



Trails Action Plan



*Connecting the Bluff
to the Willamette River*

January 2004



ACKNOWLEDGEMENTS



LENNY ANDERSON
FRANCIE ROYCE

SWAN ISLAND TRANSPORTATION MANAGEMENT ASSOCIATION
PORTLAND OFFICE OF TRANSPORTATION

ADDITIONAL THANKS TO...

*CITY OF PORTLAND - BUREAU OF PLANNING RIVER RENAISSANCE
BUREAU OF ENVIRONMENTAL SERVICES - WILLAMETTE WATERSHED PLAN
SWAN ISLAND BUSINESS ASSOCIATION
ADIDAS AMERICA
OVERLOOK NEIGHBORS
PORTLAND PARKS AND RECREATION
PORTLAND OFFICE OF TRANSPORTATION
UNION PACIFIC RAILROAD
MULTNOMAH COUNTY SHERIFF OFFICE WORK CREW
CITY OF PORTLAND - BUREAU OF MAINTENANCE
TRIMET
PORT OF PORTLAND*



ALTA PLANNING + DESIGN

GEORGE HUDSON, ASLA	PROJECT MANAGER, PRINCIPAL
MIA BIRK	PRINCIPAL
ALLISON WILDMAN	PLANNER
ARIF KHAN	PLANNER

TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
DESIGN GUIDELINES	6
TYPICAL BICYCLE FACILITIES	6
SHARED USE PATH STANDARDS	7
SIDEWALK AND BUFFER WIDTHS	8
TRAILS ON STEEP SLOPES	9
ACCESSIBLE RAMP ACCESS STANDARDS	10
TRAIL CROSSINGS: TYPE 1 - UNPROTECTED	11
TRAIL CROSSINGS: TYPE 2 - DIVERT TO EXISTING SIGNAL	11
TRAIL CROSSINGS: TYPE 3 - NEW SIGNAL	12
TRAIL CROSSINGS: TYPE 4 - GRADE-SEPARATED	13
SHARED USE PATH ADJACENT TO ENVIRONMENTALLY SENSITIVE AREA	14
TRAIL LANDSCAPING AND REVEGETATION	14
GREEN CONCEPTS FOR TRAILS AND SIDEWALKS	15
TRAIL PROJECTS	17
PROJECT 1: WILLAMETTE BLUFF TRAIL	18
PROJECT 1: WILLAMETTE BLUFF TRAIL	19
PROJECT 2: LAGOONSIDE TRAIL	20
PROJECT 2: LAGOONSIDE TRAIL	21
PROJECT 3: BASIN AVENUE	22
PROJECT 3: BASIN AVENUE	23
PROJECT 4: WAUD BLUFF TRAIL	24
PROJECT 4: WAUD BLUFF TRAIL	25
PROJECT 4-X: WAUD BLUFF TRAIL: RAILROAD CROSSING	26
PROJECT 5: RAILROAD TRAIL	28
PROJECT 5: RAILROAD TRAIL	29
PROJECT 6: LANDFILL TRAIL	30
PROJECT 6: LANDFILL TRAIL	31
PROJECT 6-C1: LANDFILL TRAIL CONNECTION OPTIONS TO BASIN AVENUE	32
PROJECT 6-C: LANDFILL TRAIL CONNECTION OPTIONS TO BASIN AVENUE	33
PROJECT 7: RIVER TO LAGOON TRAIL	34
PROJECT 7: RIVER TO LAGOON TRAIL	35
PROJECT 7 RIVER TO LAGOON TRAIL SECTIONS	36
PROJECT 8: GOING STREET CONNECTION	38
PROJECT 8: GOING STREET CONNECTION	39
PROJECT 9: NORTH GREELEY	40

PROJECT 9: NORTH GREELEY 41

MAINTENANCE GUIDELINES 42

FUNDING SOURCES 43

OPPORTUNITIES 45

 PARTNERSHIPS 45

 DEVELOPMENT 45

 LANDSCAPING AND HABITAT RESTORATION 45

 WILLAMETTE BLUFF PROMENADE..... 45

 ENVIRONMENTAL MITIGATION OPPORTUNITIES 46

 CURRENT BES REVEGETATION PROJECTS 47

 BENEFITS FROM THE WILLAMETTE BLUFFS REVEGETATION PROJECT 47

 ADDITIONAL OPPORTUNITIES FOR ENVIRONMENTAL MITIGATION 47

EXECUTIVE SUMMARY

Swan Island provides the regional and local community with a number of invaluable assets, the most prominent being family-wage employment and direct access to the Willamette River and other ecological resources. However, access to and throughout the Island is challenging for pedestrians, bicyclists, and other non-motorized users. The Swan Island Trails Action Plan examined nine trail connections on and adjacent to Swan Island to improve community connectivity and access to employment and the Willamette River. The report is divided into five sections: Design Guidelines, Trail Projects, Maintenance Guidelines, Funding, and Opportunities.

The Design Guidelines illustrate implementation guidelines for shared use paths, sidewalks, walking trails, ADA access, landscaping and revegetation, and dealing with trails in environmentally sensitive areas. It also highlights some Green Street concepts with the use of infiltration strips and bio-swales.

The Trail Projects section discusses in detail the nine proposed trails on and adjacent to Swan Island:

- # Willamette Bluff Trail
- # Lagoonside Trail
- # Basin Avenue
- # Waud Bluff Trail
- # Railroad Trail
- # Landfill Trail and Connections
- # River To Lagoon Trail
- # North Going Street Connections
- # North Greeley



Each project sheet contains a map of the trail, section drawings, descriptive information about the trail, the type and width of the proposed trail, the length of the proposed trail, the habitat of the proposed trail location, ownership of taxlot parcels the trail travels through or alongside, issues that add to the complexity of implementing the trail, and a planning-level cost estimate to implement the trail. In some cases, multiple options were given for trail/on-street configurations. If a special need arose from the configuration, it was discussed in greater detail on an accompanying page.

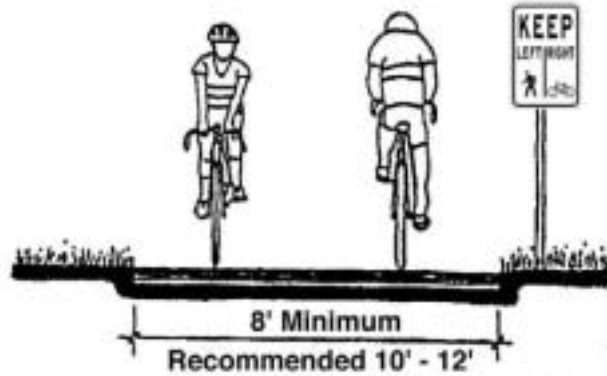
The Maintenance Guidelines section briefly outlines the various tasks for trail maintenance and a recommended schedule for completion of those tasks. The Funding section outlines various federal, state, and local funding opportunities for trails on Swan Island.

The Opportunities section discusses overall trail implementation opportunities, revegetation opportunities, and stormwater treatment opportunities to use in conjunction with trail implementation. The section briefly discusses the Willamette Bluff Revegetation Project currently being implemented by the Bureau of Environmental Services and how proposed trails on the Bluff can accentuate or improve the revegetation process. It also cites four additional opportunities to integrate Green Street concepts when building a trail.

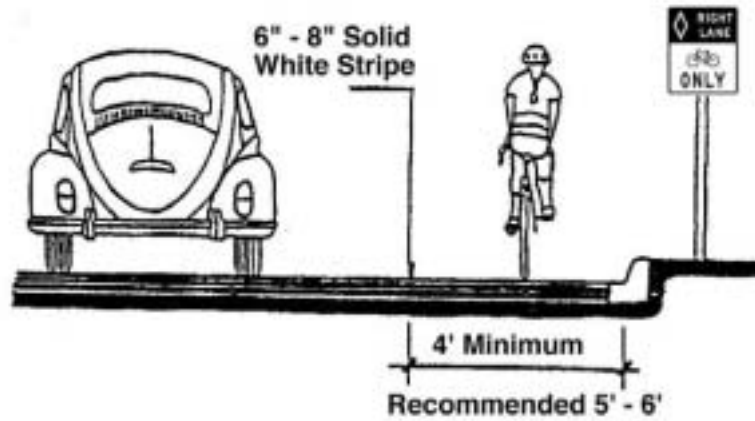
DESIGN GUIDELINES

TYPICAL BICYCLE FACILITIES

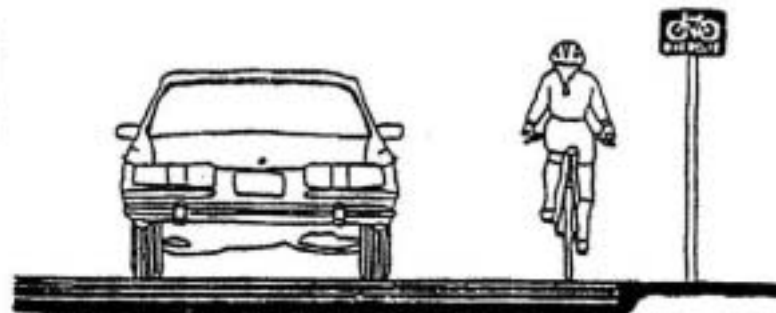
Shared Use Path



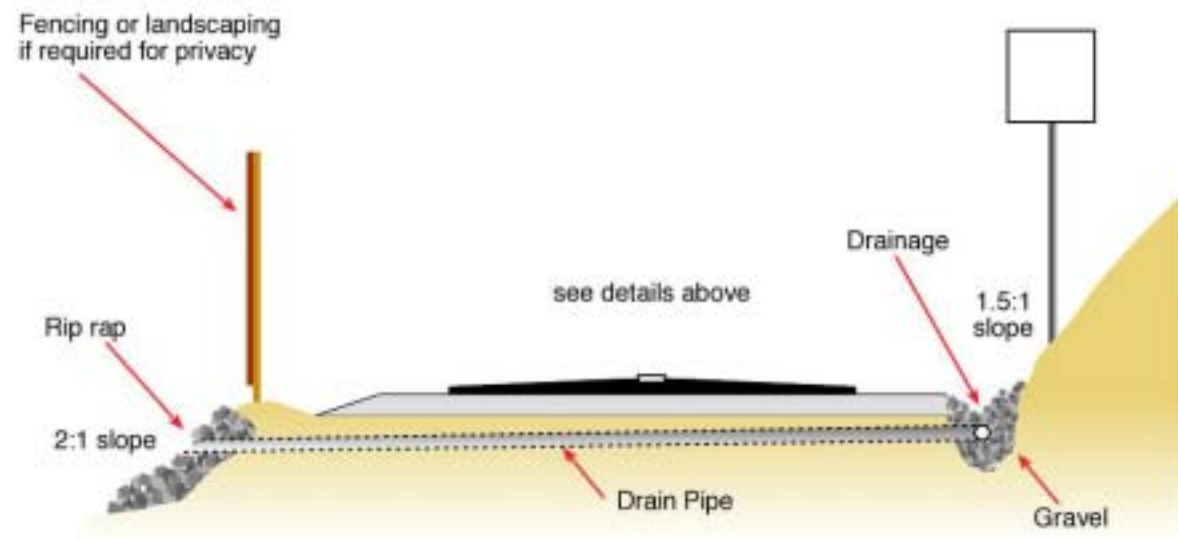
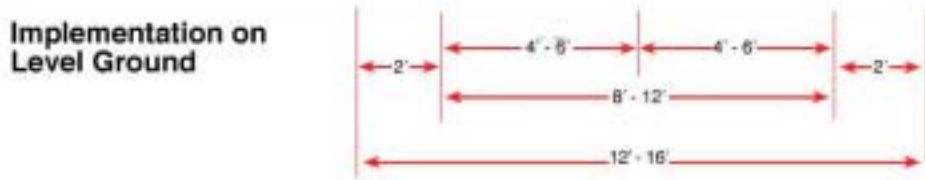
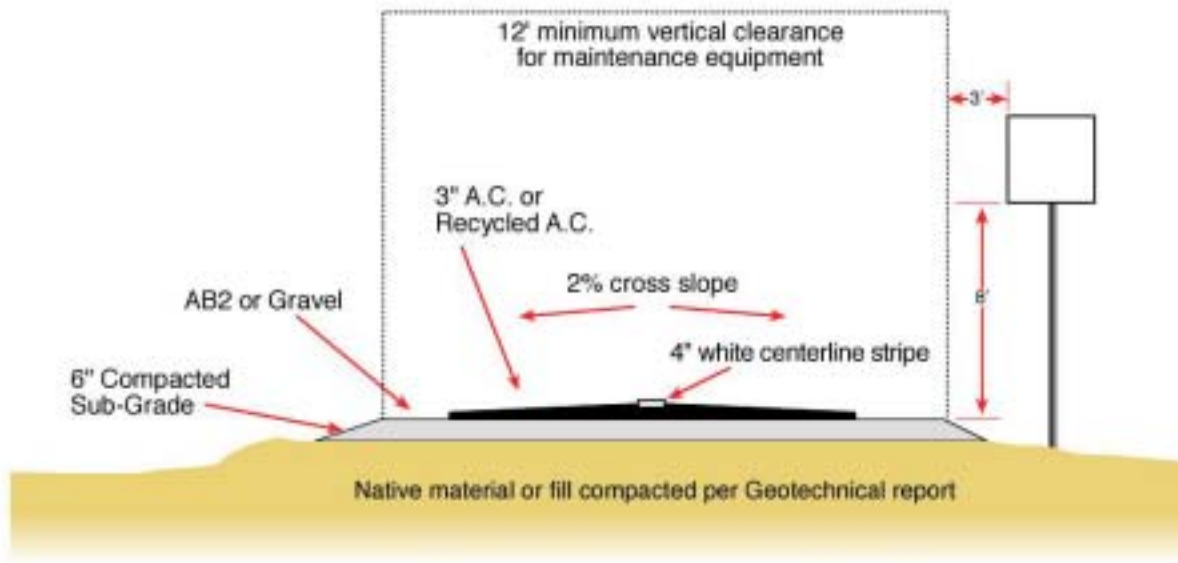
Bike Lane



Shared Roadway



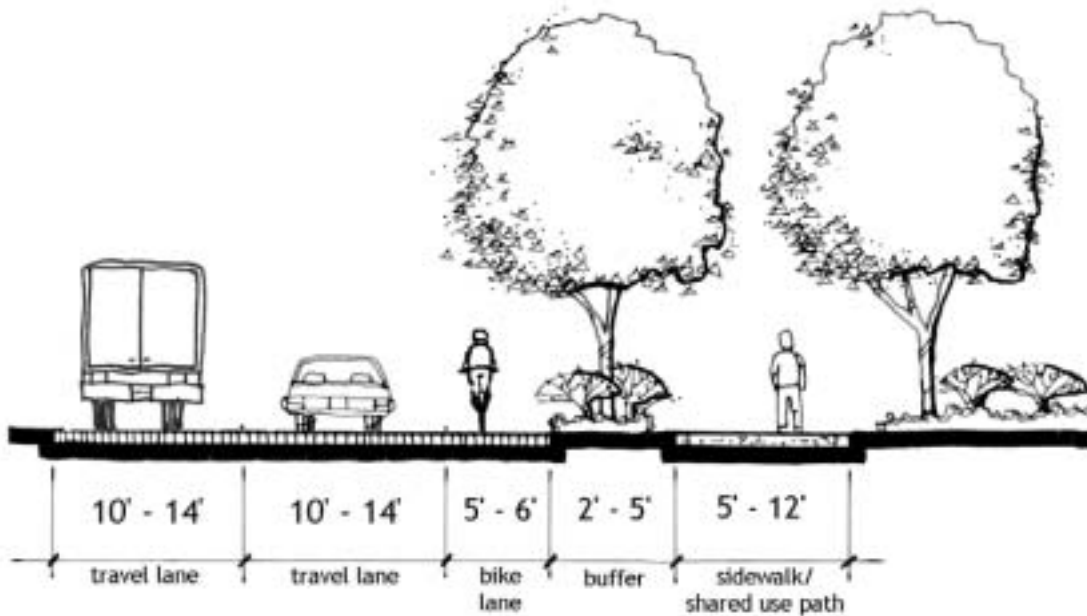
SHARED USE PATH STANDARDS



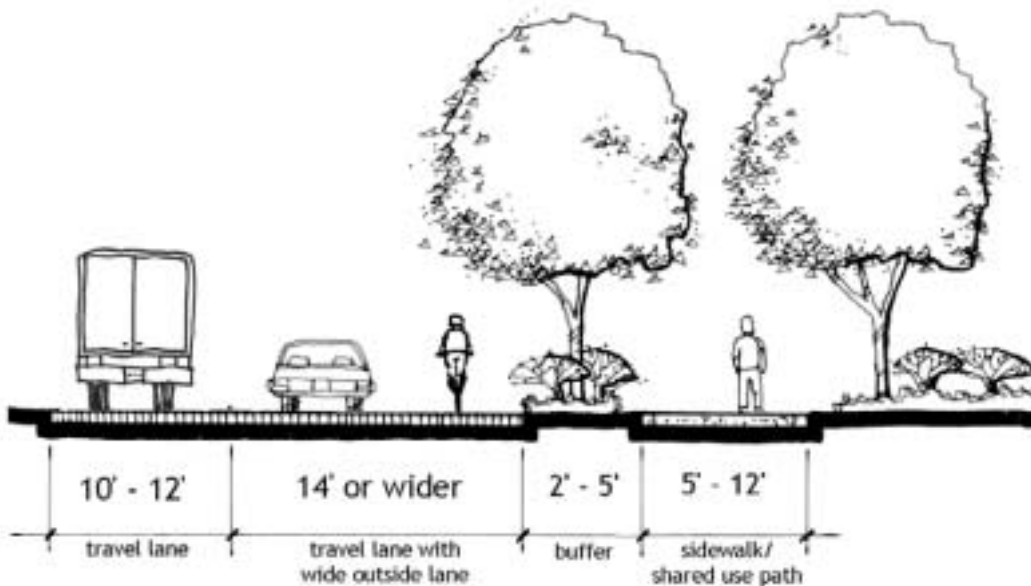
Implementation on Sloped Ground

Shared use paths are designed for two-way bicycle and pedestrian travel, typically have their own right-of-way, and are designed to accommodate maintenance and emergency vehicles.

SIDEWALK AND BUFFER WIDTHS



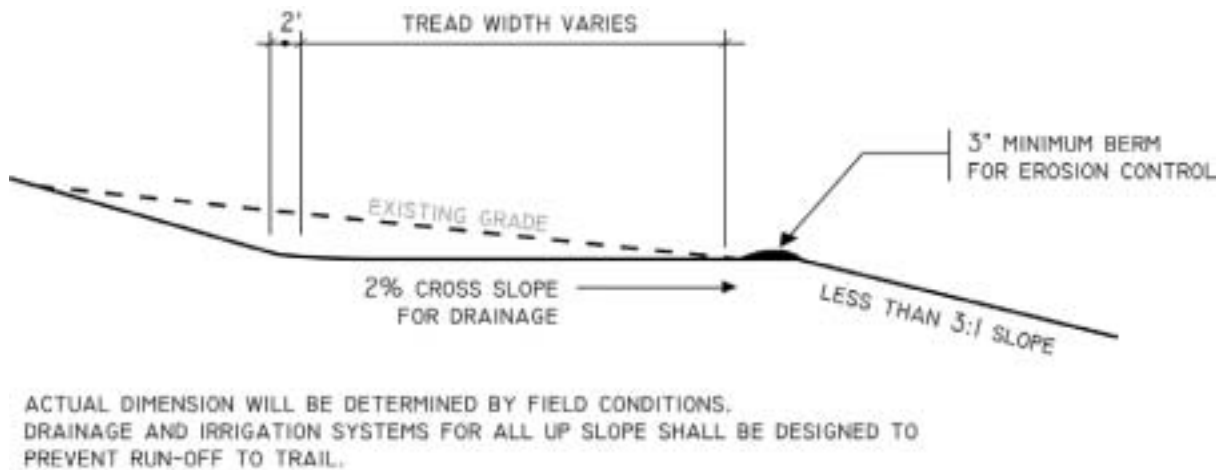
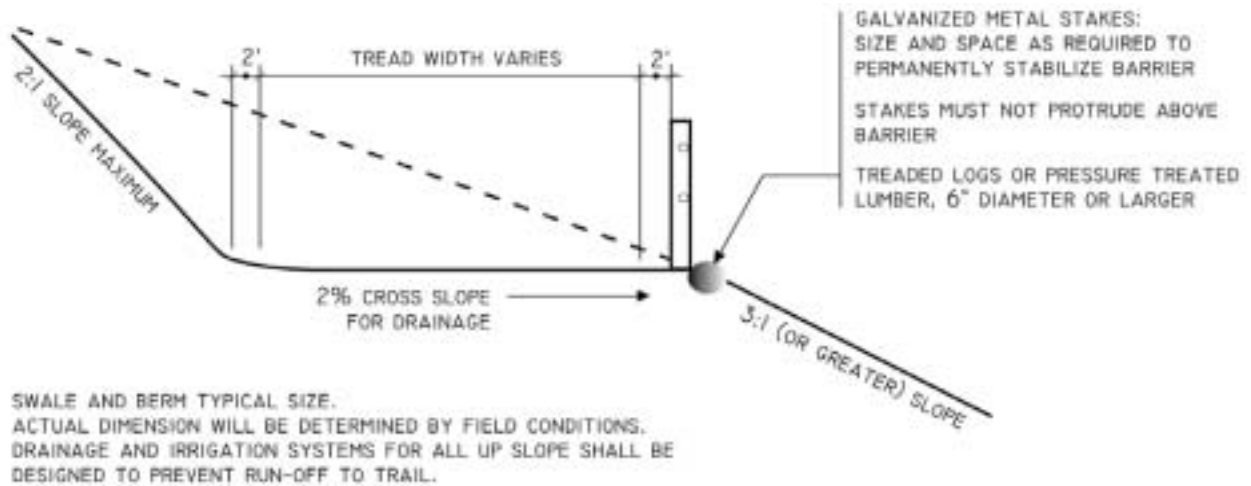
On roadways with 3,000 ADT or higher, bicycle lanes should be used to improve bicyclist safety and comfort. A buffer or curb must separate the shared use path or sidewalk from the roadway for pedestrian safety. The width of the bicycle lane, buffer, and sidewalk or shared use path should appropriately reflect the volume and speed of the vehicles using the roadway. Roadways with higher traffic volumes and speeds should have wider bicycle and pedestrian facilities.



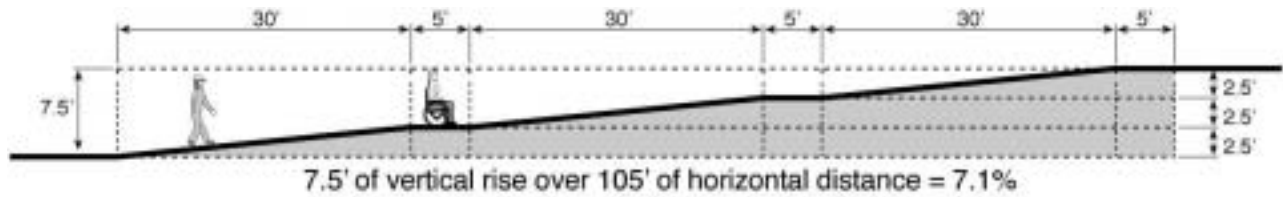
Pedestrians should be separated from low volume roadways by a curb if there is insufficient space for a buffer. The width of the sidewalk or shared use path should depend on the traffic volume, traffic type, and speeds of the adjacent roadway: higher volumes and speeds warrant wider facilities.

TRAILS ON STEEP SLOPES

Trails can vary in width depending on the existing topographic and environmental constraints. They should take into account issues like drainage, erosion, slope/grade, presence of waterways, vegetation, riparian and habitat areas, environmental requirements and regulations, and others. Areas with earthen walking trails (i.e., parks and natural areas) should have a complimentary accessible route that meets or exceeds ADA standards in addition to the earthen walking trails. Trail width will depend on intended users. For example, narrower widths (2 ft – 6 ft) would be used in an environmentally constrained area with only pedestrian uses intended. Wider widths (8 ft +) would be desirable for shared use with bicycles and other trail users.



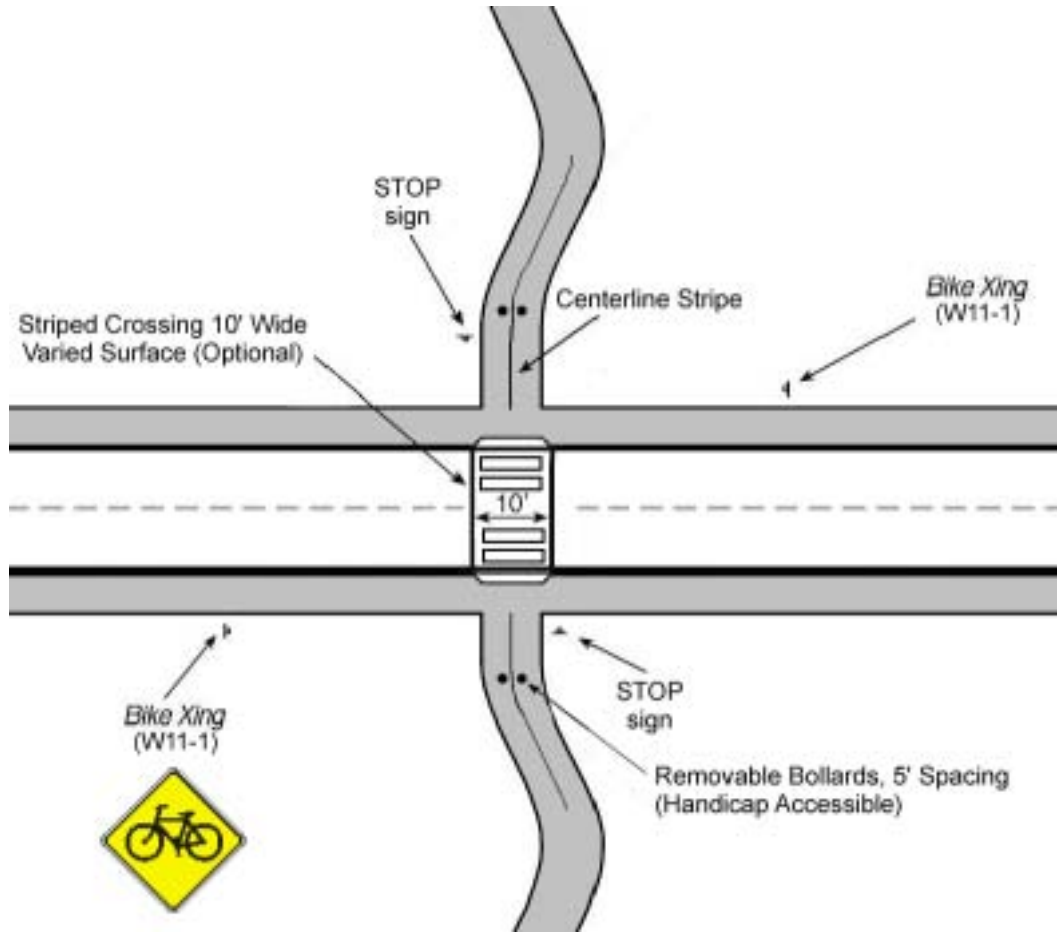
ACCESSIBLE RAMP ACCESS STANDARDS



State and local governments, regardless of whether they receive federal funds, are required to comply with the Federal ADA Accessibility Guidelines (ADAAG) or local code, whichever provides the greatest access. Privately funded improvements are required to comply with whichever code offers the greatest access or protections to individuals with disabilities.

Any part of an accessible route with a slope greater than 1:20 (5%) shall be considered a ramp, and the least possible slope shall be used for any ramp. A maximum grade of 1:12 (8.33%) is acceptable for a rise of no more than 0.75 m (2.5 ft) if a level landing at least 1.5 m (5 ft) long is provided at each end. Cross slope of ramps should be 1:50 (2%) or less.

TRAIL CROSSINGS: TYPE 1 - UNPROTECTED

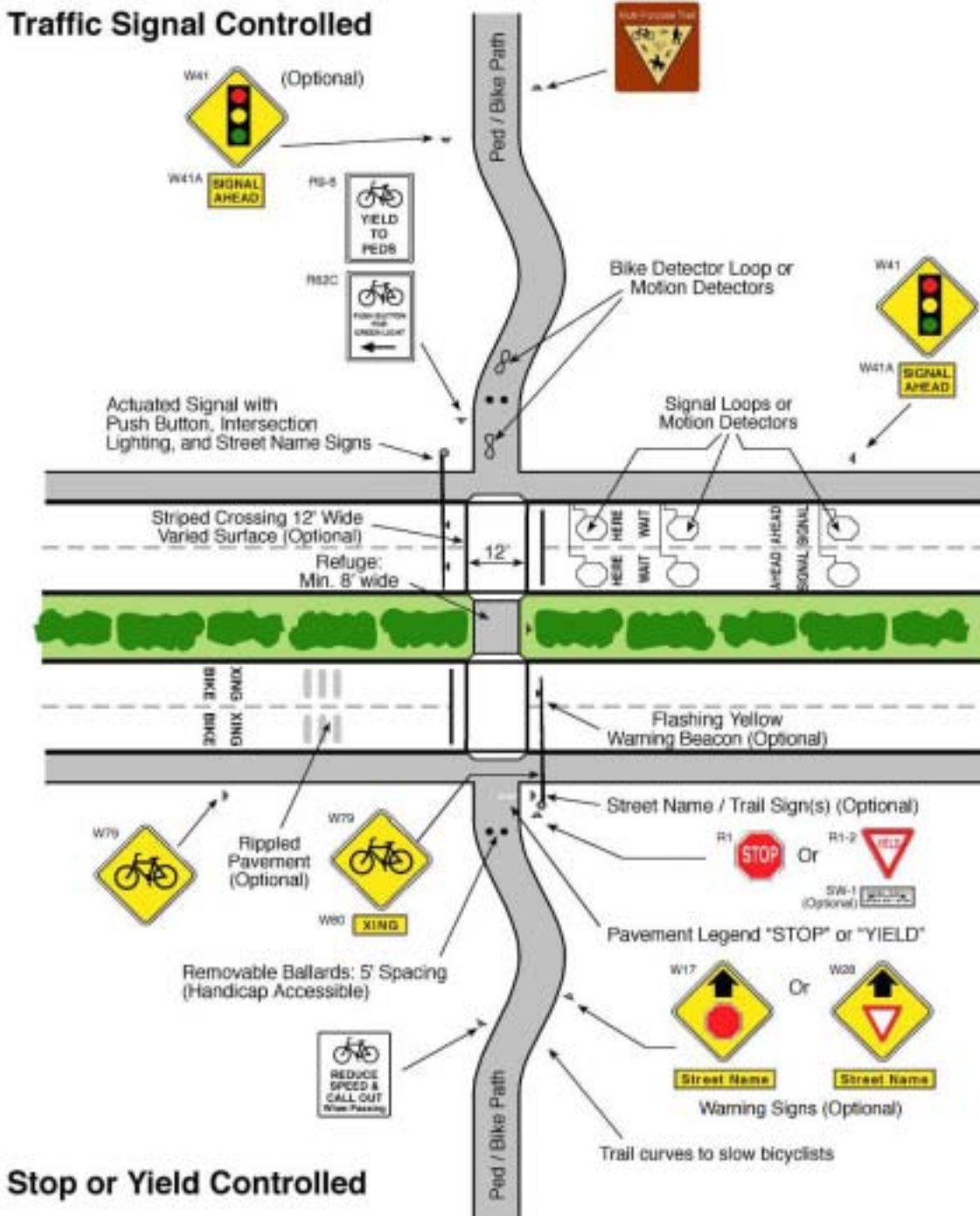


An unprotected crossing (Type 1) consists of a crosswalk, signing and often no other devices to slow or stop traffic. The approach to designing crossings at mid-block locations depends on an evaluation of vehicular traffic, line of sight, trail traffic, use patterns, vehicle speed, road type and width and other safety issues.

TRAIL CROSSINGS: TYPE 2 - DIVERT TO EXISTING SIGNAL

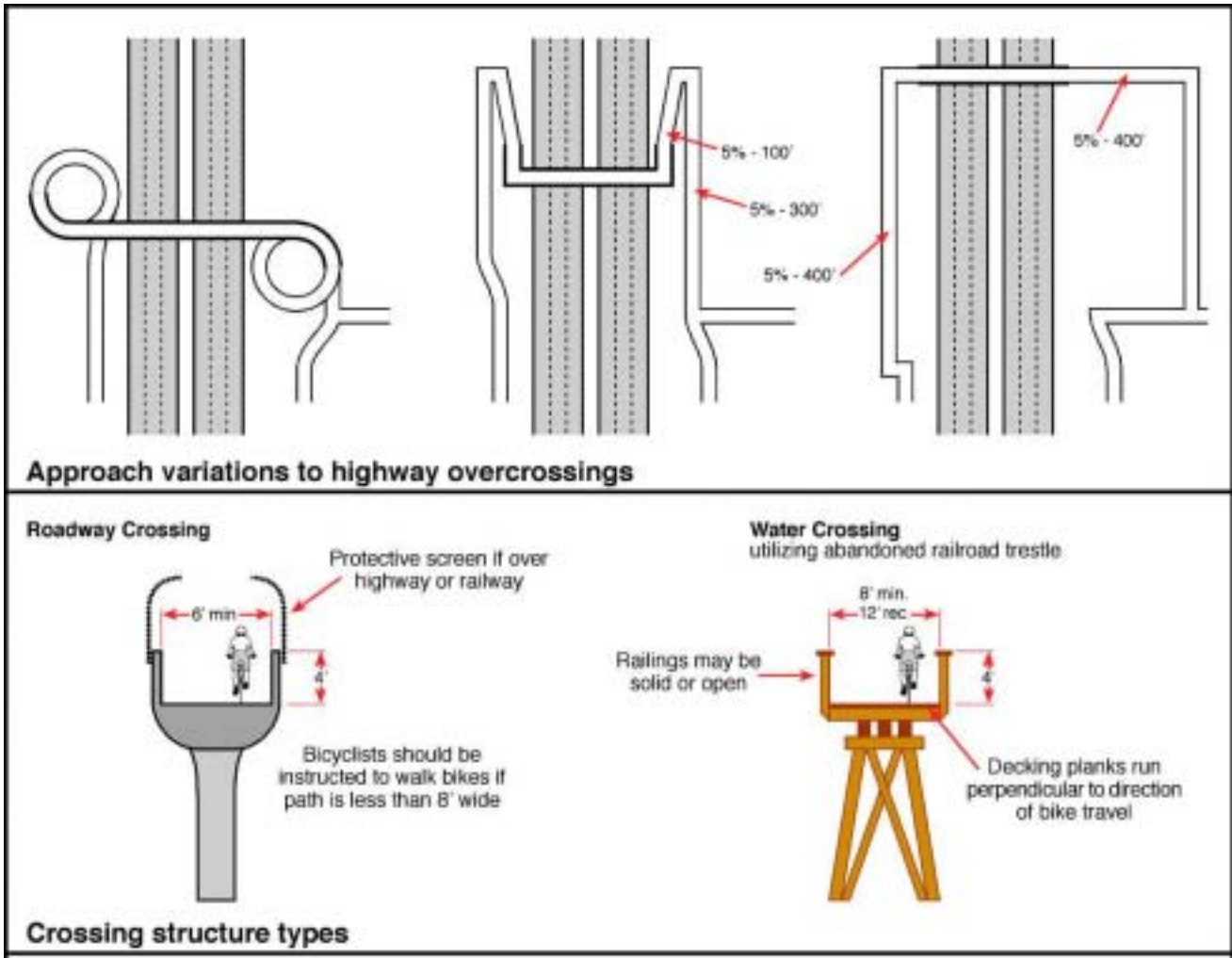
Crossings within 250 feet of an existing signalized intersection with pedestrian crosswalks are typically diverted to the signalized intersection for safety purposes. For this option to be effective, barriers and signing may be needed to direct trail users to the signalized crossings. In most cases, signal modifications would be made to add pedestrian detection and to comply with the ADA. Trail users have a tendency to cross at an unmarked trail intersection when formal trail crossings are located further than 250 feet.

TRAIL CROSSINGS: TYPE 3 - NEW SIGNAL



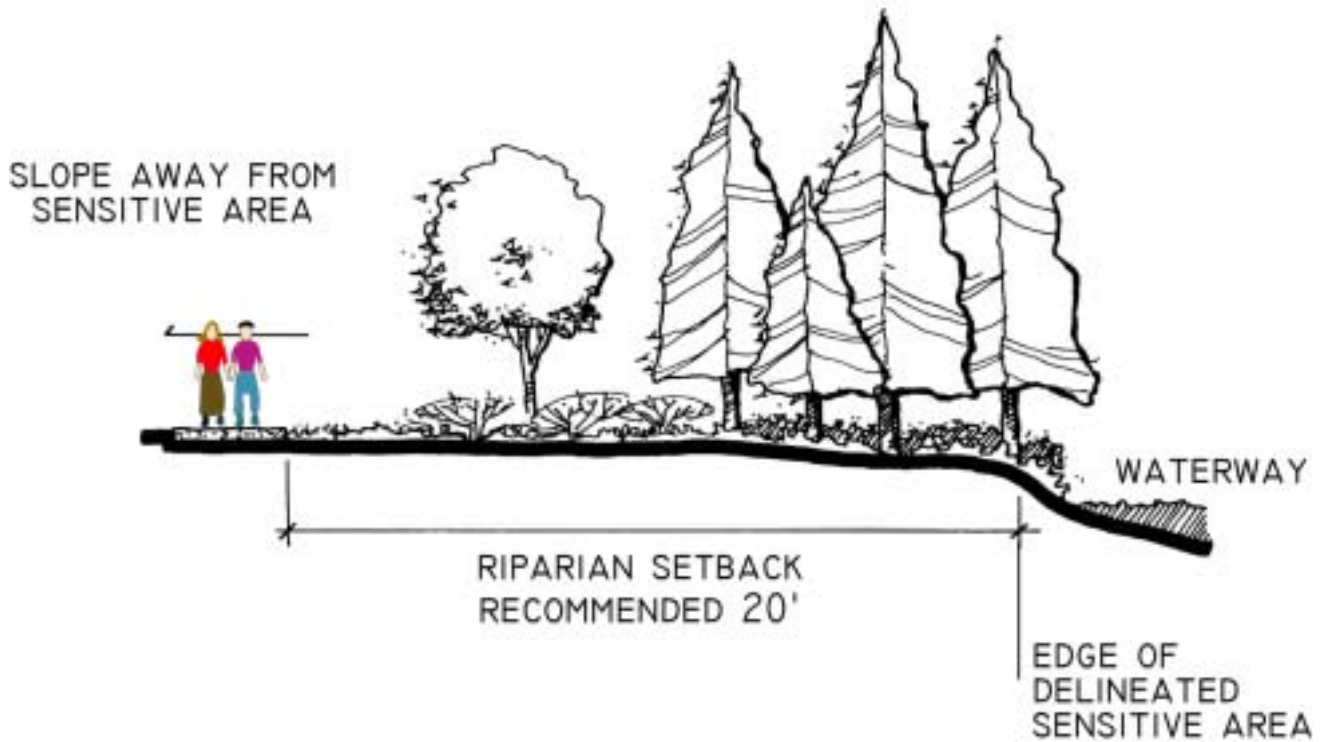
Signalized crossings (Type 3) are recommended for crossings more than 250 feet from an existing signalized intersection and where 85th percentile travel speeds are 40 mi/h and above and/or ADT exceeds 15,000 vehicles. Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity and safety.

TRAIL CROSSINGS: TYPE 4 - GRADE-SEPARATED



Grade-separated crossings (Type 4) are typically used to cross major barriers like waterways, highways, and railroad tracks. Overcrossing clearances and setbacks are usually dictated by the owner of the property being crossed. Grade-separated crossing ramp approaches can be land intensive and expensive due to ADA accessibility requirements. If grade-separated crossings are not ADA accessible, they should provide amenities for bicyclists and pedestrians, like lighting, wheel gutters for bicycles, and handrails.

SHARED USE PATH ADJACENT TO ENVIRONMENTALLY SENSITIVE AREA



TRAIL LANDSCAPING AND REVEGETATION

Trailside landscaping and revegetation should consist of trees, shrubs, and groundcovers from the Portland Plant List, a compilation of native plant species by habitat types recommended by the City of Portland. The information on habitat types is intended to provide general guidance for appropriate planting locations; certain plants, however, have highly specialized habitats which may make them appropriate for use only in specific areas of the City. For this reason, it may be helpful to consult with Bureau of Planning staff, local botanists or published sources when preparing a planting plan.

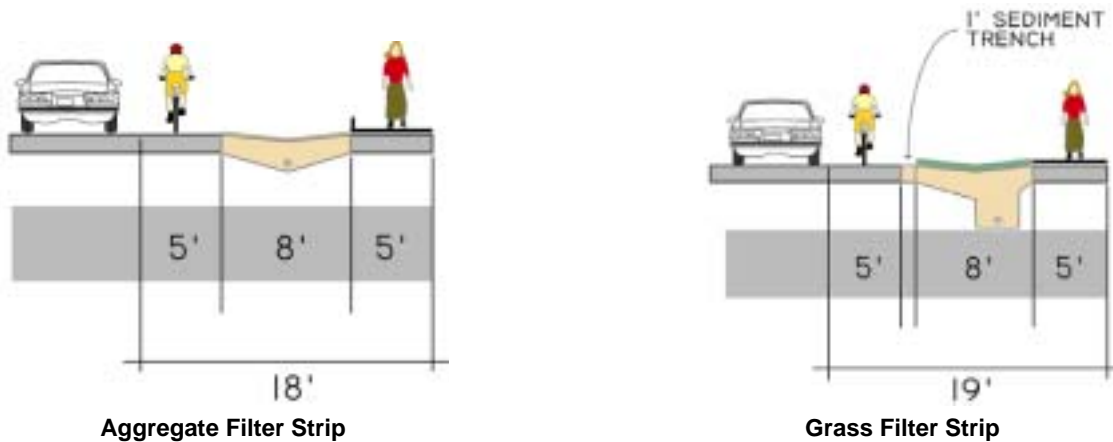
Trails established on the Bluff should use plants from the native plant community “Mixed Deciduous Forest, Steep Dry Slope.” These slopes are typically well-drained, exposed southern slopes consisting of a predominate mixture of deciduous trees with scattered conifers. Restoration work should largely focus on the removal and control of non-native species and release of existing native species. Native tree and shrub plantings should occur at the base of slope transitioning to grasses at the top of slope in order to reduce fire danger and preserve existing river views.

Trails established close to the Willamette River should use plants from the habitat type “Riparian”. These areas are located in the Greenway Overlay Zone and should follow the conditions of development in Chapter 33.440 of the City Zoning Code.

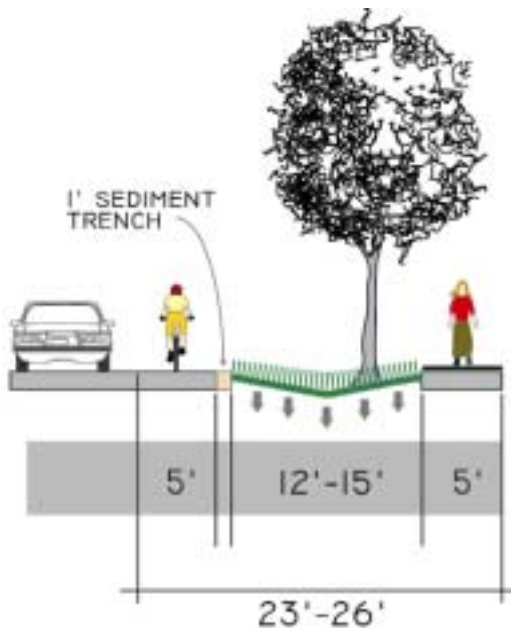
GREEN CONCEPTS FOR TRAILS AND SIDEWALKS

Filter strips and bio-swales are innovative ways to retain and treat stormwater from impervious surfaces. The design guidelines for filter strips and swales are similar; both methods use grassy vegetation or aggregate to remove sediment from stormwater runoff. Use of filter strips and swales can be limited in retrofit situations due to slope, soil, and right-of-way conditions. Existing underground utility conflicts may increase cost and complexity.

Filter strips are gently sloped grassy and aggregate areas that are used to treat small quantities of sheet flow runoff. They are often used to pretreat flow of minimal depth (.5 inches) as it passes from an impervious area into a swale or infiltration area.



Swales are shallow, wide depressions adjacent to roadways and trails that collect stormwater runoff over vegetation to slowly settle sediments and particulate matter. The pollutants are filtered out, settled, or removed by plants, causing fewer pollutants to enter ecologically sensitive water bodies. For more information and general design guidelines for swales and other Green Street concepts, consult Metro’s “Green Streets” handbook.



Bio-Swale Guidelines	
Optimal Length	200-250 ft
Slope of sides (optimal)	1% - 2%
Slope of sides (minimum, maximum)	1%, 6%
Optimal water depth	3 inches
Optimal width	12 ft

Bio-Swale



+ Opportunities

- Constraints

+ BES revegetation area

- Railroad crossing issue

+ Bike lanes funded, potential path

- Private property/ Access issues
Railroad crossings

+ Potential fish habitat in lagoon

+ Wide planting strip on Basin Ave.

+ BES-owned property: potential park/trailhead

+ Beach access

- Access issues

+ Potential trail extension

+ Portland Harbor Industrial Lands Study Underway

Wide roadways with high travel speeds

Waud Bluff Trail

Lagoonside Trail

Lagoonside Trail

Railroad Trail

Landfill Trail

Willamette Greenway Trail

River to Lagoon

N BASIN AVE

N PORTLAND BLVD

N AINSWORTH ST

N KILLINGSWORTH ST

N GREELEY AVE

N BASIN AVE

N LAGOON AVE

N CHANNEL AVE

N BALLAST ST

N COMMERCE ST

WILLAMETTE RIVER

N INTERSTATE AVE

N Prescott St Station

N Killingsworth Station

N Portland Bl Station

Swan Island Pump Station Under Construction

New Sidewalk & Crossing

New Sidewalk

New Sidewalk

New Crossing & Sidewalk

Safety Railing

3

2

4

5

1

RR Crossing

Implementation Measures										Trail Costs
Description	Plan	Acquisition/Easement	Right-of-Way Improvement	Other	Crossings	Length (miles)	Ease of Implementation	Lead Responsibility	Priority	Trail Costs
Eliminate the on-street parking lane and shift the travel lanes and bicycle lanes to the north to create an 8 ft shared use path.	None	None	Add shared use path and curb, restripe roadway. Add curb cuts at transit stops.	Scenic pullouts and interpretive areas	Type 1	1	Easy/Moderate	Portland Office of Transportation, TriMet, Bureau of Environmental Services, Neighborhood Associations	Low	\$191,000
Eliminate the on-street parking lane and shift the travel lanes and one bicycle lane to the north to create a 10 ft shared use path with a 3 ft buffer.	None	None	Add shared use path and curb, plant buffer, restripe roadway. Add curb cuts at transit stops.	Scenic pullouts and interpretive areas	Type 1	1	Easy/Moderate	Portland Office of Transportation, TriMet, Bureau of Environmental Services, Neighborhood Associations	Low	\$237,600
Trail would follow the best alignment from the boat launch to N. Ensign. Trail would use existing facilities on N. Ensign and provide an on-street connection to the Willamette Greenway Trail.	None	Easements w/ ATC, Watumull	None	Flood plain, riparian zone	None	0.6	Moderate	Port of Portland, Bureau of Environmental Services	High	\$150,000
Trail would continue from N. Ensign to the Waud Bluff Trail along the Lagoon.	None	Easements w/ Marine Salvage Consortium, USMC, USCG, Union Pacific	None	Flood plain, riparian zone	None	0.5	Difficult	None	High	\$125,000
A 6 ft sidewalk with a 4 ft buffer would supplement existing 5 ft sidewalks and enable pedestrians to access businesses and transit stops on the south side of the roadway. Add 1 ft to existing sidewalk.	TSP: City Bikeway, City Walkway	None	Add 6 ft sidewalk (south), add 1 ft sidewalk (north)	None	Multiple driveway crossings	1	Easy	City of Portland	Medium	\$142,064
A 10 ft shared use path with a 2 ft buffer on the south side of N. Basin would provide bicyclists and pedestrians with an off-street travel option and connect directly to the Waud Bluff Trail. Add 1 ft to existing sidewalk.	TSP: City Bikeway, City Walkway	None	Add 10 ft shared use path, plant buffer, add 1 ft sidewalk (north)	Relocate street lighting	Multiple driveway crossings	1	Moderate/Difficult	City of Portland	Medium	\$250,000
An 8 ft paved pathway would follow an existing earthen trail adjacent to the University of Portland property, cross the UP railroad tracks with a grade-separated crossing and follow public right-of-way to Basin Ave.	TSP: Off-street path	Easement w/ Union Pacific, University of Portland (unknown)	None	Steep slope, erosion concerns	Type 4 overcrossing	0.25	Easy/Moderate	Swan Island TMA, Bureau of Environmental Services, Port of Portland	High	\$199,000
Trail would travel on the Port of Portland property along an unused railroad track to the Union Pacific railroad tracks and the Landfill Trail.	None	Easement w/ Union Pacific, Freightliner, PGE	None	None	Type 4 overcrossing, Type 3 demand signal	0.25	Difficult	City of Portland, Port of Portland, Bureau of Environmental Services	Low	\$35,640

Projects		Implementation Measures								(Excluded)
Description	Plan	Acquisition/Easement	Right-of-Way Improvement	Other	Crossings	Length (miles)	Ease of Implementation	Lead Responsibility	Priority	Trail Costs
Trail would switchback through Landfill Park and traverse the hillside to a private parking lot and N. Cutter Circle.	None	Easement w/ Rosan, Inc.	None	Steep slope	None	0.5	Moderate/Difficult	Bureau of Environmental Services, Port of Portland	Medium	\$1,478,400.00
The route would leave the parking lot on the Rosan's property and follow N. Cutter Circle to N. Leverman and utilize an existing bridge to cross the Union Pacific railroad tracks to N. Basin.	None	None	Narrow travel lanes to 11 ft and add a 12 ft shared use path with a 2 ft buffer	None	None	0.75	Easy	City of Portland	Medium	\$31,000
Trail would switchback through Landfill Park and traverse the hillside to a grade-separated crossing of the Union Pacific railroad tracks and utilize public right-of-way on N. Emerson to N. Basin Ave.	None	Maybe UPRR and Freightliner (space for grade-separated crossing)	Add 6 ft sidewalk to one side of the road	Steep slope, may not be able to meet ADA	Type 4 overcrossing	0.57	Moderate/Difficult	Bureau of Environmental Services, Port of Portland	Medium	\$1,600,000.00
Trail would utilize extra-wide public right-of-way for shared use paths on N. Channel, N. Lagoon, N. Ballast, and N. Commerce. A shared use path would connect the trails to the boat ramp through one of two private property parcels.	TSP: Off-street path; Willamette Greenway	Easement w/ Rosan, Inc. or Yost-Peterbuilt, and BES	Add 8-12 ft shared use path on N. Commerce, N. Channel, N. Ballast, and N. Lagoon	None	Type 1 (4)	0.97	Easy/Moderate	City of Portland, Bureau of Environmental Services	High	\$140,000
Trail would follow existing sidewalks on N. Going	TSP: City Bikeway, City Walkway	None		Add lighting	Type 1 +, high visibility crosswalk	0.7	Easy/Moderate	City of Portland	Low	n/a
Trail would follow the east side of N. Greeley	None	Easements w/ 9 residential private property owners, Union Pacific, Kaiser Permanente, Halton Co.	Add 10-12 ft shared use path	Width constraints with steep slope, grade may not be able to accommodate ADA without ramping	Type 2 (2)	0.7	Easy/Moderate	City of Portland	Low	\$870,000

TRAIL PROJECTS

Project 1: Willamette Bluff Trail



Project 1: Willamette Bluff Trail

Description

The primary concept for the Willamette Bluff Trail is to create a visually appealing and functional promenade for pedestrians and bicyclists. The promenade would highlight spectacular views of downtown Portland, Forest Park, and the Willamette River, and provide a safe and efficient connection to North Portland neighborhoods. The promenade design can be achieved within existing paved right-of-way by eliminating the on-street parking lane and shifting the travel lanes to the north to create bicycle and pedestrian space on the river side of the roadway.

Option 1 keeps both existing on-street bicycle lanes for commuter cyclists and creates a paved path intended for two-way pedestrian travel. While bicycles are not prohibited from using the path, they should be encouraged to use the on-street facilities to mitigate conflict.

Option 2 eliminates the east/southbound bicycle lane and creates a 10 ft shared use path with a 3 ft vegetated buffer intended for two way pedestrian travel and one-way bicycle travel. Alternatively, the buffer could be reduced to 2 ft to create an additional foot of pathway.



Willamette Blvd. looking east from the University of Portland

Type/Width	Length
Paved shared use path / 8 - 10 ft	1.5 miles: from University of Portland to the Landfill Trail

Habitat

Medium to heavy development adjacent to steep bluff with southern exposure. Some mature Western Red Cedar, Douglas Fir; and oak.

Ownership

City of Portland

Key Land Uses / Destinations

Serves residents in the University Park, Arbor Lodge and Overlook neighborhoods; access to downtown Portland, Adidas Village, and Interstate MAX; access to employment on Swan Island and the Willamette River.

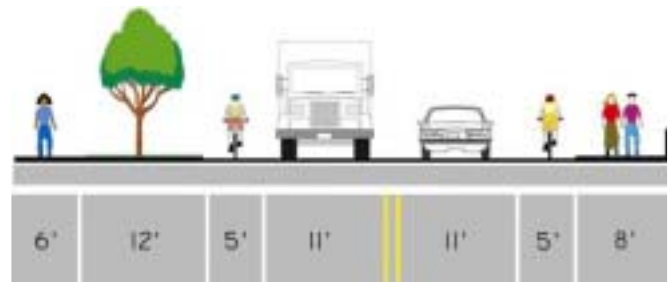
Issues

⚠️ Loss of on-street parking may affect some residential properties

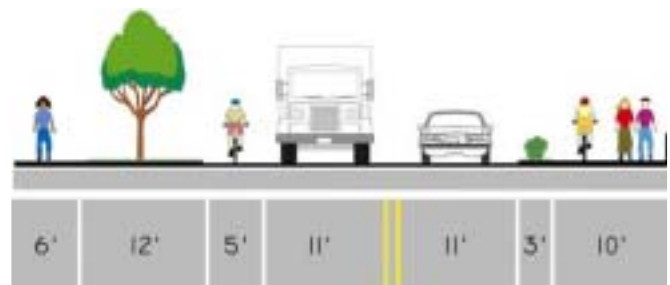
⚠️ Option 2 may be confusing for bicyclists and may foster user conflict due to two way bicycle travel.

Planning-Level Cost Estimate

\$250,000 - \$400,00



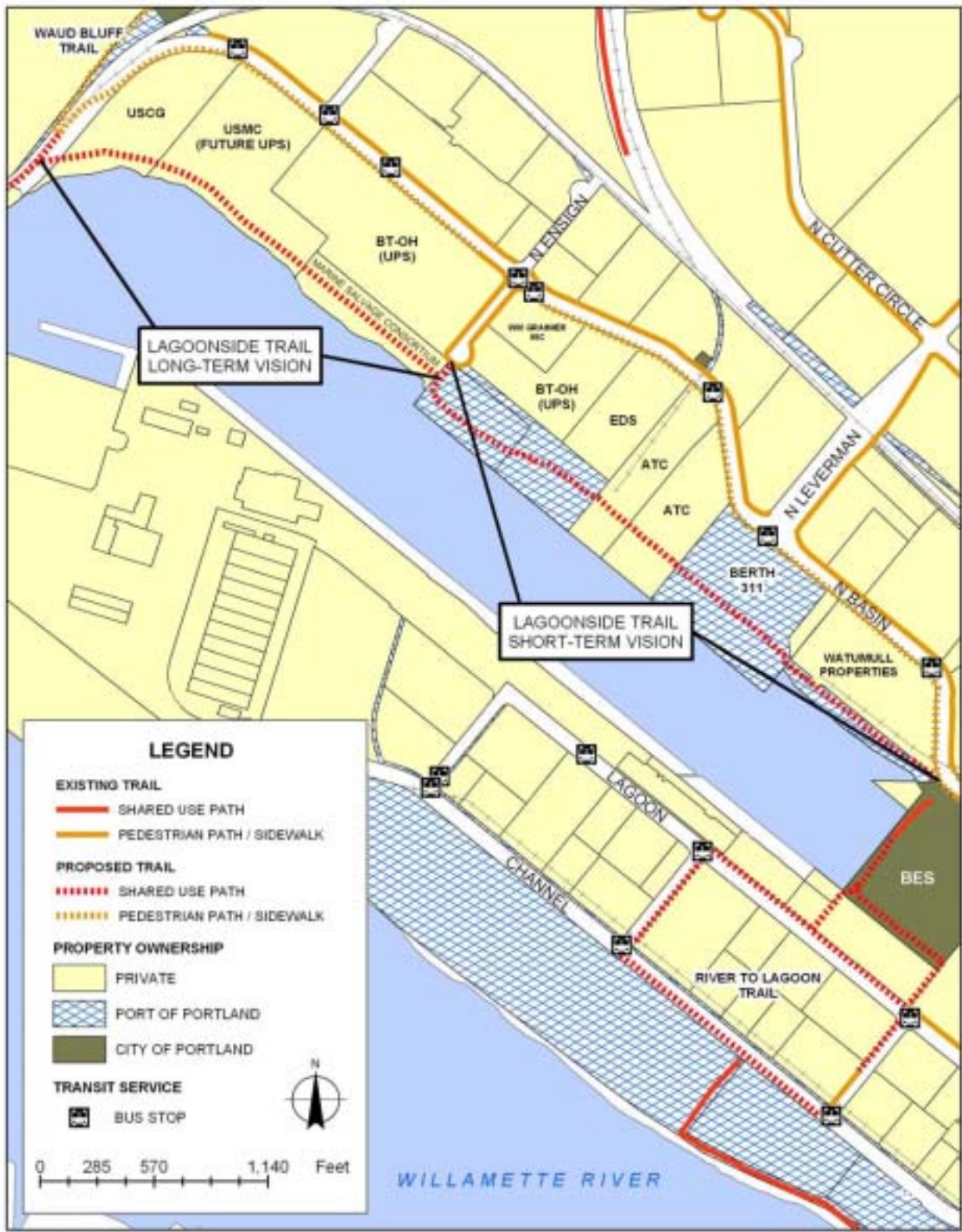
Option 1: Eliminate on-street parking lane and create an 8 ft sidewalk / shared use path on the river side of the roadway.



Option 2: Eliminate on-street parking lane and create a 10 ft shared use path with a 3 ft vegetated buffer.

Both design options provide full access to the existing bus stops and have the potential to use the natural shelf on the bluff for scenic and/or interpretive pullouts and viewpoints. Existing lighting and power poles do not need to be relocated, except to integrate pedestrian-scale, historically accurate luminaries.

Project 2: Lagoonside Trail



Project 2: Lagoonside Trail

Description

A shared use path would run along the north side of the Swan Island Basin Lagoon. This trail would be part of the larger Willamette Greenway trail system and is presented in two phases: short-term (within 10 years) and long term (10+ years).

The short term trail would travel northwest from the boat launch parking lot adjacent to the BES property to N. Ensign. The trail would terminate at the N. Ensign cul-de-sac due to the number of property, security, and land use conflicts beyond. The proposed short term sections of trail would take advantage of Port of Portland parcels and the public right-of-way on N. Ensign.

The long term trail would continue along the edge of the lagoon to the intersection with the Under Bluff Rail-with-Trail (Willamette Greenway Trail) and the Waud Bluff Trail.



Looking across the Lagoon to where the trail would travel

Type/Width	Length
Paved shared use path / 8 - 12 ft	.60 miles

Habitat

Riparian area adjacent to primary waterway: riprap, pylons, docking. Mature cottonwoods and small mammals present.

Ownership

Short Term: Port of Portland, ATC (Land o' Lakes, Lynden Farms, etc.); **Long Term:** United States Government (USCG and US MC/Navy), Fred Devine Diving and Salvage

Key Land Uses / Destinations

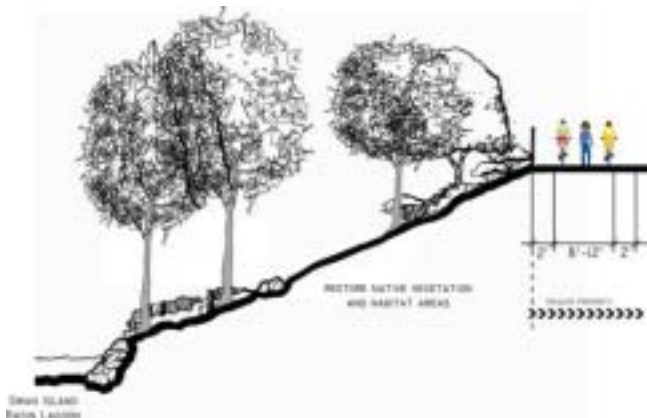
A planned section of the future Willamette Greenway serving local and regional residents; provides access for Swan Island employees and would be a traffic-free alternative to riding and walking on N. Basin.



Bank constraints near N. Ensign (Port property)

Issues

- | | |
|--|---|
| <ul style="list-style-type: none"> ⚡ Located below 100 year floodplain ⚡ Conflicts with "river dependent" land uses (docks, machinery, etc.), access/security issues with US Government-owned parcels. ⚡ Flooding and maintenance issues ⚡ Easements needed for private property | <ul style="list-style-type: none"> ⚡ DSL/Corp impacts ⚡ ESA fish and river issues ⚡ Port of Portland is not supportive of a trail in this location "due to impacts to Port property at the Navigation Base, future potential industrial use at berth 311 and environmental impacts to wetlands adjacent to the City boat ramp" |
|--|---|

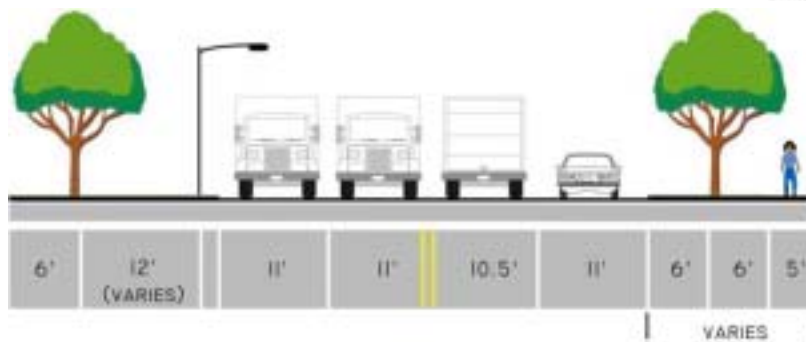


Top of bank trail alignment option

Planning-Level Cost Estimate

\$148,500 - \$173,500 + easement acquisition

Project 3: Basin Avenue



Project 3: Basin Avenue

Description

The existing public right-of-way on N. Basin is wide enough for additional sidewalks and bicycle lanes, but would require compromise on existing elements such as removing and replanting trees, relocating street lighting, and eliminating the vegetated buffer.

Option 1 proposes a 6 ft sidewalk and a 4 ft buffer on the south (river) side of N. Basin.

Option 2 proposes a 10 ft shared use path on the south side of the roadway and a 2 ft vegetated buffer. In this case, the street lighting would have to be relocated, either setback in line with the trees or moved to the other side of the road.

Type/Width	Length
Concrete sidewalk / 6 ft Asphalt shared use path / 10 ft	1 mile (N. Emerson to the cul-de-sac terminus)

Habitat

Heavy development. Wide vegetated planting strip with some newly planted young trees and mature oak trees.

Ownership

City of Portland

Key Land Uses / Destinations

A critical access route identified in Portland’s Transportation System Plan as a city bikeway, city walkway, and a community transit street on Swan Island.

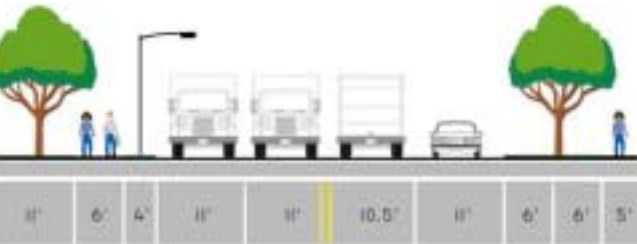
Provides access to employment in Mock’s Bottom, the Landfill Trail, the Railroad Trail, the Waud Bluff Trail, the Lagoonside Trail, the Willamette Greenway, and the northern part of the Island; TriMet bus stops on N. Basin.

Issues

⊘ Narrow travel lanes	⊘ Multiple driveway conflicts
⊘ High ADT (11,000), large proportion of truck traffic,	⊘ Limited options for on-street bicycle facilities without reducing freight capacity
⊘ “Free” right turn onto N. Leverman presents a serious conflict with bicyclists and pedestrians trying to cross N. Leverman,	

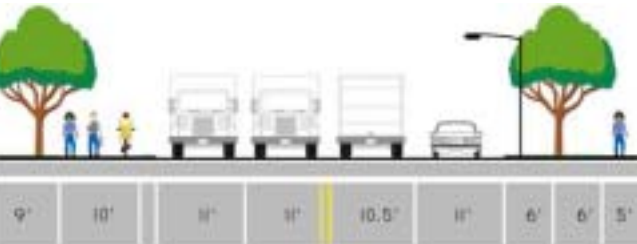
Planning-Level Cost Estimate

Option 1: \$145,000
Option 2: \$617,000



Option 1: Add 6 ft sidewalk and 4 ft buffer on south side of roadway

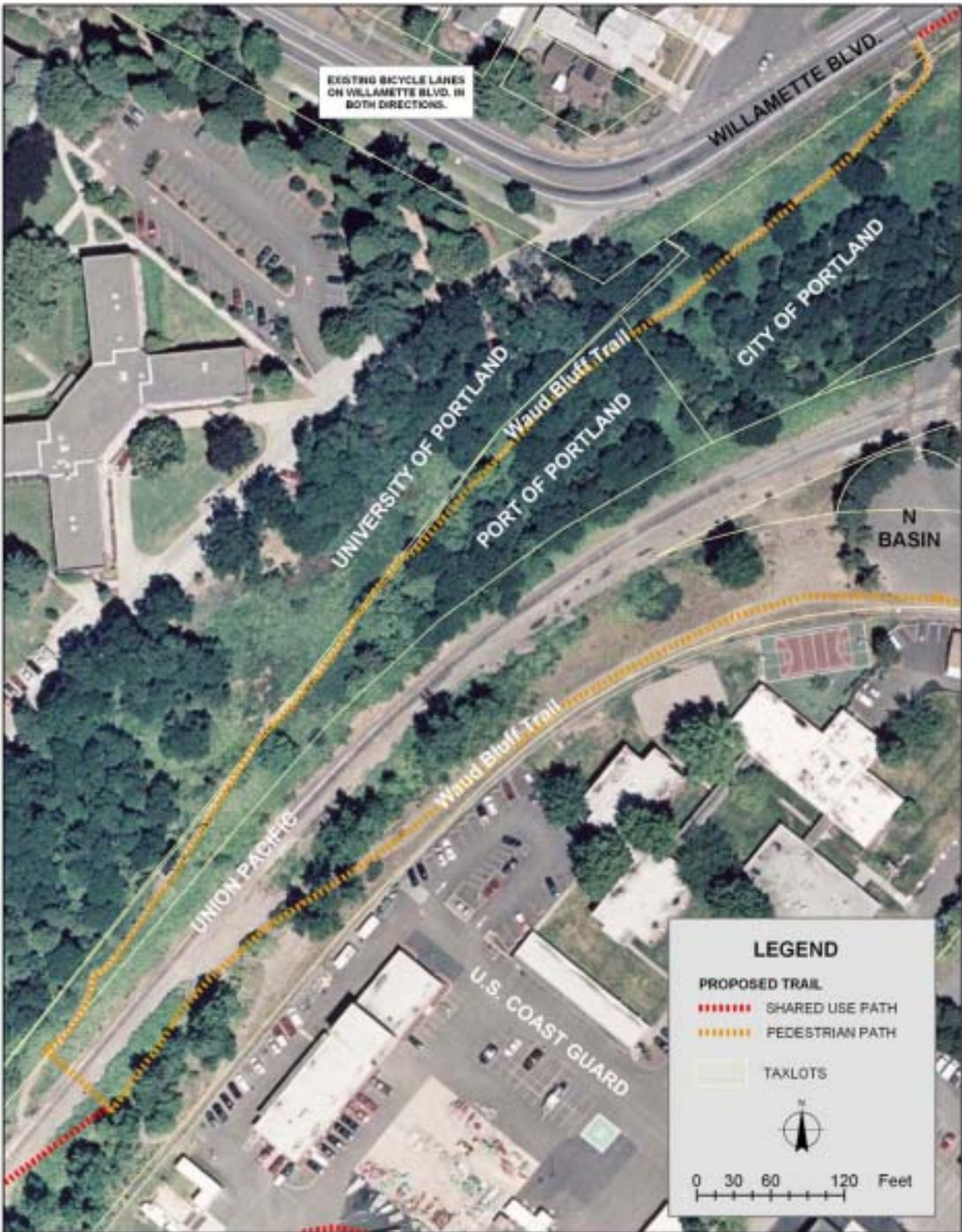
This option is the most cost effective by eliminating the need to remove trees and relocate the street lighting. This option does not directly provide facilities for bicyclists; a 6 ft sidewalk is too narrow to accommodate multiple users.



Option 2: Add 10 ft shared use path on south side of roadway; relocate street lighting to north side of roadway or set back with the trees on the south side of the roadway.

This option is allows excellent access on both sides of N. Basin but requires relocating the existing street lighting. The path would tie in with the Lagoonside Trail (short-term) at N. Ensign and provide direct access to the Waud Bluff Trail.

Project 4: Waud Bluff Trail



SOURCE: RLIS 2001

Project 4: Waud Bluff Trail

Description

The Waud Bluff trail travels from the Willamette Bluff down the hillside to the Union Pacific railroad tracks and then follows a vacated street right-of-way to N. Basin. The paved pathway would be considered a local access pedestrian pathway and though bicyclists would be allowed to access the trail, they would be encouraged to walk their bike.

The trail would not be ADA accessible. Due to the slope of the hillside, meeting federal ADA access requirements of 8.33% with minimum 5 ft landings every 30 ft would be feasible but very expensive.

Type/ Proposed Width	Length
Paved path / 8 ft	.25 miles

Habitat

Mixed Deciduous Forest, Steep Slope. Existing oak and madrone trees; poison oak. Recently cleared of invasive, non-native plants on top of the bluff. Southern exposure.

Ownership

City of Portland, Port of Portland, Union Pacific

Key Land Uses / Destinations

Serves residents in North Portland neighborhoods; provides direct access to the Willamette Greenway; provides excellent access from the Bluff to Swan Island employment centers, particularly those located on the northern part of the Island, like UPS and Freightliner.

Issues

- | | |
|---|---|
| <ul style="list-style-type: none"> ⚠ Paving the path may entice bicyclists to ride down the path at moderate/high speeds and may conflict with pedestrians. ⚠ A grade-separated crossing of the railroad tracks is needed; the grade-separated crossing would not be ADA accessible. ⚠ Steep slope may require special attention to drainage and erosion concerns. | <ul style="list-style-type: none"> ⚠ Some cut and fill and retaining walls may be necessary to maintain 8 ft clearance. ⚠ Final trail alignment will need to be situated on City and Port property or easements will need to be obtained from the University of Portland. |
|---|---|

Planning-Level Cost Estimate

\$320,000



A number of different users access Swan Island from the trail.

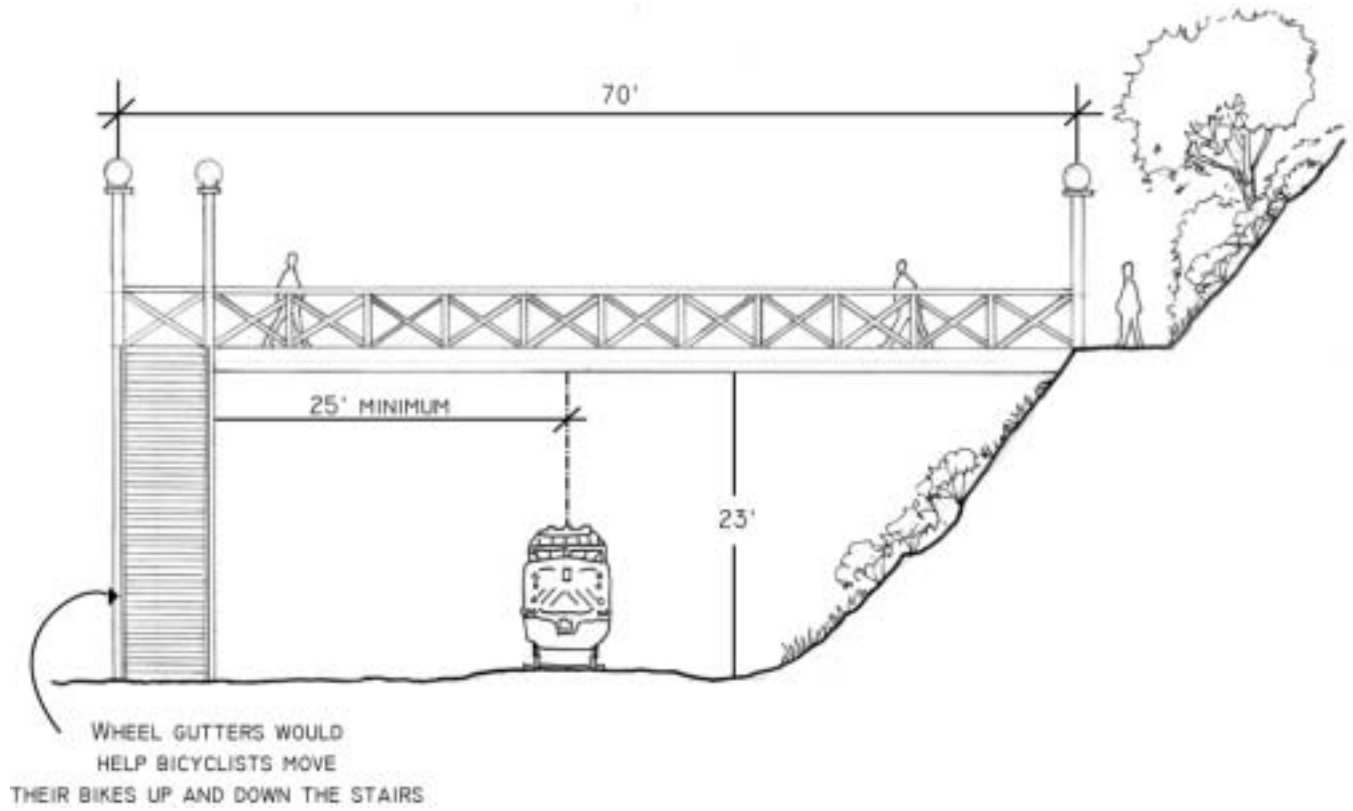


Looking down the Waud Bluff Trail from Willamette Blvd.



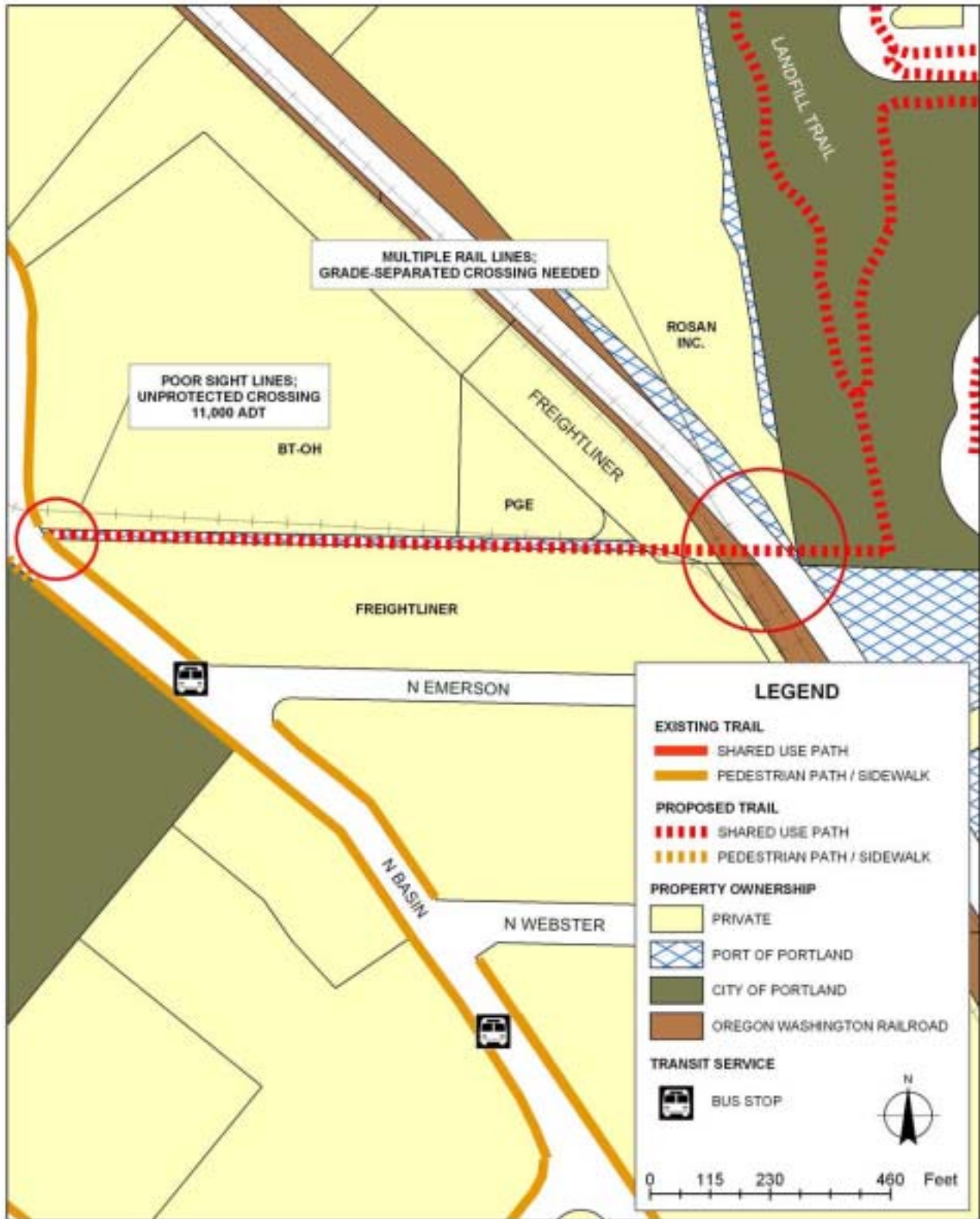
Proposed section view of the Waud Bluff Trail.

Project 4-X: Waud Bluff Trail: Railroad Crossing



Conceptual drawing of the grade-separated crossing of the Union Pacific Railroad for the Waud Bluff Trail. Grade-separated crossing is not ADA accessible.

Project 5: Railroad Trail



SOURCE: RUS 2001

Project 5: Railroad Trail

Description

This trail would provide direct access to Swan Island from the Willamette Bluff / Landfill Trail via a rail spur corridor that is presently not in use. The trail would follow the rail spur to its terminus at the Freightliner, Union Pacific and Oregon Washington Railroad properties and require a grade-separated crossing to access the Landfill Trail.

Type/Width

Shared Use Path / 12 ft
Paved or natural hard surface path / 6-8 ft

Length

.25 miles

Habitat

Heavy development: Non-pervious surface throughout.

Ownership

Port of Portland, Freightliner, Oregon Washington Railroad, Union Pacific Railroad, City of Portland
Adjacent property owners: Freightliner, BT-OH (UPS), Portland General Electric

Key Land Uses / Destinations

Provides a direct connection from the Willamette Bluff to N. Basin and employment centers on Swan Island; provides local residents access to the Basin Lagoon, Lagoonside Trail, and Willamette River Greenway.

Issues

- ⚠️ Difficult crossing of multi-party rail lines and properties.
- ⚠️ Safety issues exist due to the trail being fenced on both sides; isolated corridor.
- ⚠️ Requires grade-separated pedestrian crossing; meeting ADA access requirements would be very expensive and land intensive.
- ⚠️ Port of Portland is not supportive of a trail in this location "due to potential Rail/Pedestrian conflicts and potential security concerns, both for adjacent businesses and for potential trail users"
- ⚠️ Crossing at N. Basin is on an S-curve and would warrant a signalized, ped activated crossing; trail users will usually cross the street at that point rather than walk out of direction to a safer crossing.."

Planning-Level Cost Estimate

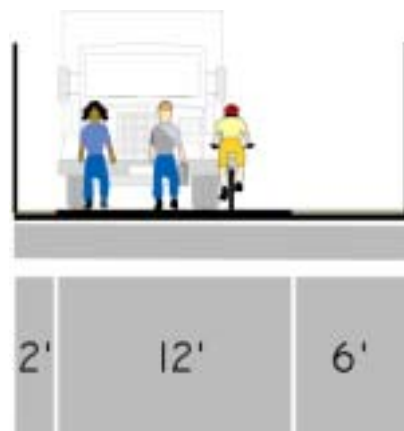
\$598,000



The railroad trail from across N. Basin



Looking east at the 20 ft Port of Portland right-of-way



Hard surface shared use path could be "shared" with service vehicles by providing a soft surface 6 ft shoulder for trail users to take refuge in when the vehicle passes.

Project 6: Landfill Trail	
Description	
<p>Option 1: A shared use path would provide access to N. Cutter Circle on Swan Island via "Landfill Park" and private property. The shared use path would follow existing hillside contours and use several long switchbacks to meet requirements. The trail would use existing facilities on N. Cutter Circle to connect to N. Basin.</p> <p>Option 2: A shared use path or pedestrian path would follow the hillside contours south to the Port of Portland property and cross the railroad tracks on a grade-separated bridge. The trail would connect to N. Basin within the public right-of-way on N. Emerson.</p>	
Type/Width	
Shared use path / 12 ft; closure of steep footpaths (2)	
Length	
Option 1: .50 miles Option 2: .57 miles	
Habitat	
Mixed Deciduous Forest, Steep Slope. Mature madrone and oak trees. Established as a restoration site by BES. Recently cleared of non-native plants by burning and chemical application.	
Ownership	
City of Portland (Bureau of Environmental Services), Port of Portland, Rosan, Inc.	
Key Land Uses / Destinations	
Serves residents in the University Park, Arbor Lodge and Overlook neighborhoods; provides access to the Willamette Greenway and to employment centers on Swan Island.	
Issues	
Option 1	Option 2
<ul style="list-style-type: none"> ⚠ The terminus of the trail on Swan Island is on N. Cutter Circle, requiring the trail to go through a parking lot on private property; ⚠ Easements will need to be negotiated with the property owners ⚠ Retaining walls will be necessary to cut into the side slope to maintain ADA accessible grade. 	<ul style="list-style-type: none"> ⚠ Retaining walls will be necessary to cut into the side slope ⚠ Requires grade-separated crossing over railroad tracks ⚠ Pedestrian facilities needed on N. Emerson
Planning Level Cost Estimate	
Option 1: \$1,485,000 + easement acquisition Option 2: \$1,600,000	



Wide shelf traversing the hillside in Landfill Park

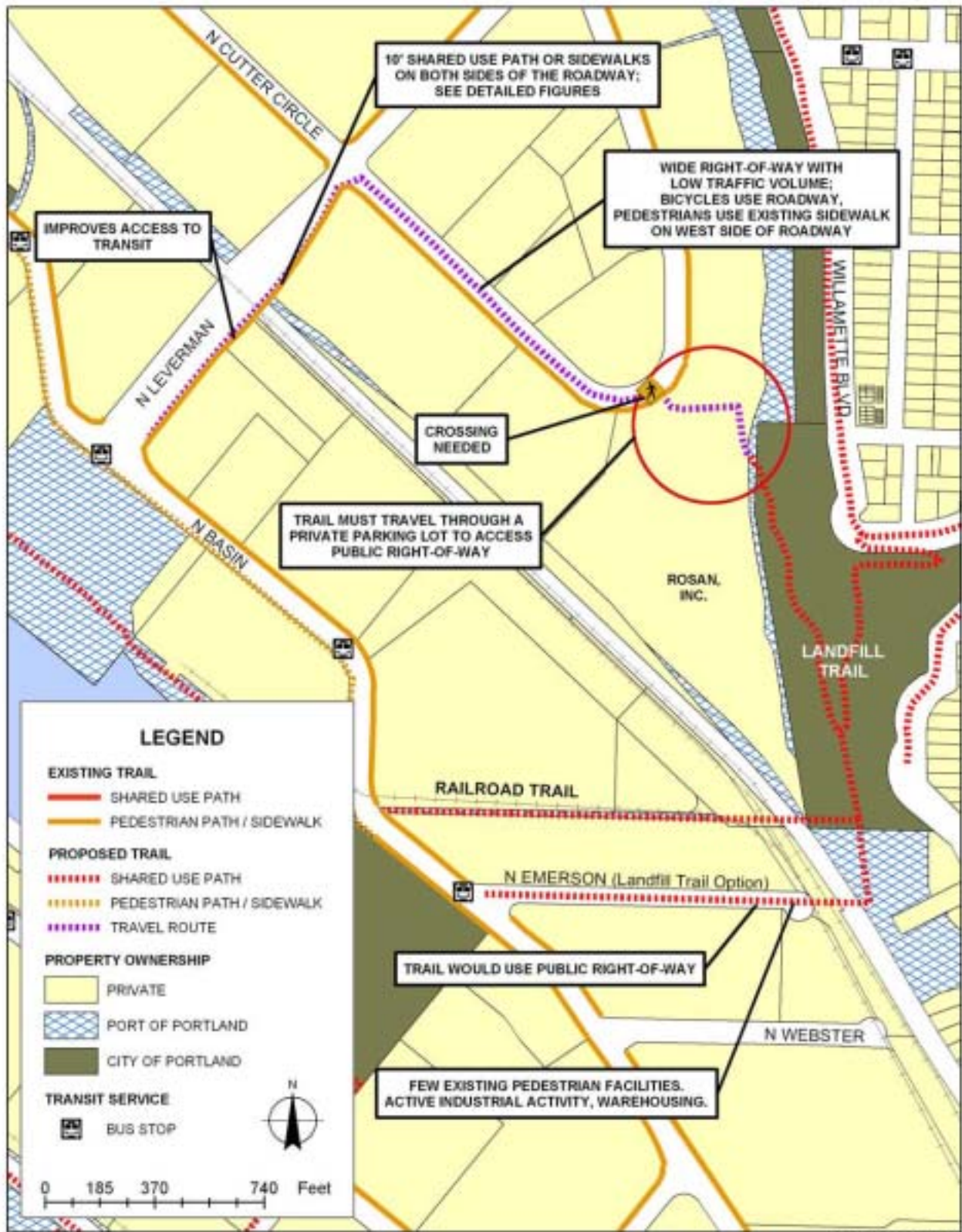


Demand footpath in Landfill Park

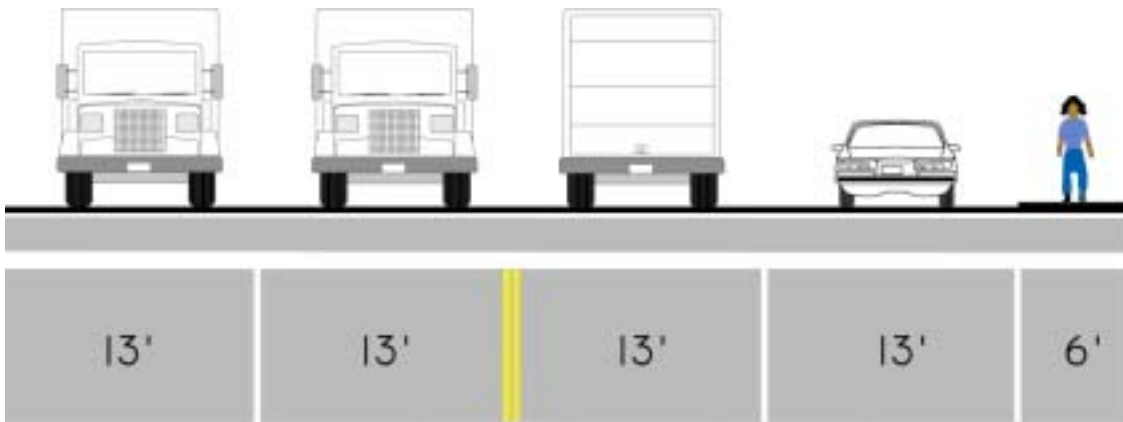


The most accessible demand trail in Landfill Park

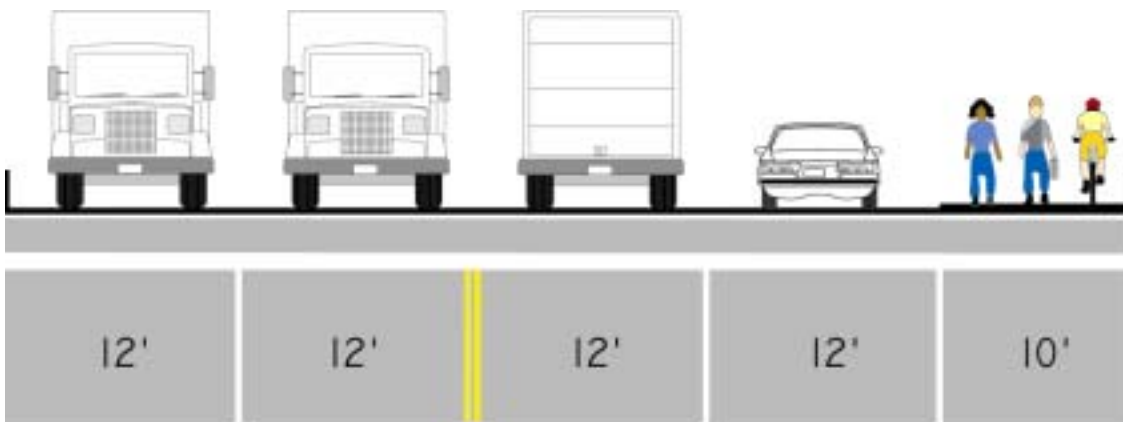
Project 6-C1: Landfill Trail Connection Options to Basin Avenue



Project 6-C: Landfill Trail Connection Options to Basin Avenue



Existing Condition: N. Leverman



Option: Narrow travel lanes to 12 ft and create a 10 ft path on the southeast side of N. Leverman

The connection on N. Leverman to N. Basin Avenue serves transit users in addition to trail users. By widening the sidewalk, the walk from the bus stops on N. Basin is safer and more pleasant, which may encourage more people to use public transit or visit businesses in Mock's Bottom on foot and by bicycle.

Project 7: River to Lagoon Trail



SOURCE: RLIS 2001

Project 7: River to Lagoon Trail

Description

The River to Lagoon Trail would connect the existing Willamette Greenway Trail to the Swan Island Basin Lagoon and the future Lagoonside Trail. The trail segments would include a shared use path on south side of N. Channel and the north side of N. Lagoon, and on the west side of N. Ballast and the east side of N. Commerce. The trail would provide critical local and regional access, as there are currently no pedestrian or bicycle facilities in this area. This trail functions as part of the proposed Willamette Greenway.

Consider extending the shared use path north on N. Channel to the shipyards to serve those employees.

Type/Width

Shared Use Path / 12 ft (N. Channel, N. Ballast, N. Commerce)
 Shared Use Path / 8 ft (N. Lagoon)

Length

.97 miles

Habitat

Heavy development. Some street trees and ground cover. Area adjacent to Lagoon is a riparian area adjacent to primary waterway of riprap and groundcover.

Ownership

City of Portland (Portland Office of Transportation and Bureau of Environmental Services), Rosan, Inc. or Yost (Peterbuilt)

Key Land Uses / Destinations

Provides circulatory access for Swan Island employees, particularly those working on the south side of the Island; provides the Willamette Greenway link serving local and regional residents.

Issues

- ⚡ Several crossings are needed for N. Channel and N. Lagoon
- ⚡ Traffic volume is not high, but traffic speeds are excessive
- ⚡ Trail must cross private property to connect to the Lagoonside Trail, either through Yost Peterbuilt or Rosan, Inc. properties
- ⚡ An easement will be necessary to access N. Lagoon from the BES property.
- ⚡ BES property is currently trying to be sold and/or redeveloped – public access through this parcel is critical for future regional and local trail connections

Planning-Level Cost Estimate

\$162,000 + easement acquisition



Public right-of-way on N. Channel

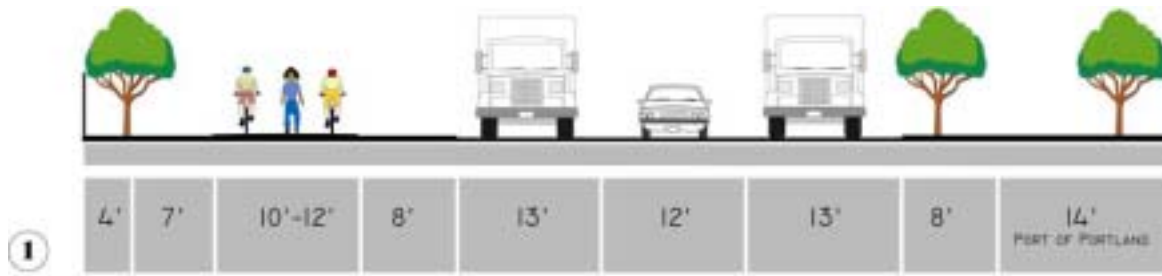


Existing shared use path on BES property

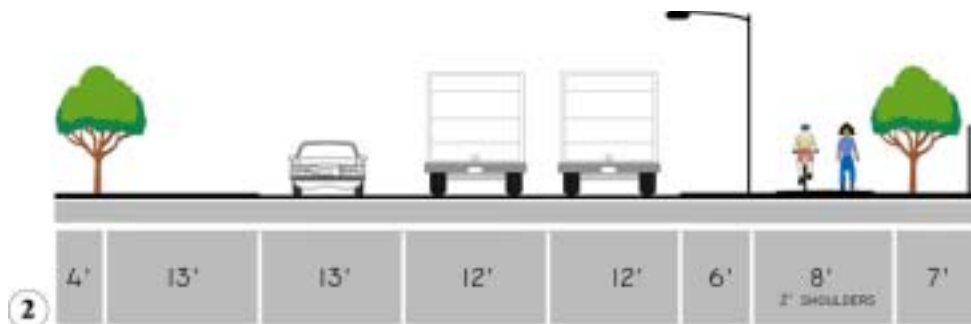


22 ft wide travel lanes on N. Ballast

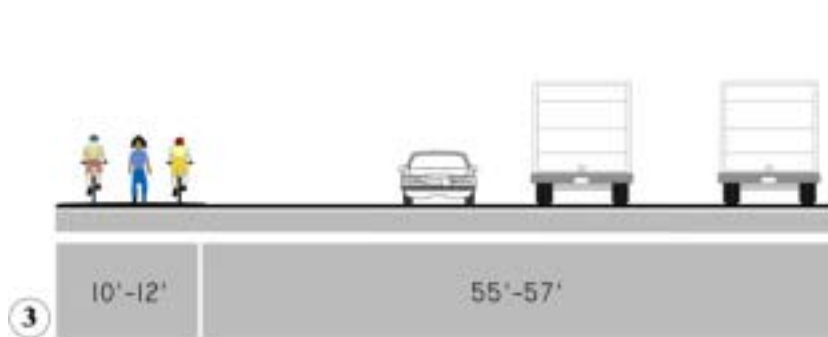
Project 7 River to Lagoon Trail Sections



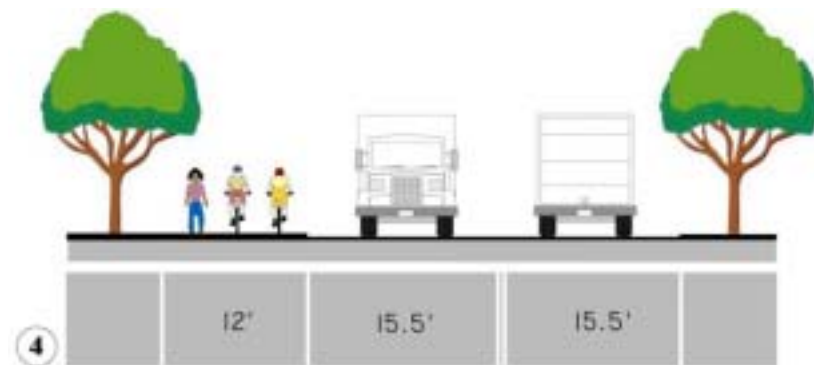
1 N. Channel Avenue looking north/west



2 N. Lagoon Avenue looking north/west

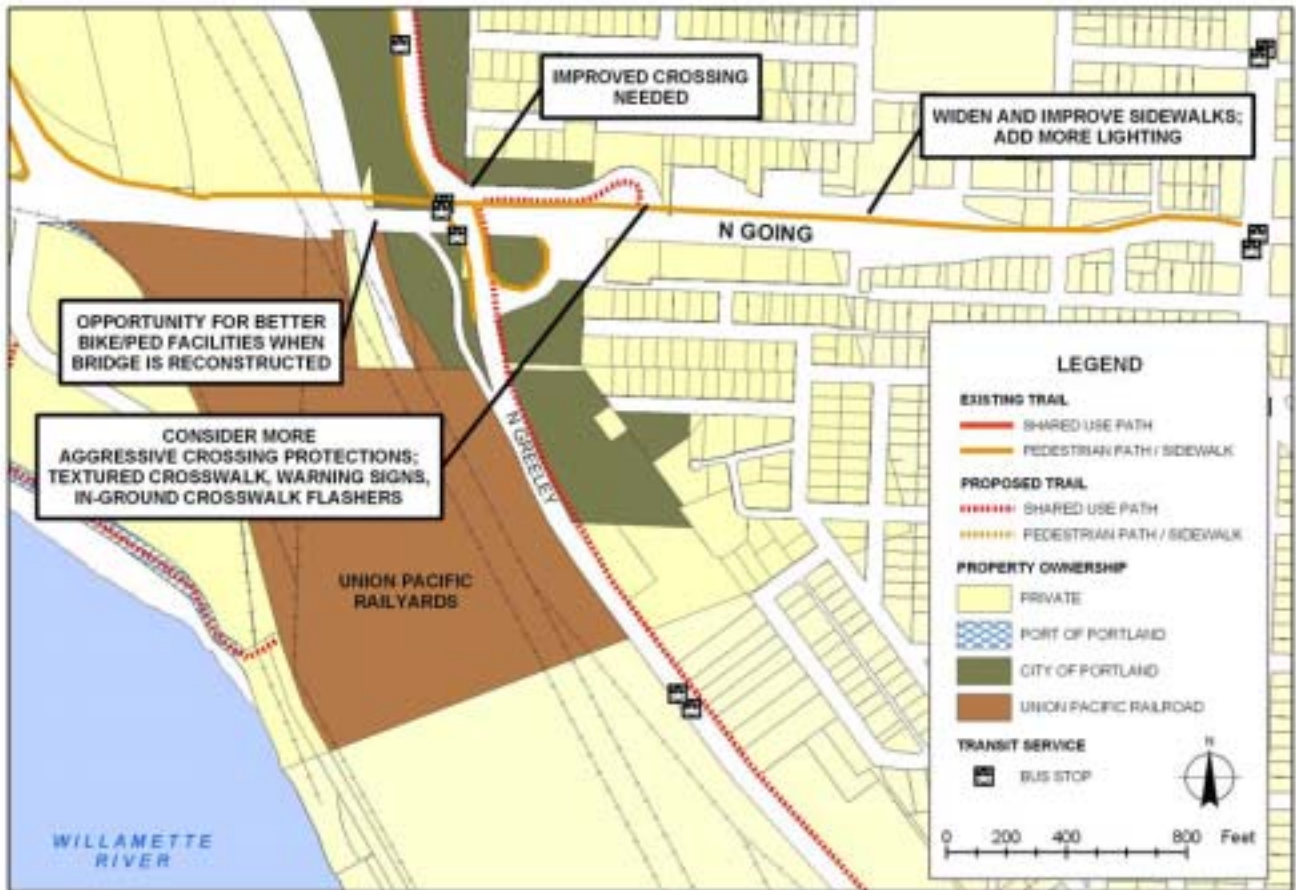


3 Alternative on private parcel (Rosan, Inc.) connecting N. Lagoon Avenue and the BES property



4 Shared use path option on N. Commerce and N. Ballast

Project 8: Going Street Connection



Project 8: Going Street Connection

Description

Wider, continuous sidewalks, better lighting, and more pedestrian amenities will improve bicycle and pedestrian access to Swan Island from Interstate MAX and other North Portland neighborhoods. Sidewalks should be treated as shared use paths (6 ft should be the absolute minimum; 8 ft – 12 ft is desirable) due to the dual-use nature of the pathway.

Consider a pathway from the westbound on-ramp from N. Greeley to N. Going to directly link to the sidewalks on N. Going.

Type/Width	Length
Concrete / 6 – 12 ft	.70 miles

Habitat

Heavy to medium development.

Ownership

City of Portland

Key Land Uses / Destinations

Primarily serves Swan Island employment centers but also serves those wanting to access Adidas Village, North Portland neighborhoods via N. Greeley, and the Willamette Greenway.

Issues

- | | |
|--|--|
| <ul style="list-style-type: none"> ⚡ Constrained by steep slope in some areas, particularly on the south side of N. Going; ⚡ Safety: High volume, high speed traffic; many trucks ⚡ Access (there are no ADA accessible routes from N. Greeley to N. Going; existing sidewalk does not meet ADA); | <ul style="list-style-type: none"> ⚡ Traffic speeds and turning movements from the off-ramps of N. Greeley ⚡ Junction with N. Basin is a difficult crossing. |
|--|--|

Cost

N/A



N. Going and Swan Island from the N. Greeley overpass

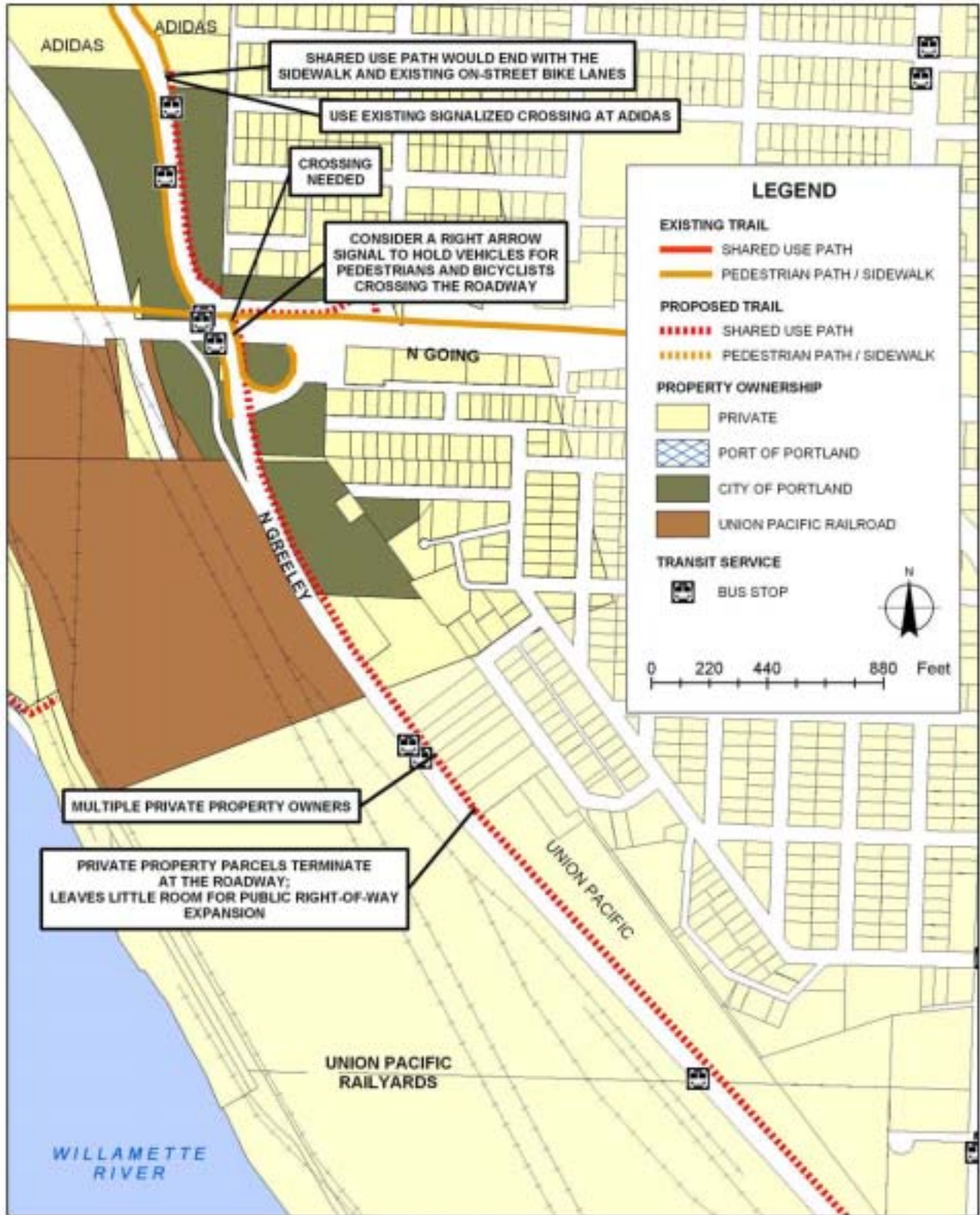


Stairways offer the only direct access from N. Greeley



Existing pedestrian access from N. Going to Swan Island

Project 9: North Greeley



Project 9: North Greeley

Description

A shared use path would supplement proposed on-street bicycle lanes from Interstate Avenue to existing bike lanes at Adidas Village. There is presently a demand footpath where people are walking on the east side of the roadway. The shared use path would provide two-way pedestrian travel and bicycle options for those not comfortable riding in the roadway.

Type/Width	Length
Shared use path / 8 – 12 ft	1 mile

Habitat

Medium to heavy development. An assortment of trees, shrubs, and grasses on steep slope.

Ownership

City of Portland, Union Pacific, the Halton Company, nine (9) private residential property owners, Kaiser Permanente

Key Land Uses / Destinations

A key north/south travel corridor. Serves people wanting to access downtown Portland, Adidas Village, North Portland neighborhoods and employment centers on Swan Island. Provides access to Northeast Portland and the Interstate MAX; TriMet bus line

Issues

- | | |
|--|---|
| <ul style="list-style-type: none"> €# Constrained public right-of-way: easements will be necessary to travel through all private property parcels; €# Slope issues will require retaining walls and tree removal | <ul style="list-style-type: none"> €# Roadway crossings at N. Going on- and off-ramps will need higher levels of protection. €# User conflicts may arise on the path due to bicyclists riding quickly downhill. |
|--|---|

Planning-Level Cost Estimate

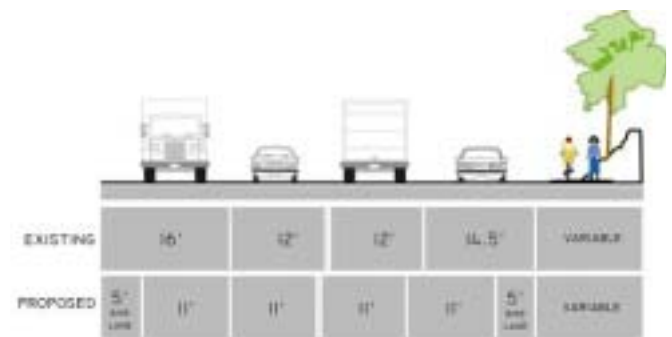
\$872,100



Demand footpath on N. Greeley looking north



Demand footpath on N. Greeley looking south



Existing and proposed roadway configurations for N. Greeley

MAINTENANCE GUIDELINES

The following table summarizes a recommended maintenance schedule for the proposed trails on Swan Island. These guidelines address maintenance for the off-street trails. On-street trails and pathways (Basin Avenue, Greeley Avenue, Going Street, N. Leverman, etc.) should be maintained as per the standards of the City of Portland.

Item	Frequency
Inspections	Seasonal - at both beginning and end of summer
Signage Replacement	1 - 3 years
Pavement Markings Replacement	1 - 3 years
Major damage response (fallen trees, washouts, flooding)	Schedule based on priorities
Pavement Sealing, Potholes	5 - 15 years
Introduced tree and shrub plantings, trimming	Every 1 -3 years
Culvert Inspection	Before winter and after major storms
Cleaning Ditches	As needed
Trash Disposal	Weekly during high use; twice monthly during low use
Lighting Luminaire Repair	Once a year
Pavement Sweeping/Blowing	As needed, before high use season. Weekly in fall.
Maintaining culvert inlets	Inspect before the onset of the wet season, then again in early fall
Shoulder plant trimming (weeds, trees, brambles)	Twice a year: middle of growing season and early fall
Waterbar maintenance (earthen trails)	Annually
Site furnishings, replace damaged components	As needed
Graffiti Removal	Weekly, as needed
Fencing Repair	Inspect monthly for holes and damage, repair immediately
Shrub/Tree Irrigation for introduced planting areas	Weekly during summer months until plants are established
Litter Pick-up	Weekly for high use; twice a month for low use

FUNDING SOURCES

There are a variety of potential funding sources including local, State, regional, and Federal funding programs that can be used to construct or augment the proposed trails on Swan Island. Most of these are competitive, and involve the completion of extensive applications with clear documentation of the project need, costs, and benefits. Local funding for these projects would typically come from the City of Portland and its various agencies and/or potential future bond or other local revenues.

The table below summarizes public funding sources for Swan Island’s trails and pathways. Some of these funds are restricted to the type of improvements that qualify for assistance. Typically State and Federal funds require trail and roadway improvements to comply with current Americans With Disabilities Act (ADA) Guidelines for accessibility.

Source	Description	Funding Cycle
Metro Transportation Improvement Program Funding	Federal transportation funds coordinated by Metro. Funds can be used for Preliminary Engineering, ROW acquisition and construction.	2 Years
Recreational Trails Grants	Coordinated by Oregon State Parks. Funds can be used for ROW acquisition and construction.	Annual
Land and Water Conservation Fund (LWCF)	Federal funds coordinated by Oregon State Parks. Funds can be used for ROW acquisition and construction.	Annual
Measure 66 funds from Oregon State Lottery	Coordinated by Oregon State Parks. Funds can be used for ROW acquisition and construction.	2 Years
Transportation Enhancements	Administered by Oregon Department of Transportation (ODOT). Must serve transportation need.	2 Years
Oregon Bike/Pedestrian Grants	Administered by ODOT's Bicycle and Pedestrian Program. Must be in public ROW.	2 Years
System Development Charges (SDCs)	Fees on new construction allocated for parks, streets and public improvements. Where available, funds can be used for ROW acquisition and trail construction.	Varies
Local/Regional bond measures approved by voters	Funds can be used for ROW acquisition, engineering, design and trail construction.	Varies
Local Improvement Districts (LIDs)	Districts are typically created by local property owners, imposing a "new tax" to fund improvements. Funds can be used for ROW acquisition and construction.	Varies
Tax Increment Financing/Urban Renewal Funds	Part of trail project must be located in an urban renewal district which meets certain economic criteria and is approved by a local governing body.	Varies
Local Traffic Safety Commission	Funding for street crossings and signals.	Varies
Community Benefit Opportunity (CBO)	Funding authorized to provide benefits to neighborhoods directly affected by Combined Sewer Overflow (CSO) construction activities. Projects are variable.	Twice

Other Funding Opportunities

Volunteer programs may substantially reduce the cost of implementing some of the proposed trails and pathways. Additionally, volunteer programs can help reduce maintenance costs. Local businesses or community groups may use the project as a project for the year, possibly working with a local designer or engineer. Work parties may be formed to help clear the right-of-way of vegetation, garbage, and other debris where needed. A local company (particularly one based on the Island) may donate or discount services and equipment. Also, Swan Island TMA could create an “Adopt A Trail” program that could be expanded to help construct and maintain more facilities. Other opportunities for implementation will appear over time, such as grants and private funds.

OPPORTUNITIES

There are a number of opportunities for successful implementation of a trail system on Swan Island.

PARTNERSHIPS

Trails benefit local businesses and their employees by providing safe and attractive facilities to bike and walk to work, meetings, and lunch, as well as providing places to exercise during the day. There are a number of opportunities for public-private collaboration, particularly with funding opportunities and maintenance programs, that should be explored. For example, corporate volunteer programs could be formed to help construct and maintain the trails.

DEVELOPMENT

There are opportunities to develop trail segments when parcels on Swan Island are developed or redeveloped. One example is the land swap that may occur with UPS and the U.S. Marine Corp/Navy property. The opportunity exists to construct a piece of the Lagoonside Trail on the property as it is redeveloped.

Opportunities exist for public right-of-way projects as well, like Basin Avenue improvements with the CSO Eastside Big Pipe project and the Going Street bridge, if it is reconstructed with wider clearance for Union Pacific trains. When these projects undergo a planning process, it will be important to highlight improved pedestrian and bicycle amenities like wider sidewalks, pedestrian-scale lighting and bicycle lanes.

LANDSCAPING AND HABITAT RESTORATION

Trails provide an opportunity to mitigate or even negate some of the environmental impacts that have previously occurred in the area. For example, when the proposed Waud Bluff Trail is implemented, invasive and non-native plants will be removed and native cover will be restored to the hillside. These treatments will help stabilize the slope and prevent further erosion, as well as provide native habitat and food sources for wildlife. The trail will also guide users to one path and rehabilitate demand trails where people have cut directly down the hillside. The Lagoonside Trail also provides an excellent opportunity to restore the riverbank, add native plants, and implement storm water treatment swales for run-off from adjacent hard surface parcels. Landscaping and restoration guidelines are in the Design Guidelines section of this document. For additional detail, consult the Bureau of Environmental Services and Metro.

WILLAMETTE BLUFF PROMENADE

While the Willamette Bluff Promenade is not technically part of Swan Island, it is a project that would complement the proposed trails on Swan Island and provide an excellent transportation connection and recreation opportunities for both local and regional residents. Constructing trails like the Waud Bluff Trail and the Landfill Trail could help garner citizen and neighborhood support for a promenade along the Willamette Bluff to connect the trails, the Willamette River, the Willamette Greenway, and the communities and services linked by Willamette Blvd. Swan Island TMA and others should remain supportive of this project and encourage citizens in the surrounding neighborhoods to participate in a planning and design process for the Promenade.

ENVIRONMENTAL MITIGATION OPPORTUNITIES



CURRENT BES REVEGETATION PROJECTS

The Willamette Bluffs Revegetation Project, implemented by the Bureau of Environmental Services, is part of a regional effort to restore oak habitat on the bluffs that run along the eastern side of the Willamette River. The vegetation covering much of the Willamette bluffs is currently dominated by non-native plant species, such as Himalayan blackberry and Scot’s broom. These noxious weeds are highly flammable, provide minimal erosion control compared to grasses, and provide limited wildlife habitat compared to the historical plant community. Benefits of revegetation will include improving wildlife habitat, reducing bank and upland soil erosion, improving water quality, and reducing the severity of wildfires.

The project site will be planted with native trees and shrubs in deficient areas along the toe of slope. Trees and shrubs used for the Oak woodland will include:

<u>Trees/Large Shrubs (2220 BR)</u>		<u>Shrubs (7620 BR)</u>	
<i>Amelanchier alnifolia</i>	10 %	<i>Acer circinatum</i>	15 %
<i>Acer macrophyllum</i>	10 %	<i>Berberis aquifolium</i>	25 %
<i>Arbutus menziesii</i>	10 %	<i>Holodiscus discolor</i>	5 %
<i>Cornus nuttallii</i>	5 %	<i>Philadelphus lewisii</i>	5 %
<i>Crataegus suksdorfii</i>	5 %	<i>Ribes sanguineum</i>	15 %
<i>Pinus ponderosa</i>	10 %	<i>Rosa nutkana</i>	5 %
<i>Quercus garryana</i>	50 %	<i>Rubus parviflorus</i>	15 %
		<i>Sambucus cerulea</i>	5 %
		<i>Sambucus racemosa</i>	5 %
		<i>Symphoricarpos albus</i>	5 %

Grasses include *Bromus carinatus*, *Elymus glaucus*, *Festuca spp.*, and a *Wildflower mix*.

BENEFITS FROM THE WILLAMETTE BLUFFS REVEGETATION PROJECT

Trails located on the bluff (Waud Bluff, Landfill Trail, etc.) will benefit from the Willamette Bluffs Revegetation Project but should encourage additional bluff rehabilitation by eliminating excessively steep footpaths, improving erosion control and drainage problems, and removing litter and other man-made debris.

ADDITIONAL OPPORTUNITIES FOR ENVIRONMENTAL MITIGATION

1. BASIN AVENUE

There are some opportunities to do some innovative stormwater treatments with infiltration strips and curbless, permeable pavement parking strips if a trail is built on the south side of Basin Avenue, northwest of N. Ensign. There are also opportunities to incorporate Green Street concepts for the portions of N. Basin that would be affected by the Eastside CBO project. These concepts, though new and regarded as somewhat difficult to incorporate into retrofit situations, should be examined for feasibility before implementation of the sidewalk/trail on N. Basin.

2. LAGOON SIDE PLANTING AND STORMWATER STRIPS

There are a number of opportunities to remove invasive, non-native vegetation and establish native plants and trees to improve water quality and habitat along the Lagoon. Also, because the trail would likely follow private property lines, there is an opportunity to incorporate infiltration strips or small bio-swales next to the trail to catch and filter water from the adjacent parking lots and buildings, particularly with new development.

3. BUREAU OF ENVIRONMENTAL SERVICES PROPERTY

There is an opportunity to restore the basin bank to establish native plants and provide better habitat for fish and wildlife. This site may be included in the Willamette Watershed Plan as a site for further study. The site could also incorporate a series of bio-swales for stormwater treatment if/when the property is developed.

4. NORTH GREELEY AVENUE

Because there is no existing curb on the north side of N. Greeley, there is an opportunity to incorporate infiltration strips and/or small bio-swales with a trail to detain and treat some of the stormwater run-off from N. Greeley. The opportunities are limited due to the number of implementation challenges.