INTERSTATE 5 COLUMBIA RIVER CROSSING

Utilities Technical Report for the Final Environmental Impact Statement

May 2011

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Utilities Technical Report for the Final Environmental Impact Statement:

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Signature

Date

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ACRONYMS

Acronym	Description
BES	Bureau of Environmental Services
BNSF	Burlington Northern Santa Fe Railroad
CD	collector-distributor
CRC	Columbia River Crossing
CTR	Commute Trip Reduction (Washington)
C-TRAN	Clark County Public Transit Benefit Area Authority
DEIS	Draft Environmental Impact Statement
DOT	U.S. Department of Transportation
ECO	Employee Commute Options (Oregon)
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
LPA	Locally Preferred Alternative
LRV	light rail vehicle
ODOT	Oregon Department of Transportation
OTC	Oregon Transportation Commission
PGE	Portland General Electric
PUD	Public Utility District
PWB	Portland Water Bureau
ROD	Record of Decision
RTC	Regional Transportation Council
SPUI	single-point urban interchange
TDM	transportation demand management
TriMet	Tri-County Metropolitan Transportation District
TSM	transportation system management
USACE	U.S. Army Corps of Engineers
VAST	Vancouver Area Smart Trek
WSDOT	Washington State Department of Transportation
WTC	Washington Transportation Commission

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1. Summary

1.1 Description of Alternatives

This technical report evaluates the CRC project's locally preferred alternative (LPA) and the No-Build Alternative. The LPA includes two design options: The preferred option, LPA Option A, which includes local vehicular access between Marine Drive and Hayden Island on an arterial bridge; and LPA Option B, which does not have arterial lanes on the light rail/multi-use path bridge, but instead provides direct access between Marine Drive and the island with collector-distributor (CD) lanes on the two new bridges that would be built adjacent to I-5. In addition to the design options, if funding availability does not allow the entire LPA to be constructed in one phase, some roadway elements of the project would be deferred to a future date. This technical report identifies several elements that could be deferred, and refers to that possible initial investment as LPA with highway phasing. The LPA with highway phasing option would build most of the LPA in the first phase, but would defer construction of specific elements of the project. The LPA and the No-Build Alternative are described in this section.

1.1.1 Adoption of a Locally Preferred Alternative

Following the publication of the Draft Environmental Impact Statement (DEIS) on May 2, 2008, the project actively solicited public and stakeholder feedback on the DEIS during a 60-day comment period. During this time, the project received over 1,600 public comments.

During and following the public comment period, the elected and appointed boards and councils of the local agencies sponsoring the CRC project held hearings and workshops to gather further public input on and discuss the DEIS alternatives as part of their efforts to determine and adopt a locally preferred alternative. The LPA represents the alternative preferred by the local and regional agencies sponsoring the CRC project. Local agency-elected boards and councils determined their preference based on the results of the evaluation in the DEIS and on the public and agency comments received both before and following its publication.

In the summer of 2008, the local agencies sponsoring the CRC project adopted the following key elements of CRC as the LPA:

- A replacement bridge as the preferred river crossing,
- Light rail as the preferred high-capacity transit mode, and
- Clark College as the preferred northern terminus for the light rail extension.

The preferences for a replacement crossing and for light rail transit were identified by all six local agencies. Only the agencies in Vancouver – the Clark County Public Transit Benefit Area Authority (C-TRAN), the City of Vancouver, and the Regional Transportation Council (RTC) – preferred the Vancouver light rail terminus. The adoption of the LPA by these local agencies does not represent a formal decision by the federal agencies leading this project – the Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) – or any federal funding commitment. A formal decision by FHWA and FTA about whether and how this project should be constructed will follow the FEIS in a Record of Decision (ROD).

1.1.2 Description of the LPA

The LPA includes an array of transportation improvements, which are described below. When the LPA differs between Option A and Option B, it is described in the associated section. For a more detailed description of the LPA, including graphics, please see Chapter 2 of the FEIS.

1.1.2.1 Multimodal River Crossing

Columbia River Bridges

The parallel bridges that form the existing I-5 crossing over the Columbia River would be replaced by two new parallel bridges. The eastern structure would accommodate northbound highway traffic on the bridge deck, with a bicycle and pedestrian path underneath; the western structure would carry southbound traffic, with a two-way light rail guideway below. Whereas the existing bridges have only three lanes each with virtually no shoulders, each of the new bridges would be wide enough to accommodate three through-lanes and two add/drop lanes. Lanes and shoulders would be built to full design standards.

The new bridges would be high enough to provide approximately 95 feet of vertical clearance for river traffic beneath, but not so high as to impede the take-offs and landings by aircraft using Pearson Field or Portland International Airport to the east. The new bridge structures over the Columbia River would not include lift spans, and both of the new bridges would each be supported by six piers in the water and two piers on land.

North Portland Harbor Bridges

The existing highway structures over North Portland Harbor would not be replaced; instead, they would be retained to accommodate all mainline I-5 traffic. As discussed at the beginning of this chapter, two design options have emerged for the Hayden Island and Marine Drive interchanges. The preferred option, LPA Option A, includes local vehicular access between Marine Drive and Hayden Island on an arterial bridge. LPA Option B does not have arterial lanes on the light rail/multi-use path bridge, but instead provides direct access between Marine Drive and the island with collector-distributor lanes on the two new bridges that would be built adjacent to I-5.

LPA Option A: Four new, narrower parallel structures would be built across the waterway, three on the west side and one on the east side of the existing North Portland Harbor bridges. Three of the new structures would carry on- and off-ramps to mainline I-5. Two structures west of the existing bridges would carry traffic merging onto or exiting off of I-5 southbound. The new structure on the east side of I-5 would serve as an on-ramp for traffic merging onto I-5 northbound.

The fourth new structure would be built slightly farther west and would include a two-lane arterial bridge for local traffic to and from Hayden Island, light rail transit, and a multi-use path for pedestrians and bicyclists. All of the new structures would have at least as much vertical clearance over the river as the existing North Portland Harbor bridges.

LPA Option B: This option would build the same number of structures over North Portland Harbor as Option A, although the locations and functions on those bridges would differ, as described below. The existing bridge over North Portland Harbor would be widened and would receive seismic upgrades.

LPA Option B does not have arterial lanes on the light rail/multi-use path bridge. Direct access between Marine Drive and the island would be provided with collector-distributor lanes. The structures adjacent to the highway bridge would carry traffic merging onto or exiting off of mainline I-5 between the Marine Drive and Hayden Island interchanges.

1.1.2.2 Interchange Improvements

The LPA includes improvements to seven interchanges along a 5-mile segment of I-5 between Victory Boulevard in Portland and SR 500 in Vancouver. These improvements include some reconfiguration of adjacent local streets to complement the new interchange designs, as well as new facilities for bicyclists and pedestrians along this corridor.

Victory Boulevard Interchange

The southern extent of the I-5 project improvements would be two ramps associated with the Victory Boulevard interchange in Portland. The Marine Drive to I-5 southbound on-ramp would be braided over the I-5 southbound to the Victory Boulevard/Denver Avenue off-ramp. The other ramp improvement would lengthen the merge distance for northbound traffic entering I-5 from Denver Avenue. The current merging ramp would be extended to become an add/drop (auxiliary) lane which would continue across the river crossing.

***Potential phased construction option*:** The aforementioned southbound ramp improvements to the Victory Boulevard interchange may not be included with the CRC project. Instead, the existing connections between I-5 southbound and Victory Boulevard could be retained. The braided ramp connection could be constructed separately in the future as funding becomes available.

Marine Drive Interchange

All movements within this interchange would be reconfigured to reduce congestion for motorists entering and exiting I-5 at this location. The interchange configuration would be a single-point urban interchange (SPUI) with a flyover ramp serving the east to north movement. With this configuration, three legs of the interchange would converge at a point on Marine Drive, over the I-5 mainline. This configuration would allow the highest volume movements to move freely without being impeded by stop signs or traffic lights.

The Marine Drive eastbound to I-5 northbound flyover ramp would provide motorists with access to I-5 northbound without stopping. Motorists from Marine Drive eastbound would access I-5 southbound without stopping. Motorists traveling on Martin Luther King Jr. Boulevard westbound to I-5 northbound would access I-5 without stopping at the intersection.

The new interchange configuration changes the westbound Marine Drive and westbound Vancouver Way connections to Martin Luther King Jr. Boulevard and to northbound I-5. These two streets would access westbound Martin Luther King Jr. Boulevard farther east. Martin Luther King Jr. Boulevard would have a new direct connection to I-5 northbound.

In the new configuration, the connections from Vancouver Way and Marine Drive would be served, improving the existing connection to Martin Luther King Jr. Boulevard east of the interchange. The improvements to this connection would allow traffic to turn right from Vancouver Way and accelerate onto Martin Luther King Jr. Boulevard. On the south side of Martin Luther King Jr. Boulevard, the existing loop connection would be replaced with a new connection farther east.

A new multi-use path would extend from the Bridgeton neighborhood to the existing Expo Center light rail station and from the station to Hayden Island along the new light rail line over North Portland Harbor.

LPA Option A: Local traffic between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel via an arterial bridge over North Portland Harbor. There would be some variation in the alignment of local streets in the area of the interchange between Option A and Option B. The most prominent differences are the alignments of Vancouver Way and Union Court.

LPA Option B: With this design option, there would be no arterial traffic lanes on the light rail/multi-use path bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island would travel on the collector-distributor bridges that would parallel each side of I-5 over North Portland Harbor. Traffic would not need to merge onto mainline I-5 to travel between the island and Martin Luther King Jr. Boulevard/Marine Drive.

***Potential phased construction option*:** The aforementioned flyover ramp could be deferred and not constructed as part of the CRC project. In this case, rather than providing a direct eastbound Marine Drive to I-5 northbound connection by a flyover ramp, the project improvements to the interchange would instead provide this connection through the signal-controlled SPUI. The flyover ramp could be constructed separately in the future as funding becomes available.

Hayden Island Interchange

All movements for this interchange would be reconfigured. The new configuration would be a split tight diamond interchange. Ramps parallel to the highway would be built, lengthening the ramps and improving merging speeds. Improvements to Jantzen Drive and Hayden Island Drive would include additional through, left-turn, and right-turn lanes. A new local road, Tomahawk Island Drive, would travel east-west through the middle of Hayden Island and under the I-5 interchange, improving connectivity across I-5 on the island. Additionally, a new multi-use path would be provided along the elevated light rail line on the west side of the Hayden Island interchange.

LPA Option A: A proposed arterial bridge with two lanes of traffic, one in each direction, would allow vehicles to travel between Martin Luther King Jr. Boulevard/ Marine Drive and Hayden Island without accessing I-5.

LPA Option B: With this design option there would be no arterial traffic lanes on the light rail/multi-use path bridge over North Portland Harbor. Instead, vehicles traveling between Martin Luther King Jr. Boulevard/Marine Drive and Hayden Island would travel on the collector-distributor bridges that parallel each side of I-5 over North Portland Harbor.

SR 14 Interchange

The function of this interchange would remain largely the same. Direct connections between I-5 and SR 14 would be rebuilt. Access to and from downtown Vancouver would be provided as it is today, but the connection points would be relocated. Downtown Vancouver I-5 access to and from the south would be at C Street rather than Washington Street, while downtown connections to and from SR 14 would be made by way of Columbia Street at 4th Street.

The multi-use bicycle and pedestrian path in the northbound (eastern) I-5 bridge would exit the structure at the SR 14 interchange, and then loop down to connect into Columbia Way.

Mill Plain Interchange

This interchange would be reconfigured into a SPUI. The existing "diamond" configuration requires two traffic signals to move vehicles through the interchange. The SPUI would use one efficient intersection and allow opposing left turns simultaneously. This would improve the capacity of the interchange by reducing delay for traffic entering or exiting the highway.

This interchange would also receive several improvements for bicyclists and pedestrians. These include bike lanes and sidewalks, clear delineation and signing, short perpendicular crossings at the ramp terminals, and ramp orientations that would make pedestrians highly visible.

Fourth Plain Interchange

The improvements to this interchange would be made to better accommodate freight mobility and access to the new park and ride at Clark College. Northbound I-5 traffic exiting to Fourth Plain would continue to use the off-ramp just north of the SR 14 interchange. The southbound I-5 exit to Fourth Plain would be braided with the SR 500 connection to I-5, which would eliminate the non-standard weave between the SR 500 connection and the off-ramp to Fourth Plain as well as the westbound SR 500 to Fourth Plain Boulevard connection.

Additionally, several improvements would be made to provide better bicycle and pedestrian mobility and accessibility, including bike lanes, neighborhood connections, and access to the park and ride.

SR 500 Interchange

Improvements would be made to the SR 500 interchange to add direct connections to and from I-5. On- and off-ramps would be built to directly connect SR 500 and I-5 to and from the north, connections that are currently made by way of 39th Street. I-5 southbound traffic would connect to SR 500 via a new tunnel underneath I-5. SR 500 eastbound traffic would connect to I-5 northbound on a new on-ramp. The 39th Street connections with I-5 to and from the north would be eliminated. Travelers would instead use the connections at Main Street to connect to and from 39th Street.

Additionally, several improvements would be made to provide better bicycle and pedestrian mobility and accessibility, including sidewalks on both sides of 39th Street, bike lanes, and neighborhood connections.

***Potential phased construction option*:** The northern half of the existing SR 500 interchange would be retained, rather than building new connections between I-5 southbound to SR 500 eastbound and from SR 500 westbound to I-5 northbound. The ramps connecting SR 500 and I-5 to and from the north could be constructed separately in the future as funding becomes available.

1.1.2.3 Transit

The primary transit element of the LPA is a 2.9-mile extension of the current Metropolitan Area Express (MAX) Yellow Line light rail from the Expo Center in North Portland, where it currently ends, to Clark College in Vancouver. The transit element would not differ between LPA and LPA with highway phasing. To accommodate and complement this major addition to the region's transit system, a variety of additional improvements are also included in the LPA:

- Three park and ride facilities in Vancouver near the new light rail stations.

- Expansion of Tri-County Metropolitan Transportation District's (TriMet's) Ruby Junction light rail maintenance base in Gresham, Oregon.
- Changes to C-TRAN local bus routes.
- Upgrades to the existing light rail crossing over the Willamette River via the Steel Bridge.

Operating Characteristics

Nineteen new light rail vehicles (LRV) would be purchased as part of the CRC project to operate this extension of the MAX Yellow Line. These vehicles would be similar to those currently used by TriMet's MAX system. With the LPA, LRVs in the new guideway and in the existing Yellow Line alignment are planned to operate with 7.5-minute headways during the "peak of the peak" (the two-hour period within the 4-hour morning and afternoon/evening peak periods where demand for transit is the highest) and 15-minute headways during off-peak periods.

Light Rail Alignment and Stations

Oregon Light Rail Alignment and Station

A two-way light rail alignment for northbound and southbound trains would be constructed to extend from the existing Expo Center MAX station over North Portland Harbor to Hayden Island. Immediately north of the Expo Center, the alignment would curve eastward toward I-5, pass beneath Marine Drive, then rise over a flood wall onto a light rail/multi-use path bridge to cross North Portland Harbor. The two-way guideway over Hayden Island would be elevated at approximately the height of the rebuilt mainline of I-5, as would a new station immediately west of I-5. The alignment would extend northward on Hayden Island along the western edge of I-5, until it transitions into the hollow support structure of the new western bridge over the Columbia River.

Downtown Vancouver Light Rail Alignment and Stations

After crossing the Columbia River, the light rail alignment would curve slightly west off of the highway bridge and onto its own smaller structure over the Burlington Northern Santa Fe (BNSF) rail line. The double-track guideway would descend on structure and touch down on Washington Street south of 5th Street, continuing north on Washington Street to 7th Street. The elevation of 5th Street would be raised to allow for an at-grade crossing of the tracks on Washington Street. Between 5th and 7th Streets, the two-way guideway would run down the center of the street. Traffic would not be allowed on Washington between 5th and 6th Streets and would be two-way between 6th and 7th Streets. There would be a station on each side of the street on Washington between 5th and 6th Streets.

At 7th Street, the light rail alignment would form a couplet. The single-track northbound guideway would turn east for two blocks, then turn north onto Broadway Street, while the single-track southbound guideway would continue on Washington Street. Seventh Street will be converted to one-way traffic eastbound between Washington and Broadway with light rail operating on the north side of 7th Street. This couplet would extend north to 17th Street, where the two guideways would join and turn east.

The light rail guideway would run on the east side of Washington Street and the west side of Broadway Street, with one-way traffic southbound on Washington Street and one-way traffic northbound on Broadway Street. On station blocks, the station platform would be on the side of

the street at the sidewalk. There would be two stations on the Washington-Broadway couplet, one pair of platforms near Evergreen Boulevard, and one pair near 15th Street.

East-west Light Rail Alignment and Terminus Station

The single-track southbound guideway would run in the center of 17th Street between Washington and Broadway Streets. At Broadway Street, the northbound and southbound alignments of the couplet would become a two-way center-running guideway traveling east-west on 17th Street. The guideway on 17th Street would run until G Street, then connect with McLoughlin Boulevard and cross under I-5. Both alignments would end at a station east of I-5 on the western boundary of Clark College.

Park and Ride Stations

Three park and ride stations would be built in Vancouver along the light rail alignment:

- Within the block surrounded by Columbia, Washington 4th and 5th Streets, with five floors above ground that include space for retail on the first floor and 570 parking stalls.
- Between Broadway and Main Streets next to the stations between 15th and 16th Streets, with space for retail on the first floor, and four floors above ground that include 420 parking stalls.
- At Clark College, just north of the terminus station, with space for retail or C-TRAN services on the first floor, and five floors that include approximately 1,910 parking stalls.

Ruby Junction Maintenance Facility Expansion

The Ruby Junction Maintenance Facility in Gresham, Oregon, would need to be expanded to accommodate the additional LRVs associated with the CRC project. Improvements include additional storage for LRVs and other maintenance material, expansion of LRV maintenance bays, and expanded parking for additional personnel. A new operations command center would also be required, and would be located at the TriMet Center Street location in Southeast Portland.

Local Bus Route Changes

As part of the CRC project, several C-TRAN bus routes would be changed in order to better complement the new light rail system. Most of these changes would re-route bus lines to downtown Vancouver where riders could transfer to light rail. Express routes, other than those listed below, are expected to continue service between Clark County and downtown Portland. The following table (Exhibit 1-1) shows anticipated future changes to C-TRAN bus routes.

Exhibit 1-1. Proposed C-TRAN Bus Routes Comparison

C-TRAN Bus Route	Route Changes
#4 - Fourth Plain	Route truncated in downtown Vancouver
#41 - Camas / Washougal Limited	Route truncated in downtown Vancouver
#44 - Fourth Plain Limited	Route truncated in downtown Vancouver
#47 - Battle Ground Limited	Route truncated in downtown Vancouver
#105 - I-5 Express	Route truncated in downtown Vancouver
#105S - I-5 Express Shortline	Route eliminated in LPA (The No-Build runs articulated buses between downtown Portland and downtown Vancouver on this route)

Steel Bridge Improvements

Currently, all light rail lines within the regional TriMet MAX system cross over the Willamette River via the Steel Bridge. By 2030, the number of LRVs that cross the Steel Bridge during the 4-hour PM peak period would increase from 152 to 176. To accommodate these additional trains, the project would retrofit the existing rails on the Steel Bridge to increase the allowed light rail speed over the bridge from 10 to 15 mph. To accomplish this, additional work along the Steel Bridge lift spans would be needed.

1.1.2.4 Tolling

Tolling cars and trucks that use the I-5 river crossing is proposed as a method to help fund the CRC project and to encourage the use of alternative modes of transportation. The authority to toll the I-5 crossing is set by federal and state laws. Federal statutes permit a toll-free bridge on an interstate highway to be converted to a tolled facility following the reconstruction or replacement of the bridge. Prior to imposing tolls on I-5, Washington and Oregon Departments of Transportation (WSDOT and ODOT) would have to enter into a toll agreement with U.S. Department of Transportation (DOT). Recently passed state legislation in Washington permits WSDOT to toll I-5 provided that the tolling of the facility is first authorized by the Washington legislature. Once authorized by the legislature, the Washington Transportation Commission (WTC) has the authority to set the toll rates. In Oregon, the Oregon Transportation Commission (OTC) has the authority to toll a facility and to set the toll rate. It is anticipated that prior to tolling I-5, ODOT and WSDOT would enter into a bi-state tolling agreement to establish a cooperative process for setting toll rates and guiding the use of toll revenues.

Tolls would be collected using an electronic toll collection system: toll collection booths would not be required. Instead, motorists could obtain a transponder that would automatically bill the vehicle owner each time the vehicle crossed the bridge, while cars without transponders would be tolled by a license-plate recognition system that would bill the address of the owner registered to that license plate.

The LPA proposes to apply a variable toll on vehicles using the I-5 crossing. Tolls would vary by time of day, with higher rates during peak travel periods and lower rates during off-peak periods. Medium and heavy trucks would be charged a higher toll than passenger vehicles. The traffic-related impact analysis in this FEIS is based on toll rates that, for passenger cars with transponders, would range from $1.00 during the off-peak to $2.00 during the peak travel times (in 2006 dollars).

1.1.2.5 Transportation System and Demand Management Measures

Many well-coordinated transportation demand management (TDM) and transportation system management (TSM) programs are already in place in the Portland-Vancouver Metropolitan region and supported by agencies and adopted plans. In most cases, the impetus for the programs is from state-mandated programs: Oregon's Employee Commute Options (ECO) rule and Washington's Commute Trip Reduction (CTR) law.

The physical and operational elements of the CRC project provide the greatest TDM opportunities by promoting other modes to fulfill more of the travel needs in the project corridor. These include:

- Major new light rail line in exclusive right-of-way, as well as express bus and feeder routes;

- Modern bicycle and pedestrian facilities that accommodate more bicyclists and pedestrians, and improve connectivity, safety, and travel time;
- Park and ride lots and garages; and
- A variable toll on the highway crossing.

In addition to these fundamental elements of the project, facilities and equipment would be implemented that could help existing or expanded TSM programs maximize capacity and efficiency of the system. These include:

- Replacement or expanded variable message signs or other traveler information systems in the CRC project area;
- Expanded incident response capabilities;
- Queue jumps or bypass lanes for transit vehicles where multi-lane approaches are provided at ramp signals for entrance ramps;
- Expanded traveler information systems with additional traffic monitoring equipment and cameras, and
- Active traffic management.

1.1.3 LPA Construction

Construction of bridges over the Columbia River is the most substantial element of the project, and this element sets the sequencing for other project components. The main river crossing and immediately adjacent highway improvement elements would account for the majority of the construction activity necessary to complete this project.

1.1.3.1 Construction Activities Sequence and Duration

The following table (Exhibit 1-2) displays the expected duration and major details of each element of the project. Due to construction sequencing requirements, the timeline to complete the initial phase of the LPA with highway phasing is the same as the full LPA.

Exhibit 1-2. Construction Activities and Estimated Duration

Element	Estimated Duration	Details
Columbia River bridges	4 years	• Construction is likely to begin with the bridges. • General sequence includes initial preparation, installation of foundation piles, shaft caps, pier columns, superstructure, and deck.
Hayden Island and SR 14 interchanges	1.5 - 4 years for each interchange	• Each interchange must be partially constructed before any traffic can be transferred to the new structure. • Each interchange needs to be completed at the same time.
Marine Drive interchange	3 years	• Construction would need to be coordinated with construction of the southbound lanes coming from Vancouver.
Demolition of the existing bridges	1.5 years	• Demolition of the existing bridges can begin only after traffic is rerouted to the new bridges.

Element	Estimated Duration	Details
Three interchanges north of SR 14	4 years for all three	• Construction of these interchanges could be independent from each other or from the southern half of the project. • More aggressive and costly staging could shorten this timeframe.
Light rail	4 years	• The river crossing for the light rail would be built with the bridges. • Any bridge structure work would be separate from the actual light rail construction activities and must be completed first.
Total Construction Timeline	6.3 years	• Funding, as well as contractor schedules, regulatory restrictions on in-water work, weather, materials, and equipment, could all influence construction duration. • This is also the same time required to complete the smallest usable segment of roadway – Hayden Island through SR 14 interchanges.

1.1.3.2 Major Staging Sites and Casting Yards

Staging of equipment and materials would occur in many areas along the project corridor throughout construction, generally within existing or newly purchased right-of-way or on nearby vacant parcels. However, at least one large site would be required for construction offices, to stage the larger equipment such as cranes, and to store materials such as rebar and aggregate. Suitable sites must be large and open to provide for heavy machinery and material storage, must have waterfront access for barges (either a slip or a dock capable of handling heavy equipment and material) to convey material to the construction zone, and must have roadway or rail access for landside transportation of materials by truck or train.

Three sites have been identified as possible major staging areas:

1. Port of Vancouver (Parcel 1A) site in Vancouver: This 52-acre site is located along SR 501 and near the Port of Vancouver's Terminal 3 North facility.
2. Red Lion at the Quay hotel site in Vancouver: This site would be partially acquired for construction of the Columbia River crossing, which would require the demolition of the building on this site, leaving approximately 2.6 acres for possible staging.
3. Vacant Thunderbird hotel site on Hayden Island: This 5.6-acre site is much like the Red Lion hotel site in that a large portion of the parcel is already required for new right-of-way necessary for the LPA.

A casting/staging yard could be required for construction of the over-water bridges if a precast concrete segmental bridge design is used. A casting yard would require access to the river for barges, including 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.

Two sites have been identified as possible casting/staging yards:

1. Port of Vancouver Alcoa/Evergreen West site: This 95-acre site was previously home to an aluminum factory and is currently undergoing environmental remediation, which should be completed before construction of the CRC project begins (2012). The western portion of this site is best suited for a casting yard.
2. Sundial site: This 50-acre site is located between Fairview and Troutdale, just north of the Troutdale Airport, and has direct access to the Columbia River. There is an existing barge slip at this location that would not have to undergo substantial improvements.

1.1.4 The No-Build Alternative

The No-Build Alternative illustrates how transportation and environmental conditions would likely change by the year 2030 if the CRC project is not built. This alternative makes the same assumptions as the build alternatives regarding population and employment growth through 2030, and also assumes that the same transportation and land use projects in the region would occur as planned. The No-Build Alternative also includes several major land use changes that are planned within the project area, such as the Riverwest development just south of Evergreen Boulevard and west of I-5, the Columbia West Renaissance project along the western waterfront in downtown Vancouver, and redevelopment of the Jantzen Beach shopping center on Hayden Island. All traffic and transit projects within or near the CRC project area that are anticipated to be built by 2030 separately from this project are included in the No-Build and build alternatives. Additionally, the No-Build Alternative assumes bridge repair and continuing maintenance costs to the existing bridge that are not anticipated with the replacement bridge option.

1.2 Long-term Effects

A number of utilities would degrade with age regardless, eventually resulting in loss of service. Most, however, are local distribution or collection systems that would experience limited impacts in terms of service disruptions. There are major utilities in the vicinity of the CRC project including water mains, large diameter sewers, gas feed lines, high voltage electrical lines and main feeds, and communication cables. These utilities tend to cross the highway corridor, instead of staying parallel to and within the highway right-of-way limits, minimizing the extent of physical impacts. The most significant exception is I-5 between the Marine Drive and SR 14 interchanges. This portion of the highway includes the North Portland Harbor and I-5 bridges. Here, the combination of the bridges and narrow width of Hayden Island has resulted in utility infrastructure being confined to a relatively narrow footprint. Outside the highway right-of-way, utilities tend to follow the existing street network.

An underwater electrical supply and telephone lines to Hayden Island would need to be replaced due to ramp construction across North Portland Harbor and a major water main, TV/data/fiber optic cables, and telephone trunk lines on Hayden Island would need to be relocated to accommodate interchange construction. On the existing southbound I-5 bridge across the Columbia River, TV/data/fiber optic cables would need to be relocated before the existing bridges are demolished. In Vancouver, a critical high-pressure gas main and large diameter water mains would need to be relocated to accommodate highway and bridge construction. The high-pressure gas main is required to keep the need pressure for downtown Vancouver. With the exception of telephone trunk lines, most utilities along the proposed transit alignment through downtown Vancouver would be considered part of the utility owners' distribution systems. The exact location of the telephone trunk line has not been determined at this time, and it is unknown whether or the duct bank and associated vaults would be affected.

Although there would be no impact to utilities for the No-Build Alternative, the North Portland Harbor and I-5 bridges do not meet current seismic design standards. A failure or collapse in the unlikely event of a major earthquake could result in a number of major utilities being severed. These utilities include a water main, main gas feed, main electrical feed and communications (telephone, cable, and fiber optic cables).

1.3 Temporary Effects

Temporary effects would be generally limited to temporary outages necessary when the relocated utilities are tied back into the existing system. Such outages are expected to be short in duration. The utility companies and agencies would work with the customers to minimize shutdown and/or work in windows that would avoid or minimize disruptions to their customers.

1.4 Proposed Mitigation

Mitigation measures would be implemented to eliminate or minimize utility relocations by designing the preferred alternative to minimize conflicts where cost-effective or by facilitating the relocation or protection of affected utilities. Mitigation measures would include relocating utilities in advance of construction and notifying communities of scheduled service disruptions. Advance utility relocation could also minimize and avoid potential construction delay to the highway and transit construction required for this project. The CRC Utility Lead will continue ongoing coordination with utility owners to maximize the likelihood of success for both long-term and temporary mitigation measures. CRC will have a Subsurface Utility Mapping contractor on the project to map all existing utilities, determine conflicts with proposed design, coordinate with utility owners and CRC designers to minimize impacts, and assist in agreements for relocation.

2. Methods

2.1 Introduction

The purpose of this discipline is to identify the impacts of alternatives included in the final Environmental Impact Statement (FEIS) on publicly and privately owned utilities.

2.2 Study Area

In general, the impact of proposed alternatives on utilities will be limited to the immediate proximity of project footprint shown on Exhibit 2-1. The footprint represents the zone of expected direct construction activities. Note that the exhibit does show the TriMet Ruby Junction Maintenance Base and Operations Center. This facility, which is located a significant distance from the core of project construction activities, will be expanded to handle the proposed light rail extension.

2.3 Effects Guidelines

Effects were determined by whether a specific utility would need to be relocated or modified to facilitate either construction or the completed project. This includes both temporary and permanent impacts.

There are no specific statutes that pertain to the impact analysis for utilities. While the individual utility operators are required to operate under a number of laws and regulations, they relate to specific aspects relocating or modifying a utility such as safety, design, and construction requirements.

2.4 Data Collection Methods

Potential cumulative effects from this project are evaluated in the Cumulative Effects Technical Report.

A “database” of mapping and engineering data was developed using MicroStation (a computer-aided drafting [CAD] software program). The base maps used to show the utility data included color aerial photography, existing highways and streets, transit facilities, surface utility features such as manholes and poles, and property boundaries.

Utilities identified within and close to the project footprint comprise:

- Water
- Sanitary sewers
- Power
- Natural gas
- Communications (telephone, cable television, fiber optic, etc.)
- Other (street and highway illumination, ramp meters, signalization, etc.)

An initial list of potential utility owners was assembled though:

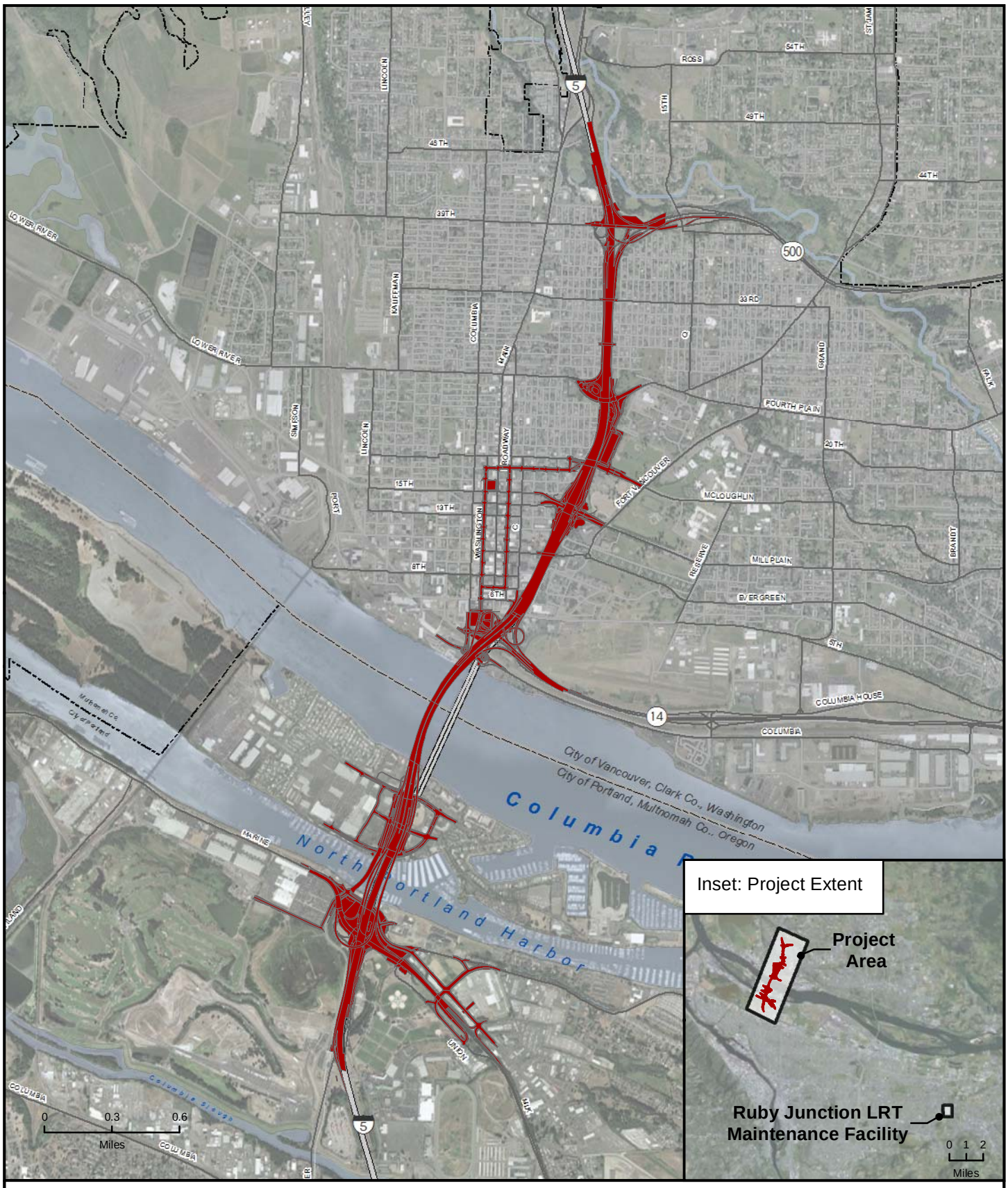
- Discussions with WSDOT and ODOT staff,
- Permits and franchise agreements for utilities located within the I-5 right-of-way (see Appendix A),
- Columbia River crossing permits provided by the U.S. Army Corps of Engineers (USACE),
- Internet searches,
- Data gathered as part of the Delta Park project, and
- Information provided by One-Call organizations in Washington and Oregon.

Utility owners were contacted as described in Section 3, and those with infrastructure in or near to the project footprint provided as-built data in electronic and/or hard-copy forms. Meetings with utility owners provided an opportunity to confirm and expand the list of utilities. In most cases, the data provided included general plan locations of facilities or, in some cases, schematic information. While the latter was typical for communication providers, much of their infrastructure is co-located on power poles and it was possible to determine most routes with a reasonable degree of certainty. The results of recent detailed topographic survey along the transit alignment through downtown Vancouver were incorporated into the utility database; subsurface utilities were tied to surface features such as manholes, meters, and telephone risers.

The *Utilities: Existing Infrastructure* report dated May 2006 describes the data provided. It was accepted on an "as is" basis and adjustments were only made where required to fit the data to existing features (such as poles and manholes) on the base map. Field visits were performed on a limited basis to visually resolve apparent discrepancies. For quality control purposes, the utility data were compared with permits and franchise information provided by WSDOT and ODOT. In addition, base maps showing utility data were provided to owners for verification.

Composite utility drawings were prepared and do not include details such as traffic signals, power distribution to street lights, the content of vaults, individual power and communications ducts, and communications and power for the Interstate MAX line. The more detailed information will be included during subsequent phases of design development. Appendix B includes half-size drawings; for security reasons, they do not show ODOT's fiber-optic communication or Vancouver Area Smart Trek (VAST) networks.

A subsurface utility company will begin working on the CRC project to update and complete our utility base maps. Once all utilities have been recorded a conflict analysis will be done to determine any conflicts between the utilities and the CRC design. The subsurfacing utility company will work with utility owners and CRC designers to minimize impacts, determine relocation needs, and assist in creating the agreements between each utility owner and CRC.



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Project Footprint

Exhibit 2-1. Proposed Project Footprint

Columbia River CROSSING

Analysis by J. Koloszar; Analysis Date: Dec. 28, 2010; File Name: Ex1_1_StormwaterProjArea.mxd

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2.5 Analysis Methods

Specific analytical techniques are not applicable to this topic. Individual utility owners were contacted as described in Section 2.6, and information regarding expected impacts was obtained through meetings. The key emphasis was to identify potential utility relocations that would require an extended period, long lead-time materials procurement and/or a long period for "tie-in" back to the existing system.

A project effect was defined as a need to physically relocate or modify utility infrastructure as a result of the project. Such effects are typically necessitated by construction activities. Utility infrastructure, for the purposes of this report, was deemed to comprise facilities required to convey water, sewage, power, gas, telecommunication, etc. Effects on support infrastructure such as administration and maintenance buildings, and publicly owned infrastructures such as street lighting, traffic signals, ramp metering signals, highway lighting, and highway traffic management systems are covered in the Public Services Technical Report.

2.6 Coordination

Each utility owner was initially contacted by phone to determine whether it had infrastructure in vicinity of the project; written confirmation was requested where this was not the case. One exception to this written request was Chevron as drawings provided by the company clearly showed their nearest infrastructure, a fuel pipeline, is approximately 4,000 feet south of the project footprint. Multiple meetings were then held with utility owners known to have infrastructure within or close to the project footprint.

Exhibit 2-2 lists utilities that indicated they did have infrastructure within the footprint. When contacted, Level 3 Communications, MCI, and Sprint confirmed that they would not be affected by the project.

Exhibit 2-2. Utilities with Infrastructure within the Project Footprint

Utility Owner	Type of Utility	Comments
AT&T	Communications	Local network services only.
Clark Public Utilities	Power	Serves the area north of the Columbia River.
Comcast	Communications	
Integra Telecom	Communications	Fiber-optic network formerly owned by Electric Lightwave.
NW Natural	Natural gas	Natural gas service provider for the area.
ODOT	Communications	
Pacific Power & Light	Power	Generally serves the area east of I-5 and south of Oregon Slough.
Portland, City of	Water, sewer and communications	
Portland General Electric	Power	Generally serves Hayden Island and the area west of I-5 and south of Oregon Slough.
Qwest	Communications	General telephone service provider for the area.
Sawtooth Technologies	Communications	Owns a fiber-optic line between the BPA Ross Complex and Vancouver VA Medical Center.
Time Warner Telecom	Communications	Fiber-optic network.
TriMet	Power & communications	Data provided showed changes made to existing utilities when the Interstate MAX Project light rail line was extended to the Expo Center.

Utility Owner	Type of Utility	Comments
Vancouver, City of	Water, sewer and communications	
Verizon Wireless	Communications	
WSDOT	Communications	

Note: Initial meetings were held with all the utility owners listed in Exhibit 2 to determine what infrastructure they had within or close to the project footprint, especially those considered important to their operations, and the most appropriate means of obtaining information on type and location.

Follow-up communications were sent and/or meetings were held on an as-required basis to obtain additional data considered necessary for this effects analysis and to resolve conflicting information. Additional meetings were held with individual utility owners to keep them updated on design development, determine the impact of construction and completed project on their infrastructure, and to ask the utility owners to confirm and verify the accuracy of the information shown on the project composite utility drawings.

3. Affected Environment

3.1 Introduction

This section presents and describes existing utilities within the project footprint. While there are a significant number of utilities that could be affected by the project (for example, the plethora of overhead and underground lines and pipes located on Hayden Island and in downtown Vancouver), the discussion focuses on major infrastructure considered to be important to utility operations.

In general, transportation agencies prefer that utilities not be located parallel to and under high-use corridors, such as a freeway or light rail guideway. Most utilities owners do not want their facilities located under such corridors either because it would be difficult and expensive to maintain, repair and replace. Additional concerns include the potential effect of stray currents from a light rail track electrification system.

Exhibits 3-1 and 3-2 (at the end of this section) show the major utility infrastructure described in the following subsections. See Appendix B for more detailed composite utility plans. As expected, utilities typically cross rather than run parallel to the existing highway alignment with one notable exception; Hayden Island and the bridges across North Portland Harbor to the south and Columbia River to the north. In addition, the proposed light rail alignment through Vancouver follows city streets where utilities run both parallel to and across the guideway.

Although there are some utilities on the I-5 bridges, the Oregon-Washington state line (about mid-river) provides a logical place to separate how the affected environment and potential impacts are presented.

3.2 Existing Utilities – Oregon

As mentioned above, the presence of bridges across North Portland Harbor and Columbia River combined with the narrow 2200-foot width of Hayden Island at this location has the effect of focusing utilities along the I-5 right-of-way. These utilities take advantage of the river crossings and include:

- A water transmission main across North Portland Harbor Bridge,
- A main gas feed line across North Portland Harbor Bridge, and
- A trunk communication cables (telephone, TV, data, and fiber optics) across North Portland Harbor, Hayden Island and Columbia River Bridges.

3.2.1 Water and Sanitary Sewer

Within the Oregon portion of the project footprint and its immediate environs, the City of Portland provides water and sanitary sewer services; the Portland Water Bureau (PWB) provides water supplies and the City of Portland Bureau of Environmental Services (BES) provides sanitary sewer service. Sewage from this part of the project area is conveyed to the Columbia Boulevard Wastewater Treatment Plant, several miles west of I-5 and well outside the project footprint.

There are two water transmission mains and one major sewage force main between Victory Boulevard and North Portland Harbor. One water main crosses I-5 between Victory Boulevard and Marine Drive, runs north along the west side of Expo Road and then west along Marine Drive. The second water main crosses I-5 immediately south of North Portland Harbor and connects with the first main west of the Marine Drive Interchange. A branch from the second main crosses North Portland Harbor on the existing highway bridge, and is one of the two primary water supplies to Hayden Island. The sewage forcemain, which comprises two pipes under I-5, crosses the highway between Victory Boulevard and Marine Drive east of I-5; the two forcemains combine into a single 36-inch pipe and head north before crossing under Marine Drive.

On Hayden Island, two water mains cross under I-5; one on Jantzen Drive and one on Hayden Island Drive. While not shown on the exhibits, a smaller diameter sewage forcemain is located on Jantzen Drive and a water supply well, which is abandoned, is located immediately north of Jantzen Drive and east of I-5. While smaller, the forcemain is important in that it serves all Hayden Island properties east of I-5. An unused well supplying a water storage tank is located south of Jantzen Drive and west of I-5.

3.2.2 Power and Natural Gas

South of the Oregon-Washington state line, Portland General Electric (PGE) provides electricity to the area west of I-5 and south of North Portland Harbor, and to all of Hayden Island. Pacific Power & Light serves the area east of I-5 and south of North Portland Harbor.

Electrical utilities within the project footprint south of North Portland Harbor comprise overhead primary distribution systems with a voltage of 13 kV or less. An underwater power cable located immediately west of the I-5 bridge across North Portland Harbor connects Delta Park and Hayden Island distribution systems: this cable also has a voltage of 13 kV or less. The location of the underwater cable is such that several main feed lines and primary switches for Hayden Island are located adjacent to I-5. On Hayden Island, electrical services within and close to the project footprint are typically underground except for an overhead line located on the north bank of North Portland Harbor and west of the highway.

NW Natural provides natural gas service to the entire project area. Infrastructure within this part of the project footprint generally comprises low- or medium-pressure distribution and feed pipes. Of note is a major feed pipe that is located on the North Portland Harbor Bridge and is the sole source of gas supplies to Hayden Island.

3.2.3 Communications

There are six communication service providers with infrastructure within this part of the project: AT&T Local Network Services, Comcast, Integra, Qwest, Time Warner and Verizon Wireless. Comcast provides television, telephone and Wireless Internet services, AT&T and Qwest provide telephone and Internet services, and Integra and Time Warner provide data and Internet services, primarily to larger clients. The customer base of AT&T, Comcast and Qwest extends through the project area. While Integra and Time Warner only have customers in Vancouver within or near the project footprint, both companies do have customers elsewhere within the Portland-Vancouver metropolitan area. In addition to the Land-line-based infrastructure, AT&T and Verizon Wireless have cellular antennae arrays close to I-5 where it crosses Hayden Island. Both arrays are in the vicinity of Jantzen Drive.

The infrastructure of all four providers is concentrated along the I-5 corridor from the Marine Drive interchange south of North Portland Harbor to the SR 14 interchange north of the Columbia River. All providers consider this infrastructure to be part of their major trunk systems. The trunk systems for all four service providers are located on the North Portland Harbor Bridge and three are located on the I-5 bridges; one company crosses the Columbia River approximately 500 feet upstream of the existing bridges and beyond the expected direct influence of construction activities. On Hayden Island, communications services are located underground. South of North Portland Harbor, the infrastructure is frequently co-located on power poles.

One communications service provider also has additional underwater cables immediately west of the North Portland Harbor Bridge that provides local services to Hayden Island. One provider also has a large controlled environment vault on Hayden Island. Relocating this vault, which requires power and ventilation, would be a major undertaking for utility owner in terms of both cost and duration.

In addition to the privately owned communication service providers described above, there is an ODOT communications system within this area. Exhibits and composite plans do not show this network for security reasons.

3.3 Existing Utilities – Washington

3.3.1 Water and Sanitary Sewer

North of the Oregon-Washington state line, the City of Vancouver provides water and sanitary sewer services within the project footprint.

Within this part of project area there are three major water transmission mains and two major gravity sanitary sewage pipes. The water main and sewage pipes generally run in an east-west direction. The water mains all cross under I-5; one at Mill Plain Boulevard, one at McLoughlin Boulevard, and one at NE 40th Street. The latter main also crosses SR 500 between N and M Streets, east of the I-5/SR 500 interchange. One sewer (the South Side Interceptor) crosses I-5 between 5th and 6th Street, while the second (the North Side Interceptor) is located on NE 39th Street east of I-5.

Although there are numerous water and sanitary sewage pipes located under downtown Vancouver streets, they mostly comprise smaller diameter distribution and collection systems. While not shown on the exhibits, one smaller diameter water main located on Columbia Way should be noted as it is the only source of potable water and fire flows to businesses adjacent to Columbia Way and immediately east of I-5.

3.3.2 Power and Natural Gas

North of the Oregon-Washington state line, Clark Public Utilities provides electrical services. Some of the Clark Public Utility overhead power lines also carry fiber-optic cables owned by the utility as well as communication cables owned by others. With the exception if a 69 kV transmission line that crosses I-5 at 33rd Street, electrical utilities within this part of the project comprise overhead feed and distribution systems with a voltage of 13 kV or less.

Similar to Oregon, NW Natural provides natural gas service to the entire project area. Infrastructure within this part of the project generally comprises low- or medium-pressure distribution and feed pipes. The one exception is high-pressure pipe located on Columbia Avenue and Columbia Street. This pipe is considered to be critical for maintaining gas pressure to

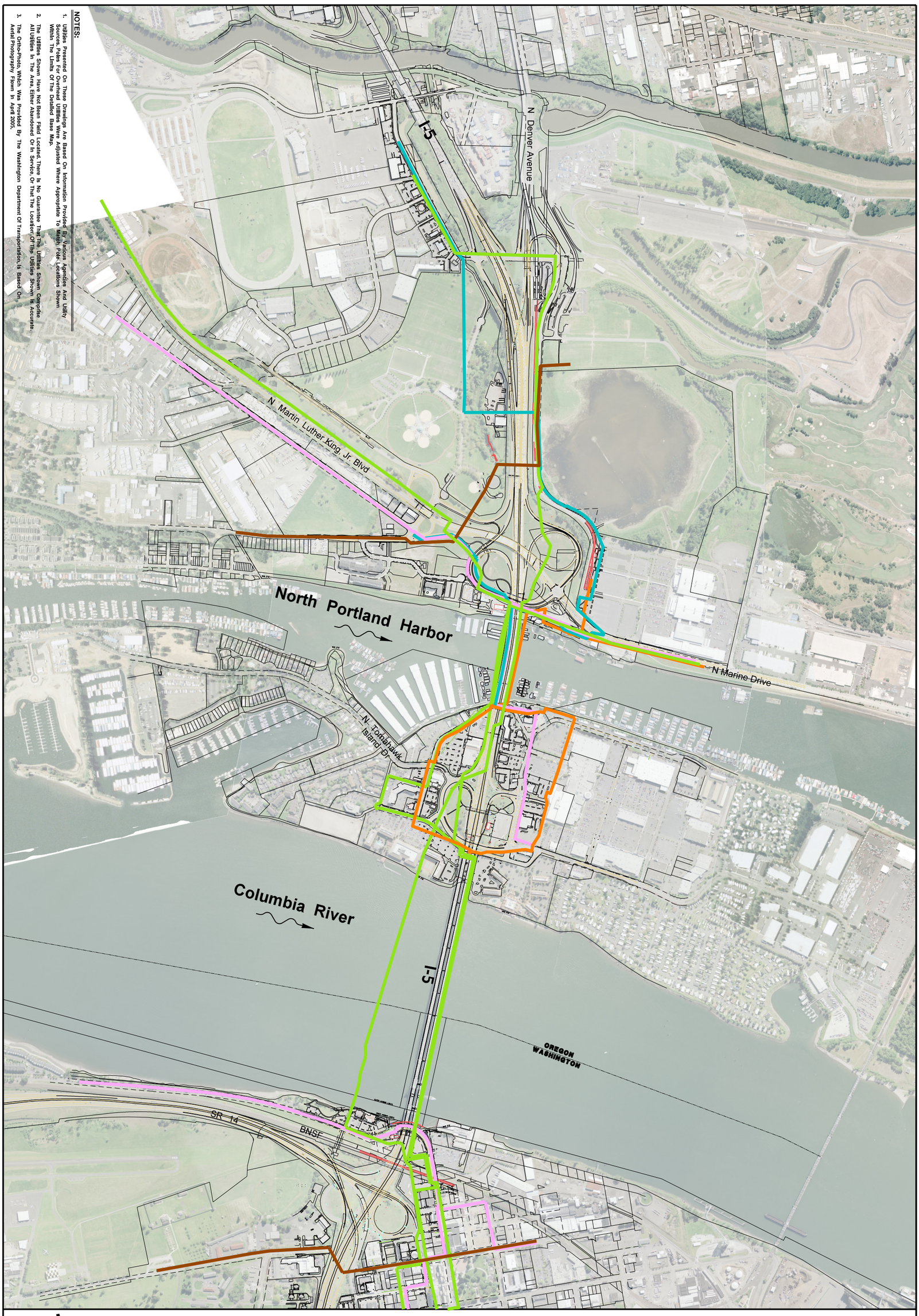
downtown Vancouver customer supply. A smaller gas line that crosses I-5 at McLoughlin Boulevard is also considered important for maintaining gas pressure to downtown Vancouver.

3.3.3 Communications

There are five communication service providers with infrastructure within the Washington State portion of the project area; AT&T Local Network Services, Comcast, Integra, Qwest, and Time Warner. Communications infrastructure within this segment is frequently co-located on Clark Public Utility power poles. Three service providers are co-located on a loop that re-crosses the Columbia River at the I-205 Glen Jackson Bridge.

One service provider has a large controlled environmental vault located in downtown Vancouver. Relocating this vault, which requires power and ventilation, would be a major undertaking for utility owner in terms of both cost and duration. The same provider has an underground trunk line located on Washington Street as well as a trunk line running east-west that crosses I-5 at the 4th Plain interchange.

In addition to the privately owned communication service providers described above, there are two publicly owned networks within this segment. They are the WSDOT communication system and VAST system. The VAST system is a cooperative effort by public transportation agencies in Clark County and is used, among other things, for transportation management, and transit operation and management. Exhibits and composite plans do not show these networks for security reasons.



NOTES:

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2. The Utilities Shown Have Not Been Field Located. There Is No Guarantee That The Utilities Shown Comprise All Utilities In The Area, Either Abandoned Or In Service, Or That The Location Of The Utilities Shown Is Accurate.
3. The Ortho-Photo, Which Was Provided By The Washington Department Of Transportation, Is Based On Aerial Photography Flown In April 2005.

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LEGEND

- Power
- Water Main
- Gas
- Sanitary Sewer
- Communications

Exhibit 3-1
Existing Major Utilities
(Sheet 1 of 2)

Columbia River CROSSING

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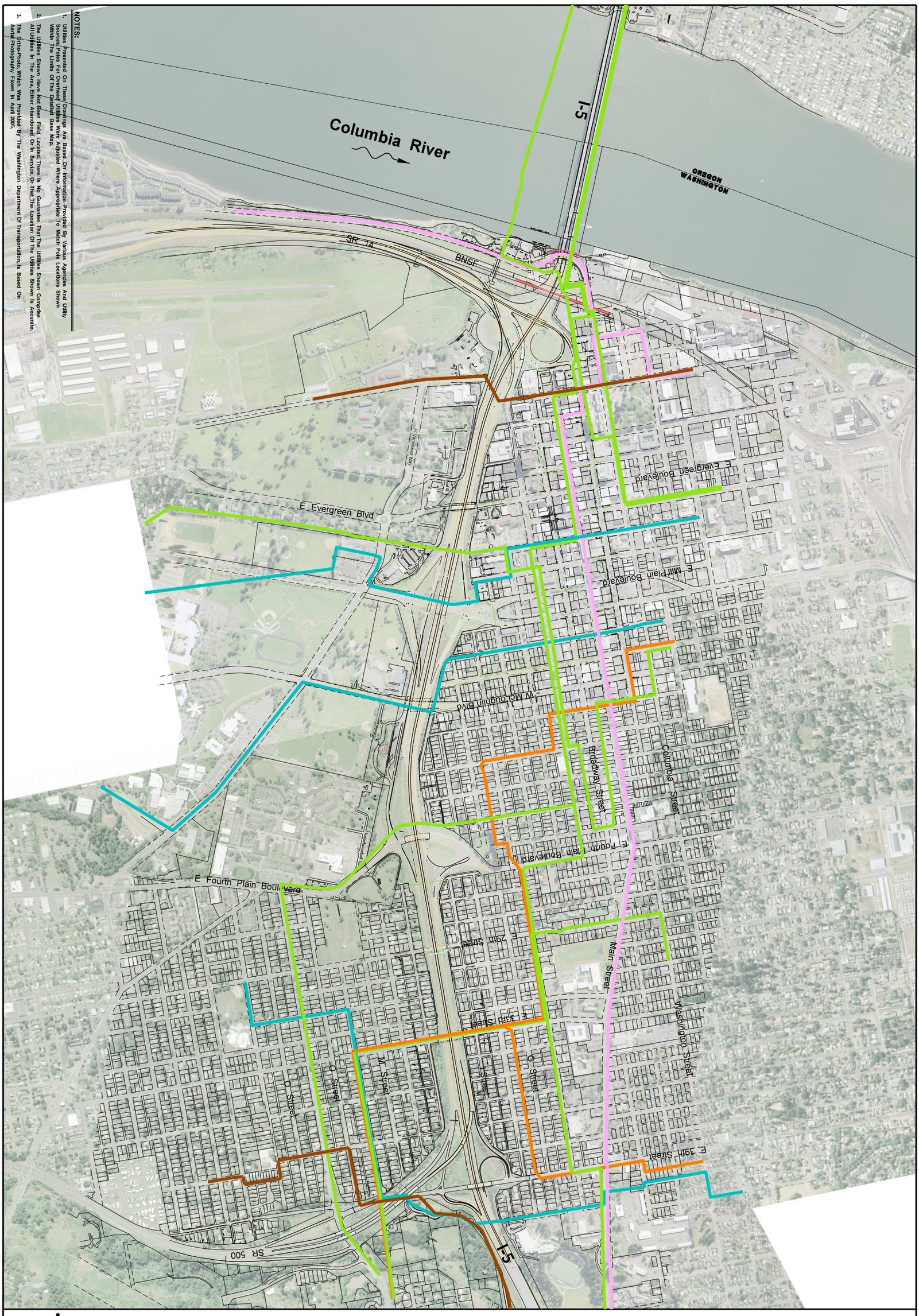

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Feet

LEGEND

- Power
- Water Main
- Gas
- Sanitary Sewer
- Communications

Exhibit 3-2
Existing Major Utilities
(Sheet 2 of 2)

Columbia River CROSSING

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4. Long-term Effects

Long-term effects on utilities could include direct impacts on infrastructure, elements of the as-constructed project impairing access for maintenance, and reductions in the level of service.

Although there are numerous utilities within or near the project footprint, most of them are part of local distribution systems and are not considered significant enough to warrant separate discussions. The effects presented focus on those that would have a major impact on a utility's operation or level of service, or on public safety.

There are a number of utilities within the project area that could be affected. Their presence will be confirmed during final design at which time their locations will be determined with a greater level of accuracy. In general, affected utilities would either be relocated or protected to maintain existing levels of service. Either the project or the utility owner would perform and/or pay for such work.

Exhibits 4-1 through 4-5 present the major utilities and proposed project footprint. Exhibits 4-1, 4-2 and 4-3 show potential impacts in Oregon with Exhibit 4-2 showing LPA Option A and Exhibit 4-3 showing LPA Option B. Exhibits 4-4 and 4-5 show potential impacts in Washington State.

4.1 No-Build Alternative

Under this scenario, there would be no impact on utilities or the levels of service provided. Note, however, that the North Portland Harbor and I-5 bridges are not designed to current seismic standards, and could fail and possibly collapse in the unlikely event of a catastrophic earthquake.

Failure of the North Portland Harbor Bridge could result in a loss of natural gas supplies to and fire flows on Hayden Island, and the underwater electrical cables and local telephone service to the island could also be severed. In addition, trunk communications cables could be cut if the North Portland Harbor and southbound I-5 bridge failed, resulting in a loss of land-based communications within the Portland-Vancouver metropolitan area and beyond.

4.2 Full-Build Alternative

The primary elements of this alternative are:

- Replacement bridges across the Columbia River,
- Light rail track from the existing Expo station in Portland to a terminus at Clark College in Vancouver, and
- Rebuilding and/or resurfacing I-5 and associated interchanges between Victory Boulevard in Portland and SR 500 in Vancouver.

4.2.1 Potential Long-term Effects - Oregon

This part of the project footprint is where the more significant utility impacts would occur, particularly in terms of coordination. As stated previously, utilities are concentrated in a relatively narrow corridor between the Marine Drive and SR 14 interchanges, and potential impacts are

complicated by utilities being located parallel to and under the highway (Exhibits 4-1, 4-2, and 4-3).

The more significant utilities that are located within or near the project footprint in Oregon and may be affected are:

- Water supply main on the North Portland Harbor Bridge. This main, which is vital for maintaining fire flows on Hayden Island, could be affected by construction of an additional span at the north end of the bridge to accommodate the realignment of Jantzen Drive.
- Natural gas feed main on North Portland Harbor Bridge that provides supplies to Hayden Island could be affected by construction of an additional span at the north end of the bridge.
- Communication cables across the North Portland Harbor Bridge, Hayden Island, and southbound I-5 bridge. Several of these are trunk lines and would be affected by construction of an additional span at the north end of the North Portland Harbor Bridge and reconstruction of the Marine Drive and Hayden Island interchanges.
- Underwater communication and power cables downstream (west) of the existing North Portland Harbor Bridge would be affected by new ramp construction.
- The smaller diameter sewage forcemain located under Jantzen Drive could be affected by the realignment and lowering of this street as it passes under I-5.
- Sanitary sewer force main crossing Marine Drive east of I-5 would be affected by the depth of fill and retaining wall located above the pipe. The force main then crosses I-5 between Victory Boulevard and Marine Drive interchanges but would likely not be affected due to the minimal change in vertical profile.

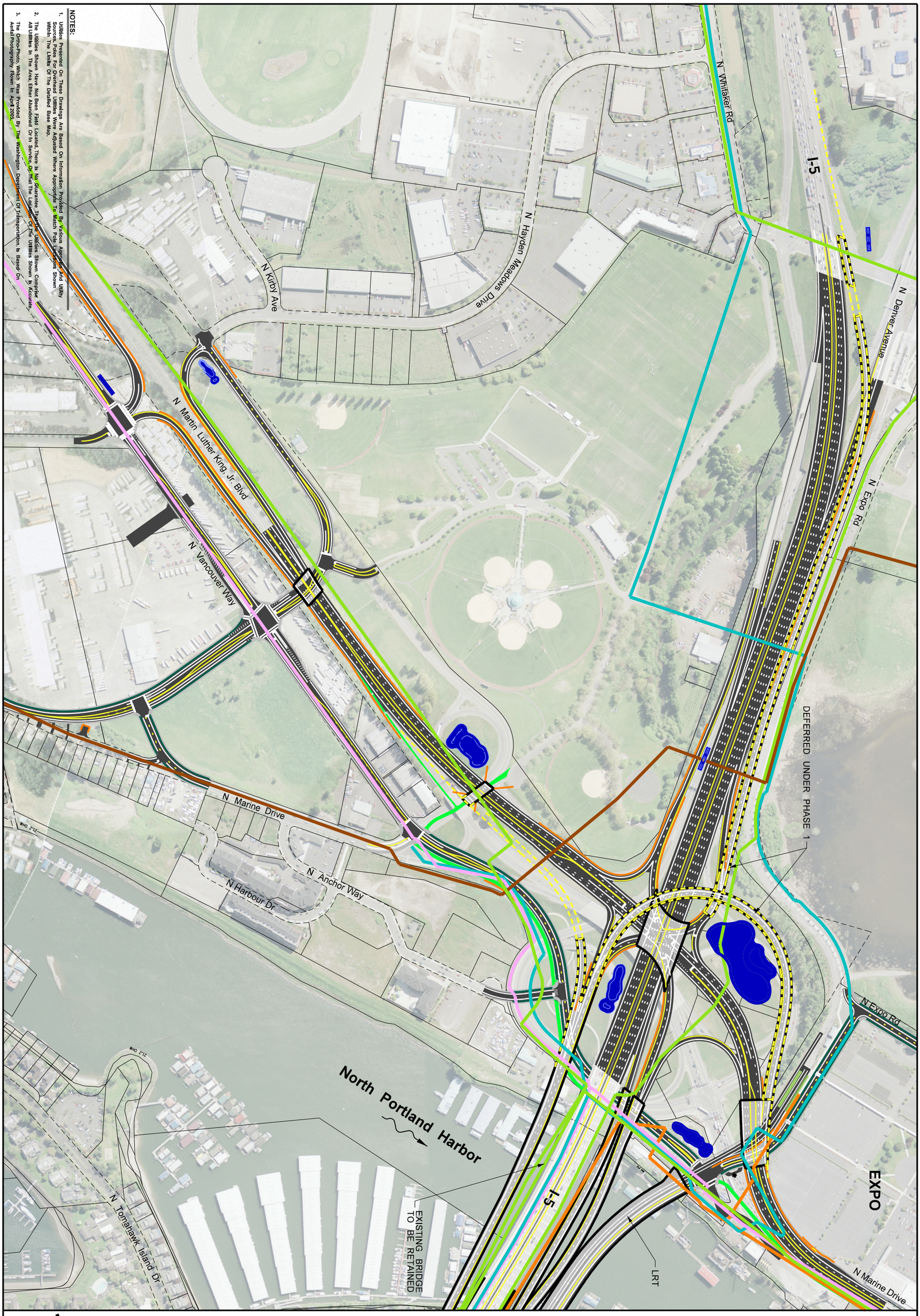
Some of the above-mentioned utilities are the only links to Hayden Island. To maintain services, either temporary utility relocation and/or staging/sequencing provision in the construction of new structures and demolition of the existing structures would need to be negotiated and mutually agreed to prior to start of the project construction.

Other potentially-affected utilities include:

- Water, power, gas and communications infrastructure within the Marine Drive interchange could be affected by reconstruction of that interchange, including potential ground improvements.
- Main electrical feeds and switches, and main gas feed adjacent to I-5 on Hayden Island that would be affected by reconstruction of the Hayden Island interchange and by construction of the elevated light rail guideway. The extent of the impact would also depend on the extent of potential ground improvements and whether rights-of-way would be vacated should existing streets be realigned.
- Two cellular antenna arrays in the vicinity of Jantzen Drive would be affected by reconstruction of the Hayden Island interchange.

While not identified on the exhibits, there are a number of utilities under Jantzen Drive and Hayden Island Drive. These two streets currently provide the only through connection under I-5 between developments on the island to the east and west of the highway.

The water main that crosses I-5 between Victory Boulevard and Marine Drive interchanges is not likely to be affected by the project. The vertical profile of the highway would not be significantly altered and construction would be kept within the existing right-of-way.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N Hayden Meadows Drive
N Kirby Ave
N Martin Luther King, Jr. Blvd
N Vancouver Way
N Denver Avenue
N Expo Rd
DEFERRED UNDER PHASE 1
N Marine Drive
N Anchor Way
N Harbour Dr
North Portland Harbor
N Tomahawk Island Dr
EXISTING BRIDGE TO BE RETAINED
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N Marine Drive
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Power
Water Main
Gas
Sanitary Sewer
Communications
Exhibit 4-1
Developed Conditions - Oregon
(Sheet 1 of 3)
Columbia River CROSSING
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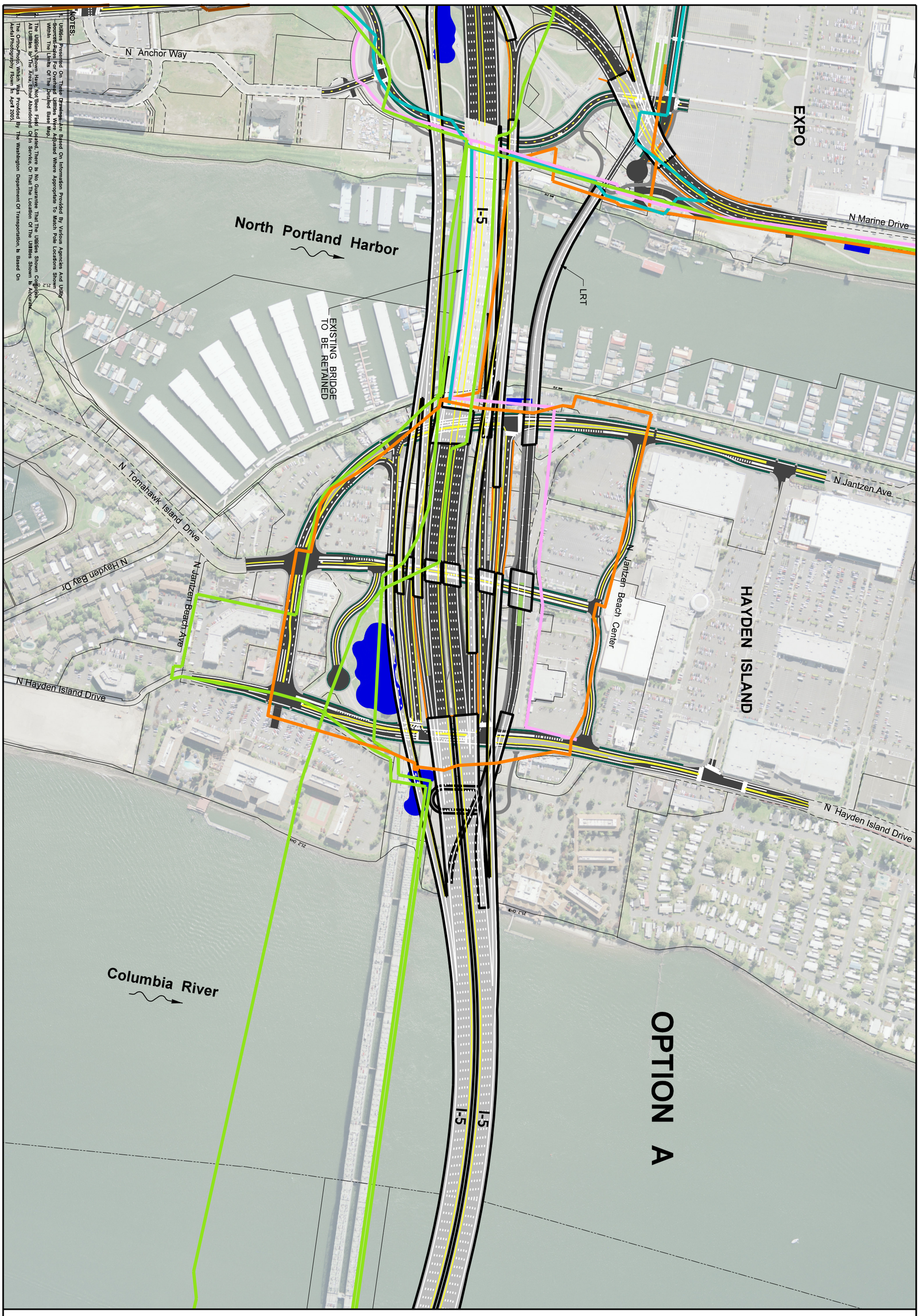
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The Orthophoto Which Was Provided By The Washington Department Of Transportation Is Based On Aerial Photography Flown In April 2005.
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N Hayden Bay Dr
N Jantzen Beach Ave
N Jantzen Beach Center
HAYDEN ISLAND
N Hayden Island Drive
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Exhibit 4-2
Developed Conditions - Oregon
(Sheet 2 of 3)
Columbia River CROSSING
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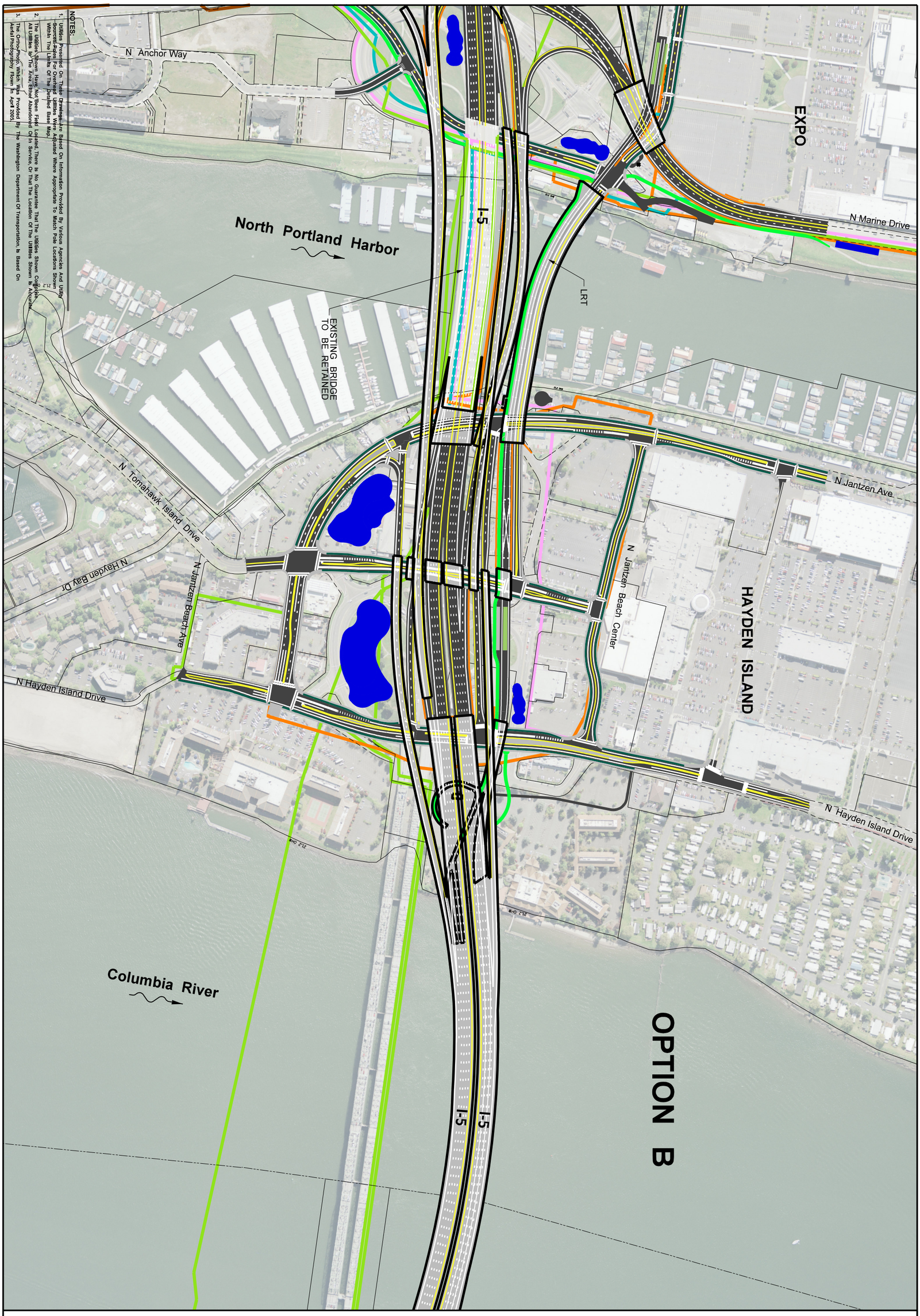
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N Anchor Way
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N Marine Drive
EXISTING BRIDGE TO BE RETAINED
N Tomahawk Island Drive
N Jantzen Ave
N Hayden Bay Dr
N Jantzen Beach Ave
N Jantzen Beach Center
HAYDEN ISLAND
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Exhibit 4-3
Developed Conditions - Oregon
(Sheet 3 of 3)
Columbia River CROSSING
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Expansion of the existing TriMet Ruby Junction maintenance base and operations center would only involve the redevelopment of existing property and TriMet facilities. As such, utility impacts would be limited to infrastructure serving those facilities and located on the property being developed.

4.2.2 Potential Long-term Effects – Washington

There are also a number of utilities within or near the project footprint in Washington State that may be affected (see Exhibits 4-4 and 4-5). The more significant highway-related impacts are:

- Large diameter gravity sanitary interceptor sewer crossing I-5 around 5th and 6th Street, Vancouver, could be affected by construction of new ramps at the SR 14 interchange.
- Communications infrastructure, sewage lift station and forcemain, and high-pressure gas line between the SR 14 interchange and Columbia River could be affected by proposed bridge construction, extension to SR 14, and local street improvements. The extent of impacts to the gas line, which is considered critical, will depend on whether Columbia Way right-of-way would be vacated should the street be realigned.
- Water supply main crossing I-5 at Mill Plain Boulevard may be affected when the vertical profile of the boulevard is lowered to provide a design vertical clearance for the widened highway. Loss of the main could affect water supplies and fire flows.
- Water supply main and gas line crossing I-5 at McLoughlin Boulevard may be affected when the vertical profile of the boulevard is lowered to provide a design vertical clearance for the widened highway and transit guideway, and by construction of the guideway S-curve between 17th Street and McLoughlin. Loss of the main could affect water supplies and fire flows. The gas line is considered important in providing service to downtown Vancouver.
- Water supply main on Washington Street could be affected by the light rail track alignment.
- Communications duct bank crossing I-5 at 4th Plain Boulevard could be affected by the construction of additional lanes.
- High voltage electrical transmission line crossing I-5 at 33rd Street that could be affected by over-crossing reconstruction. One or both poles at either end of the existing bridge may conflict with construction of a new longer bridge.
- Water supply main crossing I-5 at NE 40th Street. This could be affected by construction of a new ramp at the SR 500 interchange. Loss of the main could affect water supplies and fire flows.
- Depending on the type of bridge foundations adopted, a sewage lift station on Columbia Street might be affected.

Unlike the project footprint across North Portland Harbor and in the vicinity of Hayden Island and Marine Drive interchanges, these utilities tend to cross rather than run parallel to the highway.

Potential impacts to major utilities from proposed light rail-related development include:

- Communications trunk lines belonging to two service providers are located along Washington Street south of 12th Street. Impacts south of 5th Street would be a result of

above-grade construction and potential impacts between 5th and 12th Street would be due to at-grade guideway construction.

- A low- or medium-pressure gas feed line located on Washington Street (between 6th and 7th Street) and on 7th Street (between Washington and Main Streets) that could be affected by at-grade guideway construction.
- A water supply main under McLoughlin Boulevard and east of I-5 may be affected by at-grade guideway and station construction. This is the same water main described under potential highway-related impacts and loss of service could affect water supplies and fire flows.

All other major utilities cross rather than run parallel to the light rail guideway.

There are a number of utilities located on streets proposed for light rail construction. These include a smaller diameter water mains and sanitary sewers. Most, however, are not being considered to be major or critical infrastructure and are not listed separately.

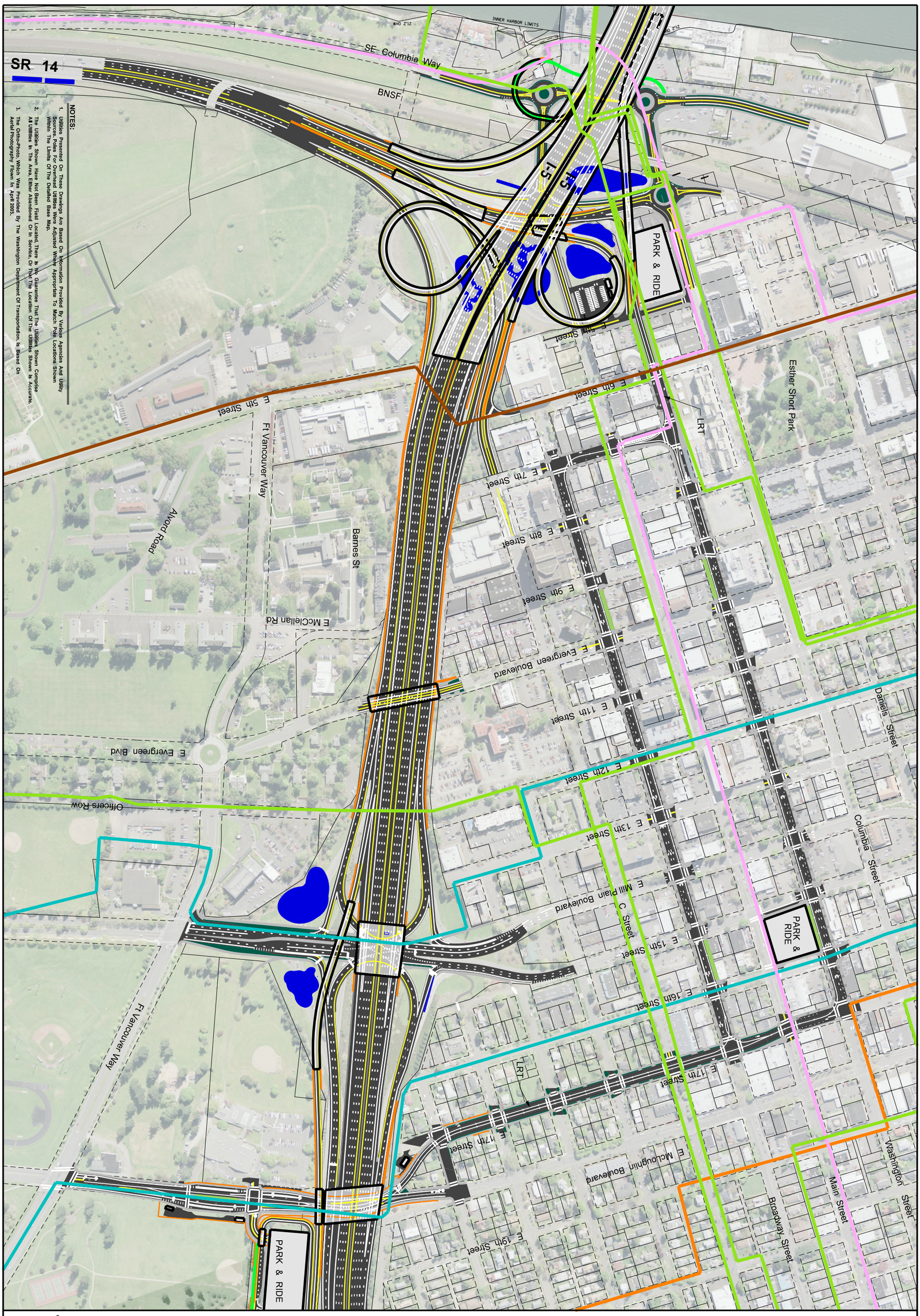
4.3 Alternatives

This section describes the differences in utility impacts between LPA Option A, LPA Option B, and Option A and Option B with highway phasing.

Please refer to Section 1.1 for a description of all alternatives.

The change in ramp configuration over North Portland Harbor in LPA Option A and LPA Option B do not change the utility impacts described in Section 4.2.1. Exhibit 4-2 shows LPA Option A and Exhibit 4-3 shows LPA Option B.

With highway phasing in both LPA Option A and LPA Option B deferring construction of the braided ramp and flyover at the Marine Drive interchange it is not expected to change the impacts described in Section 4.2.1. Deferring the construction of the ramps at the SR 500 interchange would likely eliminate impacts to the water supply main crossing I-5 at NE 40th Street (see Section 4.2.2).



NOTES:

1. Utilities Presented On These Drawings Are Based On Information Provided By Various Agencies And Utility Sources. Poles For Overhead Utilities Were Adjusted Where Appropriate To Match Pole Locations Shown Within The Limits Of The Detailed Base Map.
2. The Utilities Shown Have Not Been Field Located. There Is No Guarantee That The Utilities Shown Comprise All Utilities In The Area, Either Abandoned Or In Service, Or That The Location Of The Utilities Shown Is Accurate.
3. The Ortho-Photo, Which Was Provided By The Washington Department Of Transportation, Is Based On Aerial Photography Flown In April 2005.

0 200 400
Feet

LEGEND

- Power
- Water Main
- Gas
- Sanitary Sewer
- Communications

Exhibit 4-4
Developed Conditions - Washington State
(Sheet 1 of 2)

Columbia River CROSSING

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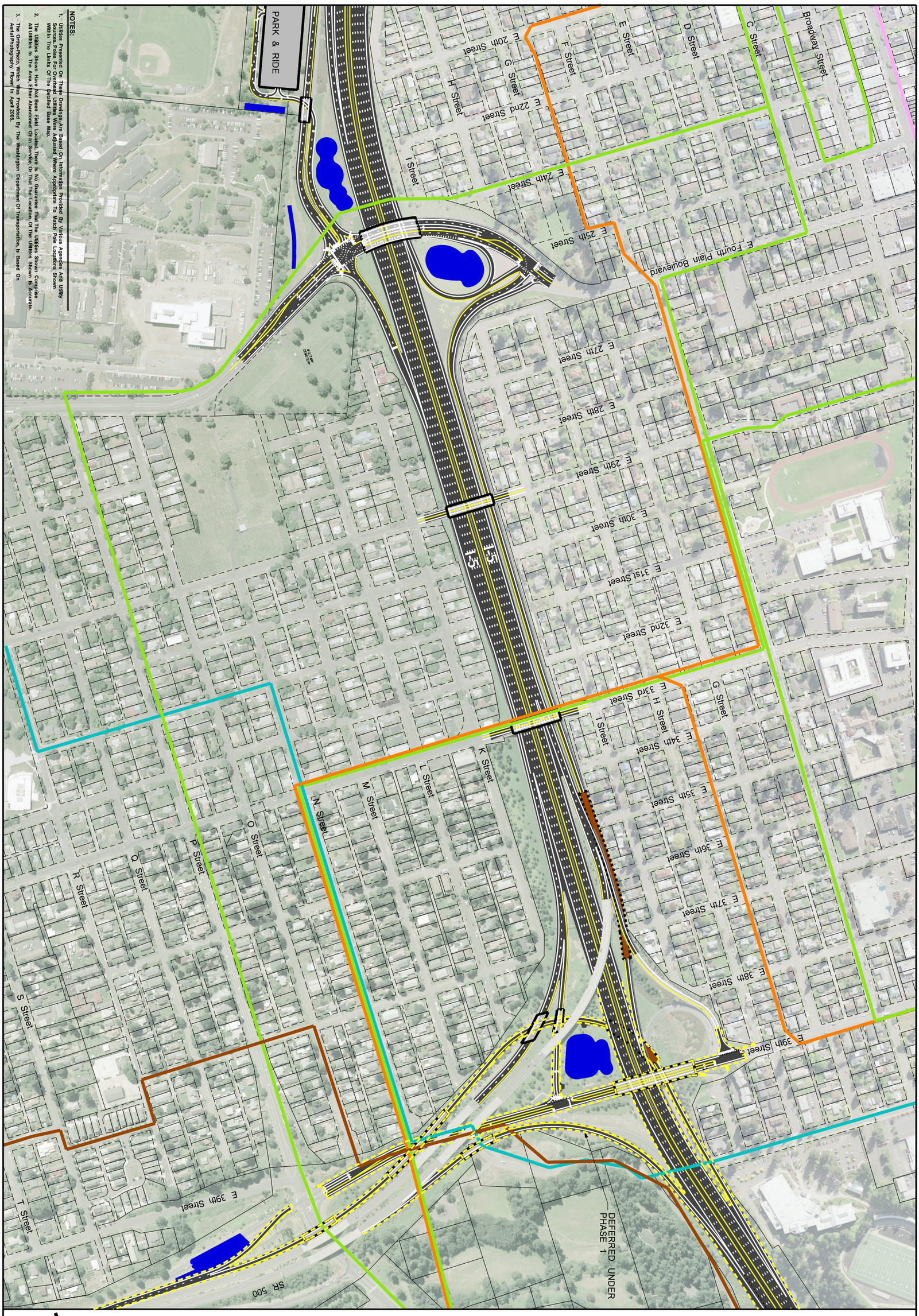
NOTES:
1. Utilities Presented On These Drawings Are Based On Information Provided By Various Agencies And Utility Sources. Poles For Overhead Utilities Were Adjusted Where Appropriate To Match Prob Locations Shown Within The Limits Of The Qualified Base Map.
2. The Utilities Shown Have Not Been Field Located. There Is NO Guarantee That The Utilities Shown Comprise All Utilities In The Area, Either Abandoned Or In Service, Or That The Location Of The Utilities Shown Is Accurate.
3. The Ortho-Photo Which Was Provided By The Washington Department Of Transportation, Is Based On Aerial Photography Flown In April 2005.
PARK & RIDE
E 20th Street
E 22nd Street
E 24th Street
E 25th Street
E Fourth Plain Boulevard
E 27th Street
E 28th Street
E 29th Street
E 30th Street
E 31st Street
E 32nd Street
E 33rd Street
E 34th Street
E 35th Street
E 36th Street
E 37th Street
E 38th Street
E 39th Street
E 39th Street
H Street
G Street
F Street
E Street
D Street
C Street
Broadway Street
K Street
L Street
M Street
N Street
O Street
P Street
Q Street
R Street
S Street
T Street
SR 500
DEFERRED UNDER PHASE 1
LEGEND
Power
Water Main
Gas
Sanitary Sewer
Communications
0
200
400
Feet
Exhibit 4-5
Developed Conditions - Washington State
(Sheet 2 of 2)
Columbia River CROSSING
$FILE$

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5. Temporary Effects

Temporary effects are generally limited to those caused by construction activities, and temporary outages that may be necessary when relocating utilities. Such impacts would be similar regardless of the highway or transit option.

Both underground and overhead utilities could be affected by construction activities such as excavation, foundation construction and earth moving. Tying in relocated utilities could result in a temporary loss of services – these are expected to have a short duration. However, for some utilities such as communications, tying into the existing trunk lines from the new relocated lines could take an extended period for splicing and connecting multiple cables.

Depending on the construction sequence, temporary relocations may be necessary before a utility is in its final location. Regardless, construction contracts will need to have provisions to protect and maintain utilities. Such provisions could include providing duct banks, facilitating the attachment of utilities to new structures, and construction windows that provide adequate time for utilities to pull cables and to tie in relocated utilities.

Three potential casting yards and staging areas have been identified at a distance from the project footprint. These include two casting yard sites adjacent to the Columbia River – a 95 acre parcel at the Port of Vancouver and a 51 acre parcel north of the Portland-Troutdale Airport (Sundial Site) – and a 52 acre staging area in the Port of Vancouver. Contractors may elect to use one or more of these sites, or use other locations. At this stage of project development, we do not know what sites might be used or the specifics of how a particular site might be developed. Regardless, it is anticipated that the sites would only contain utilities serving those parcels and in the unlikely event that this is not the case, the utility infrastructure would be protected in-situ or relocated.

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6. Mitigation for Long-term Effects

Proposed mitigation for long term effects would be the same for both highway and transit elements regardless of alignment and option. Depending on the impact, mitigation would either comprise protecting a utility in-situ or relocating it. Such mitigation would be intended to eliminate or minimize long-term impacts from the project and ensure that such impacts do not impair existing overall levels of service, and include:

- Close and ongoing coordination with utility owners during design.
- Determining the exact location and depth of utilities using techniques such as potholing and locating using electronic instruments, and confirming those locations with individual utility owners.
- Evaluating the effect on proposed utility relocation on other nearby utility infrastructure.
- Where practical and cost effective, design the project to avoid or minimize conflicts, service disruptions and access restrictions, especially for major utilities. Design would also consider the effect of relocating utilities on other nearby utility infrastructure.
- Develop detailed Composite Utility Plans that show existing utilities, and proposed temporary and permanent utility locations. These plans would be reviewed with utility owners prior to construction.
- Develop agreement(s) with affected utility owners for utilities to be relocated. Advance utility relocation is a key to minimizing project schedule delays. An alternative approach would be to include utility relocation, particularly public facilities, in the construction contracts.

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7. Mitigation for Temporary Effects

Similar to long-term effects, proposed mitigation for temporary effects would be the same for both highway and transit elements regardless of alignment and option. They are intended to minimize service disruptions during construction and include:

- Close and ongoing coordination with utility owners during design and construction.
- Relocating utilities in advance of construction where feasible.
- Identify schedule-related constraints with utility owners. For example, long lead procurement times for materials and equipment required for utility relocation, and the time that critical utilities such as water mains can be out of service.
- Incorporate temporary and permanent utility relocations and duration of expected service disruptions in the construction schedules. The schedule and sequence for utility relocation work would be reviewed with owners prior to construction.
- Notify neighborhoods of potential disruptions in service.
- Tailor construction contract(s) to include protecting and maintaining utilities, to provide duct banks, conduit, and attachments for the relocated utilities, and to have defined construction windows for utilities to pull cables and tie in relocated utilities.

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8. Permits and Approvals

Use and occupancy agreements (permits and franchises) would be required from ODOT and WSDOT for utilities located within their rights-of-way. The utility owners, however, would obtain these. The utility owner or contractor performing relocation work would also obtain any other permits and approvals specifically required for that work by federal, state or local government agencies.

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9. References

No references are cited in this report.

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