION ST	0.78
542	M L KING JR WAY S	S WALKER ST	I-90 FWY	0.46
543	M L KING JR WAY S	S MCCLELLAN ST	S WALKER ST	0.38
544	M L KING JR WAY S	CITY LIMITS	MERTONWAY S	0.50
545	M L KING JR WAY S	MERTONWAY S	S HENDERSON ST	0.43
546	M L KING JR WAY S	S HENDERSON ST	S KENYON ST	0.59
547	M L KING JR WAY S	S KENYON ST	S OTHELLO ST	0.38
548	M L KING JR WAY S	S OTHELLO ST	S HOLLY ST	0.39
549	M L KING JR WAY S	S HOLLY ST	S ORCA ST	0.64
550	M L KING JR WAY S	S ORCAS ST	S EDMUNDS ST	0.55
551	M L KING JR WAY S	S EDMUNDS ST	S COLUMBIAN WAY	0.31
552	M L KING JR WAY S	S COLUMBIAN WAY	S WALDEN ST	0.65
553	M L KING JR WAY S	S WALDEN ST	S MCLELLAN ST	0.45
554	M L KING JR WAY S	S DEARBORN ST	E YESLER WAY	0.43
555	M L KING JR WAY S	MOUNTAINS TO SOUND TRL	S DEARBORN ST	0.37

Project Number	Street	From	To	Length (miles)
556	MAGNOLIA BLVD W	W DRAVUS ST	W EMERSON ST	0.45
557	MAGNOLIA BLVD W/W HOWE ST	CLISE PL W	W DRAVUS ST	1.61
558	MAGNOLIA BRIDGE	16TH AVE W	ELLIOTT AVE W	0.95
559	MALLARD COVE CROSSING TRAIL	E ROANOKE ST	FAIRVIEW AVE E	0.15
560	MARION ST	BROADWAY	7TH AVE	0.51
561	MARY AVE NW/N 90TH ST/NW 87TH ST/ NW 90TH ST	GREENWOOD AVE N	17TH AVE NW	1.48
562	MARY GATES MEMORIAL DR NE/NE 41ST ST	NE CLARK RD	48TH AVE NE	0.80
563	MCGILVRA BLVD E	MCGILVRA BLVD E	E MADISON ST	0.84
564	MCGILVRA BLVD E/LAKE WASHINGTON BLVD E	E HOWELL ST	MCGILVRA BLVD E	0.61
565	MCGRAW PL/SMITH ST/W MCGRAW PL/W SMITH ST	W MCGRAW ST	MCGRAW ST	0.42
566	MELROSE AVE/MELROSE AVE E	E PIKE ST	E ROY ST	0.77
567	MERIDIAN AVE N	N NORTHGATE WAY	N 122ND ST	0.58
568	MERIDIAN AVE N	NE 46TH ST	N 55TH ST	0.42
569	MERIDIAN AVE N/N 46TH ST	SUNNYSIDE AVE N	WALLINGFORD AVE N	0.33
570	MERIDIAN AVE N/N 55TH ST/ WOODLAWN AVE N	N 55TH ST	N 63RD ST	0.50
571	MERIDIAN AVE N/N 90TH ST/CORLISS AVE N	STONE AVE N	N 92ND ST	0.67
572	MIDVALE AVE N/STONE AVE N	N 77TH ST	N 90TH ST	0.68
573	MILITARY RD S	AIRPORT WAY S	BEACON AVE S	0.64
574	MONTLAKE CUT CONNCTR TRL	E CALHOUN ST	MONTLAKE BLVD E	0.37
575	MOUNTAINS TO SOUND EXTENSION TRAIL	S LUCILE ST	S SNOQUALMIE ST	0.77
576	MOUNTAINS TO SOUND TRL	35TH AVE S	I90	0.94
577	N 100TH ST	FREMONT AVE N	COLLEGE WAY N	0.76
578	N 100TH ST	1ST AVE NW	FREMONT AVE N	0.37
579	N 110TH ST/NW 110TH ST	NW CARKEEK PARK RD	INTERURBAN TRAIL	0.65
580	N 117TH ST	MERIDIAN AVE N	1ST AVE NE	0.25
581	N 127TH ST/NW 127TH ST	12TH AVE NW	INTERURBAN TRAIL	1.07
582	N 130TH ST	1ST AVE NW	LINDEN AVE N	0.47
583	N 130TH ST/NE 130TH ST	5TH AVE NE	LINDEN AVE N	1.15
584	N 137TH ST/NW 137TH ST	8TH AVE NW	LINDEN AVE N	0.89
585	N 34TH ST	FREMONT AVE N	STONE WAY N	0.34
586	N 34TH ST	N NORTHLAKE PL	WALLINGFORD AVE N	0.21
587	N 34TH ST	PHINNEY AVE N	FREMONT AVE N	0.23
588	N 36TH ST	FREMONT AVE N	CORLISS AVE N	0.86
589	N 37TH ST/CORLISS AVE N	SUNNYSIDE AVE N	N 36TH ST	0.16
590	N 39TH ST/WOODLAND PARK AVE N	N 34TH ST	N 41ST ST	0.56

Project Number	Street	From	To	Length (miles)
591	N 40TH ST	WOODLAND PARK AVE N	SUNNYSIDE AVE N	0.68
592	N 40TH ST/NE 40TH ST	7TH AVE NE	SUNNYSIDE AVE N	0.47
593	N 41ST ST	FREMONT AVE N	WOODLAND PARK AVE N	0.25
594	N 42ND ST/NW 42ND ST	6TH AVE NW	LINDEN AVE N	0.72
595	N 43RD ST	WOODLAND PARK AVE N	STONE WAY N	0.11
596	N 46TH ST	WOODLAND PARK AVE N	WALLINGFORD AVE N	0.38
597	N 49TH ST/WOODLAND PARK AVE N	N 41ST ST	N 50TH ST	0.69
598	N 50TH ST	PHINNEY AVE N	GREENLAKE WAY N	0.83
599	N 51ST ST/WALLINGFORD AVE N	N 45TH ST	WOODLAWN AVE N	0.40
600	N 53RD ST	GREENLAKE WAY N	KEYSTONE PL N	0.38
601	N 55TH ST/N 56TH ST	MERIDIAN AVE N	1ST AVE NE	0.26
602	N 57TH ST/NW 56TH ST/PALATINE PL N/ WOODLAND PARK LOOP	6TH AVE NW	N 59TH ST	0.69
603	N 63RD ST	MERIDIAN AVE N	BROOKLYN AVE NE	0.91
604	N 63RD ST/WEST GREEN LAKE WAY N	N 63RD ST	N 66TH ST	0.26
605	N 68TH ST	FREMONT AVE N	AURORA AVE N	0.21
606	N 77TH ST	GREENWOOD AVE N	WINONA AVE N	0.72
607	N 82ND ST	GREEN LAKE DR N	CORLISS AVE N	1.04
608	N 83RD ST	GREENWOOD AVE N	AURORA AVE N	2.48
609	N 87TH ST	1ST AVE NW	FREMONT AVE N	0.38
610	N 90TH ST	FREMONT AVE N	STONE AVE N	0.38
611	N 92ST ST	WALLINGFORD AVE N	1ST AVE NE	0.38
612	NE 103RD ST	1ST AVE NE	15TH AVE NE	0.75
613	NE 105TH ST	40TH AVE NE	RAVENNA AVE NE	0.56
614	NE 110TH ST	ALTON AVE NE	30TH AVE NE	0.63
615	NE 115TH ST	35TH AVE NE	25TH AVE NE	0.52
616	NE 115TH ST	ALTON AVE NE	35TH AVE NE	0.29
617	NE 117TH ST	25TH AVE NE	8TH AVE NE	0.88
618	NE 123RD ST	BURKE GILMAN TRAIL	35TH AVE NE	0.73
619	NE 125TH ST	25TH AVE NE	15TH AVE NE	0.50
620	NE 125TH ST	37TH AVE NE	25TH AVE NE	0.62
621	NE 125TH ST	SAND POINT WAY NE	BURKE GILMAN TRAIL	0.31
622	NE 125TH ST/ROOSEVELT WAY N	15TH AVE NE	5TH AVE NE	0.60
623	NE 135TH ST	32ND AVE NE	15TH AVE NE	0.89
624	NE 140TH ST	37TH AVE NE	27TH AVE NE	0.51
625	NE 40TH ST	UNIVERSITY BR OFF RP	15TH AVE NE	0.41
626	NE 40TH ST/UNIVERSITY BRIDGE	NE PACIFIC ST	EASTLAKE AVE E	0.35
627	NE 40TH ST/UNIVERSITY BRIDGE	NE PACIFIC ST	EASTLAKE AVE E	0.08

Project Number	Street	From	To	Length (miles)
628	NE 43RD ST	ROOSEVELT WAY NE	15TH AVE NE	0.27
629	NE 44TH ST	LATONA AVE NE	5TH AVE NE	0.10
630	NE 45TH ST/48TH AVE NE	40TH AVE NE	NE 41ST ST	0.58
631	NE 45TH ST/49TH AVE NE/NE 50TH ST	48TH AVE NE	44TH AVE NE	0.61
632	NE 47TH ST	11TH AVE NE	19TH AVE NE	0.43
633	NE 47TH ST	11TH AVE NE	LATONA AVE NE	0.41
634	NE 55TH ST	25TH AVE NE	39TH AVE NE	0.69
635	NE 55TH ST	8TH AVE NE	20TH AVE NE	0.64
636	NE 58TH ST/RAVENNA AVE NE/RAVENNA PL NE	NE BLAKELY ST	20TH AVE NE	0.47
637	NE 60TH ST/NE 60TH ST PED BR/NE 61ST ST/NE 62ND ST/NE 62ND ST PED BR	NE RAVENNA BLVD	45TH AVE NE	1.92
638	NE 65TH ST	NE RAVENNA BLVD	12TH AVE NE	0.31
639	NE 65TH ST/20TH AVE NE	NE RAVENNA BLVD	NE 68TH ST	0.55
640	NE 66TH ST/NE 70TH ST/WEEDIN PL NE/5TH AVE NE	NE RAVENNA BLVD	15TH AVE NE	0.71
641	NE 68TH ST	20TH AVE NE	39TH AVE NE	0.96
642	NE 68TH ST	39TH AVE NE	50TH AVE NE	0.55
643	NE 70TH ST	8TH AVE NE	15TH AVE NE	0.37
644	NE 71ST ST	EAST GREEN LAKE WAY N	5TH AVE NE	0.14
645	NE 75TH ST	39TH AVE NE	55TH AVE NE	0.81
646	NE 75TH ST	24TH AVE NE	39TH AVE NE	0.72
647	NE 75TH ST	15TH AVE NE	24TH AVE NE	0.48
648	NE 80TH ST	LAKE CITY WAY NE	BANNER WAY NE	0.55
649	NE 80TH ST	20TH AVE NE	45TH AVE NE	1.27
650	NE 80TH ST	14TH AVE NE	20TH AVE NE	0.31
651	NE 85TH ST/17TH AVE NE/NE 86TH ST/20TH AVE NE	15TH AVE NE	NE 98TH ST	0.94
652	NE 89TH ST	8TH AVE NE	20TH AVE NE	0.63
653	NE 90TH ST	32ND AVE NE	40TH AVE NE	0.38
654	NE 98TH ST	5TH AVE NE	35TH AVE NE	1.51
655	NE 98TH ST/40TH AVE NE/NE 105TH ST/ NE 104TH PL/45TH AVE NE/NE 97TH ST	35TH AVE NE	BURKE GILMAN TRAIL	1.45
656	NE BOAT ST	15TH AVE NE	UNIVERSITY BRIDGE	0.32
657	NE CAMPUS PKWY	EASTLAKE AVE NE	15TH AVE NE	0.27
658	NE PACIFIC ST	UNIVERSITY BRIDGE	UNIVERSITY WAY NE	0.29
659	NE RAVENNA BLVD	ROOSEVELT WAY NE	NE 65TH ST	0.37
660	NE RAVENNA BLVD	15TH AVE NE	ROOSEVELT WAY NE	0.32
661	NE RAVENNA BLVD	NE 65TH ST	EAST GREENLAKE WAY N	0.38
662	NICKERSON ST	4TH AVE N	WARREN AVE N	0.27
663	NORTHGATE BRIDGE	1ST AVE NE	COLLEGE WAY N	0.27

Project Number	Street	From	To	Length (miles)
664	NW 105TH ST	8TH NW	12TH AVE NW	0.50
665	NW 116TH ST/NW CARKEEK PARK RD	NW 110TH ST	NW 117TH ST	0.87
666	NW 117TH ST	6TH AVE NW	INTERURBAN TRAIL	0.72
667	NW 122ND ST	12TH AVE NW	8TH AVE NW	0.25
668	NW 50TH ST	6TH AVE NW	17TH AVE NW	0.70
669	NW 64TH ST	34TH AVE NW	8TH AVE NW	1.63
670	NW 70TH ST	FREMONT AVE N	17TH AVE NW	1.36
671	NW 70TH ST/21ST AVE NW/NW SLOOP PL/19TH AVE NW	17TH AVE NW	34TH AVE NW	1.09
672	NW 80TH ST	28TH AVE NW	32ND AVE NW	0.25
673	NW 90TH ST/NW 89TH PL/23RD AVE NW	15TH AVE NW	NW 83RD ST	0.89
674	NW CARKEEK PARK RD	NW CARKEEK PARK RD	NW CARKEEK PARK RD	0.57
675	NW MARKET ST/NW 54TH ST/32ND AVE NW	24TH AVE NW	32ND AVE NW	0.65
676	OCCIDENTAL AVE S	S ROYAL BROUGHAM WAY	S JACKSON ST	0.82
677	OLYMPIC WAY W\QUEEN ANNE AVE N\ ROY ST\W OLYMPIC PL\W QUEEN ANNE DRIVEWAY	1ST AVE N	W PROSPECT ST	0.69
678	PALATINE AVE N/N 72ND ST/1ST AVE NW	NW 62ND ST	N 101ST ST	1.97
679	PHINNEY AVE N	N 50TH ST	N 60TH ST	0.53
680	PHINNEY AVE N	BURKE GILMAN TRAIL	N 50TH ST	1.01
681	PIKE ST	2ND AVE	CONVENTION PL	0.43
682	PINEHURST WAY NE/ROOSEVELT WAY N	NE NORTHGATE WAY	15TH AVE NE	0.50
683	PORTSIDE TRAIL	S ATLANTIC ST	S ROYAL BROUGHAM WAY	0.44
684	QUEEN ANNE AVE N	W BOSTON ST	MCGRAW ST	0.08
685	QUEEN ANNE AVE N	W DENNY WAY	ROY ST	0.47
686	QUEEN ANNE AVE N	W GALER ST	W CROCKETT ST	0.34
687	QUEEN ANNE CONNECTOR*	QUEEN ANNE AVE N	1ST AVE N	0.06
688	RAINIER AVE S	57TH AVE S	S HENDERSON ST	0.61
689	RAINIER AVE S	S KEPPLER ST	57TH AVE S	0.44
690	RAINIER AVE S	CORNELL AVE S	S KEPPLER ST	0.54
691	RAINIER AVE S	CITY LIMITS	CORNELL AVE S	0.49
692	RAINIER AVE S	S HILL ST	I-90 FWY	0.52
693	RAINIER AVE S	MARTIN LUTHER KING JR WAY S	S HILL ST	0.64
694	RAINIER AVE S	I 90 WB OFF RMP	DEARBORN ST	0.36
695	RENTON AVE S	S LEO ST	S GAZELLE ST	0.86
696	RENTON AVE S	55TH AVE S	51ST AVE S	0.35
697	RENTON AVE S	S BANGOR ST	55TH AVE S	0.69
698	RENTON AVE S	S 112TH ST	S BANGOR ST	0.55
699	RENTON AVE S	S CLOVERDALE ST	S HOLDEN ST	0.51

Project Number	Street	From	To	Length (miles)
700	REPUBLICAN ST	DEXTER AVE N	EASTLAKE AVE E	0.62
701	ROOSEVELT WAY NE	NE 75TH ST	NE 85TH ST	0.50
702	ROOSEVELT WAY NE	NE 85TH ST	NE 98TH ST	0.69
703	ROOSEVELT WAY NE	NE 65TH ST	NE 75TH ST	0.50
704	ROOSEVELT WAY NE	NE RAVENNA BLVD	NE 65TH ST	0.26
705	ROOSEVELT WAY NE	NE CAMPUS PKWY	NE 47TH ST	0.49
706	ROOSEVELT WAY NE	NE 47TH ST	NE RAVENNA BLVD	0.61
707	ROOSEVELT WAY NE	PINEHURST WAY NE	NE 125TH ST	0.66
708	ROOSEVELT WAY NE	NE 98TH ST	NE NORTHGATE WAY	0.57
709	S ALASKA ST	RAINIER AVE S	MARTIN LUTHER KING JR WAY S	0.30
710	S ALASKA ST\S COLUMBIAN WAY	BEACON AVE S	ML KING JR WAY S	0.55
711	S ALBRO PL/ELLIS AVE S	EAST MARGINAL WAY S	SWIFT AVE S	0.89
712	S ATLANTIC ST	1ST AVE S	ALASKAN WAY S	0.15
713	S BAILEY ST	S ALBRO PL	CORSON AVE S	0.34
714	S BANGOR ST	RENTON AVE S	55TH AVE S	0.48
715	S BANGOR ST	55TH AVE S	51ST AVE S	0.25
716	S CLOVERDALE ST	14TH AVE S	7TH AVE S	0.50
717	S CLOVERDALE ST/1ST AVE S/MYERS WAY S	CITY LIMITS	7TH AVE S	1.24
718	S COLLEGE ST/23RD AVE S	24TH AVE S	S HILL ST	0.14
719	S COLUMBIAN WAY	BEACON AVE S	15TH AVE S	0.56
720	S CRESTON ST	55TH AVE S	51ST AVE S	0.25
721	S DAWSON ST/48TH AVE S	42ND AVE S	WILSON AVE S	0.53
722	S DEARBORN ST	5TH AVE S	RAINIER AVE S	0.76
723	S EDMUNDS ST	35TH AVE S	MARTIN LUTHER KING JR S	0.15
724	S FERDINAND ST	LAKE WASHINGTON BLVD S	35TH AVE S	1.26
725	S FOREST ST	SODO TRAIL	AIRPORT WAY S	0.26
726	S FOREST ST	14TH AVE S	21ST AVE S	0.44
727	S GENESEE ST	51ST AVE S	50TH AVE S	0.06
728	S GENESEE ST/37TH AVE S\COURTLAND PL S\S ANDOVER ST\S CHARLESTOWN ST\S DAKOTA ST	42ND AVE S	34TH AVE S	0.82
729	S GRAND ST	MARTIN LUTHER KING JR WAY S	20TH AVE S	0.42
730	S HANFORD ST	18TH AVE S	MARTIN LUTHER KING JR WAY S	0.54
731	S HANFORD ST	18TH AVE S	LAFAYETTE AVE S	0.21
732	S HENDERSON PED BRIDGE	DUWAMISH RIVER TRAIL	S HENDERSON ST	0.04

Project Number	Street	From	To	Length (miles)
733	S HENDERSON ST	RAINIER AVE S	MARTIN LUTHER KING JR WAY S	0.43
734	S HENDERSON ST	8TH AVE S	14TH AVE S	0.27
735	S HENDERSON ST	8TH AVE S	S HENDERSON PED BRIDGE	0.07
736	S HILL ST	13TH AVE S	18TH AVE S	0.57
737	S HOLGATE BR/S HOLGATE ST	1ST AVE S	BEACON AVE S	0.40
738	S HOLLY PARK DR/39TH AVE S	S KENYON ST	S MYRTLE PL	0.53
739	S HOLLY ST	SEWARD PARK AVE S	46TH AVE S	0.51
740	S HOLLY ST	42ND AVE S	33RD AVE S	0.44
741	S HORTON ST/COLORADO AVE S/ SLANDER ST/UTAH AVE S	EAST MARGINAL WAY S	S ATLANTIC ST	1.47
742	S HORTON ST\S WALDEN ST	HUNTER BLVD S	MARTIN LUTHER KING JR WAY S	0.59
743	S INDUSTRIAL WAY	AIRPORT WAY S	MOUNTAINS TO SOUND TRAIL	0.33
744	S JACKSON ST	20TH AVE S	31ST AVE S	0.64
745	S JACKSON ST	5TH AVE S	12TH AVE S	0.49
746	S JUNEAU ST	51ST AVE S	42ND AVE S	0.51
747	S KENYON ST	46TH AVE S	SEWARD PARK AVE S	0.38
748	S KENYON ST	46TH AVE S	MARTIN LUTHER KING JR WAY S	0.26
749	S KENYON ST/39TH AVE S/S KENYON WAY	BEACON AVE S	MARTIN LUTHER KING JR WAY S	0.42
750	S KING ST	5TH AVE S	10TH AVE S	1.26
751	S MASSACHUSETTS ST	MARTIN LUTHER KING JR WAY S	21ST AVE S	0.33
752	S MORGAN ST	57TH AVE S	WILSON AVE S	0.11
753	S MORGAN ST	BEACON AVE S	CHIEF SEALTH TRAIL	0.35
754	S MORGAN ST/33RD AVE S	CHIEF SEALTH TRAIL	S HOLLY ST	0.22
755	S MOUNT BAKER BLVD/RAINIER AVE S	S MCCLELLAN ST	MARTIN LUTHER KING JR WAY S	1.06
756	S MYRTLE PL	MARTIN LUTHER KING JR WAY S	BEACON AVE S	0.72
757	S MYRTLE ST	37TH AVE S	SEWARD PARK AVE S	0.87
758	S MYRTLE ST/SWIFT AVE S	BEACON AVE S	S WARSAW ST	0.57
759	S OLSON PL SW/SW ROXBURY ST	8TH AVE SW	MYERS WAY S	0.68
760	S ORCAS ST	42ND AVE S	51ST AVE S	0.51
761	S ORCAS ST	42ND AVE S	MARTIN LUTHER KING JR WAY S	0.34
762	S ORCAS ST	MARTIN LUTHER KING JR WAY S	BEACON AVE S	0.64
763	S ORCAS ST/LAKE WASHINGTON BLVD S	SEWARD PARK	51ST AVE S	0.84

Project Number	Street	From	To	Length (miles)
764	S RIVER ST	S MICHIGAN ST	EAST MARGINAL WAY S	0.97
765	S ROXBURY ST	WATER AVE S	51ST AVE S	0.53
766	S ROXBURY ST	WATER AVE S	51ST AVE S	0.02
767	S ROYAL BROUGHAM WAY	4TH AVE S	AIRPORT WAY S	0.24
768	S ROYAL BROUGHAM WAY	OCCIDENTAL AVE S	4TH AVE S	0.32
769	S SNOQUALMIE ST/CHEASTY BLVD S	13TH AVE S	MARTIN LUTHER KING JR WAY S	1.49
770	S SPOKANE ST	DIAGONAL AVE S	14TH AVE S	0.44
771	S SPOKANE ST	14TH AVE S	19TH AVE S	0.39
772	S WASHINGTON ST	ALASKAN WAY S	5TH AVE S	0.39
773	SAND POINT WAY NE	NE 115TH ST	NE 125TH ST	0.65
774	SAND POINT WAY NE	NE 106TH ST	NE 115TH ST	0.53
775	SAND POINT WAY NE	BURKE GILMAN ACCESS TRAIL	NE 106TH ST	1.46
776	SAND POINT WAY NE	NE 65TH ST	BURKE GILMAN ACCESS TRAIL	0.82
777	SAND POINT WAY NE	PRINCETON AVE NE	NE 65TH ST	0.80
778	SAND POINT WAY NE	41ST AVE NE	PRINCETON AVE NE	0.49
779	SENECA ST	ALASKAN WAY	9TH AVE	0.61
780	SEWARD PARK AVE S	S JUNEAU ST	WILSON AVE S	0.44
781	SEWARD PARK AVE S	S OTHELLO ST	S MORAN ST	0.54
782	SEWARD PARK AVE S	CLOVERDALE PL S	S OTHELLO ST	0.59
783	SEWARD PARK AVE S	RAINIER AVE S	CLOVERDALE PL S	0.63
784	SPRING ST	ALASKAN WAY	7TH AVE	0.49
785	STEWART ST	7TH AVE	THOMAS ST	0.57
786	STONE AVE N	N 90TH ST	N 110TH ST	1.00
787	SUNNYSIDE AVE N	N 42ND ST	N 46TH ST	0.32
788	SUNNYSIDE AVE N	N PACIFIC ST	N 42ND ST	0.44
789	SW 104TH ST	35TH AVE SW	CALIFORNIA AVE SW	0.53
790	SW 106TH ST	35TH AVE SW	SEOLA BEACH DR SW	0.24
791	SW 98TH ST	CALIFORNIA AVE SW	35TH AVE SW	0.51
792	SW ADMIRAL WAY	45TH AVE SW	SW OLGA ST	0.61
793	SW ADMIRAL WAY	SW AVALON WAY	SW OLGA ST	0.74
794	SW ADMIRAL WAY	61ST AVE SW	45TH AVE SW	1.15
795	SW ALASKA ST	45TH AVE SW	35TH AVE SW	0.62
796	SW ALASKA ST	48TH AVE SW	45TH AVE SW	0.19
797	SW ANDOVER ST	DELRIDGE WAY SW	21ST AVE SW	0.15
798	SW ANDOVER ST	CALIFORNIA AVE SW	36TH AVE SW	0.44
799	SW ANDOVER ST/28TH AVE SW/SW YANCY ST/35TH AVE SW	36TH AVE SW	26TH AVE SW	0.68
800	SW AVALON WAY	FAUNTLEROY WAY SW	SW SPOKANE ST	0.77

Project Number	Street	From	To	Length (miles)
801	SW BARTON ST	CALIFORNIA AVE SW	35TH AVE SW	0.54
802	SW BARTON ST	35TH AVE SW	25TH AVE SW	0.57
803	SW BRANDON ST/30TH AVE SW/SW JUNEAU ST	32ND AVE SW	DELRIDGE WAY SW	0.75
804	SW CHARLESTOWN ST	55TH AVE SW	CALIFORNIA AVE SW	0.75
805	SW CLOVERDALE ST	10TH AVE SW	4TH AVE SW	0.37
806	SW DAWSON ST	21ST AVE SW	16TH AVE SW	0.32
807	SW FINDLAY ST/38TH AVE SW	SW GRAHAM ST	39TH AVE SW	0.44
808	SW GENESEE ST	DELRIDGE WAY SW	21ST AVE SW	0.15
809	SW GENESEE ST	46TH AVE SW	55TH AVE SW	0.57
810	SW GRAHAM ST	42ND AVE SW	LANHAM PL SW	0.59
811	SW GRAHAM ST/CROFT PL SW/SW JUNEAU ST	26TH AVE SW	END (NEAR 17TH AVE SW)	0.65
812	SW HENDERSON ST	17TH AVE SW	9TH AVE SW	0.45
813	SW HENDERSON ST/ SW BARTON ST/SW BARTON PL	25TH AVE SW	17TH AVE SW	0.43
814	SW HILL ST/FERRY AVE SW/SW WALKER ST/45TH AVE SW	SW ADMIRAL WAY	42ND AVE SW	0.42
815	SW HINDS ST	51ST AVE SW	CALIFORNIA AVE SW	0.49
816	SW HINDS ST	42ND AVE SW	BELVIDERE AVE SW	0.30
817	SW HOLDEN ST	CALIFORNIA AVE SW	35TH AVE SW	0.50
818	SW HOLDEN ST	35TH AVE SW	28TH AVE SW	0.38
819	SW HOLDEN ST/17TH AVE SW	SW THISTLE ST	16TH AVE SW	1.09
820	SW HOLLY ST	34TH AVE SW	SYLVAN WAY SW	0.21
821	SW JUNEAU ST	48TH AVE SW	LANHAM PL SW	0.94
822	SW MORGAN ST	CALIFORNIA AVE SW	35TH AVE SW	0.50
823	SW MORGAN ST/SW ORCHARD ST/ SYLVAN WAY SW	DELRIDGE WAY SW	35TH AVE SW	1.03
824	SW MYRTLE ST/SW ORCHARD ST	21ST AVE SW/DUNMAR WAY SW	12TH AVE SW	0.56
825	SW NEVADA ST/30TH AVE SW	SW YANCY ST	26TH AVE SW	0.40
826	SW OREGON ST/23RD AVE SW/22ND AVE SW	21ST AVE SW	DELRIDGE WAY SW	0.30
827	SW PORTLAND ST	10TH AVE SW	9TH AVE SW	0.05
828	SW RAYMOND ST/HIGH POINT DR SW	SYLVAN WAY SW	32ND AVE SW	0.62
829	SW ROXBURY ST	35TH AVE SW	16TH AVE SW	1.02
830	SW ROXBURY ST	16TH AVE SW	8TH AVE SW	0.46
831	SW THISTLE ST	CALIFORNIA AVE SW	35TH AVE SW	0.50
832	SW THISTLE ST	DELRIDGE WAY SW	10TH AVE SW	0.58
833	SW THISTLE ST	35TH AVE SW	DELRIDGE WAY SW	0.76
834	SW TRENTON ST	10TH AVE SW	17TH AVE SW	0.39
835	SWIFT AVE S	S WARSAW ST	S ALBRO PL	0.47
836	TERRY AVE	BROADWAY	UNIVERSITY ST	0.72

Project Number	Street	From	To	Length (miles)
837	THOMAS ST	3RD AVE W	EASTLAKE AVE E	1.46
838	THORNDYKE AVE W	W GALER ST	W PLYMOUTH ST	0.31
839	W BERTONA ST/11TH AVE W	W ETRURIA ST	W NICKERSON ST	0.72
840	W BLAINE ST\NEWTON ST\BLAINE ST\4TH AVE N	BIGELOW AVE N	7TH AVE W	1.13
841	W CROCKETT ST/3RD AVE W/W BOSTON ST	7TH AVE W	QUEEN ANNE AVE N	0.48
842	W DRAVUS ST	20TH AVE W	14TH AVE W	0.33
843	W DRAVUS ST	MAGNOLIA BLVD W	32ND AVE W	0.75
844	W DRAVUS ST/11TH AVE W/WBARRETT ST	14TH AVE W	W SMITH ST	1.00
845	W EMERSON PL	GILMAN AVE W	SHIP CANAL TRAIL	0.16
846	W EMERSON ST	MAGNOLIA BLVD W	36TH AVE W	0.40
847	W GOVERNMENT WAY	34TH AVE W	32ND AVE W	0.14
848	W MCGRAW PL/W SMITH ST	3RD AVE W	7TH AVE W	0.30
849	W MCGRAW ST	35TH AVE W	32ND AVE W	0.19
850	W MCGRAW ST	6TH AVE W	QUEEN ANNE AVE N	0.38
851	W NICKERSON ST	W BERTONA ST	3RD AVE W	0.09
852	W NICKERSON ST	12TH AVE W	13TH AVE W	0.07
853	W ROY ST	5TH AVE W	QUEEN ANNE AVE N	0.25
854	W ROY ST/2ND AVE W	5TH AVE W	QUEEN ANNE AVE N	0.27
855	WALLINGFORD AVE N	EAST GREEN LAKE DR N	N 92ND ST	0.72
856	WALLINGFORD AVE N	N 34TH ST	N 45TH ST	0.92
857	WALNUT AVE SW/42ND AVE SW	SW HINDS ST	SW HILL ST	0.93
858	WATERS AVE S\57TH AVE S\64TH AVE S	S ROXBURY ST	RAINIER AVE S	0.31
859	WATERS AVE S\57TH AVE S\64TH AVE S	S BANGOR ST	S ROXBURY ST	1.15
860	WEST GREEN LAKE DR N/WINONA AVE N	N 73RD ST	DENSMORE AVE N	0.48
861	WESTERN AVE	YESLER WAY	UNIVERSITY ST	0.37
862	WILSON AVE S	S ORCAS ST	S DAWSON ST	0.32
863	WILSON AVE S	S MORGAN ST	S ORCAS ST	0.51
864	WOODLAWN AVE N	N NORTHLAKE PL	N 36TH ST	0.22
865	YAKIMA AVE S/30TH AVE S	S IRVING ST	E YESLER WAY	0.81

Catalyst Project List

Catalyst projects are located at significant choke points in the network that pose challenges to implementation due to infrastructure physical constraints. Completion of these projects will significantly reduce barriers and increase safety by creating a connected all ages and abilities network to the maximum extent feasible. These projects are likely to be expensive, but are very important for network connectivity.

Project Number	Project Type	Title	Project Location	Description
1	Intersection Improvement	Rainier Ave S/ Martin Luther King Jr Way S intersection improvements	Intersection of Rainier Ave S and Martin Luther King Jr Way S	Intersection safety improvements due to significant traffic volumes at this area and could occur with implementation of cycle track or overall intersection re-design. A retro-fit of the existing overpass could help to ensure better pedestrian and bicycle accessibility as well.
2	Overpass	Mountains to Sound Trail over I-5	West side of Dr. Jose Rizal Park to the intersection of Aiport Way S and S Royal Brougham Way	A crossing of I-5 at the north end of Beacon Hill, near Dr. Jose Rizal Park and the International District, to provide a more direct connection to downtown Seattle for those coming off the I-90 Trail.
3	Overpass	S Holgate St across I-5	From S Holgate St across I-5 to Beacon Ave S.	A grade separated overpass of I-5 to connect SODO to Beacon Hill. Project could entail improved Holgate connection or an I-5 underpass trail south of Holgate to an existing (though currently abandoned) staircase. This project could be considered in conjunction with project #4.
4	Complete Streets Redesign	S Spokane St. viaduct at grade to Beacon Hill	At-grade portion of S Spokane St. from E Marginal Way S to S Columbian Way.	A connection across I-5 from S Spokane St to S Columbian Way through the forested section east of I-5 to create a direct connection between Beacon Hill and SODO. An east-west connection along the Spokane Street corridor would help multiple bicycle routes in SODO where east/west connections are difficult across I-5, and is vital to bicyclists coming to and from West Seattle and Beacon Hill. This project could be considered in conjunction with project #3.

Project Number	Project Type	Title	Project Location	Description
5	Overpass	Military Road S to Airport Way S connection across railroad tracks	S Webster St to Airport Way S	A bridge or an underpass across the railroad tracks to provide a connection between South Beacon Hill and Boeing Field/Duwamish industrial area near the south city limits. Years ago, an overpass of the tracks allowed bicyclists to access Airport Way S from Military Rd S; however this connections was removed. Bicyclists now have to travel two miles north or south to the next available railroad crossing.
6	Intersection Improvement	Chelan Ave SW / W Marginal Way / Alki Trail / SW Marginal Way / Delridge Way SW / SR 99 Intersection	Six-way intersection	Intersection safety improvements for pedestrians and bicyclists, providing easier access from the Spokane Swing Bridge to Alki Trail. Existing connection requires bicyclists to navigate a very complex intersection with many pedestrian crossings at a high traffic volume and truck location.
7	Overpass	NE 47th St I-5 overpass	New bridge across I-5 from 7th Ave NE to 5th Ave NE, on NE 47th St	A bicycle/pedestrian bridge across I-5 to connect the University District and the Wallingford Neighborhood. This project would provide a crucial crossing of I-5 in a high traffic corridor.
8	Underpass	Green Lake Way to N 63rd Street underpass of SR-99	From Woodland Pl N, underneath Aurora to West Green Lake Way N	Improvements to the existing underpass. This will be challenging due to ROW constraints of the existing brige structure. Future design should consider options with and without major structural renovation.
9	Extended hours of operation	Ballard Locks crossing	Ballard Locks	An improved crossing is required as an alternative to the Ballard Bridge. Currently, times of access and requirements to walk bikes restrict the usability of the current crossing; partnership with the Army Corps of Engineers is necessary to extend the hours of operation.
10	Overpass	Ship Canal Crossing	In the vicinity of the Fremond Ballard Bridges, and connections east and west to both the Burke-Gilman Trail and the Ship Canal Trail.	Current pedestrian and bike facilities on the Fremont and Ballard bridges are inadequate. This project would identify a new crossing of the ship canal to connect the Ship Canal and Burke-Gilman trails. Renovation of the bridge approaches should ensure adequate space for pedestrians and bicyclists, and could also incorporate transit.
11	Extension of multi-use trail	Ship Canal Trail to Gilman Ave W	Ship Canal Trail to W Emerson Pl, connecting to Gilman Ave W.	Continuation of a safe route from the Ship Canal Trail along Emerson Place to connect to Gilman Ave W and southbound to the Elliot Bay Trail for bicyclist safety and connectivity.

Project Number	Project Type	Title	Project Location	Description
12	Corridor Improvement	Elliott Bay Trail to Interbay	Proposed off-street trail parallel to Elliott Ave/15th Ave W.	A trail crossing the Interbay rail yard and along the east side of the rail yard would provide non-motorized connections between the Ship Canal Trail and the Elliot Bay Trail.
13	Intersection Improvement	University Bridge - south leg to Eastlake Ave E/Harvard Ave E	Eastlake Ave E from the University Bridge up to Capitol Hill.	Intersection safety improvements are needed at Eastlake Ave E and Harvard Ave E for southbound bicyclists wanting to continue on Eastlake or travel to Capitol Hill.
14	Overpass	SR-520 connection across Portage Bay	Proposed off-street trail from Boylston Ave E to Montlake Blvd SR - 520 interchange.	A multi-use path on the Portage Bay Bridge to provide direct connection between Montlake and Capitol Hill. This all ages and abilities facility would significantly alleviate travel between these two heavily used corridors and provide access to the east side.
15	Overpass	Montlake Bridge Crossing	Montlake Bridge from NE Pacific St. to E Shelby St.	A future bridge or renovation of the existing bridge to provide adequate capacity for both pedestrians and people riding bikes. Additional capacity across this portion of the Ship Canal will improve due to access to the University of Washington(UW), the UW medical center and the future Link Light Rail Station.
16	Overpass	South Lake Union to Capitol Hill I-5 crossing	Crossing I-5 and between Mercer St and Denny Way.	Explore I-5 crossing to better facilitate bicycle and pedestrian movement between South Lake Union and Capitol Hill. Innovative solutions could also serve as a tourist attraction with great views.
17	Corridor Improvement	E-3 busway trail extension to railroad tracks	Extension of the E-3 busway trail southbound	Explore the feasibility of extending the E-3 busway to the railroad tracks to better facilitate safe bicycle movement from Downtown through SODO and to Georgetown neighborhoods.
18	Overpass	6th Ave S connection over railroad tracks	6th Ave S over Argo railroad tracks	Explore the feasibility of a pedestrian and bike crossing of the railroad tracks to better facilitate safe non-motorized movement from Downtown via SODO to Georgetown. This project could occur in conjunction with or as an extension of project #17.
19	Multi-use Trail Improvement	Burke Gilman Trail “missing link” completion	Fill the gap in the Burke-Gilman Trail from 11th Ave NW to the Ballard Locks.	Completion of the final segment of the Burke Gilman Trail. There are existing bicyclist safety concerns along this corridor. The final alignment will be determined after completion of the project’s Environmental Impact Statement (EIS).

Project Number	Project Type	Title	Project Location	Description
20	Intersection Improvement	University Bridge - north leg to Roosevelt Way Way NE / 11th Ave NE and the University of Washington	University Bridge north to NE Campus Parkway and the University Bridge Off Ramp	Intersection safety improvements at the north end of University Bridge to minimize conflicts associated with multiple turning patterns by different modes and connect bicyclists to the University of Washington and the Burke-Gilman Trail safely.
21	Corridor Improvement	Duwamish Trail to West Seattle	Highland Park Way SW from Duwamish River Trail to SW Holden St	Improvements to this corridor should be explored to create a multi-use trail or innovative hill climb assistance, allowing bicyclists to travel between the Duwamish Trail to West Seattle without competing with heavy vehicle volumes.
22	Intersection Improvement	West Seattle Bridge Triangle area	35th Ave SW / Fauntleroy Way SW / SW Avalon Way	Intersection safety improvements at these three large high volume intersections to ensure safe travel by bicyclists and pedestrians.
23	Corridor Improvement	Cheshiahud Loop: Mallard Cove connection	Fairview Ave E between E Hamlin St and E Edgar St	A floating bridge or other innovative ideas over or around Mallard Cove would make this connection along the shoreline and provide an scenic facility on Lake Union. The existing Cheshiahud Loop routes bicyclists through a steep connection of streets and alleys.
24	Intersection Improvement	Ship Canal Trail and Dexter Ave to Fremont Bridge connection	South end of Fremont Bridge.	Intersection safety improvements for bicyclists traveling east and westbound from south of the Fremont bridge to the Ship Canal Trail. Each leg of this intersection (Nickerson, Dexter, Westlake, and Fremont) has high bike volumes, and they could all benefit from easier access to the Ship Canal Trail.
25	Intersection Improvement	North 34th Street and Fremont Avenue intersection	North end of Fremont Bridge.	Intersection improvements to ensure safe bicycle turning movements at this high bicycle volume crossing of the Ship Canal, especially bicyclists wanting to head westbound to Ballard wiothout first traveling eastbound along N 34th St.
26	Overpass	Northgate pedestrian/biccyle bridge	NE 100th Street across I-5 to Link Light Rail Station and Northgate neighborhood.	A pedestrian/bicycle bridge across I-5 to connect two neighborhoods with direct access tot he Northgate Link Light Rail Station.
27	Overpass/ Compleet Streets Improvement	Magnolia Bridge	16th Ave W and the Elliott Bay Trail to W Galer St	Renovation of the existing Magnolia Bridge or a new bridge to allow bicycle and pedestrian access from the Elliott Bay Trail to the Magnolia neighborhood.