3.10 LIGHT RAIL CONSTRUCTION AND OPERATION

LRT generally refers to electric-powered train systems operating on city streets or on separate rail systems. LRT differs from heavy rail in that it carries fewer passengers, operates at slower speeds, is more flexible, and is therefore better able to access more locations in urban centers. Conversely, in comparison to street cars or trams, LRT carries a higher number of passengers and operates at higher speeds.

The proposed project includes construction of LRT guideways, both at-grade and elevated, park and ride facilities, and transit stations; and expansion of TriMet's Ruby Junction Maintenance Facility in Gresham. These components are described below.

3.10.1 Portland Expo Center to Vancouver

The new high-capacity LRT project component will be an extension of the existing MAX Yellow Line. New tracks will be constructed starting just north of the existing platform at the Portland Expo Center Station.

Construction elements include:

- Grading and excavation
- Demolition of the north platform access
- Placement of underground utilities
- Placement and tie-in of signal and Thermal Energy Storage (TES) duct bank
- Construction of systems foundations
- Installation of overhead catenaries
- Concrete surface work
- Landscaping

The track from the Expo Center to north of Marine Drive will be pervious tie and ballast construction. North of Marine Drive, the trackway will be located on an impervious structure to cross over North Portland Harbor and onto Hayden Island as described in Section 3.5.3. On Hayden Island, the guideway will be located on an impervious surface and constructed on engineered fill. Leaving the island, the transit alignment will be located on structure and will then enter the lower deck of the stacked southbound replacement bridge over the Columbia River as described in Section 3.5.2. The track will then be placed on the bridge structure without ballast. These structures are also considered impervious surfaces. Upon leaving the northern portal of the stacked bridge, the light rail alignment will travel on impervious structure to a touch down at 5th Street in downtown Vancouver. Total trackway pervious and impervious surfaces from the Expo Center to the touchdown in Vancouver (not including the stacked highway structure) are approximately 25,000 and 160,000 sq. ft., respectively. The light rail structure across North Portland Harbor will also carry a bike/ped path facility. The area of this facility is not included in the estimates provided above. The construction of elevated guideways over existing streets may impact traffic because of temporary road closures. This and other traffic issues will be addressed in a traffic management plan prepared and approved by the project before construction begins. Clearing and grading activities and demolition of other structures for newly acquired right-of-way will occur where the elevated guideway transitions to at-grade track.

Elevated guideways and stations for light rail will be constructed of steel, reinforced concrete, or combinations of both. Construction will begin with preparation to build foundations that may consist of shallow spread footings, deep driven or augered piles, or drilled shafts. Once foundations are in place, concrete columns and crossbeams will be constructed.

The superstructure of each elevated structure may be built of steel, cast-in-place concrete, or precast concrete. If steel or precast concrete is used, sections can be transported to the site and lifted into place from the street. If cast-in-place concrete is used, then temporary structures will be required to support the superstructure until the cast concrete has gained enough strength (through curing) to support itself.

3.10.2 In-Street Construction in Vancouver

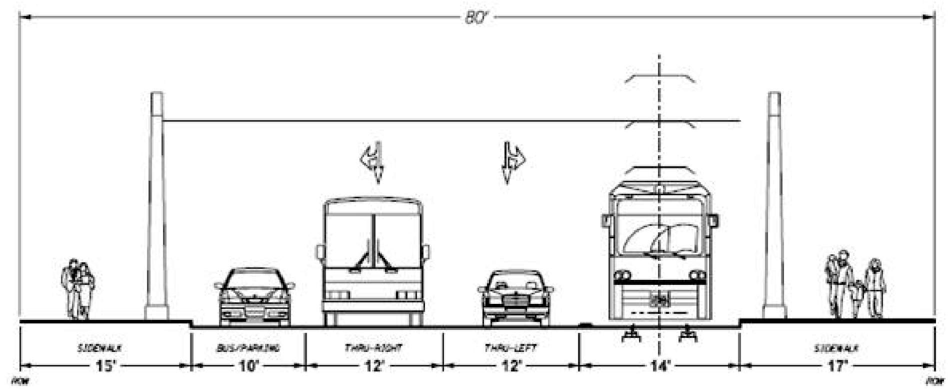
The new light rail guideway will be located within existing streets in Vancouver and will not contribute to a net increase in existing impervious surface. Final design of the LRT alignment and integration of automobile, pedestrian, and bicycle traffic facilities will occur in the future. Drawings showing proposed spacing of automobile, bus, and LRT on surface streets are presented in Figure 3-23.

Roadway construction for the light rail alignment will include restriping or rebuilding the road surface, rebuilding sidewalks, and constructing station platforms. Streetscape improvements will include removing, replacing, or adding vegetation, curb extensions, new signs and signals, and other measures to improve access to, and use of, the transit stations. Stations, park and rides, and new structures could require land-based pile driving and earthwork for clearing and grading these sites.

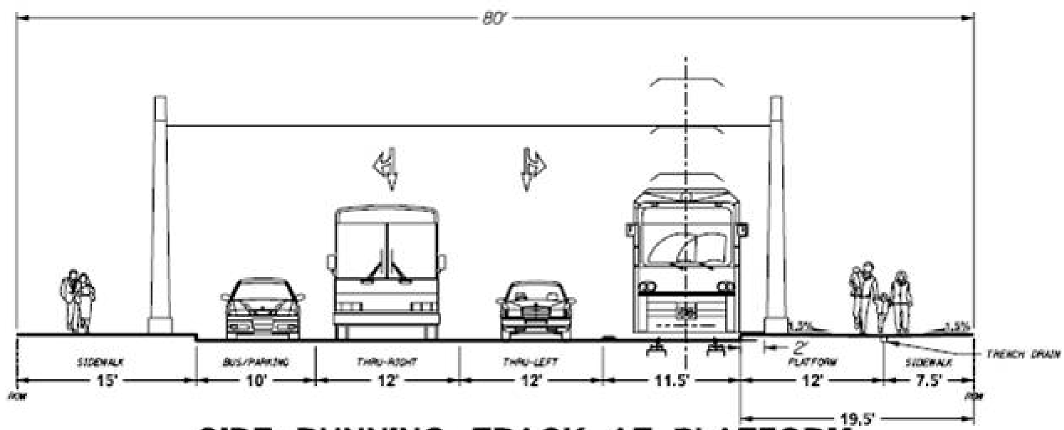
The roadway along the light rail alignment will need to be rebuilt to support the weight of a two-car train. This will generally require relocation of utilities. At-grade LRT tracks will require clearing, grading, and typically shallow excavations. Clearing may include demolition and removal of pavement, vegetation, and other surface features, and implementation of a TESC plan with BMPs, and a Pollution Control Plan. During the grading phase, the contractors will install culverts or other permanent drainage structures and below-grade light rail infrastructure. This may require temporary steel plates in the roadway and temporary lane closures. Where in-street track is proposed within existing or expanded street right-of-way, grading will generally be minimal, but extensive reconstruction of streets, sidewalks, and other facilities may occur. Shallow, near-surface excavations will be required to construct the subgrade and track and station platform slabs for at-grade segments.

Light rail will also require construction of an OCS over the guideway to provide electrical power to the trains. Additionally, it will be necessary to seek temporary construction easements or small permanent easements on some properties adjacent to the light rail alignment to allow construction workers to encroach on several feet of a property while rebuilding the sidewalk in front of the property or to place specific elements.

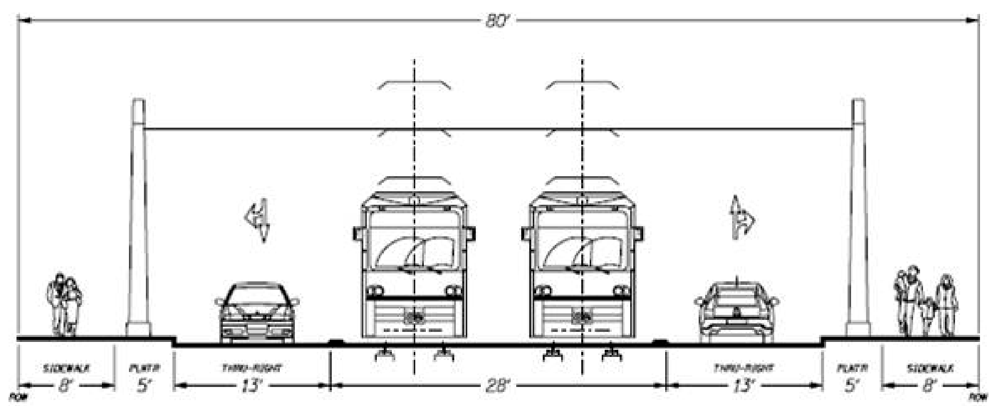
Transit construction will also require staging areas adjacent to or within the guideway to store construction equipment and materials. Many of the staging activities will take advantage of land that is already in the public right-of-way or in public ownership and that is not being used for other purposes, such as vacant lots.



SIDE RUNNING TRACK - 17/15 SIDEWALKS



SIDE RUNNING TRACK AT PLATFORM
17/15 SIDEWALKS



17TH CENTER RUNNING TRACKS

Figure 3-23. Designs for At-Grade LRT in Vancouver

3.10.3 Ruby Junction Maintenance Facility

The project includes an expansion of the TriMet's Ruby Junction Maintenance Facility on NW Eleven Mile Avenue in Gresham to accommodate the additional LRT vehicles included for the light rail component of this project (Figure 3-24). This expansion will include the need to acquire additional right-of-way and to build new storage tracks. This expansion of right-of-way will also provide enough land to accommodate LRT vehicles that might be added to TriMet's system by future projects, such as the planned Portland-Milwaukie LRT extension that is currently undergoing NEPA review and preliminary design.

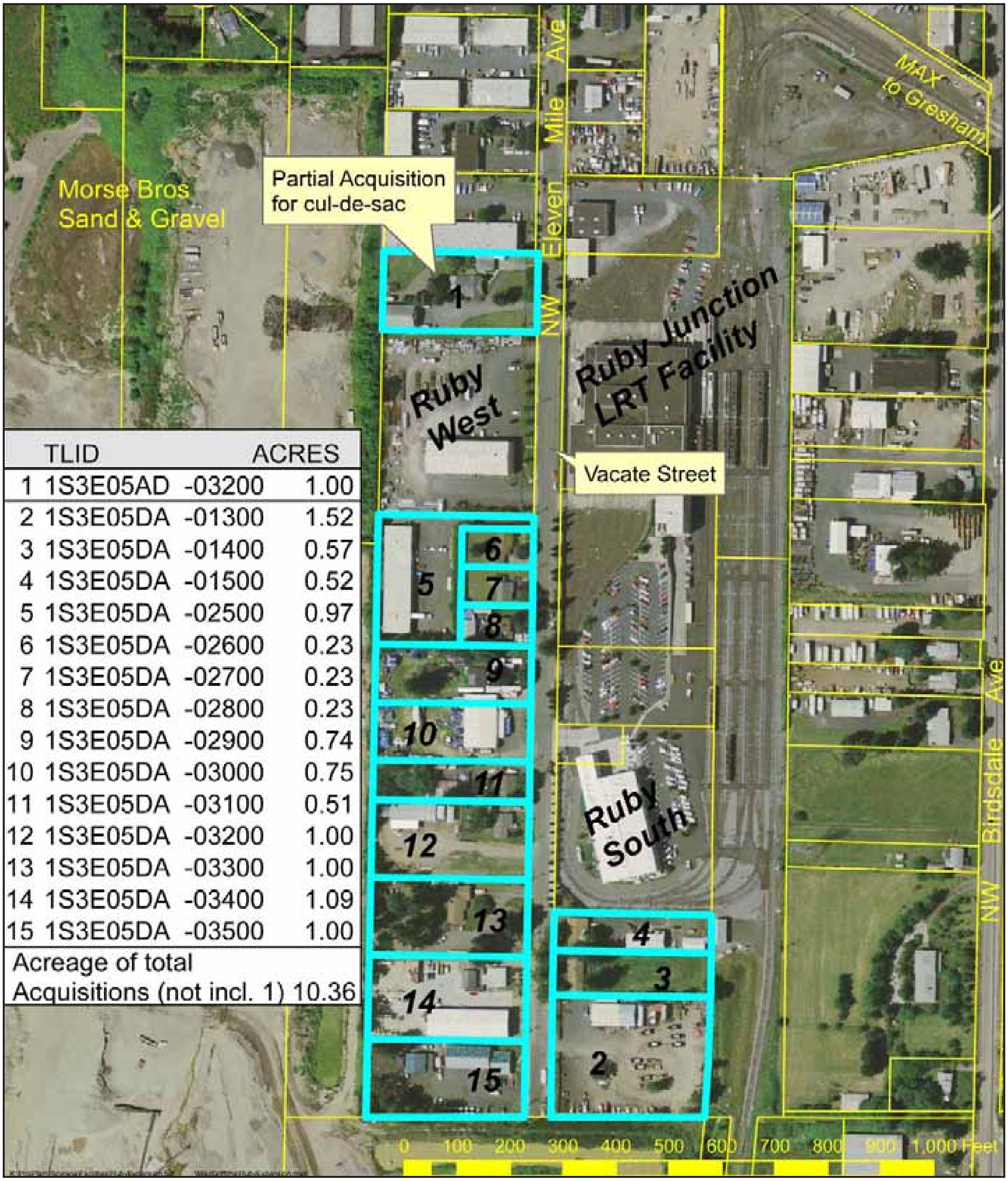
The expansion will convert some pervious surfaces to impervious surfaces; however, stormwater runoff from all new impervious surfaces will be infiltrated. Portions of three parcels, totaling approximately 2.0 acres, to be acquired as part of the facility expansion lie within the Federal Emergency Management Agency (FEMA) 100-year floodplain of Fairview Creek. Although no buildings will be constructed in the floodplain, portions of the floodplain may be developed for track and outside storage. Approximately 235,000 sq. ft. of impervious surface will be added at the facility, but approximately 60% will be used for LRT storage and is not pollutant-generating.

3.11 STAGING AND CASTING AREAS

Construction will require staging areas to store construction material, load and unload trucks, and conduct other construction support activities. Multiple staging areas will be needed, given the linear nature of the project and that much of it could be under construction at the same time. The existing I-5 right-of-way will accommodate most of the common construction staging requirements. Interchange areas at Marine Drive, SR 14, Mill Plain and Fourth Plain Boulevards, and 39th Street have enough room for staging most typical earthwork, drainage, utility, and structure activities. However, some construction staging may be needed outside the existing right-of-way, requiring temporary easements on nearby properties. The equipment will include, but may not be limited to paving equipment, hauling trucks, pile drivers, rotators/oscillators, concrete trucks, bulldozers, track excavators, backhoes, graders, scrapers, dump trucks, cranes, compactors, general use vehicles, and wheel loaders.

In addition, at least one large site will be required to stage larger equipment and materials such as rebar and aggregate, to accommodate construction offices, and to use as a casting yard for fabricating segments of the bridges. Suitable site characteristics for such a staging area include a large, previously developed site suitable for heavy machinery and material storage, proximity to the construction zone, roadway or rail access for landside transportation of materials, and waterfront access for barges (either an existing slip or dock capable of handling heavy equipment and material). The following three previously developed sites (Figure 3-25) are identified as possible major staging areas:

- The Port of Vancouver site: This 52-acre site is located along SR 501 near the Port of Vancouver's Terminal 3 North facility. This site is without river frontage, so materials would be transported over land to the construction site. Most of the property has an asphalt concrete surface, and any improvements will most likely be on top of this surface. Activities will consist of material storage, material fabrication (e.g., concrete and asphalt plants), equipment storage and repair, and temporary buildings. This site is currently used as a staging area for windmill components.



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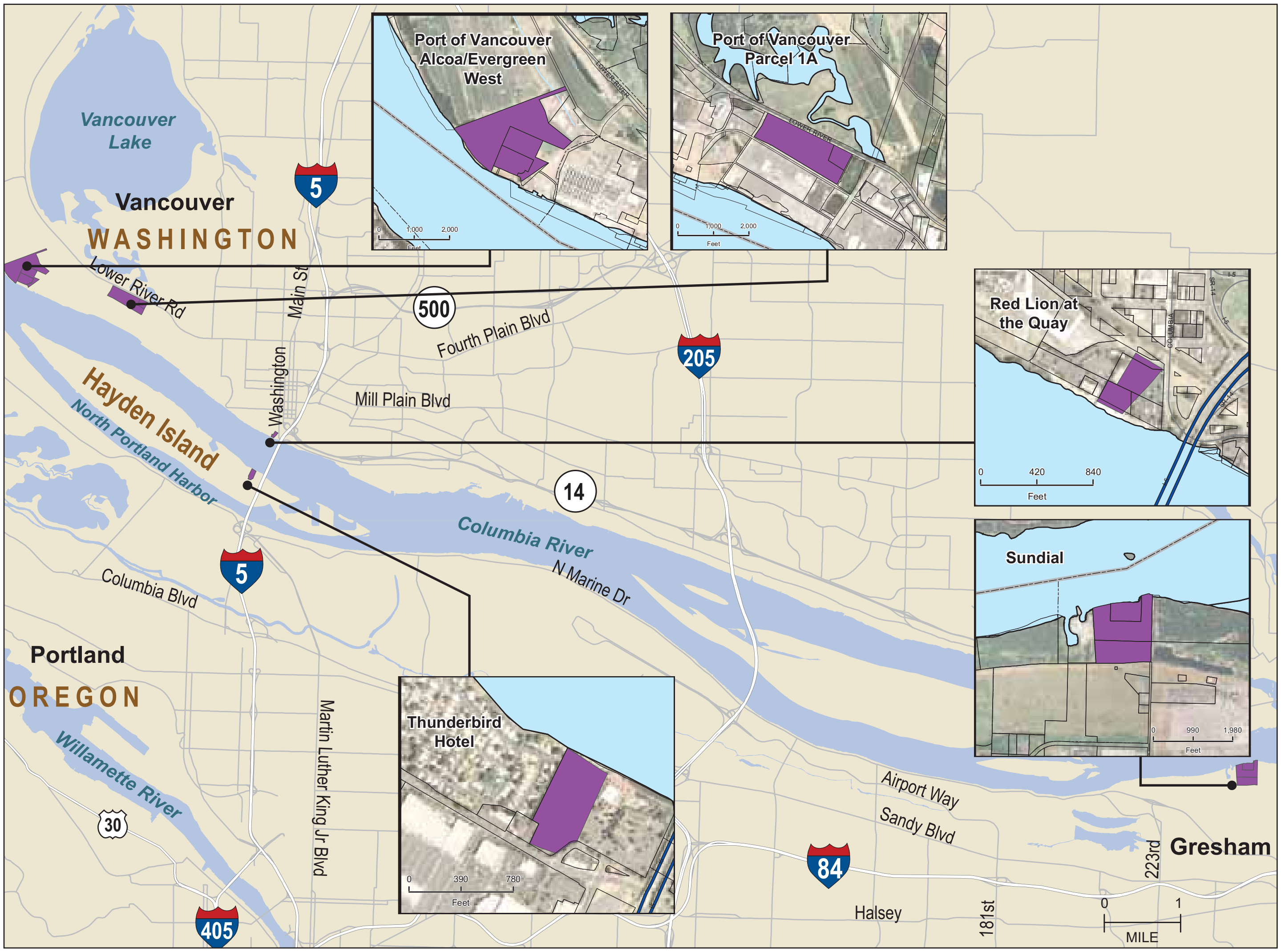
5	1S3E05DA -02500	0.97
6	1S3E05DA -02600	0.23
7	1S3E05DA -02700	0.23
8	1S3E05DA -02800	0.23
9	1S3E05DA -02900	0.74
10	1S3E05DA -03000	0.75
11	1S3E05DA -03100	0.51
12	1S3E05DA -03200	1.00
13	1S3E05DA -03300	1.00
14	1S3E05DA -03400	1.09
15	1S3E05DA -03500	1.00
Acreage of total Acquisitions (not incl. 1)		10.36

Columbia River CROSSING

Figure 3-24.
Ruby Junction Maintenance Facility Expansion Area
Columbia River Crossing



Dimensions are approximate.

N W E S

Parcel Boundaries

Proposed Staging and Casting Areas

Figure 3-25.
Proposed Staging and Casting Areas

Columbia River CROSSING

- The Red Lion at the Quay Hotel: This is a 2.6-acre site on the north shore of the Columbia River, immediately downstream of the existing bridge alignment. A portion of this site will be acquired as right-of-way for the new bridge. Construction will require demolition of most of the buildings on the site. It could make an ideal staging area due to its proximity to bridge construction, large size, and access to the river, and because the project may already need to acquire the entire parcel. This site could be used for staging materials and equipment and for fabrication of smaller bridge and roadway components. Temporary buildings, such as trailers or other mobile units, will be built on the site for construction offices.
- Thunderbird Hotel Site: This is a 5.6-acre site on Hayden Island on the south shore of the Columbia River, immediately downstream of the existing bridge alignment. A large portion of the parcel will be acquired as new right-of-way for the new bridge alignment. The site is relatively large and it is adjacent to the river and the construction zone. The same types of activities could occur on this site as on the Red Lion Hotel site.

If a precast concrete segmental bridge design is used, a casting yard will be required for construction of the superstructure segments spanning the bridge piers. The superstructure segments will be precast, shipped to the bridge construction site, and set in place atop the pier columns, as described in Section 3.5. A casting yard will require access to the river for barges (either a slip or a dock capable of handling heavy equipment and material), a large area suitable for a concrete batch plant and associated heavy machinery and equipment, and access to a highway and/or railway for delivery of materials over land. All work to prepare the casting yard will occur in upland areas and will be required to follow the BMPs in this BA (include a TESC and SPCC plan), and will meet all conditions of the site use permits. No riparian vegetation will be impacted at these sites.

Two sites have been identified as major casting/staging yard areas (Figure 3-25):

- Alcoa/Evergreen site: This 94.5-acre site on the north shore of the Columbia River at approximately RM 102 (RKm 164) was previously used as an aluminum smelter and is currently undergoing environmental remediation, which should be completed before the anticipated 2013 start date. The western portion of this site, which is best suited for a casting yard, currently contains two large settling ponds that will have to be worked around. In addition, the property will require grading, drainage, and surfacing work to support the materials and equipment needed for a casting yard.
- Sundial site: This 56-acre site lies on the south shore of the Columbia River near RM 120.2 (RKm 193), between Fairview and Troutdale, and just north of the Troutdale Airport, and has direct access to the Columbia River. Currently owned by Knife River, approximately one-third of the property is being used for aggregate storage, stockpile, crushing, and sifting, as well as asphalt recycling. A recently improved landing and barge slip is located on the site.

3.12 STORMWATER RUNOFF TREATMENT

This section describes the stormwater management proposed for temporary construction activities and for increases in runoff from permanent new impervious surface areas constructed by the project. For the purposes of this section, the “project footprint” is defined as areas of new and rebuilt pavement, existing pavement that will be resurfaced and existing pavement that will be removed. It does not include existing pavement that will not be affected, even if runoff from that surface will be treated by the project. Stormwater treatment is not described for the Ruby Junction Maintenance Facilities elements of the project. For the Ruby Junction Maintenance Facility expansion, all new impervious surfaces will be infiltrated with no runoff anticipated to Fairview Creek or other surface waters.

3.12.1 Existing Conditions

Figure 3-26 through Figure 3-28 show existing drainage systems, watershed boundaries, and outfalls in the project corridor. Following is a brief description of these features based on the waterbody to which runoff is discharged. From south to north, these waterbodies are the Columbia Slough, Columbia River (including North Portland Harbor), and Burnt Bridge Creek. Table 3-22 shows the average monthly discharges for each watercourse, based on data available from U.S. Geological Survey (USGS) gauging stations (Figure 3-29 for locations). These data provide an indication of the relative size of each waterbody and permit a comparison of estimated project runoff with discharges in waterbodies receiving that runoff. For reasons discussed in Section 3.12.3, this section does not include Fairview Creek.[3]

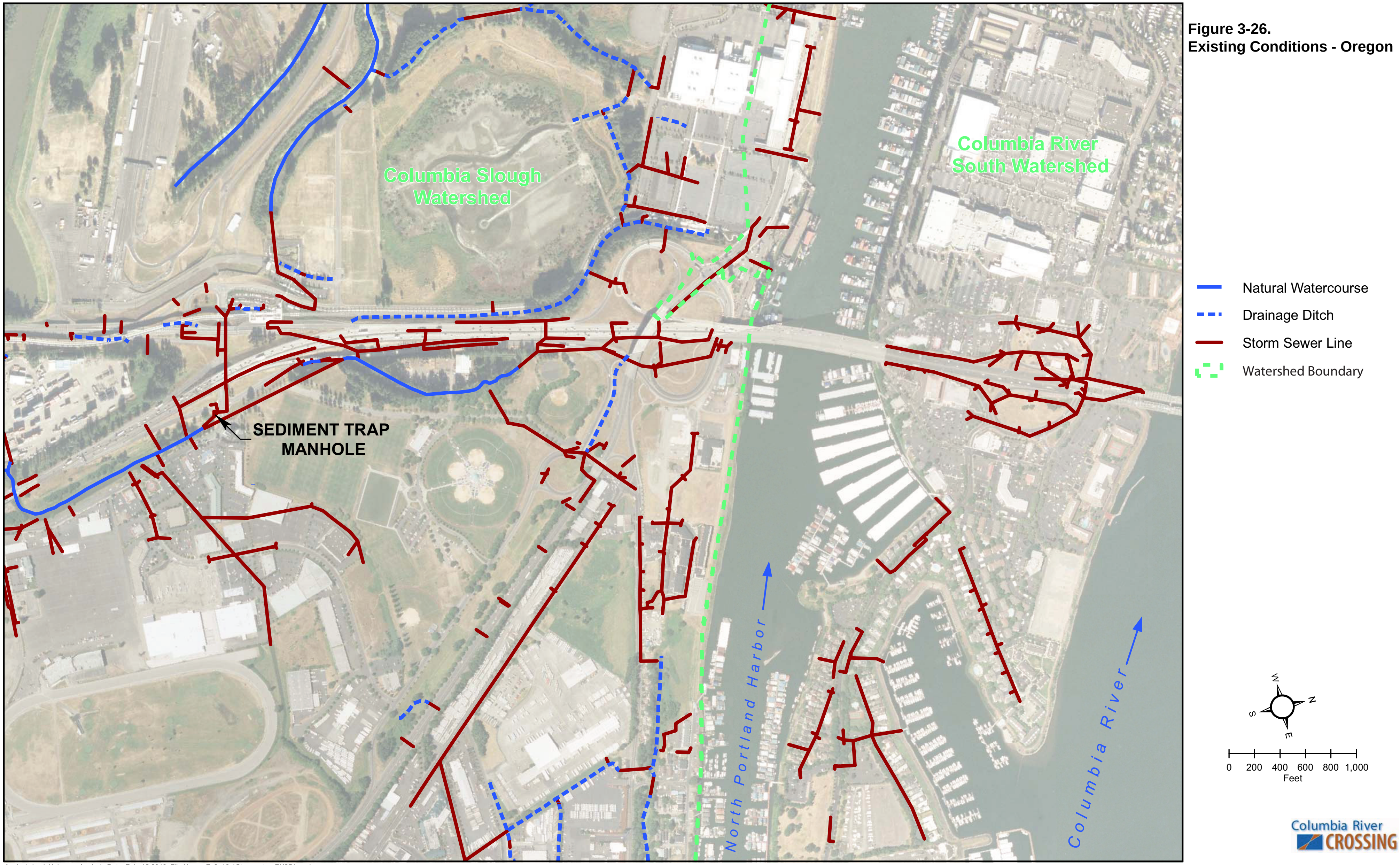
Table 3-22. Mean Monthly Discharge

Month	Columbia Slough at Portland[a] (USGS 14211820)	Columbia River at Vancouver[a] (USGS 14144700)	Burnt Bridge Creek near Mouth[a] (USGS 14211902)
January	162	156,000	46
February	151	163,000	53
March	135	170,000	39
April	85	204,000	21
May	29[b]	286,000	19
June	65[c]	415,000	14
July	79	291,000	9.1
August	74	153,000	7.4
September	63	117,000	7.0
October	96	116,000	9.8
November	112	122,000	34
December	123	138,000	41

a Measured in cubic feet per second.
b Reverse flow from the Willamette River was recorded for mean monthly discharge in 1997, 2006, and 2008.
c Reverse flow from the Willamette was recorded for mean monthly discharge in 1990.

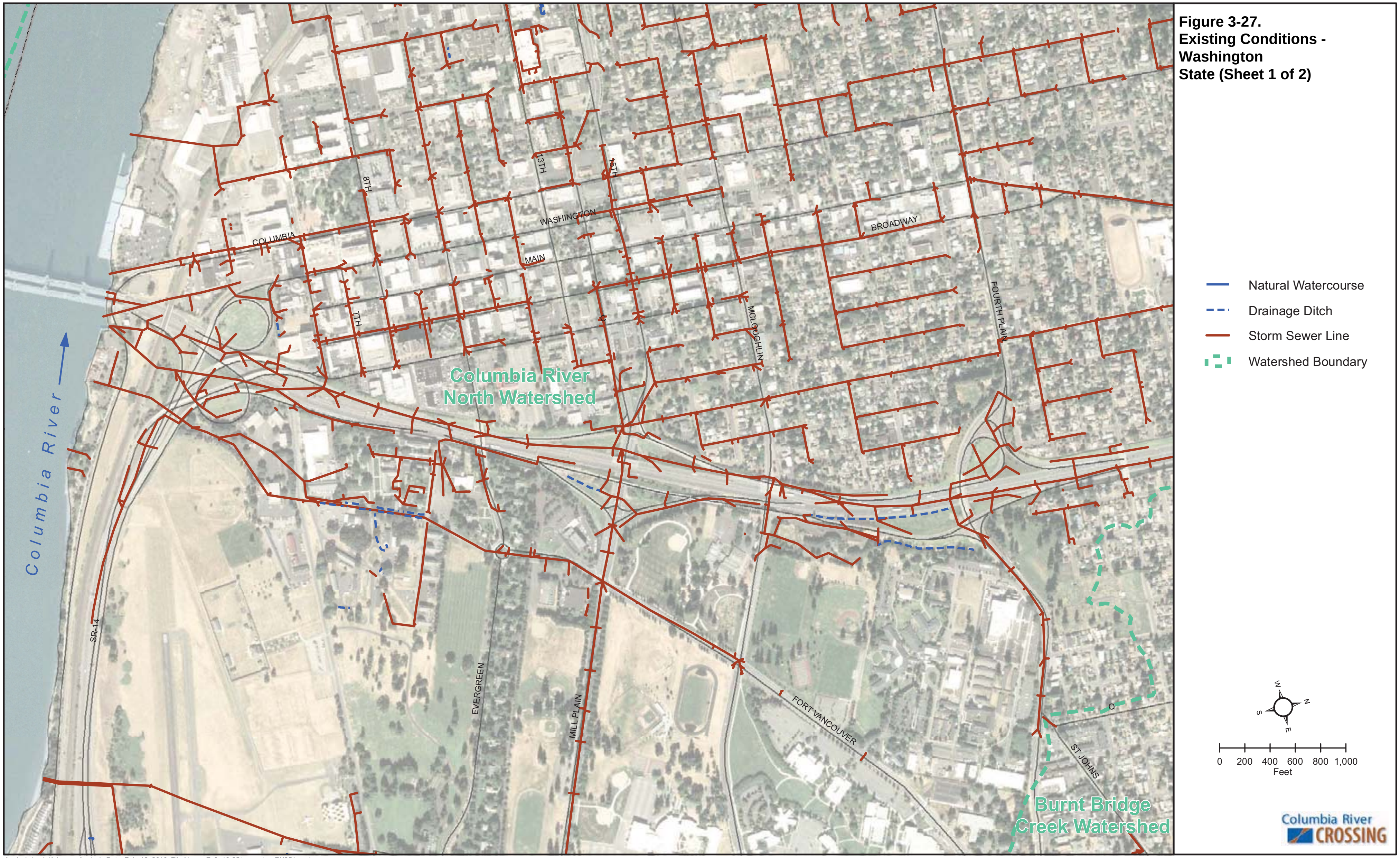
[3] Fairview Creek is the receiving waterbody for runoff from TriMet’s Ruby Junction Maintenance Facility.

Figure 3-26.
Existing Conditions - Oregon



Analysis by J. Koloszar; Analysis Date: Feb. 12 2010; File Name: Ex3_13-1Stormwater_RK251.mxd

Figure 3-27. Existing Conditions - Washington State (Sheet 1 of 2)



Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Feb. 12, 2010; File Name: Ex3_13-2Stormwater_RK251.mxd

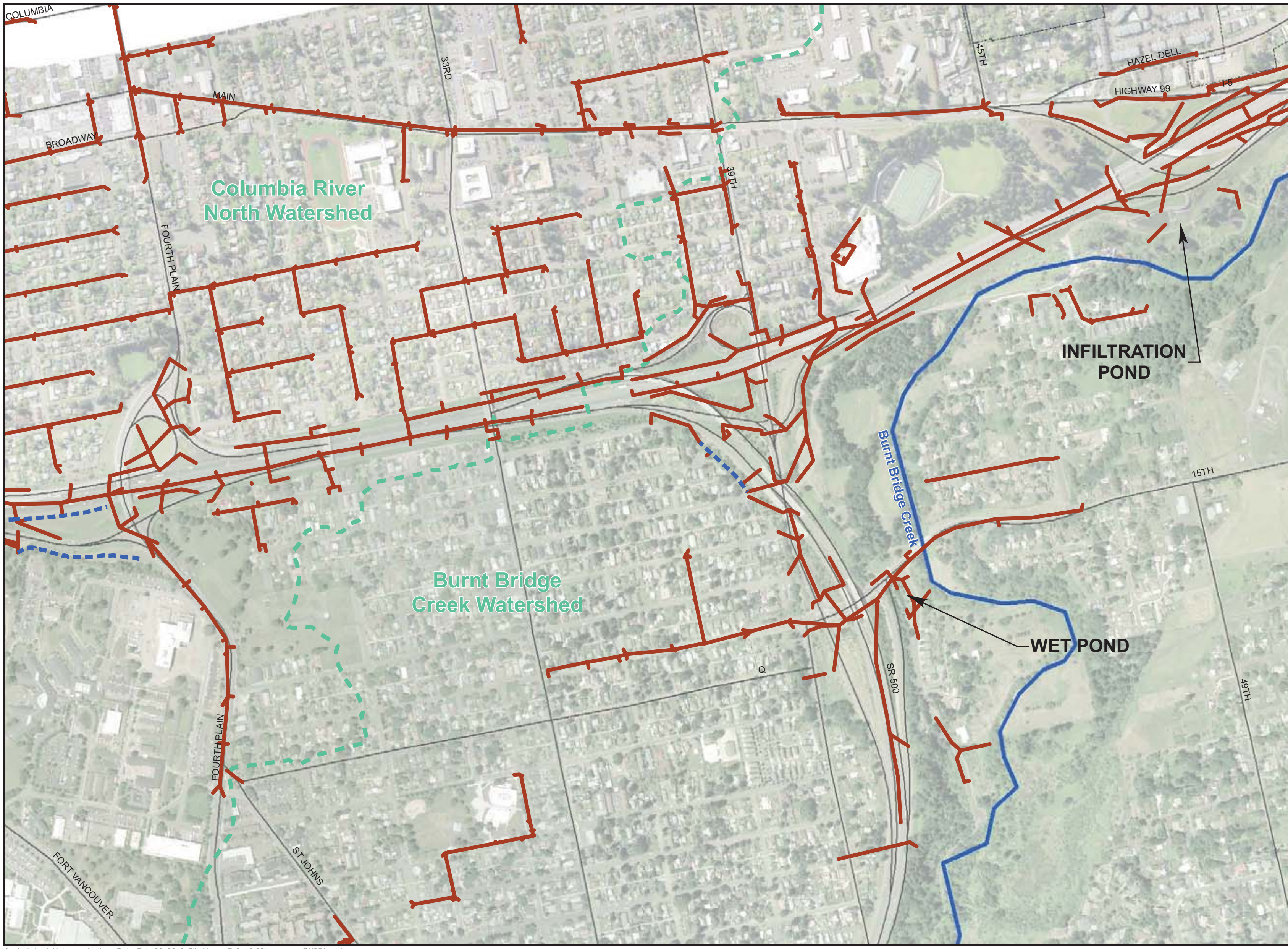


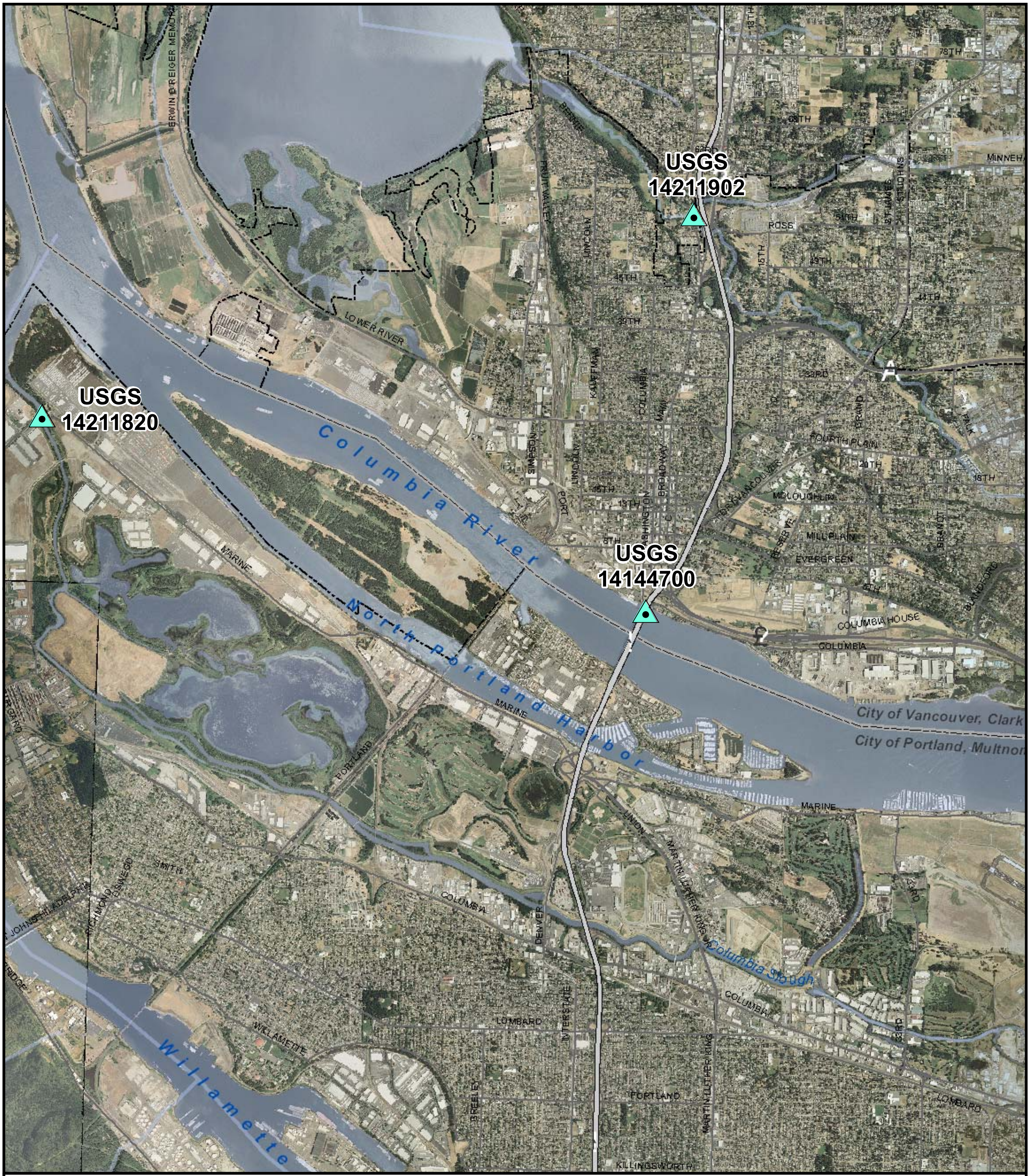
Figure 3-28. Existing Conditions - Washington State (Sheet 2 of 2)

- Natural Watercourse
- Drainage Ditch
- Storm Sewer Line
- Watershed Boundary

0 200 400 600 800 1,000
Feet

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Feb. 03, 2010; File Name: Ex3_13-3Stormwater_RK251.mxd



USGS Surface Water Gauging Station

Figure 3-29.
USGS Gauging Station Locations

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Feb 12, 2010; File Name: Ex_13-4Stormwater_RK251.mxd

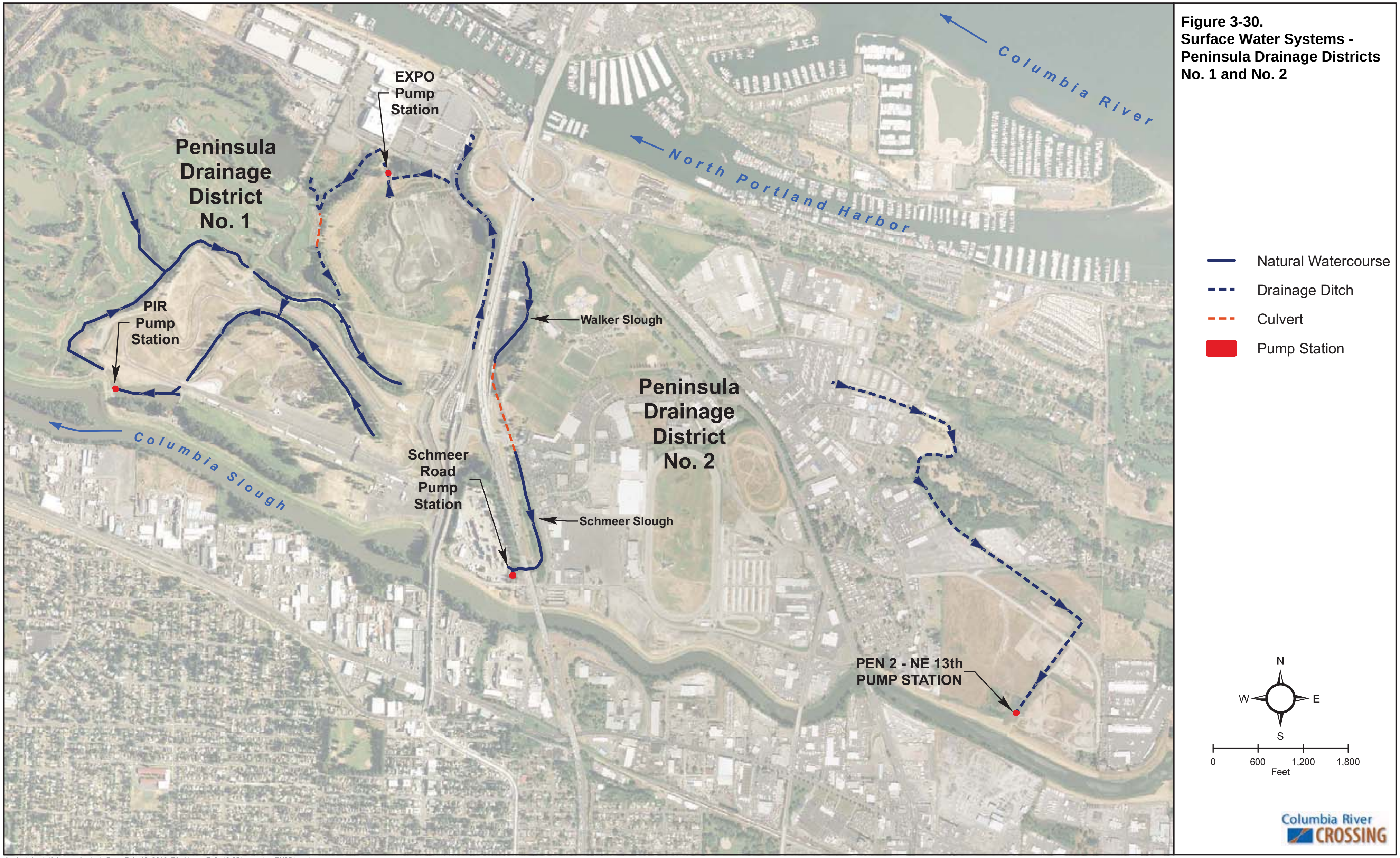
3.12.1.1 Columbia Slough Watershed

Columbia Slough, located south of the CRC project, discharges to the Willamette River. Its watershed is a 51-square-mile area that extends from Kelley Point to the west to Fairview Lake and Fairview Creek to the east (COP 2005). This watershed includes portions of the former Columbia River floodplain and before the construction of a levee system and pump stations, would have been subjected to frequent inundation. Near I-5, the original ground surface is below the OHW for the Columbia River. There are two drainage districts within the project footprint: Peninsula Drainage Districts No. 1 and No. 2 (or Pen 1 and Pen 2, respectively). I-5 is the boundary between the two districts with No. 1 to the west and No. 2 to the east (Figure 3-30). Daily operations of both districts are managed by the Multnomah County Drainage District (MCDD).

Based on data available from the Natural Resources Conservation Service (NRCS) website, surficial soils in this area mainly comprise the Sauvie-Rafton-Urban land complex. These soils belong to Hydrologic Group D, and have a low infiltration rate and high runoff potential. A soil survey conducted in Multnomah County indicates that water tables in this area are at a depth of less than 1 foot (USDA 1983). While borehole logs available for the project area confirm the high groundwater table, they also indicate that the soils can be highly variable. Land west of I-5 generally has an Industrial zoning designation, while land to the east is generally designated as Open Space. The latter area includes sports facilities such as baseball diamonds.

I-5, Marine Drive, and Martin Luther King Jr. Boulevard are elevated on embankments or structures, and the drainage systems that serve these roads do not handle runoff from outside the right-of-way. These embankments are also part of the levee system. Surface runoff from I-5 and roads within the project footprint is generally confined to the roadway surface by continuous concrete barriers or curbs, and is collected almost entirely by closed gravity drainage systems with inlets and stormwater pipes, The one notable exception is Martin Luther King Jr. Boulevard east of I-5, where runoff is shed off the south shoulder. As shown on Figure 3-30, runoff from the project area drains to a system of sloughs before being discharged to the Columbia Slough via the Portland International Raceway, Schmeer Road, or Pen 2-NE 13th pump stations. These pump stations, which are sized to handle the 1-in-100-year runoff, have installed capacities of 19,700, 40,000, and 32,000 gallons per minute, respectively. Note that Marine Drive west of I-5, while within the confines of the levee system, drains to outfalls on North Portland Harbor and is included in the Columbia River South Watershed.

Figure 3-30.
Surface Water Systems - Peninsula Drainage Districts No. 1 and No. 2



Analysis by J. Koloszar; Analysis Date: Feb. 12, 2010; File Name: Ex3_13-5Stormwater_RK251.mxd

The existing pollutant-generating impervious surface (PGIS; see Section 3.12.3.1) within the project footprint in this watershed is approximately 46 acres. Runoff from about 3 acres (Martin Luther King Jr. Boulevard and Union Court) is dispersed and infiltrated. There are no flow control measures for runoff within the project footprint beyond the regulation of discharges to Columbia Slough provided by pump station operation. In addition, there are no engineered water quality facilities except for a manhole sediment trap located at the Victory Boulevard interchange (Figure 3-26) that treats runoff from approximately 6 acres of impervious surfaces at the interchange (not within the project footprint).

3.12.1.2 Columbia River South Watershed

For convenience, the areas draining to the Columbia River are divided into those within Oregon and those within Washington State. The Columbia River South Watershed includes the portion of the project area south of North Portland Harbor that drains to that waterbody, North Portland Harbor Bridge, Hayden Island, and the Columbia River bridges south of the state line.

Like the Columbia Slough Watershed, the project footprint within this watershed is located in what was part of the Columbia River floodplain. The portion south of North Portland Harbor is protected against flooding by a levee system, material dredged from the Columbia River has been used to raise the overall ground surface on Hayden Island east of the Burlington Northern Santa Fe (BNSF) railroad tracks above the 1-in-100-year flood elevation.

Surficial soils on Hayden Island comprise the Pilchuck-Urban land complex, based on available NRCS data. These are Hydrologic Group A soils that have a high infiltration rate and consist mainly of deep, well drained to excessively drained sands or gravelly sands. Available borehole information confirms this description. While limited piezometer data indicates that the groundwater table is about 15 feet below ground, the phreatic surface is expected to respond to changes in river level, given the highly permeable nature of the soils. The land either side of I-5 on Hayden Island is highly developed and comprises service-related businesses such as retail stores and restaurants, and their parking lots.

Like the Columbia Slough Watershed, I-5 is elevated on an embankment across Hayden Island. Surface runoff from I-5 and local roads within the project footprint is generally confined to the roadway surface by continuous concrete barriers or curbs. Except for the North Portland Harbor and Columbia River Bridges, runoff is collected entirely by closed gravity drainage systems with inlets and stormwater pipes that discharge directly to North Portland Harbor or the Columbia River. Runoff from the bridges is discharged through scuppers directly to the water surface below. The existing PGIS within the project footprint in this watershed is approximately 56 acres; there are no flow control measures or engineered water quality facilities.

3.12.1.3 Columbia River North Watershed

This watershed comprises the project footprint from the state line in the south to the SR 500 interchange in the north. It encompasses the current I-5 corridor as well as Vancouver city streets on which the LRT guideway will be located. The existing PGIS within the project footprint is approximately 97 acres; there are no flow control measures or engineered water quality facilities, with the exception of approximately 3 acres of SR 14 from which runoff is dispersed and infiltrated.

Within the project footprint, the land is formed of the gently-sloping Wind River and Lauren surficial soils. These soils belong to Hydrologic Group B and have a moderate infiltration rate. While depths to water table are not provided (USDA 1972), borehole logs available for the area indicate that groundwater levels are close to water levels in the Columbia River. In addition, piezometer readings taken by WSDOT in the SR 14 interchange area demonstrate that the water table, at least at that particular location, responds to changes in river level.

Land west of I-5 comprises downtown Vancouver and residential neighborhoods to the north. The area east of I-5 and south of Fourth Plain Boulevard contains the Pearson Airpark and Fort Vancouver Historic Park, both of which are low-density land uses. North of Fourth Plain Boulevard, land east of the highway comprises residential development.

Surface runoff from I-5 and local streets is generally confined to the roadway by continuous curbs and concrete barriers, and is collected almost entirely by closed drainage systems. The only exceptions are the Columbia River bridges and a few ditches adjacent to the highway. These closed systems discharge runoff directly to the Columbia River via outfalls in the vicinity of the existing highway bridges, while runoff from the bridges themselves drains through scuppers to the river below. A pump station located southeast of the SR 14 interchange (Figure 3-27) discharges runoff from lower lying portions of the interchange to the Columbia River during high river levels.

The vertical grade of I-5 is generally below the surrounding areas and as a result, the drainage system serving the highway also handles runoff from built-up areas outside the highway right-of-way, as shown on Figure 3-27 and Figure 3-28. These areas, which are extensive, are estimated to comprise over 50 percent of the total drainage area served by this system, and their contribution to flows was an important consideration when developing the approach to stormwater management in this watershed.

3.12.1.4 Burnt Bridge Creek Watershed

The project footprint within this watershed includes approximately 16 acres of existing PGIS, including the SR 500 interchange and portions of I-5 to the north and SR 500 to the east. Surficial soils in this area typically consist of Wind River loams. These soils belong to Hydrologic Group B and are considered to have a moderate infiltration rate. Residential developments are located south of the SR 500 interchange. There is a school to the northwest of the SR 500 interchange and a park to the northeast. Available information suggests that the groundwater table in this area is deep.

Typical of an urban environment, surface runoff from the highways and local streets is generally confined to the roadway by continuous curbs and concrete barriers, and is collected almost entirely by closed drainage systems. In contrast to the other watersheds, runoff from the entire PGIS within this portion of the project footprint currently contains some form of treatment. Runoff from about 15 acres within the project footprint is conveyed to an infiltration pond at the Main Street interchange, and the balance is conveyed to a wet pond north of SR 500 (Figure 3-28 for both locations).

The infiltration pond will prevent pollutants from entering the creek and will infiltrate flows; however, the primary water quality function of the wet pond is to reduce sediment. For this reason, runoff from the area served by this pond is not included in this report as receiving water quality treatment.

3.12.2 Temporary Construction Activities

Without proper management, construction activities could create temporary adverse effects on water quality in nearby water bodies, such as erosion or the accidental release of fuels and soluble or water-transportable construction materials.

Table 3-23 summarizes project-related areas of temporary disturbance by watershed and includes all areas within the proposed project footprint. It does not include potential staging areas on land outside the footprint, construction areas in or over water, or possible casting yard sites that may be required for fabricating segmental box bridge segments. Staging areas and casting yard sites are discussed in Section 3.11.

Table 3-23. Areas of Potential Disturbance During Construction

Watershed	Potential Area of Temporary Disturbance
Columbia Slough	105 acres
Columbia River – Oregon	70 acres
Columbia River – Washington	170 acres
Burnt Bridge Creek	55 acres
Fairview Creek	15 acres

Staging and casting yard sites will be required to local and state stormwater treatment requirements. Typical runoff from these sites could include oils, greases, metals, and high-pH water from concrete production. Stormwater treatment BMPs would be designed to treat specific areas of these sites. Site-specific BMPs could include pre-treatment facilities such as oil-water separators and sediment traps and standard facilities to meet water quality and water quantity issues, as appropriate. Appropriate BMPs for stormwater treatment are discussed further in Section 3.

National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Discharge Permits will regulate the discharge of stormwater from construction sites. These permits include discharge water quality standards, runoff monitoring requirements, and provision for preparing a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP contains all the elements of TESC and SPCC plans.

The SWPPP and its adoption by construction personnel are essential for ensuring water quality standards are met during construction, and a single, comprehensive plan will ensure project-wide consistency. Contractors will be required to have a certified Erosion and Sediment Control Lead on staff to ensure proper implementation of the SWPPP. In addition, the agency or agencies responsible for providing construction oversight will also have one or more staff assigned to monitor SWPPP implementation.

Typical elements of a SWPPP are listed in Section 7. Water quality standards, which include standards for turbidity and pH, are usually monitored at the point of discharge. There may also be special requirements, in addition to those for turbidity and pH, for discharges to the Columbia Slough and Burnt Bridge Creek, both of which are 303(d)-listed watercourses.

The selection of construction BMPs is dependent on the specific site layout and sequence of construction activities.

3.12.3 Permanent Water Quality and Flow Control Systems

The following sections describe the general approach to the management of runoff from impervious areas constructed by the project and from existing impervious areas within the project footprint that will remain after the project is completed. The project footprint is the area defined by the extent of property required for the completed project. It does not include areas that might be required to facilitate construction, such as temporary construction easements and staging areas.

The focus is on the potential effect of the project on runoff to receiving waterbodies in terms of pollutants and discharge. These waterbodies are the Columbia Slough, Columbia River (including North Portland Harbor), and Burnt Bridge Creek. Although there will be project-related construction in the Fairview Creek watershed,[4] the creek is not fish-bearing, the proposed impervious area will be less than currently exists, and runoff will be infiltrated. For these reasons, this watershed is not included in subsequent discussions.

3.12.3.1 Pollutant-Generating Surfaces

The intent of project stormwater management strategies is to reduce the potential impact on water quality and discharge from project-related changes in impervious area, especially PGIS. PGIS, defined as impervious surfaces considered to be significant sources of pollutants in stormwater runoff, provide a good indicator of the potential impact of the project on water quality in receiving waterbodies. For the permanent project facilities, these areas include:

- Highways and ramps, including non-vegetated shoulders
- LRT guideway subject to vehicular traffic (referred to as a semi-exclusive guideway where the tracks are subject to cross-traffic, or as non-exclusive where vehicles such as buses can travel along the guideway)
- Streets, alleys, and driveways
- Bus layover facilities, surface parking lots, and the top floor of parking structures

The following types of impervious area are considered non-PGIS:

- LRT guideway not subject to vehicular traffic except for occasional use by emergency or maintenance vehicles (often referred to as an exclusive guideway)
- LRT platforms
- Bike/ped paths and sidewalks

[4] Construction will comprise expansion of the TriMet LRT Maintenance Facility. The expansion would be a joint undertaking of the CRC and Portland-Milwaukie LRT Projects.

Exclusive LRT guideway is considered non-pollution-generating because the light rail vehicles are electric, and other potential sources of pollution such as bearings and gears are sealed to prevent the loss of lubricants. Light rail vehicle braking is almost exclusively accomplished via (power) regenerative braking, which avoids any friction or wear on the vehicle brake pads and, thus, releases very few pollutants. Sand, however, may need to be applied to the tracks to aid traction on steeper grades and this is taken into consideration when assessing water quality facility requirements.

Bus shelter roofs might be pollutant-generating if they are constructed from galvanized metal. Such areas will be very small in relation to the overall area of sidewalk and were not included in the calculation of PGIS area. In addition, these types of facility are not typically well-defined at this early stage of project development.

The focus on PGIS should not be taken to infer that only runoff from these areas will be treated. Runoff from contiguous non-PGIS sidewalks, for example, typically commingles with roadway drainage and, as such, would also be treated. As discussed in Section 3.12.5.5 the PGIS and non-PGIS within the project footprint together form most of the contributing impervious area for the project.

Table 3-24 provides the approximate areas of new and rebuilt impervious surfaces by project element and watershed. The acreages presented below include all impervious areas across the project corridor. The acreages presented later in this section, which are in relation to stormwater treatment design, include PGIS acreages only, a 10-acre allowance for post-project development on Hayden Island, and do not include Ruby Junction acreages since all new PGIS at that site will be infiltrated post-project. Therefore, the values in Table 3-24 are similar to values presented in further discussion, but cannot be compared directly.

Table 3-24. New and Rebuilt Impervious Surface Area in Acres by Project Element and Watershed

Element	Columbia Slough	Columbia River South	Columbia River North	Burnt Bridge Creek	Fairview Creek (Ruby Junction)	Total
Highway structures	12	20	20	1	0	**54**
Highway pavement (including tunnels)	27	22[a]	54	8	0	**111**
Transit guideway, platforms, and associated roadway	0	1	13	0	0	**14**
Transit maintenance facilities	0	0	0	0	5	**5**
Transit structures	0	3	1	0	0	**3**
Park and ride structures	0	0	5	0	0	**5**
Sidewalks and bike/ped paths (including those on transit structures)	4	6	13	1	0	**23**
Total	**43**	**52**	**105**	**10**	**5**	**215**

a This does not include 10 acres of post-project transit-oriented development assumed to be constructed adjacent to the Hayden Island LRT station.

Figure 3-31 through Figure 3-33 show the project footprint and those parts of the project that will be new or rebuilt versus those parts expected to be resurfaced. Within the project footprint, the project will increase the overall PGIS area by approximately 21 acres or approximately 10 percent over the existing 217 PGIS acres. New PGIS includes new and rebuilt pavement. The current design will result in approximately 191 acres of new PGIS and 43 acres of resurfaced pavement.

Project water management strategies will result in a reduction from current conditions of over 188 acres of PGIS from which runoff is discharged untreated. In addition, runoff from 183 of the 191 acres of PGIS created or rebuilt by the project (or over 95 percent) will be infiltrated (67 acres) or treated (116 acres), as well as 34 of the 43 acres of resurfaced roadway. In addition, runoff from about 4 acres on the existing North Portland Harbor Bridge and approximately 19 acres of existing PGIS that lie outside the project footprint (and will not be affected by the project) will be treated. These latter areas mainly comprise Vancouver streets from which runoff will naturally drain to proposed water quality facilities and other roadway surfaces that are considered to be “equivalent” areas for new project-related PGIS that will be difficult to treat.

The total Contributing Impervious Area (CIA) for the project, which includes PGIS and non-PGIS, is estimated to be approximately 291 acres. This area includes about 261 acres of new, rebuilt, and resurfaced impervious surface area created by the project and approximately 30 acres of existing impervious area that, while unaffected by the project, will contribute runoff to the area included in the project footprint. Runoff from approximately 262 acres or about 90 percent of the CIA will be treated or infiltrated.

3.12.3.2 Objectives

To minimize permanent stormwater-related impacts, the following stormwater management objectives were adopted for the project:

1. Provide flow control for new and rebuilt[5] impervious areas in accordance with state and local requirements. Note that flow control is only required for stormwater discharges to Burnt Bridge Creek. Discharges to the Columbia Slough, North Portland Harbor, and Columbia River are exempt.[6] Although Columbia Slough is exempt from flow control, the discharge of runoff from the project area to the waterbody is regulated by the operation of drainage district pump stations.

2. Select and provide water quality treatment for runoff from new and rebuilt PGIS in accordance with the most restrictive requirements of the agencies that have authority over the affected drainage areas.

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[5] Rebuilt impervious surfaces are existing impervious areas that are excavated to a depth at or below the top of the subgrade.

[6] Flow exemption is provided in the City of Portland’s 2008 Stormwater Management Manual .

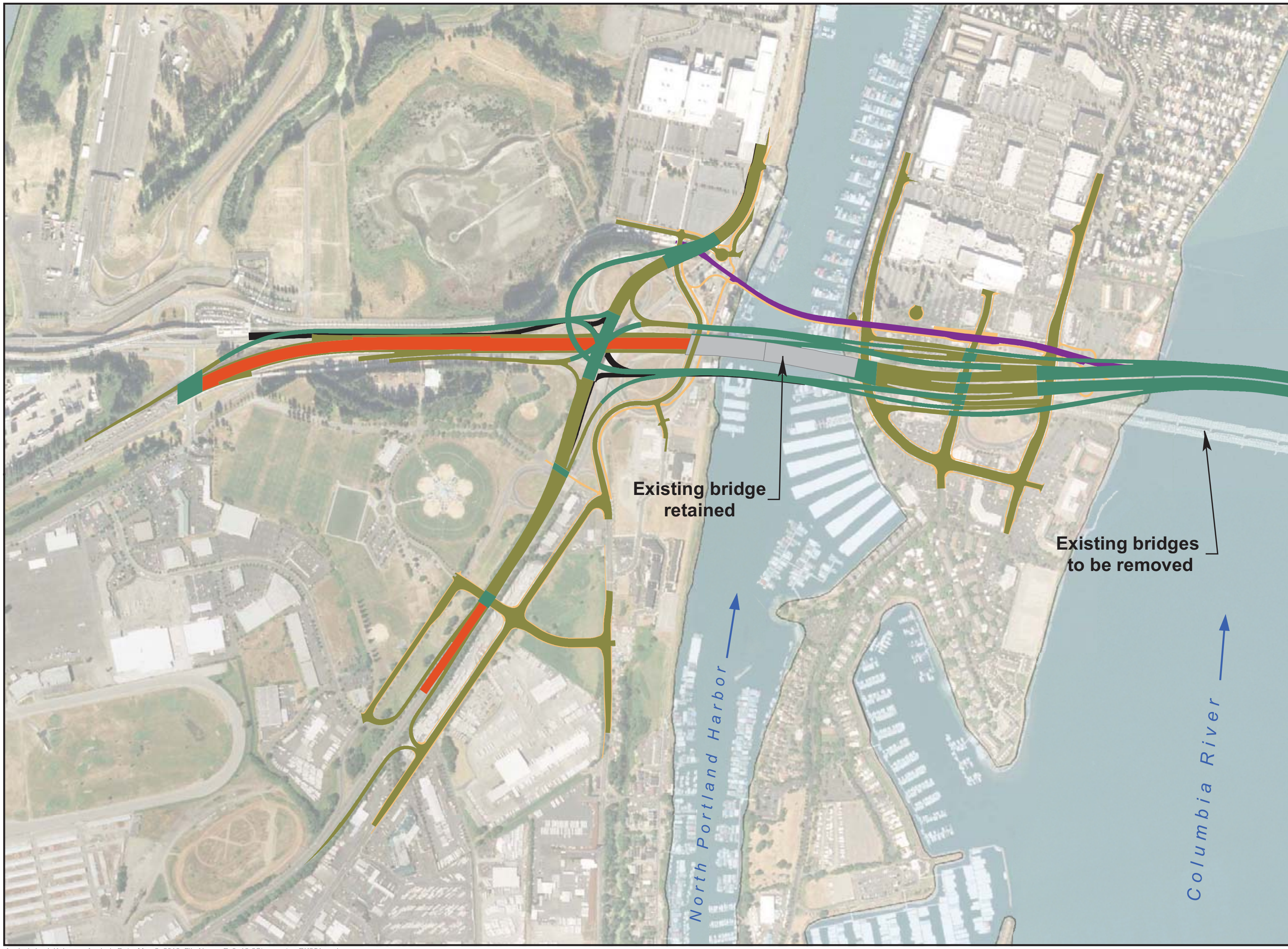

Figure 3-31.
Rebuilt, New, and Resurfaced Pavement - Oregon

New rebuilt pavement
New Bridge
New Bridge - Phase 1
Exclusive transit guideway
Overlay/resurfaced pavement
New park & ride structure
New tunnel
New bike-pedestrian path/sidewalk
Existing North Portland Harbor Bridge

Columbia River CROSSING

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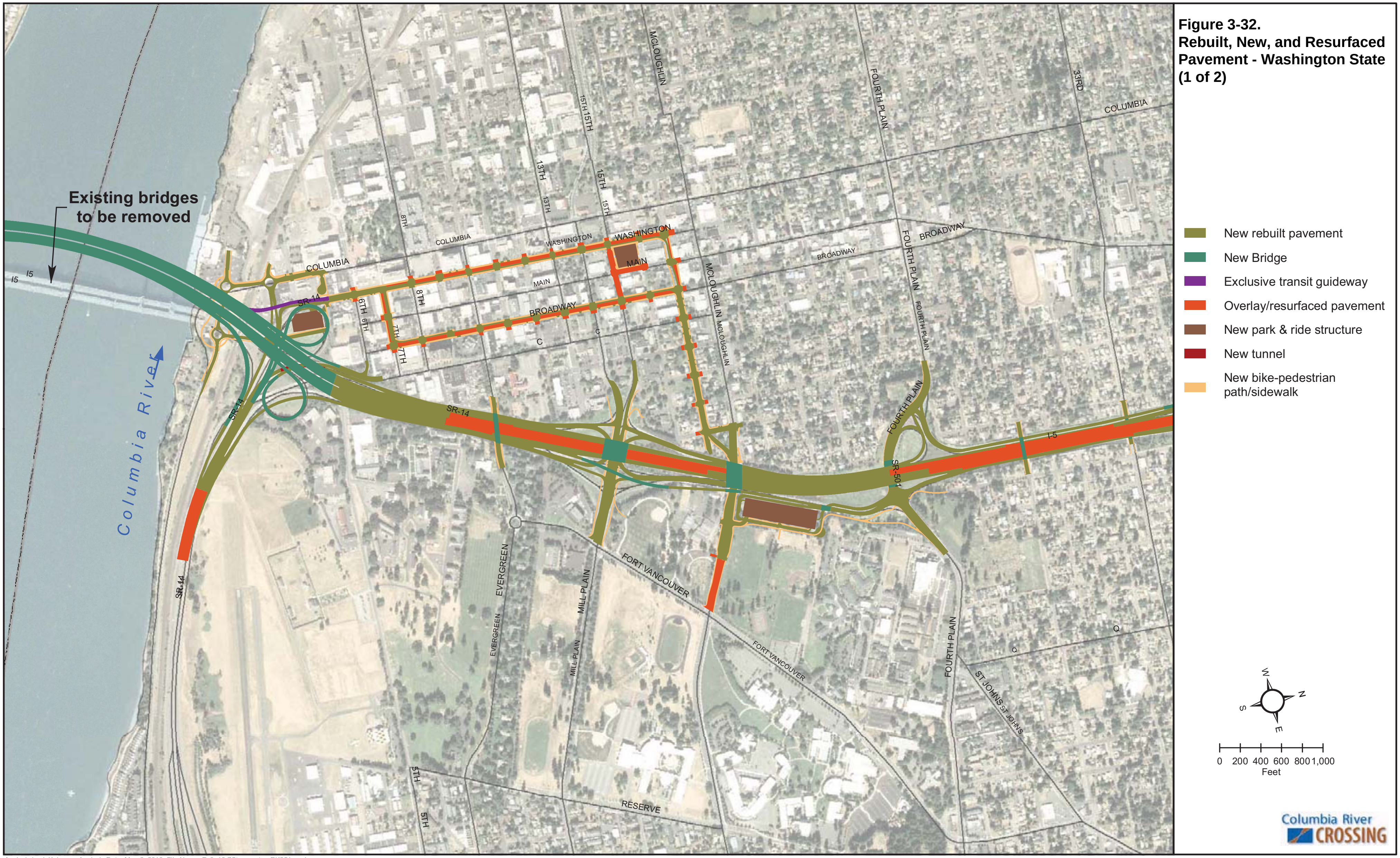
Figure 3-32.
Rebuilt, New, and Resurfaced Pavement - Washington State (1 of 2)



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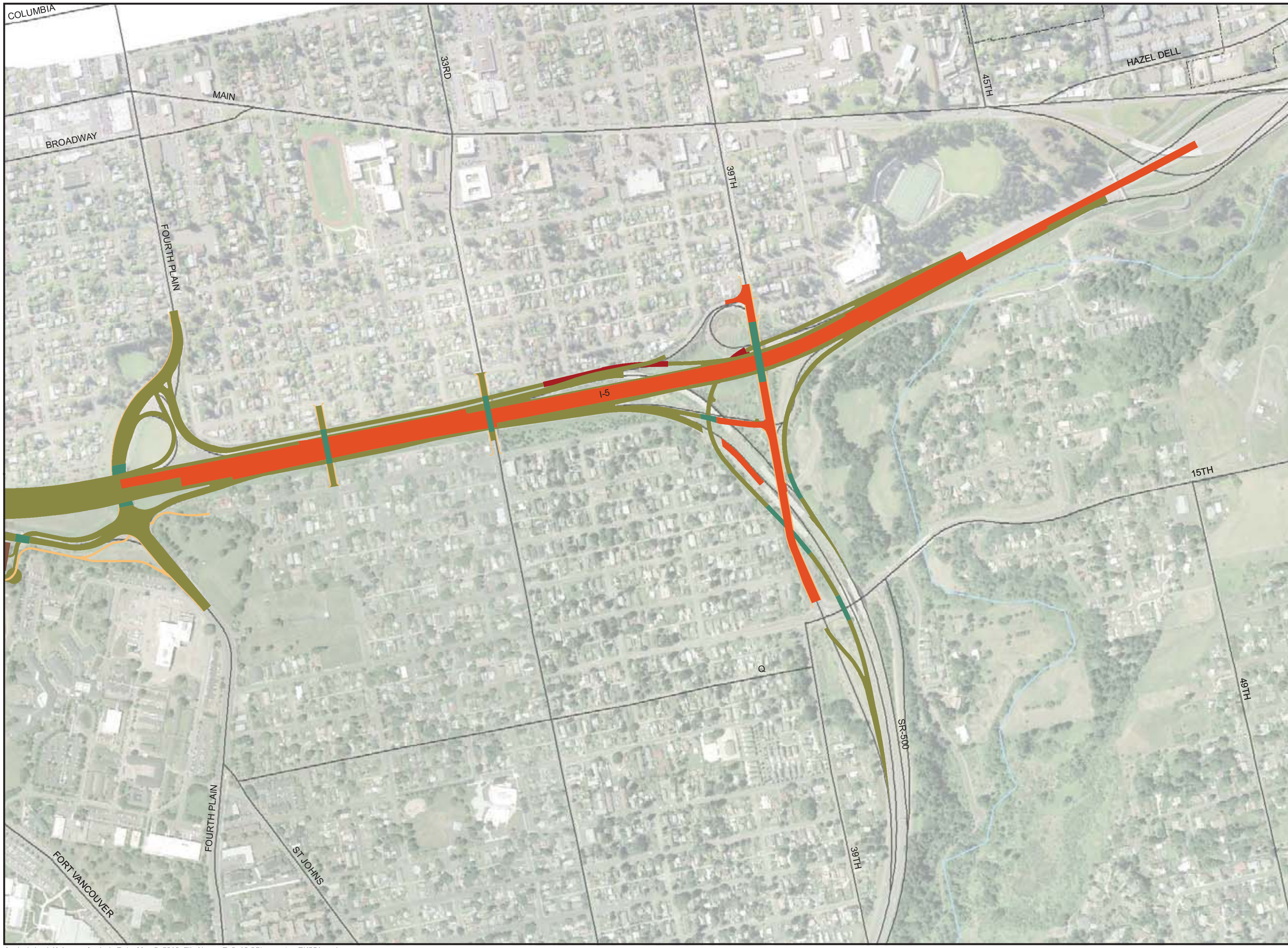

Figure 3-33.
Rebuilt, New, and Resurfaced Pavement - Washington State (2 of 2)

New rebuilt pavement
New Bridge
Overlay/resurfaced pavement
New park & ride structure
New tunnel
New bike-pedestrian path/sidewalk

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Mar. 2, 2010; File Name: Ex3_13-8Stormwater_RK251.mxd

3. Where practical and cost-effective,[7] provide additional water quality treatment for runoff from resurfaced (or overlaid),[8] and existing PGIS where none currently exists.
4. The different approach to new versus resurfaced pavement is consistent with the Standard Local Operating Procedures for Endangered Species (SLOPES IV) (NMFS 2008j), a programmatic biological opinion and incidental take statement for transportation projects undertaken in Oregon and on the north shore of the Columbia River and permitted by the USACE.

3.12.4 Water Quality Best Management Practices

The stormwater water quality management approach is to treat runoff to reduce the following pollutants that are typically associated with transportation projects:

- Debris and litter
- Suspended solids such as sand, silt and particulate metals
- Oil and grease
- Dissolved metals

Dissolved metals, especially dissolved copper, are of particular concern due to their potential impact on the olfactory systems of listed fish.

CRC adopted ODOT's recent technical memorandum on stormwater water quality on a project-wide basis to provide a standard approach to determining types of water quality facilities that will provide adequate protection to listed species (ODOT 2009). The memorandum is the result of a collaborative venture by ODOT, FHWA, and natural resource agencies (NOAA Fisheries, DEQ, USFWS, EPA, and ODFW). The decision to use this approach on the CRC project was endorsed by WSDOT and Ecology. For the project, the suite of BMPs resulting from the application of this technical bulletin was found to be comparable to or more restrictive than the results that would be obtained by using state and municipal agency requirements.

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[7] Based on the WSDOT Highway Runoff Manual guidelines: a) Treat runoff from existing PGIS (primarily in Vancouver) that would run on to new or rebuilt pavement, the runoff from which is proposed to be treated, and b) treat runoff from resurfaced PGIS (primarily on I-5) where it could be captured and conveyed to a proposed water quality facility without the need to excavate the resurfaced pavement to install new conveyance systems.

[8] Resurfaced impervious surfaces are those existing impervious surfaces where the asphalt or concrete is not removed down to or below the top of the subgrade.

Based on the ODOT memorandum, the following water quality BMPs are effective in reducing sediments, particulates, and dissolved metals, which are pollutants of concern for ESA-listed species observed in the waterbodies to which stormwater will be discharged:

- **Bioretention Ponds** are infiltration ponds that use an engineered (amended) soil mix to remove pollutants as runoff infiltrates through this zone to the underlying soils. The primary mechanisms for pollutant reduction are filtration, sorption, biological uptake, and microbial activity. While this BMP is best suited to sites with Hydrologic Group A and B soils, it may be used for Group C and D Hydrologic Group soils with the addition of an underdrain system to collect infiltration runoff and direct it to a stormwater conveyance system. An infiltration rate of 1 inch per hour was assumed when estimating the size of these facilities. If the soils cannot sustain this rate and there is insufficient space to increase the pond size to accommodate a lower value, underdrains will be installed.
- **Constructed Treatment Wetlands** are shallow, permanent, vegetated ponds that function like natural wetlands. They remove pollutants through sedimentation, sorption, biological uptake, and microbial activity.
- **Soil-Amended Biofiltration Swales** are trapezoidal channels with mild slopes and shallow depths of flow. The channels are dry between storm events and are typically vegetated. They treat runoff by filtration and sorption as runoff flows through the grass surface and amended soils. Amended soils, especially compost-amended, constitute an excellent filtration medium. Compost-amended soils have a high cation exchange capacity that will bind and trap dissolved metals. Similar to bioretention ponds, an underdrain system is recommended for sites with Group C and D Hydrologic Group soils.
- **Soil-Amended Filter Strips** are intended to treat sheet runoff from an adjacent roadway surface. Similar to grass swales, filter strips treat runoff by filtration and sorption as runoff flows through the vegetated surface and amended soils. In a confined urban setting such as the project corridor, opportunities to use this BMP are limited.
- **Bioslopes**, like filter strips, are intended to treat sheet runoff from an adjacent roadway surface. They comprise a vegetated filter strip, infiltration trench, and underdrain, and reduce pollutants through sorption and filtration. The percolating runoff flows through a special mixture of materials, including dolomite and gypsum, which promotes the adsorption of pollutants. Bioslopes are also known as media filter drains and ecology embankments.

Other water quality BMPs, including **dispersal**, **drywells** and **proprietary systems** (such as cartridge filters),[9] are considered on a case-by-case basis where the BMPs listed above are not practical or feasible.

Oil control pretreatment may be required at high-traffic intersections and park and ride facilities, where high concentrations of oil and grease are expected in stormwater runoff. Suitable types of treatment facilities include **baffle type oil-water separators** and **coalescing plate oil-water separators**.

[9] Cartridge filters are passive flow-through devices similar to the filters commonly available for household faucets. Media in the cartridges will trap or adsorb contaminants such as suspended particles and dissolved metals.

As the project design progresses, the team will continue to assess new technologies and whether they should be added to the suite of acceptable BMPs. For example, Ecology recently approved Americast's Filterra® system for reducing dissolved metals and other pollutants (Ecology 2006). This system uses engineered bioretention filtration incorporated into a planter box to treat runoff.

The sizing and detailed design of individual water quality facilities will be in accordance with the specific requirements of the state or local agency that has jurisdiction over that facility. For example, water quality facilities (or BMPs) within the WSDOT right-of-way will be sized and designed in accordance with the WSDOT Highway Runoff Manual. Runoff in excess of the flow needed to meet requirements for water quality treatment will be routed around such facilities to the maximum extent practical. This approach will reduce maintenance requirements and extend the life of the facility without compromising water quality objectives.

In Oregon, single rainfall events are typically used to size water quality facilities. ODOT uses rainfall events that will result in treatment of approximately 85 percent of the cumulative runoff, while the City of Gresham's and the City of Portland's design rainfall will result in treatment of approximately 80 and 90 percent of the average annual runoff, respectively.

In Washington, the types of water quality facility being proposed will be sized to treat at least 91 percent of the runoff volume, regardless of where the facility is located. Unlike in Oregon, design flows and volumes for water quality facilities in Washington are estimated using a continuous rainfall-runoff simulation model.

It should be noted that many of the proposed water quality facilities rely on infiltration as the primary mechanism for treatment and disposal. Depending on the infiltration rates available at a particular site, these facilities may be able provide an even higher percentage of runoff treatment. However, for purposes of describing and analyzing effects, the published state and local standards discussed above and in Section 3.12.5 will be used.

3.12.5 Stormwater Management Facilities

The following subsections describe the proposed stormwater water quality and flow control facilities on a watershed basis. As noted in the preceding section, water quality facilities were selected from the list of acceptable BMPs developed using the ODOT technical guidance memorandum cited in Section 2. The general approach is to provide centralized water quality facilities located in interchange areas, thereby minimizing the need for additional property acquisitions. Design development and refinements may necessitate considering BMPs other than those presented in this report, and stormwater conveyance system design may result in changes in areas draining to individual water quality facilities. The project will also identify and evaluate options as design progresses for low impact development and the use of more localized water quality facilities that treat runoff closer to its source, thereby reducing the size of the stormwater management facilities currently proposed. The ODOT technical memorandum will continue to be employed, ensuring that project objectives are not compromised and that water quality facilities will be provided for an equal or greater area of new and rebuilt PGIS.

In general, where feasible, water quality stormwater treatment facilities will be provided for new and rebuilt PGIS. Where this does not appear to be feasible, the treatment of the same or greater area of "equivalent" PGIS is proposed. In addition, water quality facilities are proposed for resurfaced and existing surfaces where practical and cost-effective.[10] As discussed in the preamble to Section 3.12.3, this approach is consistent with local and state jurisdictional agency requirements. The CRC design team has evaluated the need to resurface versus rebuilding existing I-5 pavement with the intention of reducing project cost and minimizing the use of non-renewable resources. This has resulted in the proposed mix of resurfaced and rebuilt pavement, a mix that will continue to be reviewed with a view to minimizing the extent of existing pavement that requires complete reconstruction. As a result of this stormwater treatment approach, the area of untreated PGIS is reduced from its existing condition in all watersheds.

Flow control is proposed only for discharges to Burnt Bridge Creek. As described in Section 3.12.3.2, the Columbia Slough and Columbia River are exempt from such requirements.

3.12.5.1 Columbia Slough Watershed

Overall, the project will increase the total PGIS in this watershed by approximately 10 acres. This increase may be attributed to new streets connecting areas on either side of the Marine Drive interchange, and the addition of runoff from the North Portland Harbor Bridge. As stated in Section 3.12.1, runoff from the existing structure currently discharges through scuppers to the water surface below. The project will create approximately 39 acres of new and rebuilt PGIS. While I-5 will generally follow its current alignment and grade, the Marine Drive interchange will be completely rebuilt and will differ significantly from its existing layout. In addition, about 11 acres of existing PGIS (primarily I-5 north of Victory Boulevard) will be resurfaced rather than rebuilt. The existing stormwater conveyance system will not be modified where highway resurfacing is proposed, and there does not appear to be adequate space between I-5 and Walker Slough to retrofit the existing stormwater conveyance system to treat runoff from approximately 3.7 acres of resurfaced and 2.1 acres of new I-5 pavement.

The existing LRT track will be extended north of the existing Expo Station, but since the guideway is ballasted track and considered non-polluting, it is not included in this summary. Table 3-25 summarizes project changes to PGIS and the areas from which runoff will be treated. The paragraphs following the table describe the individual water quality facilities, the locations of which are shown on Figure 3-34 through Figure 3-36.

Flow control is not required for runoff discharged to Columbia Slough, and no new outfalls are proposed. The stormwater management plan for this watershed reflects a request by the MCDD to minimize runoff from the project to the Peninsula Drainage District No. 2 surface water system, in order to provide greater flexibility for handling increased runoff from a potential redevelopment of the Hayden Meadows race track.

As described in Section 3.12.1, soils in this area are comprised of the Sauvie-Rafton-Urban land complex that belong to Hydrologic Soil Group D and are poorly drained. For this reason, the primary BMP proposed for water quality facilities in this watershed is a constructed treatment wetland. However, boreholes in the area show that the soils can be quite variable. As the project

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[10] Based on the WSDOT Highway Runoff Manual guidelines; a) Treat runoff from existing PGIS (primarily in Vancouver) that would run on to new or rebuilt pavement the runoff from which is proposed to be treated, and b) treat runoff from resurfaced PGIS (primarily on I-5) where it could be captured an conveyed to a proposed water quality facility without the need to excavate the resurfaced pavement to install new conveyance systems.

design advances, site-specific geotechnical investigations may prove that one or more of the locations proposed for water quality facilities may be suitable for infiltration.

Table 3-25. Summary of Changes in PGIS – Columbia Slough Watershed

	Area (acres)			
	Infiltrated	Treated	Untreated	Total
Existing PGIS	2.7	0.0	39.0	**41.7**
Post-Project PGIS				
Existing PGIS retained as-is	0.0	1.9[a]	0.0	**1.9**
Existing PGIS resurfaced	0.0	6.3	4.7	**11.0**
Net change in existing PGIS	(2.7)	8.2	(34.3)	**(28.8)**
New and rebuilt PGIS	1.0	34.1	3.7	**38.8**
Net change in total PGIS	**(1.7)**	**42.3**	**(30.6)**	**10.0**

a The existing North Portland Harbor Bridge. This area is not currently in the watershed.

The following paragraphs describe individual proposed water quality facilities and the areas they serve.

Water Quality Facility CS-A

This facility, which comprises a biofiltration swale located south of Victory Boulevard and west of I-5, will be sized to handle runoff from about 1.7 acres of PGIS comprising the new bridge over Victory Boulevard and ramp from Marine Drive to southbound I-5 to the north of that bridge. Outflows from the swale will be discharged to Schmeer Slough at Outfall CS-01 via a stormwater pipe located on Victory Boulevard.

Runoff from a very short length of the Marine Drive to southbound I-5 (about 0.5 acre of PGIS) south of Victory Boulevard will be conveyed to a water quality swale constructed as part of the I-5 Delta Park project. This swale has adequate capacity to handle the additional runoff.

Water Quality Facility CS-B

This facility, a constructed treatment wetland located east of I-5 at the Marine Drive interchange, is sized to handle runoff from about 7.5 acres of PGIS comprising the interchange ramps on the east side of the highway. The grades are such that it would be difficult to convey runoff from about 1.0 acre of the ramp from northbound I-5 to Marine Drive to the wetland; therefore, a biofiltration swale is proposed (see Water Quality Facility CS-C). Outflows from the constructed wetland will be discharged to the upstream end of Walker Slough via Outfall CS-02.

Water Quality Facility CS-C

This is the biofiltration swale referred to under Water Quality Facility CS-B and, as mentioned in the preceding paragraph, it will treat runoff from approximately 1.0 acre of the south end of the new northbound I-5 to Marine Drive ramp. Like CS-B, treated runoff will be discharged to the upstream end of Walker Slough via Outfall CS-02.

Water Quality Facility CS-D

About 17.2 acres of PGIS comprising I-5 and the interchange ramps on the west side of the highway will be conveyed to a constructed treatment wetland located west of I-5 at the Marine Drive interchange. This drainage area includes approximately 4.6 acres of resurfaced PGIS and about 2.1 acres of PGIS on the existing North Portland Harbor Bridge that will be retrofitted with a stormwater collection and conveyance system.

Outflows from the constructed wetland will be released via outfall CS-03 to the drainage channel located immediately south of the Expo Center. The channel and associated pump stations may need to be enlarged to handle additional flows. Alternatively, the wetland could be enlarged to provide detention storage and reduce peak outflows. If necessary, an oil-water separation facility will be provided to pretreat runoff from the part of the Marine Drive bridge where traffic flow is controlled by traffic lights.

Water Quality Facility CS-E

Runoff from about 1.9 acres of new and rebuilt PGIS between Martin Luther King Jr. Boulevard and the new connection between Union Court and Martin Luther King Jr. Boulevard will be treated at a constructed treatment wetland located southwest of Martin Luther King Jr. Boulevard and northwest of the connection. The constructed wetland will handle runoff from Martin Luther King Jr. Boulevard and new ramp from Martin Luther King Jr. Boulevard to Union Court. Flows from the constructed wetland will be discharged to an existing stormwater pipe on Union Court at CS-04.

Runoff from the rebuilt Union Court west of the connection with Martin Luther King Jr. Boulevard (about 1.0 acre) will likely continue to be shed off the shoulders, dispersed and infiltrated, as presently occurs.

Water Quality Facility CS -F

A biofiltration swale is proposed adjacent to Vancouver Way and southeast of the new connection between Martin Luther King Jr. Boulevard and Vancouver Way. Flows from the swale would be discharged to an existing stormwater pipe on Vancouver Way at CS-05. The swale would treat runoff from about 3.6 acres of new and resurfaced westbound Martin Luther King Jr. Boulevard and the connection between Martin Luther King Jr. Boulevard and Vancouver Way.

Water Quality Facility CS -G

A biofiltration swale is proposed northeast of Vancouver Way and the new connection between Union Court, Vancouver Way, and Marine Drive. Flows from the swale will be discharged to an existing stormwater pipe on Vancouver Way at CS-06. The swale will treat runoff from about 2.4 acres of new and resurfaced pavement comprising the new connection between Union Court and Marine Drive and part of the rebuilt portion of Marine Drive.

Local Street Improvements

Approximately 6.1 acres of local streets will be constructed within this watershed in addition to those mentioned above, including portions of Vancouver Way and Marine Drive. Runoff from these streets would be treated in semi-continuous inflow biofiltration swales with the exception of about 0.9 acres of rebuilt pavement on Vancouver Way and about 0.7 acres on Marine Drive. The project team will continue to evaluate options to provide water quality facilities for the local streets the runoff from which not currently proposed to be treated.

3.12.5.2 Columbia River Watershed – Oregon

This watershed includes Hayden Island and a portion of Marine Drive, the runoff from which discharges to North Portland Harbor. The project will rebuild the Hayden Island interchange, retrofit the existing North Portland Harbor bridge with a stormwater collection and conveyance system, and demolish the existing the existing Columbia River bridges. The last two actions will result in eliminating runoff from approximately 8 acres of bridge deck that is presently discharged directly to the water surface below. The project will reduce the PGIS within this part of the Columbia River watershed by approximately 5 acres and create approximately 52 acres of new and rebuilt PGIS. Runoff from these areas and 2.3 acres of the existing North Portland Harbor Bridge will be treated prior to being released to North Portland Harbor or the Columbia River. Currently, there are no water quality facilities for runoff from the project footprint in this watershed.

Constructed treatment wetlands are proposed for the main water quality facilities on Hayden Island, rather than biofiltration ponds, even though the soils belong to the Pilchuck-Urban land complex and are classified as Hydrologic Group A. At locations where such facilities are being be considered, the depth to groundwater is only about 15 feet, and may be less depending on the influence of river levels on the phreatic surface. Considering the depth of the pond (approximately 8 feet), there may not be adequate separation between the invert and groundwater table for treating runoff. The EPA recommends a "significant separation distance (2 to 5 feet) between the bottom of an infiltration basin and seasonal high groundwater table." Again, no flow control facilities are required or proposed.

While the existing LRT track will be extended across the island, the guideway and adjacent bike/ped path are considered non-polluting and are not included in this summary. Proposed grades on the south end of the new transit bridge across North Portland Harbor are such that sand might be applied to the tracks to aid traction. For this reason, a manhole sediment trap or other sediment reducing BMP will be provided in the stormwater conveyance system at the south end of the structure.

Table 3-26 summarizes project changes to PGIS and the areas from which runoff will be treated. The paragraphs following the table describe the water quality facilities, the locations of which are shown on Figure 3-34, and the PGIS that will be treated by each. Flow control is not required or provided for runoff discharged to the Columbia River or North Portland Harbor, and only one new outfall is proposed: see Water Quality Facility NPH-B.

Table 3-26. Summary of Changes in PGIS – Columbia River South Watershed

	Area (acres)			
	Infiltrated	**Treated**	**Untreated**	**Total**
Existing PGIS	**0.0**	**0.0**	59.1	**59.1**
Post-Project PGIS				
Existing PGIS retained as-is	0.0	2.3[a]	0.0	2.3
Existing PGIS resurfaced	0.0	0.0	0.0	0.0
Net change in existing PGIS	0.0	2.3	(59.1)	(56.8)
New and rebuilt PGIS	0.0	52.3	0.7	52.3
Net change in total PGIS	**0.0**	**54.6**	**(59.1)**	**(4.5)**

a The existing North Portland Harbor Bridge.

The following paragraphs describe individual proposed water quality facilities and the areas they serve.

Water Quality Facility NPH-A

Grades are such that it would be difficult to convey runoff from Marine Drive west of the LRT track to the constructed treatment wetland CS-D described in Section 3.12.5.1. Instead, runoff from this area (approximately 3.3 acres of rebuilt and new PGIS) will be conveyed to a biofiltration swale located between Marine Drive and the flood control levee adjacent to North Portland Harbor. Flows from the swale will be discharged to an existing outfall (NPH-01) on North Portland Harbor via an existing City of Portland stormwater system. These actions will reduce the existing PGIS draining to this outfall by about 2 acres.

Water Quality Facility NPH-B

Runoff from about 4.3 acres of PGIS comprising the ramps to and from Jantzen Drive will be directed to a biofiltration swale located at the south end of the ramps; ramp grades are such that it would be difficult to convey runoff to water quality facility CR-A or CR-B. As noted in the preamble to this subsection, a new outfall may be required to convey outflows to North Portland Harbor (NPH-02) (Figure 3-34).

Water Quality Facility CR-A

A constructed treatment wetland is proposed east of I-5, between Tomahawk Island and Hayden Island Drives. The facility would treat runoff from approximately 22.0 acres of PGIS mainly comprising the new I-5 mainline. This area includes about 2.3 acres on the existing North Portland Harbor Bridge and approximately 1.6 acre of PGIS on the Tomahawk Drive extension under I-5 which will be pumped to this constructed wetland (proposed grades preclude gravity drainage). Flows from the wetland would be discharged to the Columbia River via one of the two ODOT outfalls located under the existing Columbia River Bridges (CR-01 and CR-02).

Water Quality Facility CR-B

About 7.7 acres on the lower portion of ramps to and from Hayden Island Drive will be directed to a constructed treatment wetland located underneath the south end of the existing Columbia

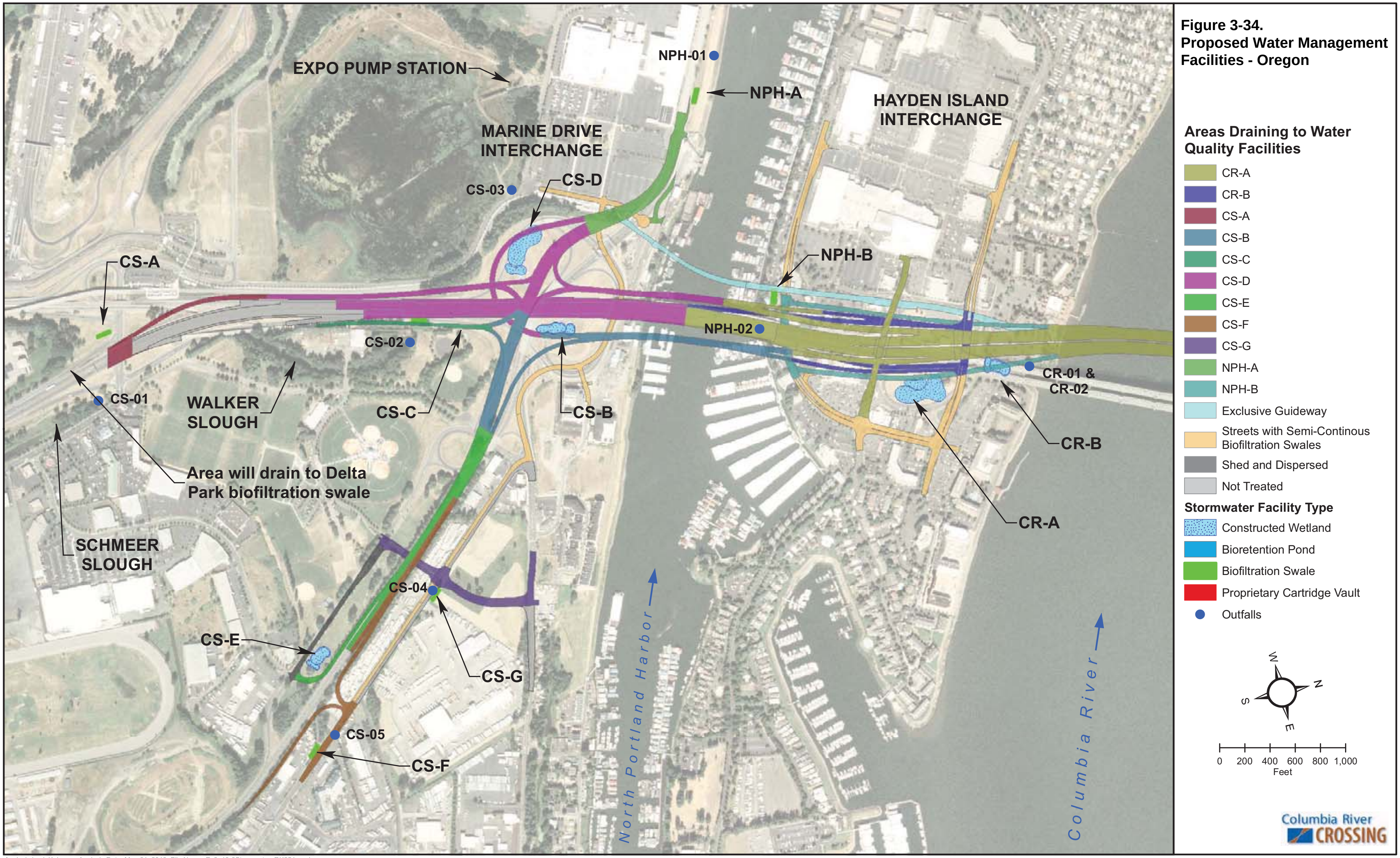
River bridges. Similar to facility CR-A, flows from this pond will be discharged to the Columbia River via one of the two ODOT outfalls located under the existing bridges.

Local Street Improvements

The project will rebuild or realign approximately 8.9 acres of local streets within this watershed. Except for about 1.6 acre of Tomahawk Island Drive (see Water Quality Facility CR-A), runoff from these roads will be treated in semi-continuous inflow biofiltration swales constructed on either side of the roadways, to the maximum feasible extent. Note that it may not be feasible to treat runoff from about 0.7 acre at the west end of proposed improvements to Hayden Island Drive. At this location, the proposed improvements tie back into existing pavement, and the proximity of businesses to the street limits options for installing swales.

Hayden Island Redevelopment

This watershed includes existing surface parking areas that may or may not remain after the project is complete depending on final designs for the post-project development of Hayden Island. Due to uncertainity at this stage in project design, the design team has made some assumptions in order to include this area in preliminary stormwater treatment designs. They have assumed that 10 acres (this value is included in Table 3-26) west of I-5 would be redeveloped for commercial use. This assumption is based on the fact that there would be an LRT station on the west side of the highway. The remaining area east of I-5 would be landscaped, which is a reasonable assumption since a large portion of this area would be occupied by a water quality facility. Regardless of alterations to this preliminary stormwater design, redevelopment of these areas will need to comply with the stormwater requirements of either ODOT or the City of Portland and runoff would either be infiltrated or treated before being released to the Columbia River or North Portland Harbor.



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