



Seattle Department of Transportation

Ballard Corridor Design Study
(11th Ave NW to Locks)

February, 2003

Table of Contents

Executive Summary	4
Resolution 30408	4
Routes and Phasing	4
Guiding Principles	5
Study Conclusions	5
Additional Steps	6
Background/Orientation	7
Community Involvement	10
Open House/Public Outreach	11
Design Criteria	12
Safety	12
Intersection Crossings	13
Driveway Crossings	13
Salmon Bay Sand and Gravel	14
“Almost 54 th St”	15
Traffic Volumes	16
Traffic Speeds	17
Truck and Bus Traffic	18
Train Traffic/Crossings	19
Collision History	20
Personal Security	20
Quality of the Pavement Surface	21
Projected Use	22
Route Length/Travel Time	22
Bicycle counts	23
Elevation	24
Accessability	24
Business Operations	25
Parking	25
Access/Loading	26
Railroad Operations	27
Truck Movements	27
Funding/Resources	28
Cost	28
Property Acquisition Needs	28
Liability	28
Recommended Route: Design Challenges and Solutions	29
“Decision Point A” (11 th Ave NW and NE 45 th St)	29
Recommendation	30
Design Challenges	30
“Decision Point D” (11 th Ave NW and NE 45 th St)	31
Recommendation	31
“Decision Point G” (Ballard Ave NW and NW Vernon Place)	32
Recommendation	32
Design Challenges	33
“Decision Point M” (Shilshole Ave NW and 24 th Ave NW)	33
Recommendation	33
Design Challenges	34
“Decision Point Q”(NW Market St and 28 th Ave NW)	34
Recommendation	34
Design Ideas Considered but Eliminated	35

Figures

Figure 1: Recommended bicycle and pedestrian route.....	4
Figure 2: Alternatives considered and study area.....	7
Figure 3: Green area designations.....	8
Figure 4: Red area designations.....	8
Figure 5: Blue area designations.....	8
Figure 6: Intersection crossings.....	13
Figure 7: Number of crossings for each alternative.....	13
Figure 8: Salmon Bay Sand and Gravel access count demographics.....	14
Figure 9: Ballard Oil ramp count demographics.....	15
Figure 10: Kemp Fisheries ramp crossing count demographics.....	16
Figure 11: Ballard Transfer crossing count demographics.....	16
Figure 12: Traffic volumes.....	17
Figure 13: Average vehicle speed.....	18
Figure 14: Reported accidents.....	20
Figure 15: Route length (Miles).....	22
Figure 16: Route bicycle travel times (Minutes).....	23
Figure 17: Weekend bicycle counts.....	24
Figure 18: Map of route alternatives.....	29
Figure 19: NW 45 th St, looking west from 11 th Ave NW.....	30
Figure 20: Shilshole Ave NW, looking west from intersection at NW 46 th St.....	31
Figure 21: Shilshole Ave NW, looking northwest from NW Vernon Place.....	32

Tables

Table 1: PAC Members.....	10
Table 2: Stakeholder groups.....	10
Table 3: Common themes from open house.....	11
Table 4: Salmon Bay Sand and Gravel crossings 12/17/2002.....	14
Table 5: Almost 54th St crossings.....	15
Table 6: Parking impacts of recommended route.....	25
Table 7: Parking impacts of add-on options.....	25
Table 8: Parking impacts for future route.....	26
Table 9: Surplus parking available in areas surrounding recommendation.....	26

Appendices

Appendix A
Conceptual Design Plans (Recommendation)

Appendix B
Cost Estimates
Appendix B1
Green Alternative Cost Estimates
Appendix B2
Red Alternative Cost Estimates
Appendix B3
Blue Alternative Cost Estimates
Appendix B4
Phase 1 Recommendation Cost Estimate
Appendix B5
Future Trail Cost Estimate

Appendix C
Conceptual Design Plans (All Options)

Appendix D
History of the "Missing Link"

Appendix E
Cross Section Guide

Appendix F
Parking Data

Appendix G
Route Photos
Appendix G1
Green Route Photos
Appendix G2
Red Route Photos
Appendix G3
Blue Route Photos

Executive Summary

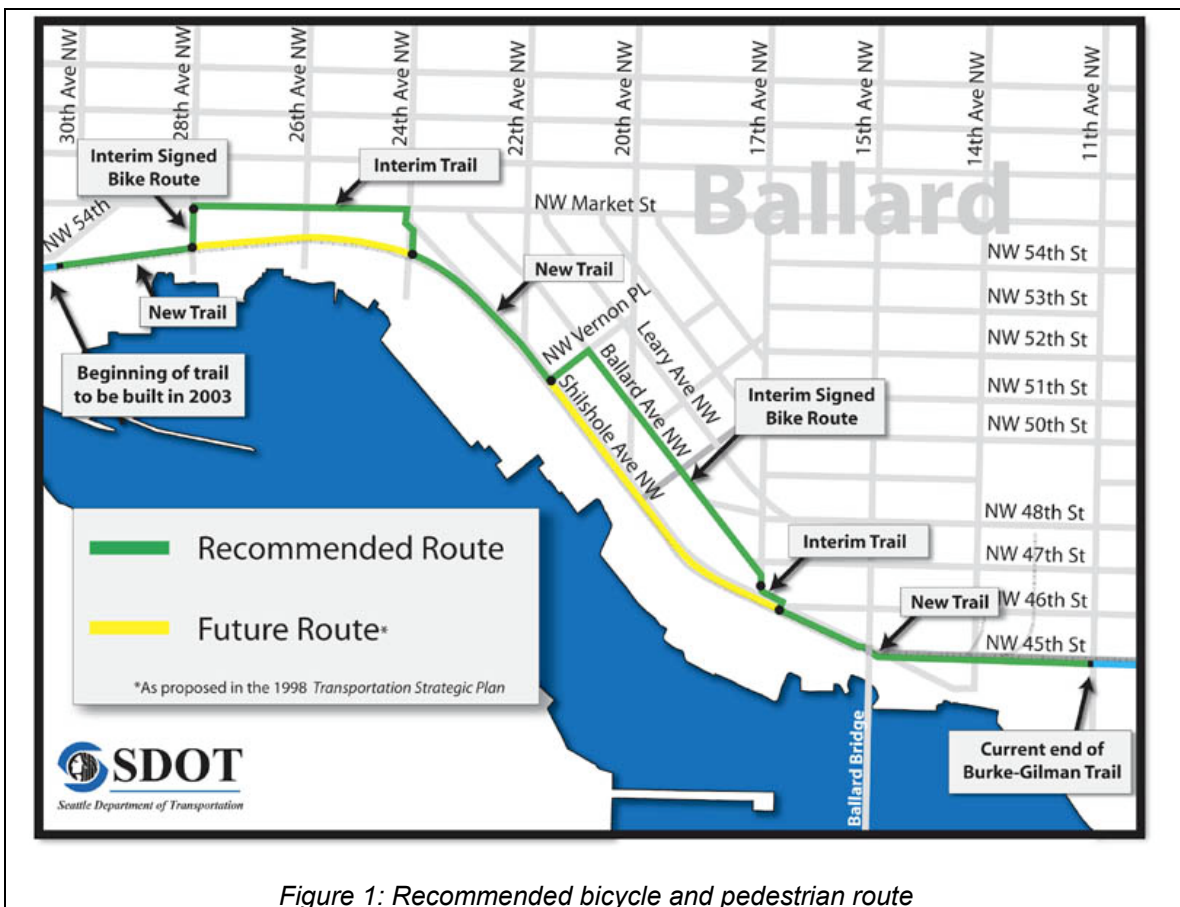
Resolution 30408

On October 22, 2001, the Seattle City Council adopted Resolution 30408, which directed the Seattle Department of Transportation (then SeaTran) to complete the following:

- Lead a project work team to evaluate up to three bicycle/pedestrian alternatives to complete the Burke-Gilman trail between 11th NW and the Locks, including the publicly owned railbanked right-of-way.
- Complete a project work plan - including budget and guiding principles that will initiate a full technical analysis.
- In conjunction with the design work, the project work team will conduct outreach to include residential, business and bike/trail advocacy groups with regard to access, safety and other relevant issues.
- The project work team is directed to determine where acquisition of land may be necessary and undertaken to ensure construction of a well-designed and safe multi-use route of travel for non-motorized modes of transportation.

Routes and Phasing

The analysis, as directed by Resolution 30408, has been completed and the plan for completing the Burke Gilman Trail missing link between 11th Avenue NW and the Locks is as follows (trail construction west of the Locks to start later this year):



- The City will seek funding, and then design and construct three sections of trail (**Estimated Cost = \$6.7 million**).
 - On the south side of NW 45th St from 11th Ave NW (the current terminus of the Burke-Gilman Trail) to 17th Ave NW
 - On the south side of Shilshole Ave NW between NW Vernon Pl. and 24th Ave NW
 - On the north side of the rail corridor from 28th Ave NW to 30th Ave NW (the Locks).
- Once the above trail sections are completed, trail users will be directed along interim routes (**Estimated Cost = \$0.7 million**), described east to west as follows:
 - At 17th Avenue NW, trail users will be directed northwest along Ballard Ave NW and then south on NW Vernon Pl. to Shilshole Ave NW using bike route signs
 - At 24th Ave NW and the rail corridor, a trail will be constructed that directs trail users one block north to NW Market St; along NW Market St
 - From 24th Ave NW to 28th Ave NW, an interim trail will be constructed which can later be used as a sidewalk; and then connect trail users back to the railroad corridor using a signed bike route along 28th Ave NW.

***Note:** The schedule for construction is dependent on funding.*

Guiding Principles

The above recommendation is based on the following guiding principles that have guided trail development as for the past 15 years.

- The first priority when building transportation facilities is always safety.
- Safe and efficient customer and freight access to businesses must be maintained.
- Continued rail service, for freight purposes, by the private sector, must be encouraged and promoted.
- Multi-use trails should be constructed in rail corridors when they are no longer needed for rail purposes; and when it is determined that a “Rail-with-Trail” can be constructed that meets the above safety and access objectives.

Study Conclusions

Other significant findings and conclusions of the study just completed:

- Pedestrian, bicycle and motor vehicle safety is by far the greatest concern of businesses and property owners adjacent to proposed routes. This fact suggests that if safety concerns can be addressed, there will be greater community support for the route that is selected.
- From a strictly design point of view, a bicycle/pedestrian corridor can be designed to meet adopted design guidelines in each of the three route alternatives.
- All of the alternatives have design solutions that maintain access to adjacent businesses and allow for continued freight movement by rail.
- Each of the three alternatives studied has unique design challenges at specific locations that would require fairly costly treatments (for instance, installation of new signals; adjustment to roadway location; purchase of property, and so on).

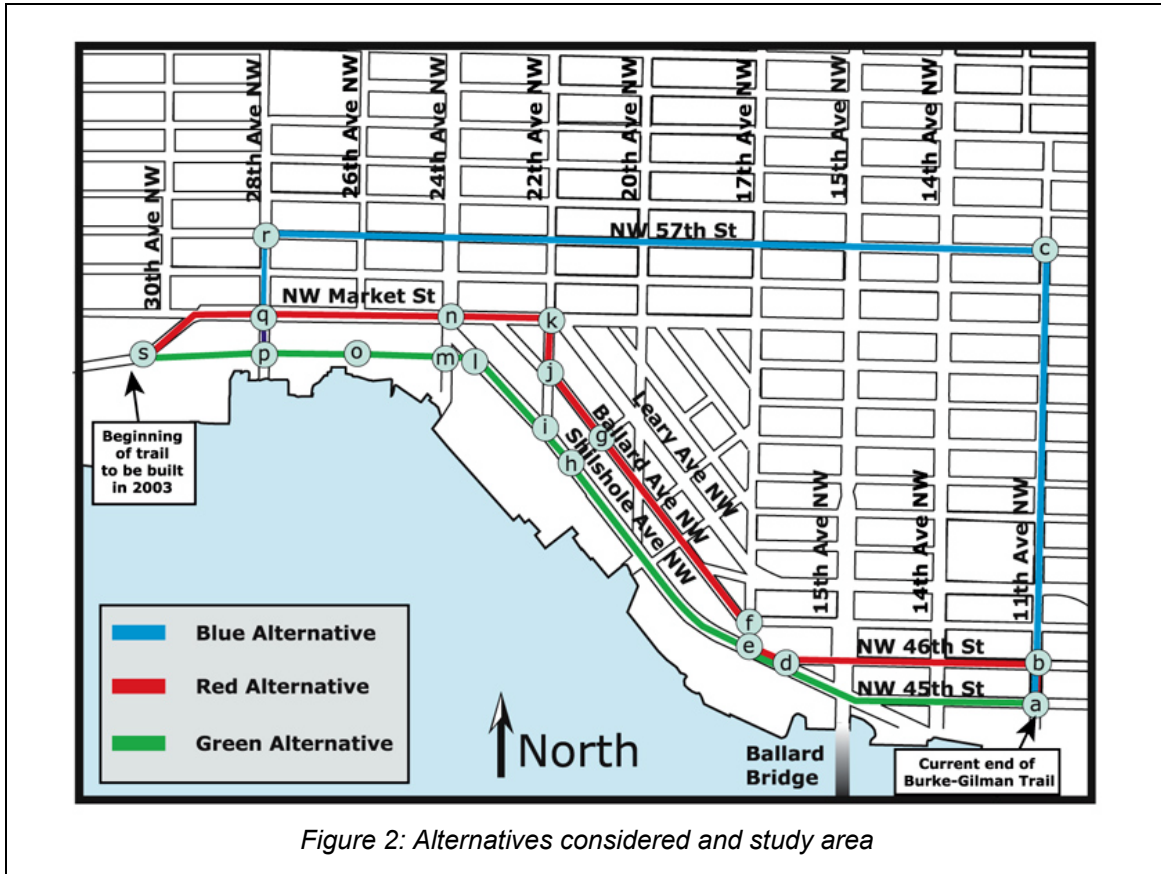
- Length of route, the time it takes to bicycle each route, topography, and current bike patterns are all significant factors when determining where it is possible to route bicyclists successfully.
- Ballard is changing fairly rapidly with more than 25 projects within the study area at various stages of consideration and development. Where land use is changing, there are opportunities to resolve design challenges and make safety improvements for all modes of transportation.
- Historically, bicycle facilities in Seattle have been built in phases with temporary routes providing interim solutions. This approach has proven successful in the past and should be considered as a way to address difficult funding and design problems.

Additional Steps

- In cooperation with other appropriate City departments, including the Budget Office, seek funding (e.g. Federal Grants - other sources that may be available) for the following:
 - a) The design and construction of the trail as described above
 - b) The purchase, for public use, of a narrow strip of property (its exact width to be determined) on the north side the railroad tracks, east of 28th Avenue. NW; and other smaller pieces of property, as needed, to complete the design
- In locations where redevelopment is being considered near the rail corridor, SDOT and other appropriate City departments should begin to work immediately with the property owners to resolve design challenges and make safety improvements for all modes, so as to accommodate a future trail.
- The rail corridor is already in public ownership. Consistent with current City policy, the City should continue preservation of the corridor, in public ownership, for rail and trail use.
- Consistent with adopted City policies and plans; the long-term plan is to construct a multi-use trail along the entire railroad right-of-way once activity levels are deemed appropriate.

Background/Orientation

In October, 2001, the Seattle City Council passed Resolution #30408 that directed the Seattle Department of Transportation (SDOT) to initiate and complete a technical design study of options for a bicycle and pedestrian route for the area in the South Ballard transportation corridor between 11th Ave NW and the Ballard Locks. The three primary alternatives considered for this design study are shown below.



The three alternatives are the “blue,” “red” and “green” alternatives. The “blue” alternative travels north on 11th Ave NW, west on 57th Ave NW, south on 28th Ave NW, and then continues to the Ballard Locks along the railroad corridor. The “red” alternative travels north on 11th Ave NW, west on 46th Ave NW, continuing west on Ballard Ave NW and NW Market St to the Ballard Locks. The Green alternative follows the railroad corridor west along 45th Ave NW, Shilshole Ave NW and continues to the Ballard Locks along the railroad corridor that is sometimes referred to as “Almost 54th St”.

All of these alternatives were evaluated at the level of conceptual design. The goal was to design the best route for pedestrians and bicycles using each alternative. Although each alternative was designed to be a stand alone alternative, the design team also pursued ideas for combining alternatives. The letters on Figure 2 establish points of reference. Appendix G includes photo tours of each of the routes to further assist one’s orientation. A final aid to help assist the reader is the separation of each alternative into areas. These areas are illustrated in the following figures.



Figure 3: Green area designations

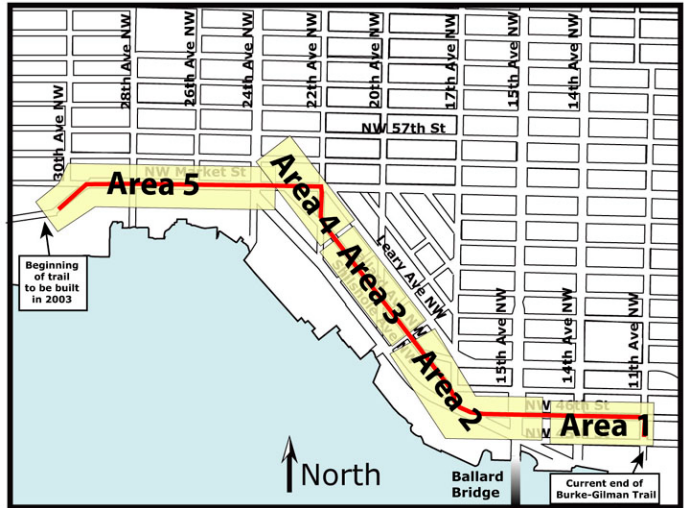


Figure 4: Red area designations

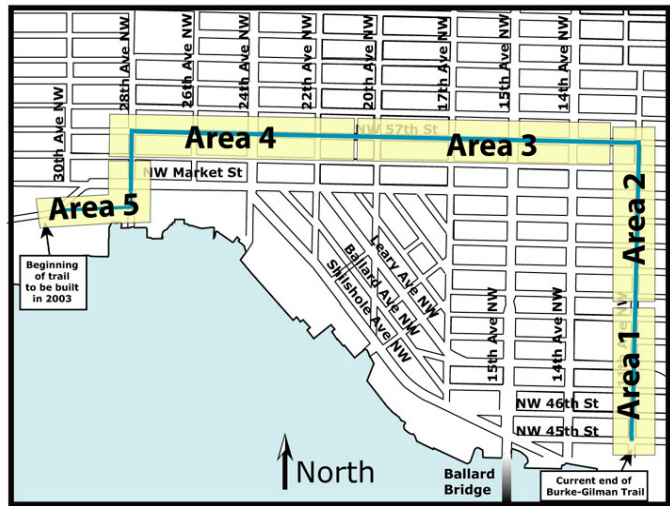


Figure 5: Blue area designations

Area designations and reference letters are used to illustrate differences between options outlined in the conceptual plans (see Appendix C). There are areas that include as many as five different design alternatives. It is helpful to understand the area designations before examining the details of the design.

Community Involvement

Although the heart of this study is based on evaluating each design option with respect to design criteria, the opinions of stakeholders (users of the trail, local business and community leaders) are an equally important part of the equation. For this reason, Resolution 30408 directed SDOT to contact stakeholders to involve them in the development of this study.

The South Ballard Transportation Corridor Study established a committee of stakeholders, the **Project Advisory Committee (PAC)**, to help guide them through their study. SDOT has continued the City's relationship with the PAC by consulting them throughout the study. They have provided valuable local insight to the project team. The PAC members are listed in the table below.

Table 1: PAC Members

PAC Member Name	Organization	Business
Paul Nerdrum	North Seattle Industrial Association	Salmon Bay Sand and Gravel
Davidya Kasperzyk	Groundswell Northwest	
Tom Bayley	Ballard Chamber of Commerce	C.D. Stimson Company
Jody Haug	Central Ballard Community Council	
Warren Aakervik, Jr	BINMIC Action Committee	Ballard Oil
Jennifer Macuiba	Friends of Burke-Gilman Trail	
Steve Cohn	BDC Transportation Committee	
Byron Cole		Ballard Terminal Railroad Company

After the initial boundaries of the study were established, the project team began meeting with **stakeholder groups** identified by the PAC (see the project web site for stakeholder meeting notes, www.seattle.gov/transportation/ballardcorridorlist.htm). The stakeholder list consists of key groups with interest in the bicycle and pedestrian facilities in this area and local businesses and residents who are affected directly by changes to the area. These stakeholder groups helped SDOT confirm study directives, and they also helped SDOT understand specific local information to guide the department through the design study.

Table 2: Stakeholder groups

Stakeholder Group	Meeting Date
BINMIC Action Committee	16-Jan
North Seattle Industrial Association	23-Jan
Friends of Burke-Gilman Trail	23-Jan
Groundswell NW	04-Feb
Ballard Avenue Landmarks Board	07-Feb
Ballard Chamber of Commerce	07-Feb
Sunset Hill Community Association	13-Feb
Area Businesses	13-Feb
Cascade Bicycle Club, Bicycle Alliance, Feet First	15-Feb
Seattle Bicycle Advisory Board	4-April
Ballard Terminal Railroad	4-March
Ballard Merchants Association	Declined
Ballard Civic Center Steering Committee	Declined
Ballard District Council	Declined
Ballard Rotary	No Response
Central Ballard Community Council	No Response
East Ballard Community Association	No Response

Open House/Public Outreach

On November 19, 2002, SDOT held an **Open House** to present the design study plans (see Appendix C). The public was encouraged to comment on route options that were presented on display boards. Approximately 500 people attended the Open House. More than 450 written comments were received via telephone, e-mail and the Internet.

Note: The comments may be viewed at the project web site
www.seattle.gov/transportation/pdf/bgdscomments1202.PDF)

Although all stakeholder groups were represented, a large majority of the participants were bicycle and trail advocates. Most of the comments were general in nature, not specifically identifying any one area or option. Given the sheer quantity and length of the comments, it is difficult to establish any meaningful categorization. Many of the comments appeared to be votes for a particular route (blue, green and red), but there were some comments that were helpful and specific in nature. Several comments advocated a mixing of the routes. Our interpretations of the primary concerns expressed at the open house are summarized in Table 3.

Table 3: Common themes from open house

Concerns About Safety	
Green	<ul style="list-style-type: none"> trains, trucks, cars, forklifts, and pedestrians mixing along the route and crossings with heavy volumes existing conditions are less than ideal for bicyclist, particularly under the Ballard Bridge at 15th Ave NW heavy motor vehicle traffic along Shilshole
Blue	<ul style="list-style-type: none"> narrow streets parallel parking and possible bicycle conflicts with the vehicle doors of vehicles crossing busy streets, particularly NW Market St, Leary, and 15th Ave NW congestion around Ballard Market, the post office and QFC along 57th
Red	<ul style="list-style-type: none"> vehicle and pedestrian traffic on NW Market St slippery bricks on Ballard Ave NW parallel parking and possible bicycle conflicts with open vehicle doors
Concerns About Projected Use	
	<ul style="list-style-type: none"> Bicyclists and pedestrians will not use the blue route because it is up hill and not as direct as existing routes
Concerns About Business Preservation	
	<ul style="list-style-type: none"> Desire to preserve the industrial/maritime nature of the corridor
Concerns About Trail Separation	
	<ul style="list-style-type: none"> Tied to safety - many attendees feel that a separated trail is necessary for completion of the Burke-Gilman Trail. Bike lanes and signed routes are fine, but not for the Burke-Gilman Trail

Design Criteria

The route options were evaluated based on design criteria from the AASHTO Guide for the Development of Bicycle Facilities as well as other information that the project team determined was essential. These criteria are as follows:

Safety

- Intersection Crossings
- Driveway Crossings
- Traffic Volumes
- Traffic Speeds
- Truck and Bus Traffic
- Train Traffic/Crossings
- Collision History
- Personal Security
- Quality of the Pavement Surface

Projected Use

- Route Length/Travel Time
- Bicycle counts
- Elevation
- Accessibility

Business

- Parking
- Access/Loading
- Railroad Operations
- Truck Movement

Funding/Resources

- Cost
- Property Acquisition Needs
- Liability

The project team has weighed carefully each of these criteria and has also taken into account public comments received, in order to come up with a weighted decision matrix to help determine the best approach for the continuation of the Burke-Gilman trail. The following sections analyze each of these criteria and will provide the reader with background on how the recommendation was produced.

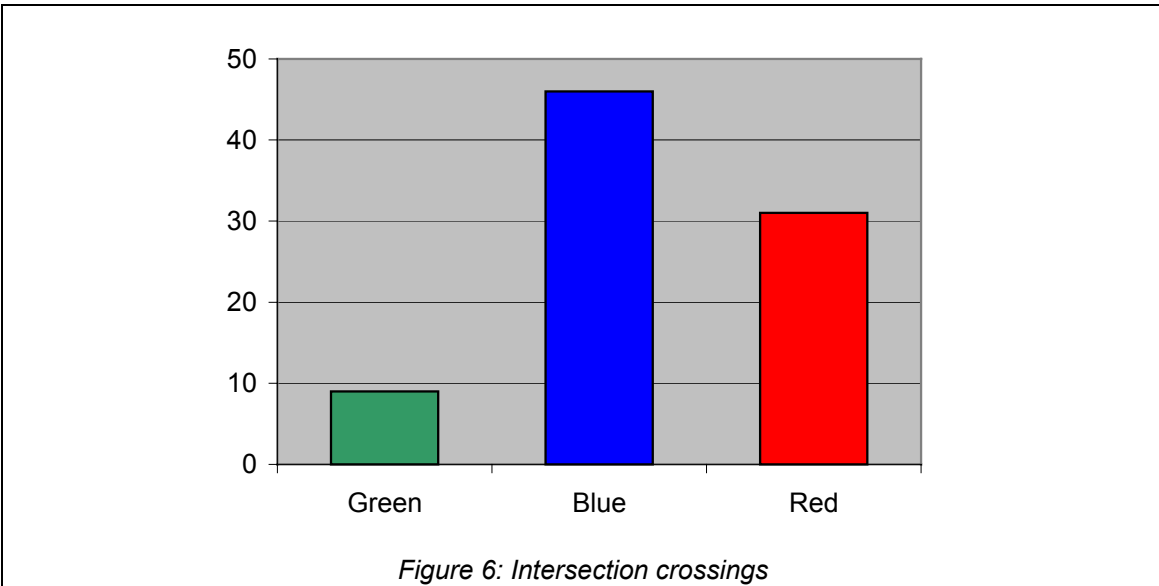
Safety

Safety was the most common theme raised at the Open House in November. Ensuring safety is also of primary importance to the City of Seattle. There are many factors to consider with respect to the safety of a pedestrian and bicycle facility. This study evaluates the following safety criteria:

- Intersection Crossings
- Driveway Crossings
- Traffic Volumes
- Traffic Speeds
- Truck and Bus Traffic
- Train Traffic/Crossings
- Collision History
- Personal Security
- Quality of the Pavement Surface

Intersection Crossings

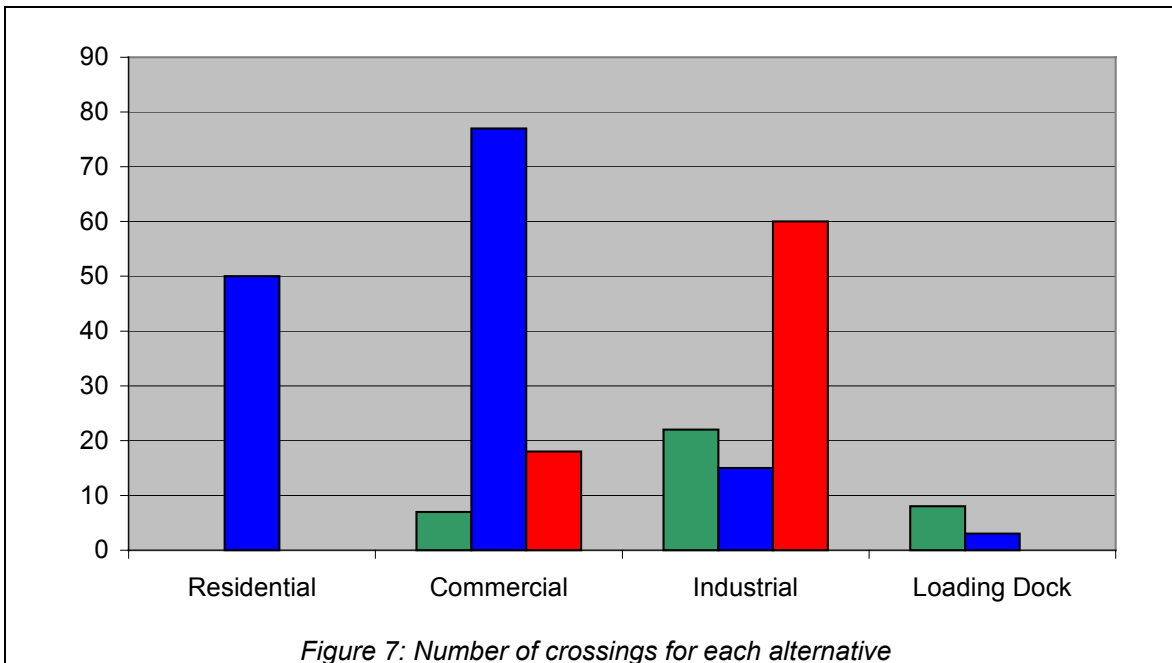
Figure 6 illustrates the number of intersection crossings connected with each alternative.



The blue alternative crosses a significant number of intersections including busy arterials such as 15th Ave NW and NW Market St. The red alternative also crosses numerous streets, but fewer busy intersections as the blue alternative. The green alternative crosses the fewest number of streets, and it avoids busy intersections. The green route is the best option when considering this criteria.

Driveway Crossings

Driveways along each of the alternatives were identified and classified. The results of these counts are shown in Figure 7.



Note:

The following options were considered for the crossing counts (see Appendix C for design details)
Green, area 1, option 4/area 2, option 4/area 3, option 1
Red, area 5, option 3
Blue, option 1

Although some of the initial conclusions may be deceiving to some degree, a few key facts may be drawn from this graph. They are as follows.

1. The blue alternative crosses the most residential and commercial driveways.
2. The red alternative crosses the most industrial business driveways.
3. The green alternative crosses the most loading docks.

One driveway, however, may average 6 crossings per day, while another may average 200. Counting each driveway was beyond the scope of this study. In general, however, commercial driveways to retail establishments show patterns of highest use. Two areas that were identified by the PAC as sensitive high-volume crossings were counted in detail, and they are detailed in the section that follows.

Salmon Bay Sand and Gravel

Salmon Bay Sand and Gravel maintains a consistent flow of concrete trucks to and from the four points of access to its property. Because many of the green alternatives cross these driveways, it was considered a critical crossing that needed to be counted in greater detail. The results of the counts are as follows. Currently there are at least four locations where vehicles and trucks cross onto the street. The area is somewhat undefined. The counts shown in Table 4 and Figure 8 assume two access points only (north and south). All southerly or northerly crossings are grouped in their respective categories.

Table 4: Salmon Bay Sand and Gravel crossings 12/17/2002

Access Point	Crossings/11hr day	Avg. Crossings/hour
South	80	7
North	98	9
Total	178	16

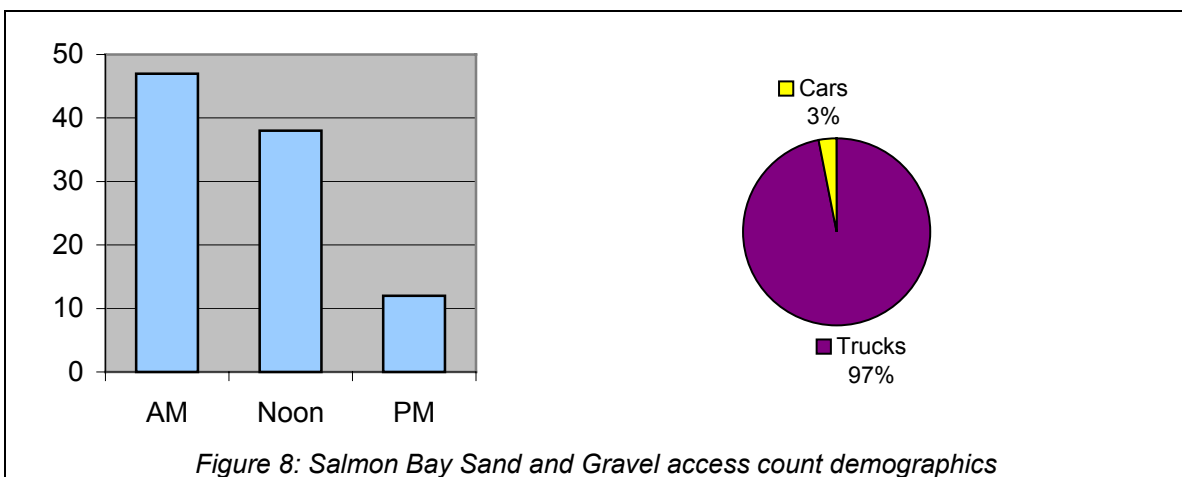


Figure 8: Salmon Bay Sand and Gravel access count demographics

The majority of traffic at Salmon Bay Sand and Gravel is truck traffic that is disproportionately heavy in the morning hours, between 7 a.m. and 9 a.m. Although weekend traffic was not counted, it is substantially lower than weekday counts. Given that they have an average of 16 crossings per hour, these driveways will require further design work until a safe solution to crossing them can be found.

“Almost 54th St”

Another critical area is the so-called “Almost 54th St” (the railroad corridor between 24th Ave NW and 26th Ave NW). See Appendix G1, photo 11 & 12 for a photo representation of this area. This is the only access point Ballard Oil and Kemp Fisheries, two large businesses along the south side of the railroad corridor. The alley also serves as an industrial access point for Ballard Transfer Company. Truck loading and movement along the north side of this corridor are heavy, given the nature of the business activity. These movements are summarized in Table 5 and Figure 9, Figure 10 and Figure 11.

Table 5: Almost 54th St crossings

Access Point	Car Crossings		Truck and Forklift Crossings	
	Per 11hr day	Per Hour	Per 11hr day	Per Hour
Ballard Oil	87	8	5	1
Kemp Fisheries	141	13	13	1
Ballard Transfer	132	12	41	4
Total	359	33	59	6

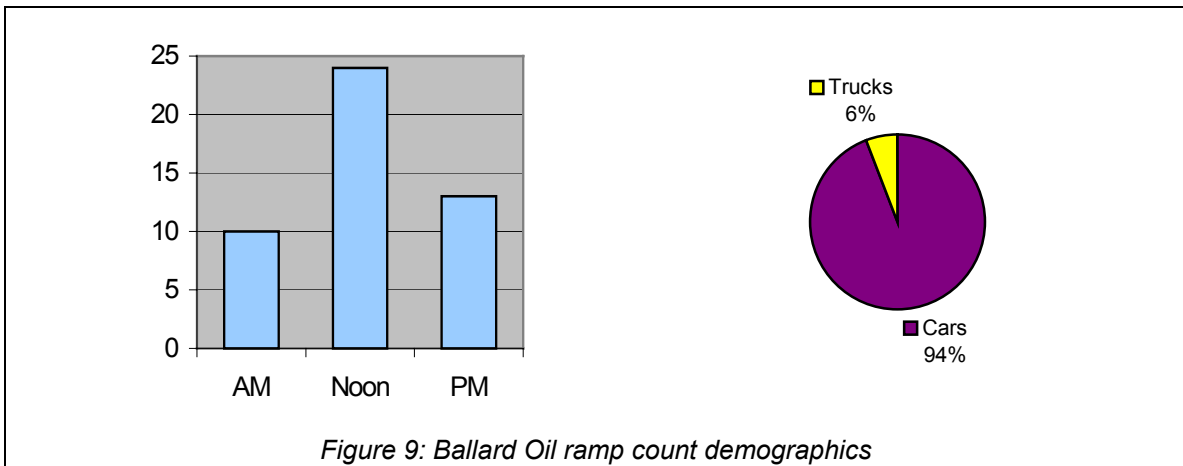
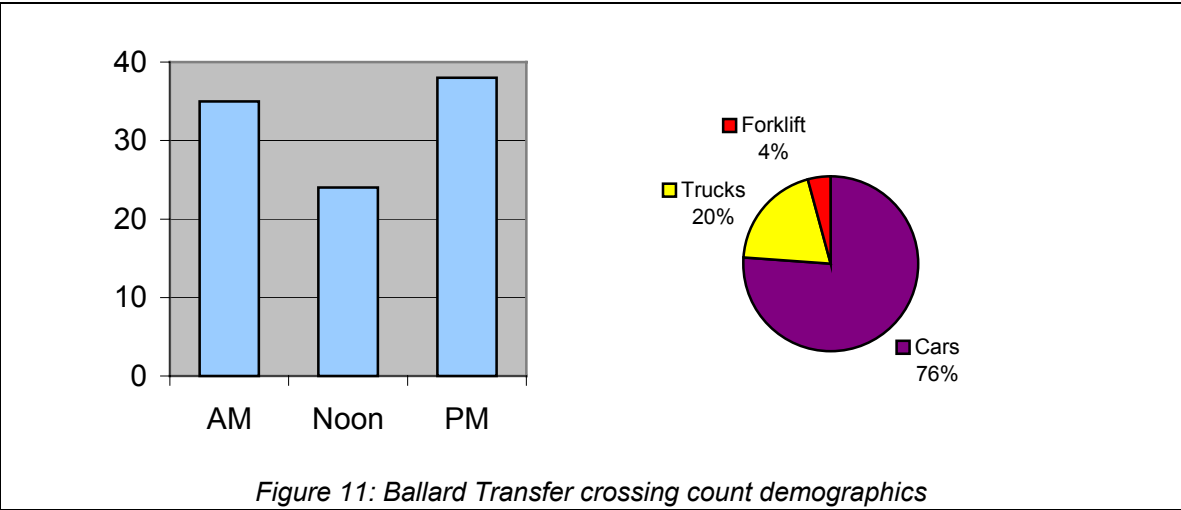
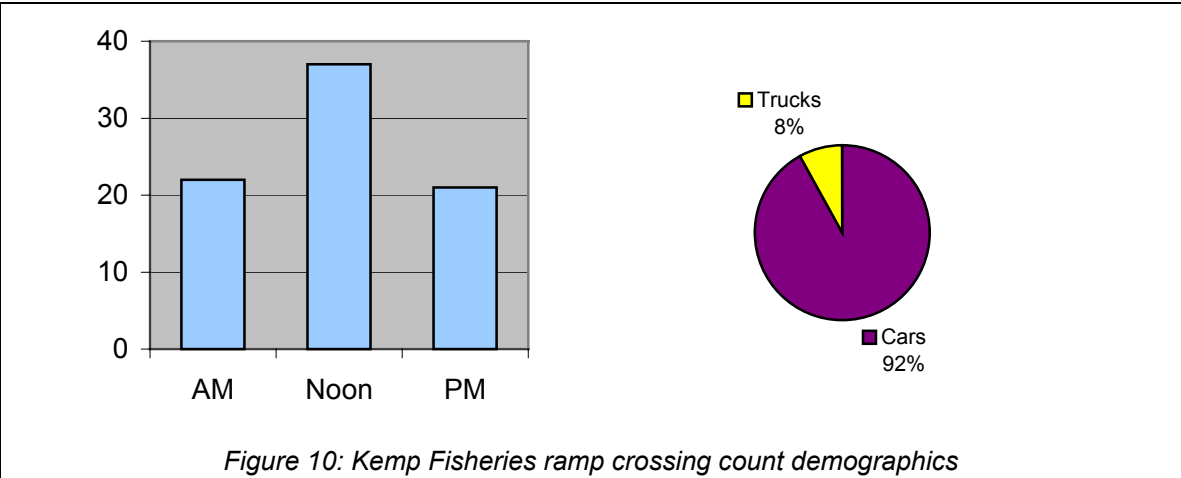


Figure 9: Ballard Oil ramp count demographics



The majority of traffic along “Almost 54th St”, is car traffic. All three crossings, however, see a higher than normal volume of truck traffic. Poor sight lines at Ballard Oil and Kemp Fisheries add to the difficulty in this area. The main area of concern is related to the undefined truck movements associated with Ballard Transfer. Trucks are often backing in and out, and loading (via forklift) on City of Seattle property. Although weekend traffic was not counted, it is believed to be substantially lower than weekday counts. The issues described above necessitate further design work to provide a safe solution for any alternative through this corridor.

Traffic Volumes

Traffic data collected shows that 15th Ave NW is by far the busiest street in the corridor. NW Market St and Shilshole Ave NW are also used heavily. Leary Ave NW and NW 46th St also have moderately high volumes of traffic. Any alternative using or crossing these routes will require consideration of these high volumes.

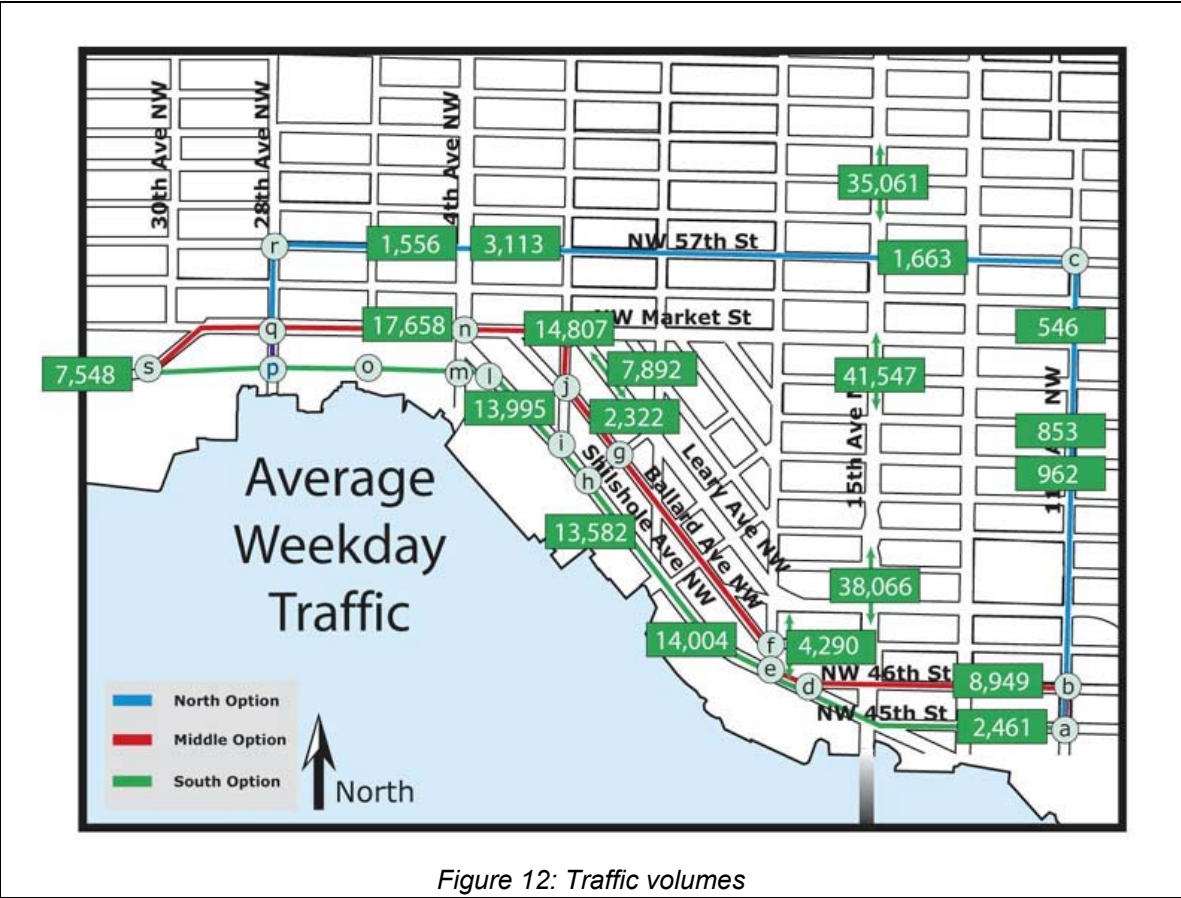


Figure 12: Traffic volumes

It is possible to design bicycle and pedestrian facilities along roads that carry heavy volumes of traffic. The type of facility that will be best for a particular location depends on many factors including the number of driveways and street crossings, the design of the intersections and the turning movements of vehicles.

Traffic Speeds

NW Market St, west of 26th Ave NW is an area of concern with respect to bicycle and pedestrian safety. The speeds on this arterial are somewhat higher than other areas included in the study.

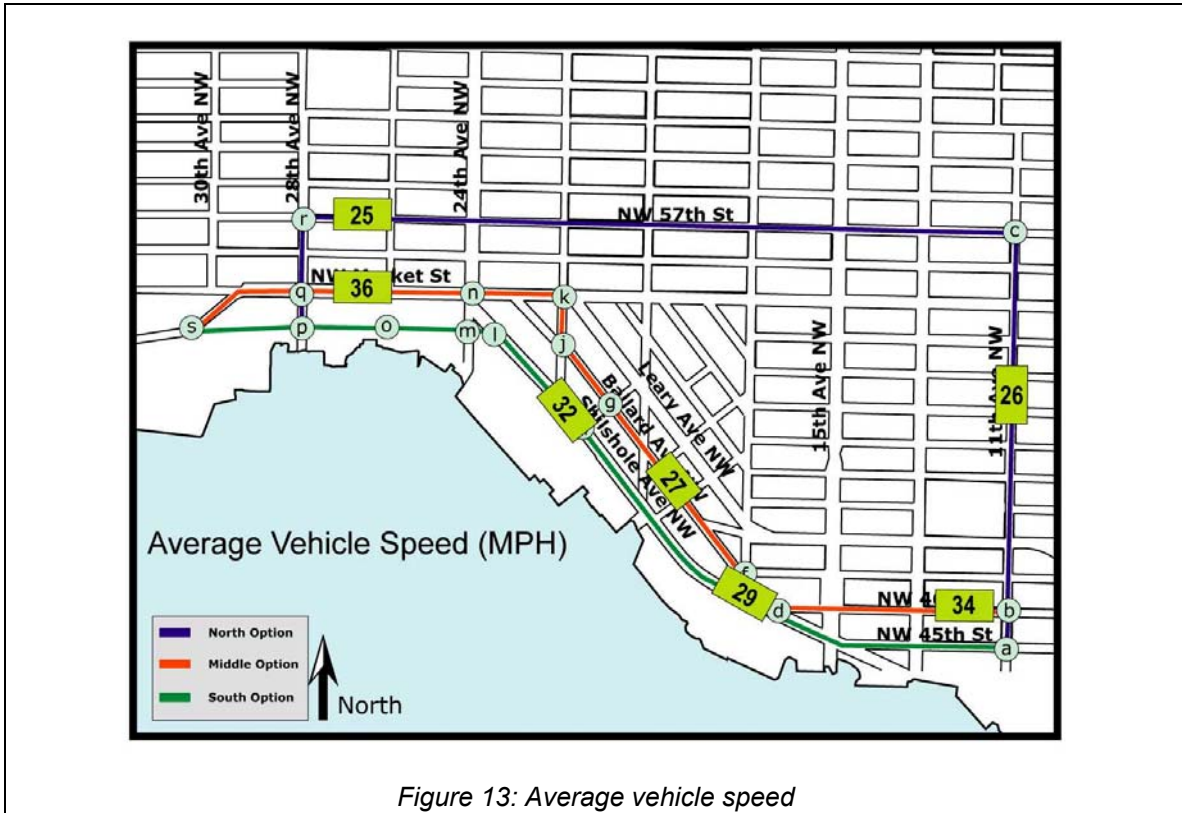


Figure 13: Average vehicle speed

Any alternative using Market St must provide designs that address these speed characteristics. Bicycle and pedestrian facilities can be designed along roads with high vehicle speeds. Crossing roadways with high vehicle speeds can be more problematic, however, and the issue of crossings must be addressed through appropriate design. Possible considerations for this portion of NW Market St include an off-street trail along the extremely wide (23 foot) sidewalk, in-street bike lanes and narrowing of the roadway.

Truck and Bus Traffic

Although formal counts were not done on all streets, the trends in the area are as follows. Truck traffic travels primarily on Shilshole Ave NW and on Leary Ave NW. Bus traffic is primarily on NW Market St, Leary Ave NW, and north on 24th Ave NW.

Reference: South Ballard Transportation Corridor Study, August 2002

Performed by Heffron Transportation for the City of Seattle

“SeaTran performed vehicle classification counts on several of the study area roadways in 1995. The counts were either full-day counts (midnight to midnight) or between 6:00 A.M. and 8:00 P.M., and were used to determine the percentage of trucks on the various roadways.”

“Leary Way and Shilshole Avenue have the highest volume of truck traffic.”

“Most truck travel occurs between 6:00 A.M. and 7:00 P.M. with peak hourly truck volumes occurring around noon. Midday truck volumes on these roadways account for approximately 5% to 8% of the total traffic volume on Leary Way and approximately 6% to 7% of the traffic volume on Shilshole Avenue. While there is truck and bus traffic on other routes, these are the primary areas where the volumes warrant special consideration due to the reduced sight lines and increased stopping distances associated with truck traffic.”

Any alternative along Shilshole Ave NW or crossing Leary Way must address high truck volumes along that route. Appropriate safety measures would be necessary to provide bicycles and pedestrians travelling that corridor with a safe means of crossing. It is possible to design safe bicycle and pedestrian facilities along roadways with high volumes of truck traffic. A typical impact to traffic is longer stop times at traffic signals and intersections that allow safe pedestrian/bicycle crossings. The longer stop times and restricted sight lines at any truck crossing must be taken into consideration.

Train Traffic/Crossings

The green alternative is adjacent to the operation of the Ballard Terminal Railroad, along its entire length. The other routes do not approach railroad tracks except where they approach the green alternative. Rail traffic must therefore be considered when routing bicycles and pedestrians along the rail corridor, regardless of how frequently the railroad track is in operation.

Reference: South Ballard Transportation Corridor Study, August 2002

Performed by Heffron Transportation for the City of Seattle

“The BTRC currently has several major customers along the line. One is Salmon Bay Sand & Gravel that receives about three carloads of raw cement each week. The BTRC delivers these cars in pairs—two on Wednesday and two on Sunday, and spots (leaves) them on the siding adjacent to Salmon Bay Sand & Gravel. This company owns a small track mover that they use to position each car when they are ready to unload it. Because these cars are left on the siding while waiting to be unloaded, there is a second track parallel Salmon Bay Sand & Gravel that allows other rail traffic to bypass these stored cars.

Another major customer is Western Pioneer, for which BTRC hauls boxcars of frozen fish. These boxcars are positioned on a track along Shilshole Avenue west of the Ballard Bridge. Western Pioneer loads pallets of frozen fish into both sides of the boxcar using a forklift. This work is seasonal and the volume of boxcars needed varies. Again, because the boxcars are stored on the tracks while awaiting loading, the BTRC has constructed a second parallel track as a bypass the stored cars.

Olsen Furniture also receives shipments of goods by rail. Boxcars of furniture are unloaded directly to the back of a truck from the tracks on Shilshole Avenue north of Vernon Street. At this location, the truck can back directly up to the boxcar at a right angle without extending onto the street.”

All proposed options running adjacent to the railroad tracks provide a minimum of 8.5 feet of clearance from the centerline of the railroad tracks. Although some fences are shown, the final placement of fences will be addressed during the design phase and will be in conformance with Washington State law that regulates the design and placement of fixed objects adjacent to active intra-state railroads.

All design options specify the installation of rubberized crossing material to fill the flangeway gap thus eliminating the problem of bicyclists falling at rail crossings. Although all railroad crossings proposed in the design alternatives will need to be evaluated more closely in the design phase, all of the proposals are workable from the perspective of safety. Efforts will need to be made to cross railroad tracks at as close to a 90-degree angle as possible, in order to minimize possible incidents.

Area 1 of the green alternative includes railroad crossings. Area 1 of the red alternative also crosses two tracks that are presently not in use. The blue alternative and the red alternative both cross the tracks at NW 45th St as they proceed north.

The green alternative presents the most interactions with the railway line. All options under consideration, however, maintain adequate clearances and provide safe crossings.

Collision History

Along all of the routes, collision data from the City (from 1997 to 2002) was researched. The data includes any reported collision involving a vehicle, bicycle or pedestrian. Not all collisions are reported, and therefore collision analysis only suggests collision trends along the route alternatives.

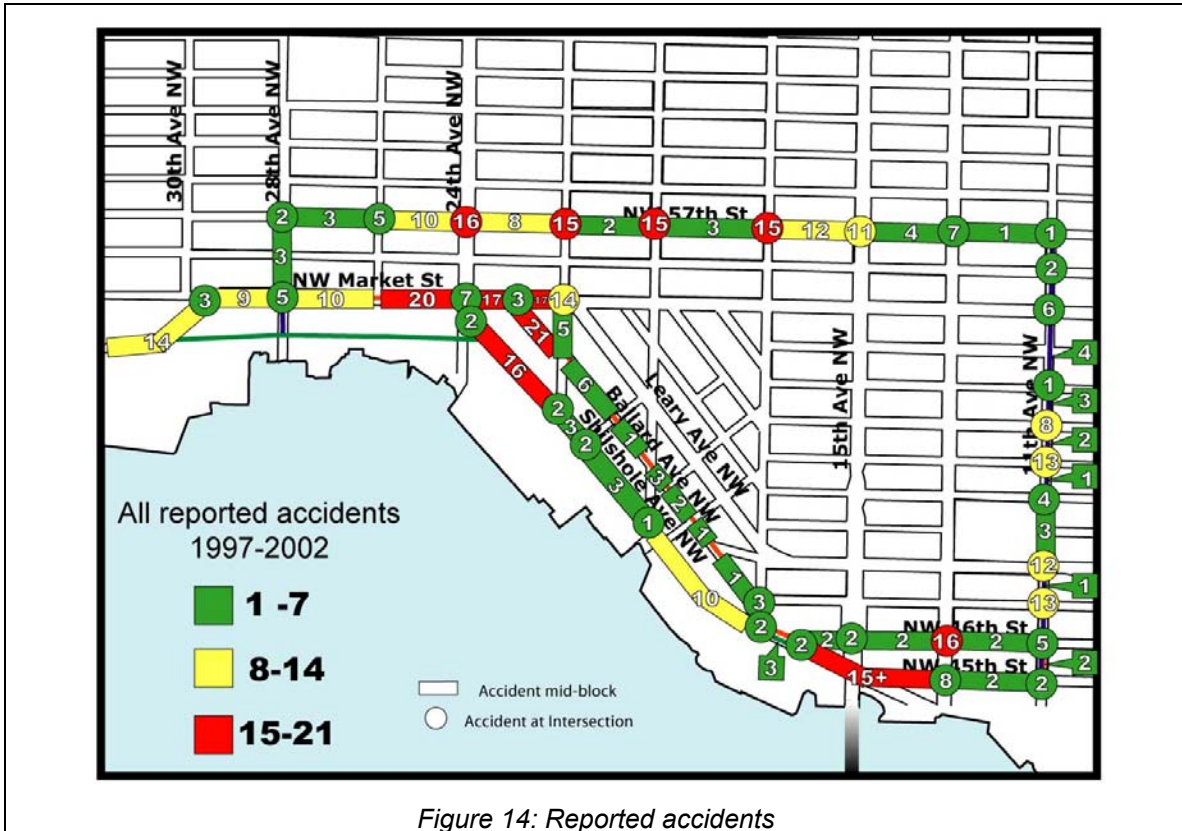


Figure 14: Reported accidents

The red segments above illustrate the potential problem areas with respect to their potential for collisions. Additional measures need to be taken in design to mitigate the potential problem areas. Collisions may be caused by a variety of underlying issues occur for a variety of reasons. Collision numbers may or may not reflect the severity or nature of a particular difficulty. Some kinds of collisions are more easily addressed through improved design. Any consideration of trail options must incorporate not only the number of collisions that have occurred, but also the underlying causes.

Note: Although little data exists on collisions on Shilshole Ave NW at NW 45th St and 15th Ave NW (under the Ballard Bridge), this data represents only reported collisions. A number of bicycle incidents have been witnessed where bicycles cross the railroad tracks. SDOT and the Ballard Terminal Railroad Company have made improvements to the configuration in the area to improve bicycle and motor vehicle safety. All of route options cross the railroad tracks and all include rubberized crossings, an improvement that should enhance safety to a significant degree.

Personal Security

None of the options under consideration are unduly problematic in terms of personal security. Almost 54th St, between 24th Ave NW and the Ballard Locks is the most isolated portion that was

studied. Additional lighting to increase security should be considered at intersections and at locations where the existing ambient lighting provides unsatisfactory illumination. In most cases, additional lighting can be installed on existing utility poles.

Quality of the Pavement Surface

All of the design options take measures to bring the quality of the pavement surface to those standards required for bicycles and pedestrians. For that reason this design criteria is rated evenly for all options

Projected Use

This study evaluates the following Projected Use based criteria:

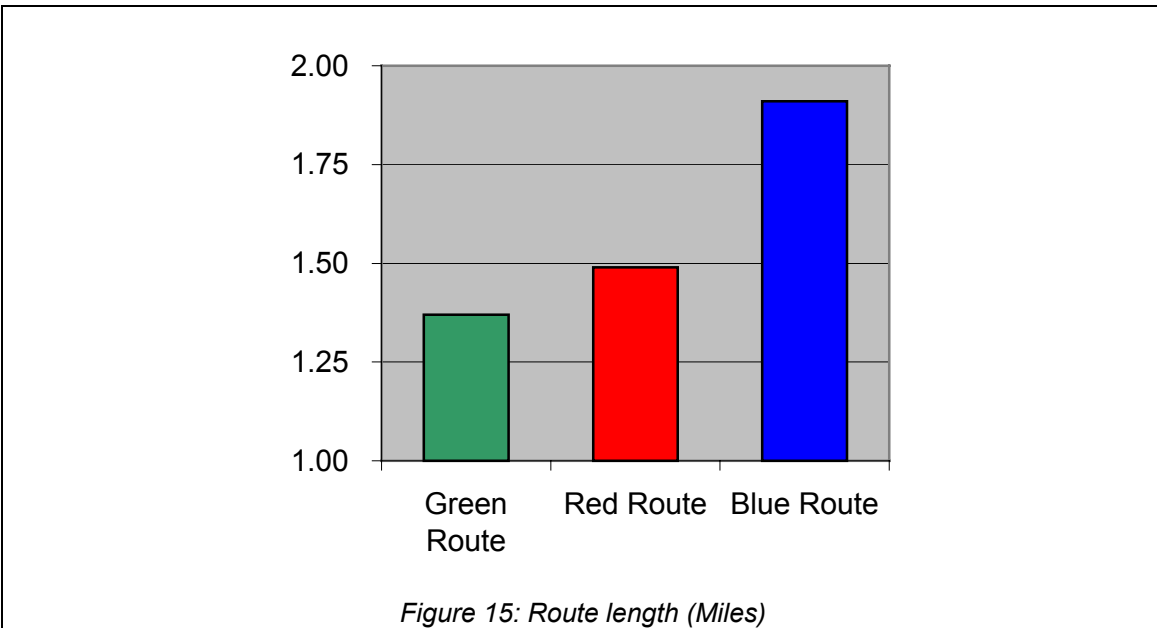
- Route Length/Travel Time
- Bicycle counts
- Elevation
- Accesibility

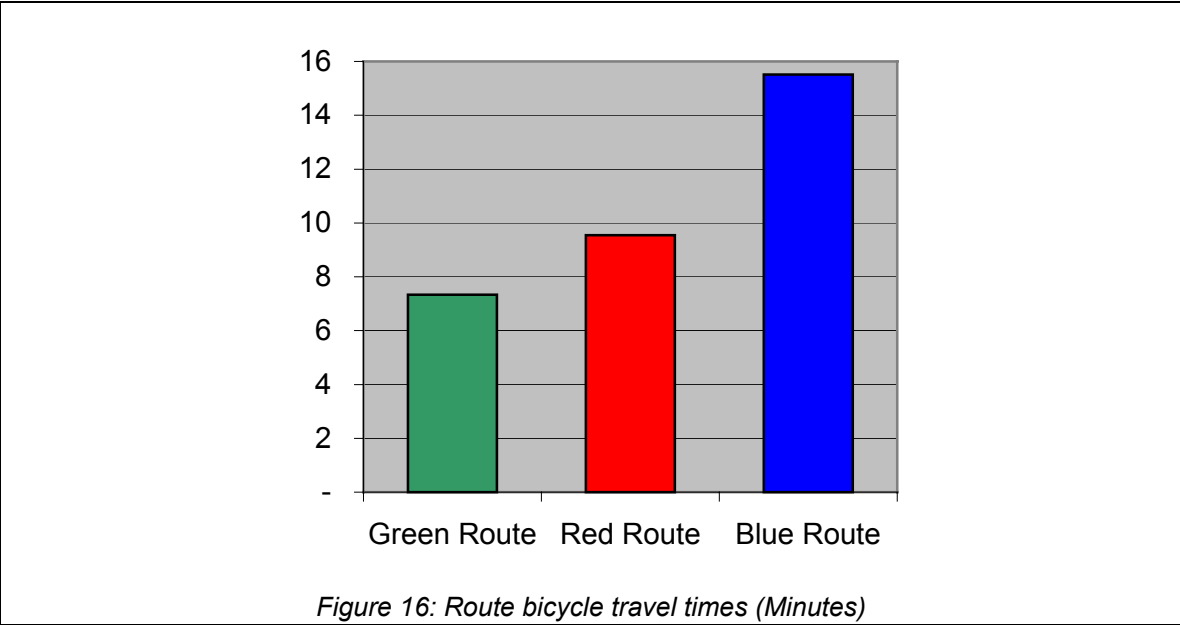
The second most common concern raised during the Open House and the various stakeholder sessions was projected use. We do not want to build something that people will not use. This concern relates strongly to the primary concern: safety. If we build a bicycle facility that is not used, bicyclists and pedestrians will continue to use other alternatives that, if not improved, are less suited to bicycle and pedestrian traffic.

Route Length/Travel Time

Two primary criteria for the selection of bicycle and pedestrian routes are directness, and the time it takes to travel the route. The more direct the route, the more likely bicyclists and pedestrians will use it. Conversely, if a route is perceived to be circuitous, potential users may choose alternate routes to get to their final destination. For this reason, route length is a significant criteria when studying potential route alternatives.

The following charts represent data from three test rides on all three primary route alternatives. All but two runs were performed on the afternoon of May 20, 2002. Run #2 and #3 for the green route were performed the morning of May 29, 2002. Weather and wind conditions were similar on all runs. The results were obtained bicycling on a mountain bike with 26x1.95" knobby tires, inflated to 55psi. A steady cadence and level of effort were maintained at approximately 90 rpm and 70-75% of maximum heart rate, respectively.





Although route lengths are constant, the travel times are only estimates of the travel times a bicyclist can expect along these routes. Conditions will change depending on the improvements made. For instance, all of the blue route alternatives make efforts to give priority to bicyclists through the use of signing and traffic calming devices. In addition, new traffic signals would be installed at major intersections. Depending on traffic conditions, that factor may increase or decrease travel times slightly.

Test runs for the green route were traveled on the existing roadway. The green route alternatives would be along a separated path or bike lane. This may have the following impact on travel times.

1. Decrease in travel times crossing the intersection of Shilshole Ave NW and NW 46th St due to the reconfiguration of the intersection, new traffic signal at 17th Ave NW and Shilshole Ave NW, and bypassing the intersection with some options along the rail.
2. Increase in travel times with on-street options given the traffic signal at 17th Ave NW and Shilshole Ave NW
3. Increase in travel times for off-street options along Shilshole Ave NW between 17th Ave NW and 22nd Ave NW because of driveway management efforts anticipated at major crossings
4. Decrease in travel times at 24th Ave NW and Almost 54th St because of the new trail construction eliminating the need to ride up to 24th Ave NW and cut back to Almost 54th St
5. Decrease in travel times along Almost 54th St because of improvements to the existing pavement

Summary of travel time adjustments after improvements:
Green alternative: slight increase travel times or no change
Red alternative: no impact
Blue alternative: slight decrease in travel times

Bicycle counts

Bicycle counts were taken on a sunny Saturday afternoon on December 7, 2002. Counts were conducted over a three hour period at key locations along each of the alternatives. The results are shown in the figure below.

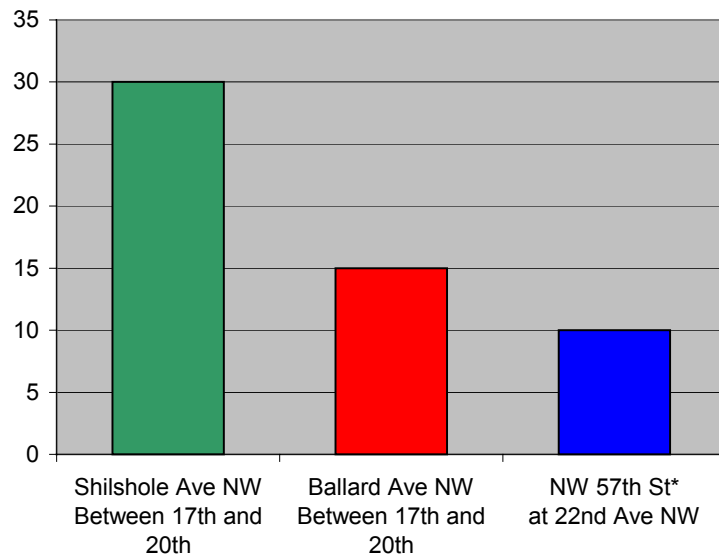


Figure 17: Weekend bicycle counts

Note: The majority of the bicyclists observed on 57th appeared to travel to destinations along NW 57th St as as distinct from being “through” traffic.

These counts should be considered as indicators that show current trends through the corridor. Only these three streets were counted, however. There are several streets through the corridor that people use at present. Shilshole Ave NW is the most heavily used street for travelling east/west through the corridor. This fact suggests that any improvements to the bicycle facilities along Shilshole Ave NW would be heavily used. These counts also raise concern about the blue route in terms of projected use.

Elevation

Another indicator of projected use is elevation change. The blue route is the least desirable, with moderate changes in grade throughout. The red route has some grade changes, but it is relatively flat, and the green route is primarily flat and therefore is the preferred route when evaluating based on the criteria of elevation change.

Accessibility

The more accessible the alternative, the higher the projected use. Each of these alternatives is relatively accessible. The major flow of bike traffic is from the northwest to the southeast. The blue alternative rates slightly higher because it is closer to the population base, but there are several north/south streets that provide access to each of the alternatives.

Business Operations

This study evaluates the impact on Business operations within the study area.

- Parking
- Access/Loading
- Railroad Operations
- Truck Movements

Parking

A common concern related to most public projects is a potential loss of parking. The blue alternative propose no changes at this time to the existing parking. Minor changes may be necessary in the design phase, but no significant overall changes would be necessary.

The red alternative would not change parking with the exception of the Area 5 options which propose an adjustment to the current four-lane road to three lanes and the elimination of parking during peak hours.

The only alternative that has a significant impact on parking is the green alternative, particularly Area 1 and 2. A complete breakdown of the parking impacts is located in Appendix F. Given the undefined nature of the corridor, all parking counts must be considered estimates only. Ballard Terminal Railroad currently restricts parking on its days of operation. The estimated decrease in parking spots on days when the railroad is in operation is 20 in area 2 and 6 in area 3. Table 6 shows the parking impacts associated with the recommendation.

Table 6: Parking impacts of recommended route

	Current Capacity	New Capacity	Change
45th Ave NW, 11th to 46th (One-Way)	72	53	-19
Shilshole Ave NW, 46th to 17th (no left turn pocket)	20	9	-11
Ballard Ave NW (17th to Vernon)	No Change	No Change	0
Shilshole Ave NW (Vernon to 24th)	14	0	-14
24th Ave NW (railroad to Market)	23	18	-5
NW Market St (24th to 28th)	No Change	No Change	0
Rail Corridor (28th to Ballard Locks)	No Change	No Change	0
			-49

The recommendation includes two optional elements that may be included if they are determined to be necessary during detailed design (see Appendix A, sheet 2 and 3). The parking impacts as a result of these add-on options are detailed in Table 7.

Table 7: Parking impacts of add-on options

	Additional Change
45th Ave NW, 11th to 46th (Two-Way)	-8
Shilshole Ave NW, 46th to 17th (add left turn pocket)	-15
	-23

If a trail is eventually constructed along the future route, as proposed in the 1998 Transportation Strategic Plan, there will be additional parking impacts as shown in Table 8.

Table 8: Parking impacts for future route

	Current Capacity	New Capacity	Change Counted in Table 6	Additional Change
Green, Area 2, Option 3 (see Appendix C)	239	138	0	-101
Green, Area 3, Option 2 (see Appendix C)	118	102	-14	-2
			Total	-103

A parking study was conducted to estimate the current parking demand in the area. The parking study quantifies the demand for all-day parking as well as short-term parking. If a car was observed to occupy a parking space the entire day, this spot was classified as all-day parking. If a car vacated a spot and another car parked there later during the day, this spot was classified as short-term parking. The short-term parking spot was re-counted every time a new car entered. Table 9 shows the current surplus parking in the area surrounding the recommendation. The areas indicated in Table 9 correspond to the areas illustrated in Figure 3 and Figure 4.

Table 9: Surplus parking available in areas surrounding recommendation

Area	Current Surplus
Green Area 1	8
Green Area 2	132
Green Area 3	53
Red Area 1	38
Red Area 2	17
Total	248
Total possible impact	175
Remaining surplus	73

Table 6+Table 7+Table 8

Table 9 illustrates that there is sufficient parking available in the area if all phases of the recommendation are implemented. Approximately 73 spaces will be available for short-term parking. Employees for surrounding companies may have to park farther from their offices, particularly in the green alternative, Area 1. This data suggests that there will be ample street parking for customers, no matter what alternative is pursued. Although the green options have the most impact on parking, SDOT does not believe that the impact is significant enough to create a parking shortage.

Access/Loading

Based on an analysis of operations, access to and from, and loading at, businesses can be accommodated regardless of which route is selected.

The blue alternative has a minimal impact on property access or loading activities.

The red alternative may have a slight impact on business loading along Ballard Ave NW. Presently, some businesses use the middle of Ballard Ave NW for loading. These operators will have to use caution while loading and unloading to avoid conflicts with bicycles and pedestrians. The street, however, is wide enough to allow for these activities to happen concurrently. These operators must use caution at present. The volume of riders is likely to increase if this route becomes a signed bike route.

The green options have impacts on the loading activities of adjacent businesses, primarily at Salmon Bay Sand and Gravel (Appendix G Route Photos, photo G6 and G7.), Ballard Transfer (Appendix G Route Photos, photo G11 and G12), and Western Pioneer (discussed below, in Railroad Operations). Currently many businesses use the right-of-way for loading activities. These areas are used casually, and most businesses have not obtained permits for these activities. Our design study has evaluated each of these instances. In all cases, we feel that there are solutions for these businesses that will allow them to adjust their operations and continue their loading activities effectively. SDOT acknowledges, however, that change can be difficult and it has therefore rated each option based on the amount of change that may possibly be required. This is a subjective rating, and it is therefore difficult to quantify.

Railroad Operations

Railroad operations are outlined in a previous section (see Train Traffic/Crossings). Railroad activity is infrequent, but the railroad has shown growth in recent years and there is a possibility that there may be increased demand in the future. The green alternative has the potential for the greatest impact on railroad operations. All options under consideration will accommodate current railroad operations and will maintain an 8.5-foot clearance from the centerline of the tracks.

The primary challenge is the loading activities. West of the Ballard Bridge, Ballard Terminal Railroad uses the south edge of the right-of-way for loading rail cars, a situation that creates an ongoing potential for conflicts between forklifts and trail users (Appendix G1, Photo G5a & G5b). One solution to this problem is to create a bike lane bypass that would allow trail users to avoid the loading and unloading activity when it is in progress. The railroad would have to provide some sort of traffic control (for instance, cones and/or signs) to re-route trail users.

Another area of concern is at “Almost 54th St”, between 24th Ave NW and 26th Ave NW, where Ballard Terminal Railroad has installed a loading dock facility along the south edge of the roadway. To the best of our knowledge, this loading facility has seldom, if ever, been used. If it were used in the future, the railroad would need to provide traffic control (flaggers) on the trail (Appendix G1, Photo G11).

All options have solutions for maintaining adequate space for the continued operation of the railroad. SDOT, however, acknowledges that change is often difficult and it has rated each option based on the amount of change that may occur. Again, this is a subjective rating, and it is difficult to quantify.

Truck Movements

As outlined in previous sections (see Truck and Bus Traffic), the area is home to many industrial businesses, and truck activity along the green and portions of the red alternative is high.

Truck activity per say is not incompatible with other modes. However, it does require that design issues be given special attention in order to ensure safety. Consequently, wherever truck turning movements are anticipated, the designs include the following

- Adequate driveway width to allow safe turning movement
- Appropriate curb radius to allow turns to be made without going over curbs
- Optimum sight distances to ensure all users can see each other
- Definition of roadway, driveway, trail and parking areas to create maximum predictability of movement
- Appropriate signing to alert all users to potential conflict points.

Funding/Resources

This study addresses the following Funding/Resource based criteria:

- Cost
- Property Acquisition Needs
- Liability

Cost

Although costs are always a consideration, safety and projected use are greater concerns when evaluating the various options. This study does not attempt to rate each alternative based upon cost. Each option, however, has been estimated at a conceptual level. These cost estimates are detailed in Appendix B.

Property Acquisition Needs

The blue and red alternatives do not require any acquisition of property. Although not insurmountable, requirements to acquire property can be costly and should therefore be minimized. The need to acquire property will be considered by the City of Seattle when such action would provide the best option or preserve future options for trails.

Green Area 2, Option 4, requires the acquisition of a 5000 square foot property adjacent to the right of way, in order to create a new loading dock for the railroad. The existing loading space would be taken up by the trail and the relocated track.

Green Area 3 options include the acquisition of a 5200 square foot property along the north side of the corridor, south of 28th Ave NW. Option 2 includes the acquisition of 15,000 square feet for the new roadway connecting 24th Ave NW and Shilshole Ave NW.

Estimated costs of the property acquisition are detailed in Appendix B.

Liability

A recurring theme raised by local businesses is the issue of liability. The concern is that any bicycle or pedestrian facility along the green alternative would generate collisions and that their businesses would be held responsible, from a financial point of view. Liability is an issue any time SDOT implements a new facility or roadway. Liability must be addressed through design.

SDOT is recommending options that increase safety in all cases. The goal is to recommend an option that bicyclist and pedestrians will use, and also one that is safe for both users and adjacent businesses and property owners. In addition, whatever facility is built will meet all relevant design guidelines. Given the City's adherence to these policies, concern over liability can be mitigated. However, adherence to good design principals does not remove responsibility from users of the transportation system. Driver, pedestrians, and bicyclists share in the responsibility for conducting their activities upon the transportation system in a safe manner, consistent with the rules of the road.

Recommended Route: Design Challenges and Solutions

This section provides details on the recommended route, beginning at the current end of the Burke-Gilman Trail, at 11th Ave NW and NW 45th St, and continuing west to the Ballard Locks. The map and the letters on Figure 18 will help to establish the relevant points of reference for this section. Both design challenges and potential solutions are spelled out in detail. The resolution of these challenges will be completed during the detailed design process.

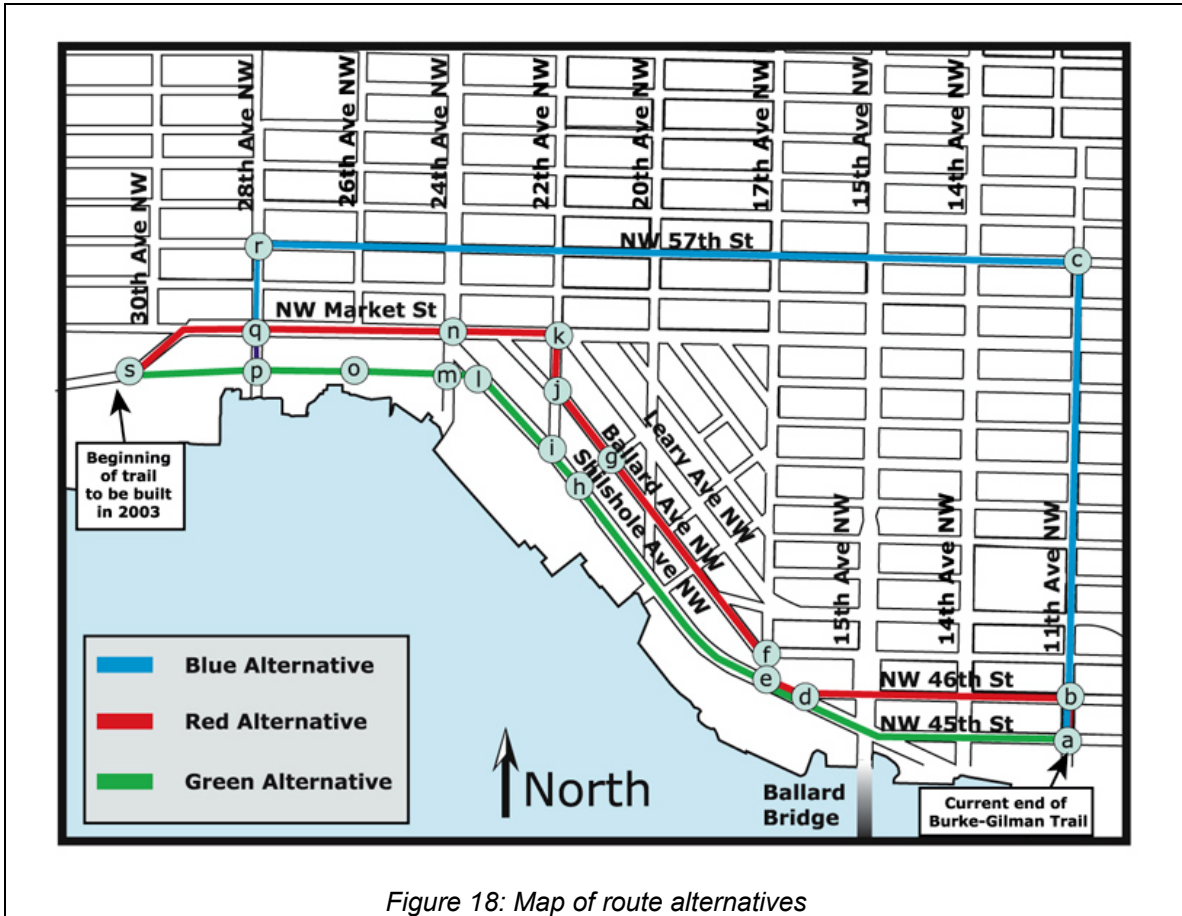


Figure 18: Map of route alternatives

“Decision Point A” (11th Ave NW and NE 45th St)

Option 1 (Northbound on the Red Alternative):

NW 45th St is preferred over NW 46th St because the average daily traffic volumes on NW 46th St (an arterial street) are over 3.5 times greater than on NW 45th Street (a non-arterial). These lower volumes of vehicles also makes it more favorable to convert NW 45th St to a one-way only street. Converting NW 45th St to a one-way street leaves sufficient room for a separated bicycle facility, creates improved sight lines, frees further space for parking, and leaves sufficient room for businesses to continue operating with a minimal amount of change.

Option 2 (Northbound on the Blue Alternative):

The blue option was eliminated for several reasons. It rates extremely low in terms of projected use. Travel time, grades and distances are all substantially more than other routes (see previous section: Projected Use). Even with substantial improvements along the route, legitimate concern remains that this alternative would not be used by a good majority of bicyclists. Another concern is the number of high volume arterial crossings. Such streets would require signalization, a

change that would probably interrupt east/west vehicular flow. In addition, the high number of driveway crossings along the blue alternative could present safety problems.

Recommendation

Westbound on the green alternative

This option is recommended because it is the safest option and also rates most highly when considering projected use.



Figure 19: NW 45th St, looking west from 11th Ave NW

A multi-use trail is recommended on the south side of the street (see left side of picture). The trail works with a one-way or a two-way roadway. One-way works best. In a scenario assuming a one-way road, motor vehicles would be on the north side of the street (see right side of picture). A traffic signal could be installed at NW 45th St and Shilshole Ave NW or 17th Ave NW and Shilshole Ave NW, if necessary. Details of the conceptual design details may be found on sheets 1 and 2 of Appendix A.

Design Challenges

- **Business Loading at 14th Ave NW and NW 45th St**
Trail options at this location limit the area that this business can use for loading and loading activities. A potential solution is to adjust the location of the trail to accommodate loading and either move or rebuild the loading dock.
- **Track Crossing under Ballard Bridge**
An area of concern that has experienced a high number of bicycle accidents (prior to changes that were made in 2002) is under the Ballard Bridge, where the railroad crosses NW 45th St. The proposed trail crosses the railroad tracks at 15th Ave NW and Shilshole Ave N. The flangeway gap (the gap next to the rail) can cause bicyclists to fall. Striping

modifications have already decreased significantly the number of accidents occurring. The addition of a dedicated trail crossing at a more abrupt angle combined with a rubberized crossing material that fills the flangeway gap, will mitigate this important safety issue.

- **Separation between Railroad Tracks and Trail**

East of NW 46th St and Shilshole Ave NW, the railroad tracks are built 7.5 feet from the edge of the roadway. (Appendix G, Photo G5a). There is sufficient width in the right-of-way to move the roadway over one foot, to create an 8.5-foot separation. This will move the parking area over one foot on the opposite side of the road.

“Decision Point D” (11th Ave NW and NE 45th St)

Option 1 (Continue Green Alternative along Shilshole Ave NW and the Railroad Corridor):

At this time, the cumulative intensity of activity along Shilshole Ave NW between 17th Ave NW and NW Vernon Place - trains, trucks, storefronts, loading, and so on - suggests that an alternative route should be selected, if at all possible. That said, any alternative must not be overly circuitous, or there is a high degree of probability that novice and family bicyclists will continue along Shilshole Ave NW (more experienced bicyclists would continue to use Shilshole Ave NW, as they do at present). Ballard Ave NW would provide a direct route to bypass this industrial area.

Recommendation

Signed Bike Route along the Red Alternative, Ballard Ave NW

Routing bicyclists along Ballard Ave NW, with the use of a signed bike route, is recommended. That route would avoid the section of Shilshole with the highest intensity of use while remaining sufficiently direct to attract novice bicyclists. Avoiding Shilshole Ave NW in this segment will minimize the impact to adjacent businesses that currently use portions of the Shilshole Ave NW right-of-way for loading activities and for customer parking.



Figure 20: Shilshole Ave NW, looking west from intersection at NW 46th St

A multi-use trail is recommended on the north side of Shilshole Ave NW for a distance of one block (see right side of picture), connecting to a signed bike route beginning at 17th Ave NW and continuing along Ballard Ave NW as a signed bicycle route. The details of the conceptual design details may be found on sheet 2 of Appendix A.

“Decision Point G” (Ballard Ave NW and NW Vernon Place)

Option 1 (Continue along Ballard Ave NW Connecting to NW Market St)

The traffic volumes and pedestrian, bus and business activities along NW Market St between 20th Ave NW and 24th Ave NW are not conducive to the construction of a bicycle and pedestrian facility through this area.

Option 2 (Continue along Ballard Ave NW Connecting to the Blue Alternative on NW 57th St)

Routing users up to NW 57th St would increase the users' travel time, adding a minimum of four blocks to any of the other alternatives. Such a rerouting would also mean crossing NW Market St, a busy arterial street.

Recommendation

Route Bicyclists along NW Vernon Place, Back to the Green Alternative

Routing bicyclists back to the railroad corridor along NW Vernon Place is recommended because that is the safest option, and it brings users back to the most direct connection between 11th Ave NW and the Ballard Locks. The activities along the south side of Shilshole Ave NW, between NW Vernon Place and 24th Ave NW, are much less intense than in the previous segment (there are fewer crossings, no rail loading and unloading, and a minimal number of loading dock activities).



Figure 21: Shilshole Ave NW, looking northwest from NW Vernon Place

A signed bike route is recommended to bring users to a crossing of Shilshole Ave NW at NW Vernon Place. This signed crossing will bring users back to a multi-use path on the north side of the railroad tracks. Construct a path following the railroad (the left side of Figure 21) to the next decision point at 24th Ave NW and Shilshole Ave NW. Detail of the conceptual design may be found on sheet 4 of Appendix A.

Design Challenges

- **Loss of Parking along Shilshole Ave NW**
Constructing a trail along Shilshole Ave N will result in a relocation and loss of parking. Although not a major problem as discussed in previous sections (see Business Operations, Parking), the project will establish clearly defined parking spaces. That change will improve safety and enhance the aesthetic appeal of that area, making it less confusing for customers who at present are faced with a random and often chaotic parking situation. In addition, we will look for ways to manage the parking area more efficiently (for instance, install signs indicating a time restriction) to ensure that customer parking is available.

“Decision Point M” (Shilshole Ave NW and 24th Ave NW)

Option 1 (Continue along the Railroad Corridor (“Almost 54th Street”) to the Ballard Locks)

At this time, the cumulative intensity of activity along “Almost 54th Street” between 24th Ave NW and 28th Ave NW - trains, trucks, forklifts, loading, and so on - suggests that an alternative option be used as long as it is direct enough to attract novice and family bicyclists.

Option 2 (Elevated bike path along almost 54th)

Many stakeholders have raised the idea of an elevated bike path to separate bicycle and pedestrian traffic from the industrial traffic in this corridor. Although this idea may be feasible, the analysis of this concept would require a detailed analysis that lies outside the scope and budget of this design study. Such an analysis would require consultation with geotechnical and structural design specialists. Clearances, operations and aesthetics along the lower roadway would need to be investigated in detail. Any elevated solution would far exceed the cost of any of the designs that we are presenting in this study. A cursory examination of this idea suggests that ramps at either end of the elevated structure would block access and views to adjacent properties. In addition, it is unlikely that trail users would choose an elevated structure when the roadway itself is a direct and reasonably flat option.

Recommendation

Construct a Short Section of Trail along 24th Ave NW to NW Market St

Construct an Interim Sidewalk Bikeway along the South Side of NW Market St from 24th Ave NW to 28th Ave NW

This option is the best one at this time. It is direct enough to attract novice and family riders and it minimizes the impact to businesses that use the “Almost 54th St” corridor. The south edge of the NW Market St right-of-way is approximately 23-foot wide, providing sufficient room for an interim multi-use path between 24th Ave NW and 28th Ave NW. In making this recommendation, it is acknowledged that a sidewalk bikeway only works at speeds under ten miles per hour. Experienced bicyclists who wish to travel at higher speeds will be encouraged to use the street, much as they do at present.

The recommendation is to construct a multi-use trail along the north side of the railroad tracks to NW 24th St. Continue the trail northbound along the east side of 24th Ave NW, crossing to the west side at Shilshole Ave NW. This trail can be converted to an extra-wide sidewalk if it is no longer needed for trail purposes. Details of the conceptual design may be found on sheet 5 of Appendix A.

Design Challenges

- **Advanced Bike Riders**

This option is not ideal for advanced riders who wish to ride at high speeds because of the high degree of pedestrian activity expected along this segment. Experienced riders may choose to ride in the street to bypass this segment of the trail. Appropriate signing would therefore be required.

“Decision Point Q”(NW Market St and 28th Ave NW)

Option 1 (Continue along the NW Market St, Connecting to the Ballard Locks)

Since there is sufficient room along the railroad corridor for a safe, separated trail facility, continuing a trail along NW Market St is unnecessary. In addition, between 28th Ave NW and the Ballard Locks, there are a number of recently opened retail businesses that are generating high pedestrian activity. This intensity could create bicycle/pedestrian conflicts if the trail were routed in front of these businesses.

Recommendation

Route bicyclists south on 28th Ave NW to the railroad corridor

This is the safest option. There are no driveway crossings, the route is direct and the flat grade provides the best transition to the new trail beginning at the Ballard Locks.

A bike path is recommended along the north side of the railroad corridor connecting 28th Ave NW to the Ballard Locks. Details of the conceptual design details may be found on sheet 6 of Appendix A.

Design Ideas Considered but Eliminated

Elliptical Traffic Islands

An idea was raised in a PAC meeting about the addition of elliptical traffic islands that would allow bikes to pass more easily. This idea was rejected because elliptical traffic islands would provide insufficient traffic calming in one direction. Vehicles travelling along the narrow direction of the island would not need to slow down to travel around the island. Elliptical traffic islands may cause confusion at these intersections and, therefore, increase the probability of incidents.

Bike Path along Blue Alternative

Near the end of the study, PAC committee members proposed the idea of a bike path along the blue alternative. Their rationale was that the current options that show traffic calming devices indicated insufficient provisions for the priority of bicycles. A bike path along the blue alternative was rejected because the existing design provides sufficient safety for cyclists, given that traffic moves slowly in that area. A bicycle path would require eliminating half of the parking along these streets and would not be ideal, given the great number of driveways along the proposed route.

Bikes on Extra Wide Sidewalk on Market St (22nd Ave NW to 24th Ave NW)

This idea was rejected because of the high volumes of pedestrian traffic and the high density of storefronts along this stretch of NW Market Street. A bike path in this area would almost certainly create pedestrian bike conflicts.

Widen ROW along 11th or 57th

Widening this stretch of roadway would be extremely costly and would not create a desirable solution, given the number of driveways along the route.

Why not 58th Ave NW Instead of 57th Ave NW

This idea was eliminated early in the design. Users would have to travel two additional blocks to reach their destination. The roadway has steeper than desirable grades towards the west end of the route. Presently, the road is closed just east of 15th Ave NW to accommodate a school playground.

Lower Roadway along “Almost 54th St”

There have been discussions about building an access road south of the retaining wall to serve the south side businesses, relocating the rail to the north, and building a trail along the north side of the retaining wall. Unfortunately, there are flaws in this design concept. Our design team's analysis of this concept exposed the following concerns:

- There is insufficient right-of-way for a two-way street that supports the industrial uses of the area. There is an average of 16 feet from the concrete retaining wall to the right-of-way line.
- A one-way street would create difficulties for trucks because there is insufficient room for turnarounds inside the property.
- Rebuilding the retaining wall with 10 feet of clearance from the tracks would provide approximately 20 feet of clearance, an insufficient amount of space to provide an adequate turning radius for large trucks.
- The desirable minimum for this kind of street is 28 feet. That minimum standard would require purchasing some additional right-of-way (it would likely require condemnation) and demolishing five buildings or structures. Even with these changes, access would possibly still not be ideal

Signal Tripping Devices for Bikes Along NW 57th St

Although some members of the PAC have expressed a desire to install mid-block signal tripping devices to help decrease bike queue times at major crossings along the blue route, SDOT does not believe that this is a practical idea for the following reasons:

- Many users may ignore such devices, making them ineffective.
- Traffic along already congested arterials would be impacted negatively
- Such a device would likely require a bicyclist to dismount. Bicyclists would almost certainly resist the idea of dismounting. They would likely therefore ignore the device.

Appendix A
Conceptual Design Plans (Recommendation)

Appendix B
Cost Estimates

Appendix B1
Green Alternative Cost Estimates

Appendix B2
Red Alternative Cost Estimates

Appendix B3
Blue Alternative Cost Estimates

Appendix B4
Phase 1 Recommendation Cost Estimate

Appendix B5
Future Trail Cost Estimate

Appendix C
Conceptual Design Plans (All Options)

Appendix D
History of the “Missing Link”

Appendix E
Cross Section Guide

Appendix F
Parking Data

Appendix G
Route Photos

Appendix G1
Green Route Photos

Appendix G2
Red Route Photos

Appendix G3
Blue Route Photos