CITY OF RICHLAND/PORT OF BENTON

NORTH HORN RAPIDS AREA MASTER PLAN

MAY 2017

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In Coordination with the City of Richland and Port of Benton

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INTRODUCTION

Background

The City of Richland and Port of Benton recently acquired 1,341 acres of federally transferred property from the Department of Energy (DOE). Approximately 884 of the 1,341 acres are located outside of the current City of Richland Urban Growth Area (UGA). At this time the City of Richland has requested to expand the UGA to include this area, with the intention of including this property into the Richland City Limits. As part of the UBA expansion request, a Capital Facilities Plan was prepared that identified on and off-site infrastructure needs to serve the area and the ability of the City and Port to provide such infrastructure. The intention of the City and Port is to improve and market the site for large industrial land uses.

The north Richland area has been envisioned as an employment center for the community and is anticipated to provide employment and business opportunities for the region. This area consists of Industrial, Manufacturing, and Research related land uses. At this time, most of the current development has occurred to the south in the Horn Rapids Industrial Park. The area consists of industrial and manufacturing developments 50-100 acres in size.

As the Tri-City region grows and the Hanford cleanup activities are completed over the next twenty years, there is a need to attract industrial developers that will help offset the projected decline of Hanford jobs. It is intended that the Master Plan area will help provide the necessary land base to provide larger industrial sites (200 to 500 acres in size). Sites of this size are not readily available for development throughout the Pacific Northwest until now. If development of this area occurs, the jobs associated with the cleanup efforts could be replaced sustaining an economically healthy city and region.

Purpose of the Plan

The City and Port have initiated the North Horn Rapids Area Master Plan (NHRAMP) to assess on-site infrastructure needs, evaluate the development layout options, and provide some guidelines for future development. This Master Plan looks at the opportunities and challenges associated with developing the site. The Master Plan identifies a long term vision of the North Horn Rapids Area with flexible plan implementation approaches that respect market conditions and interests within the Plan's anticipated 20 to 30 year build-out period. The area is anticipated to continue to develop as a major employment center in Richland. A vicinity map is shown in Figure 1.

Planning Process

The NHRAMP envisions the area as an active and vital employment and economic center, attracting new development, reinvestment and employment. As part of the planning process the project team met with key stakeholders, including the City of Richland, Port of Benton, Benton County, Inter-Tribal Advisory Board (ITAB), Tri-Cities Economic Development Council (TRI-DEC), Energy Northwest, Department of Energy (DOE), Pacific Northwest National Laboratory (PNNL), Hanford Advisory Board, Laser Inferometer GravitationalWave Observatory (LIGO) to solicit input on the Master Plan. Through these meetings, current issues and concerns were identified and recommendations for the Plan were established.

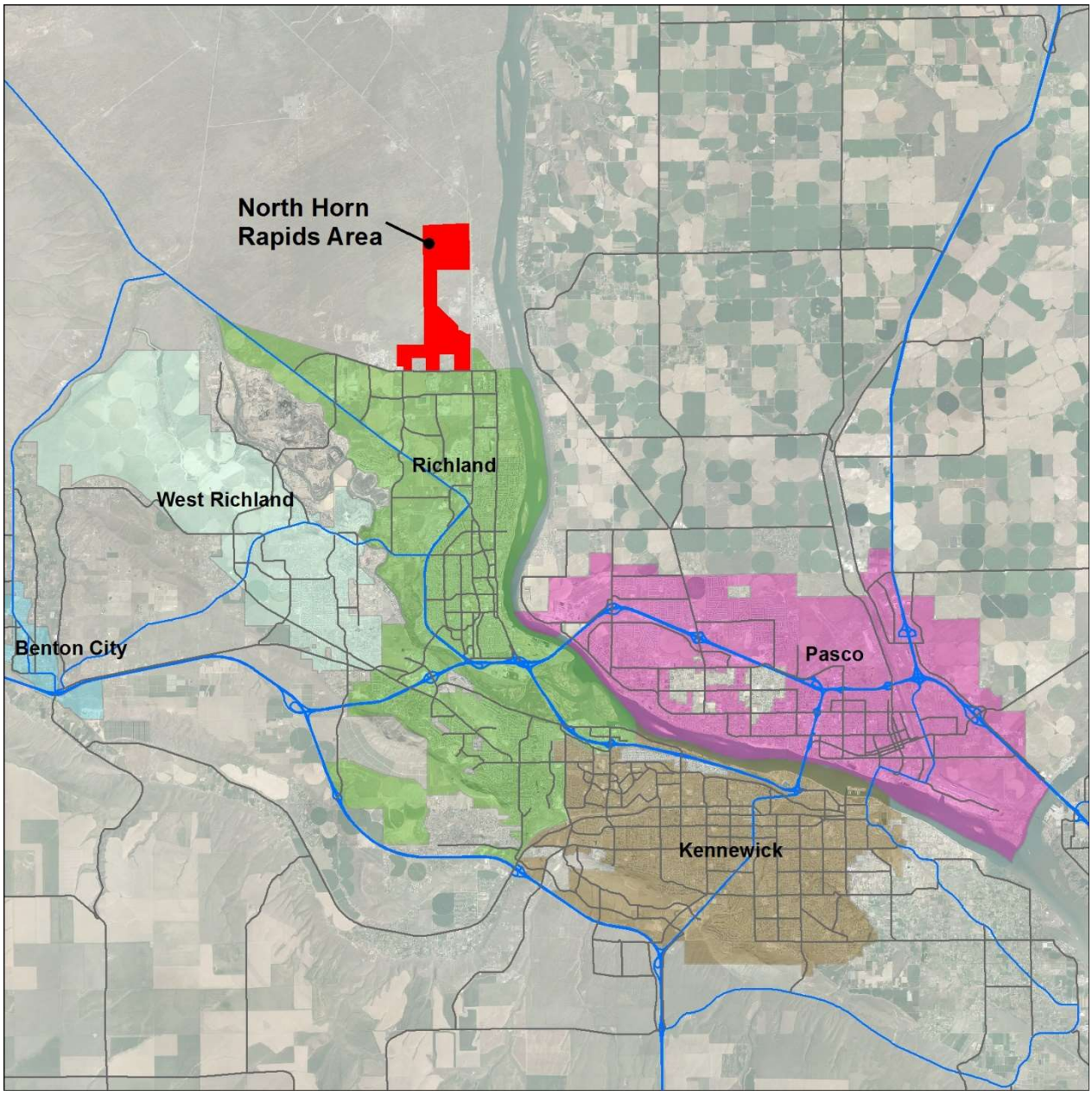
Five specific focal areas emerged during our discussions with stakeholders:

1) Road standards for circulation systems within the site needed to be agreed upon and adopted as part of the update process.

2) Future rail expansion to the site needed to be considered in the site layout and design.

3) Future development of the DOE PNNL Site and Hanford Site 300 Area to the east and the Future DOE Land Transfer Property to the west need to be considered as part of the transportation network.

Figure 1. Vicinity Map



4) Opportunities to develop an east-west regional transportation corridor to support the proposed North Richland Bridge needs to be considered.

5) Create a site layout that accommodates large mega sites of 200 - 500 acres in size.

As a result of these meetings, existing facilities and improvements were identified through the development of the Capital Facilities Plan. In addition, ongoing issues as well as planned improvements for the area, and preliminary development alternatives were identified.

Existing Property Description

The land being evaluated for the NHRAMP is comprised of four parcels in Benton County:

- 134183000001000 (285.2 acres)
- 103084000001000 (219.36 acres)
- 110081000001003 (581.2 acres)
- 110081000001004 (257.7 acres)

It is situated north of the City of Richland as shown in Figure 2. Generally speaking, the property is located north of Horn Rapids Road and west of Stevens Drive (Route 4 South), approximately 0.5 miles west of the Columbia River. The planning area is approximately 1.5 miles wide at the south end for about 0.5 miles north of Horn Rapids Road, then narrows to one mile in width for more than 2.6 miles to the north. There is a 518-acre area, approximately 0.75 miles wide, located along Route 4 adjacent to the site that is not part of the Master Plan. This area is known as Tract 38/Pit 6 and is still owned by DOE. There are also two smaller parcels along the north side of Horn Rapids Road that are not included in the Master Plan.

Land Use and Zoning

The property is currently included in the Hanford Zoning Classification for the portion within Benton County, and light Industrial for the portion within the City of Richland Urban Growth Area. The City is currently seeking approval from the County to expand the Urban Growth Area to include this property. If approved the proposed land use and zoning for the site is Industrial. The surrounding area consists of a primarily heavy and medium industrial uses with small amounts of commercial.

South of Horn Rapids Road is the Horn Rapids Industrial Park which includes industrial and commercial developments on 50-100 acres' sites. To the east is the DOE PNNL Site and Hanford 300 Area Site. At this time the north end of this site is being decommissioned, but there are future plans to redevelop the southern portion of the site into a research campus. Southeast of the site is the Tri-Cities Research District. North and west of the site is comprised of vacant land owned by the DOE. The site is relatively flat with grade of approximately 0.5%. Current use of the site is undeveloped.

It is intended that future development would include industrial, manufacturing, and/or research related uses as allowed in the Industrial Zoning designation. Authorized uses for the master planned area as noted within the deeded transfer agreement with the Department of Energy, include:

1. Warehousing and distribution (e.g. manufactured parts and materials distribution, food and agriculture; refrigerated warehousing and storage; material handling, packaging and crating; and logistics);

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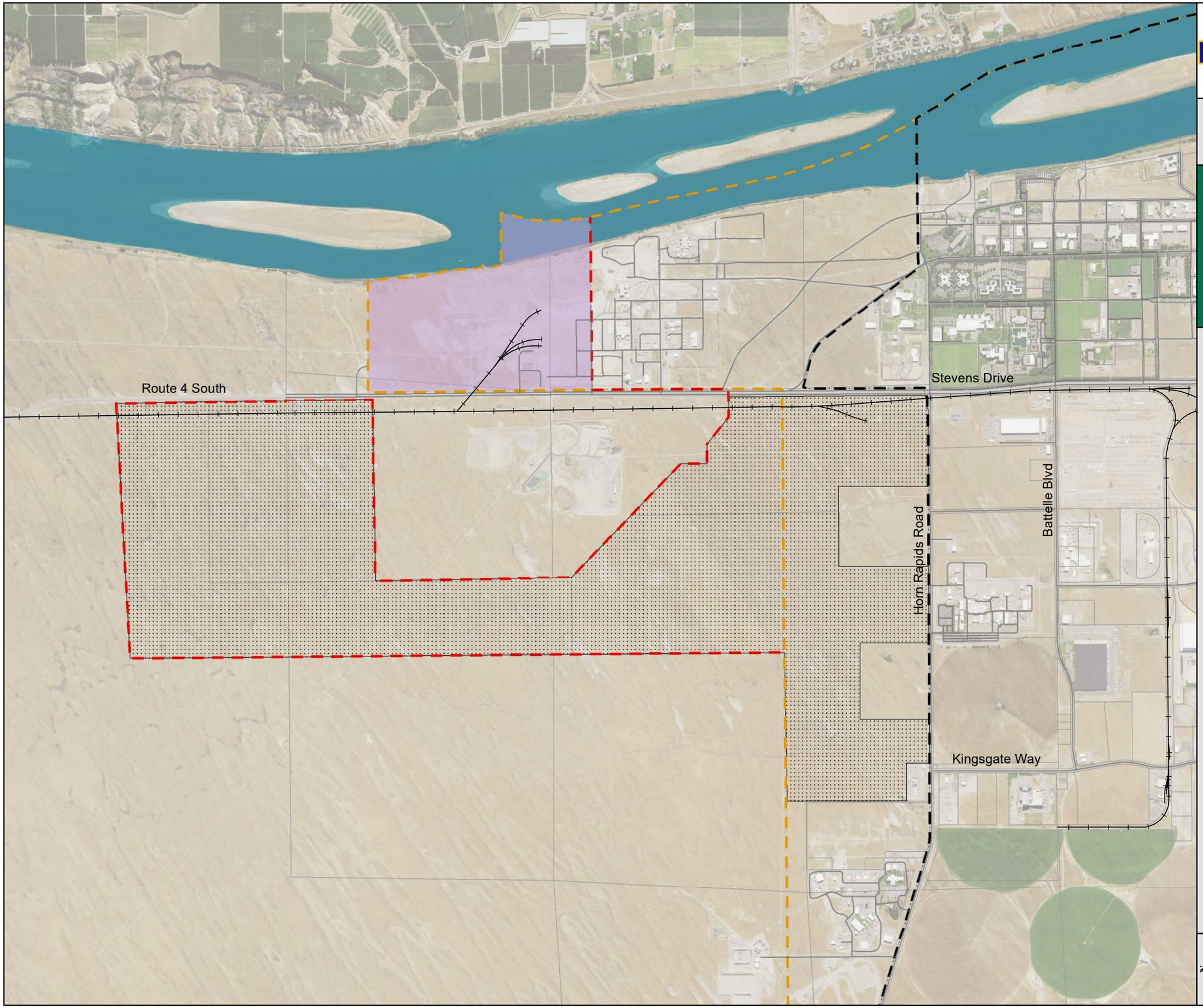
Richland Washington

North Horn Rapids Area
Master Plan

Figure 2
Master Plan Area



Legend

- City Limits
- Existing UGA
- Proposed UGA (1,187 acres)
- Existing UGA To Be Removed (283 acres)
- Master Plan Area (1,641 acres)

0 2,000 4,000 Feet

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2. Research and development (e.g. scientific research; software; data security; computation; energy technology; environmental; and biotechnology);

3. Technology manufacturing (e.g., defense manufacturing; sensor manufacturing; medical device manufacturing; food processing; machinery manufacturing; advanced materials manufacturing; and carbon fiber manufacturing);

4. Food processing and agriculture (e.g. wine processing; food processing; agricultural products; and craft beer production);

5. Back office (e.g. call centers; administrative processing; data processing; information technology; remote sensing; professional services; and training); and

6. Energy (e.g. solar energy production; smart grid; and biofuels manufacturing).

It should also be noted that the site contains a few development constraints as identified in the conditions of the land transfer from DOE (AFN 2015-029457). The purpose of these conditions is to ensure that no adverse environmental impacts will result in the development of the site. These conditions are identified in Exhibit H of the Deed Restrictions and are summarized below:

1. Net Proceeds. All net proceeds for the sale or lease of the property within 7-years of the agreement shall be used to support the economic redevelopment of or related to the Hanford Site.

2. Groundwater. prohibited from extracting, permitting to be extracted, consuming or otherwise accessing or utilizing any groundwater below the surface of the Premises. Purpose is to prevent disturbance to area hydrologic conditions that might adversely affect the movement of other transportation of groundwater contaminants. All established roads or other access routes to all groundwater monitoring wells shall not be altered or destroyed without receiving further approval by DOE.

3. Storm water. The northern portion of property is not allowed to discharge to groundwater due to the potential to mobilize stable waste sites in the vicinity of the Hanford 300 Area.

4. Excavation. All ground disturbance is prohibited below a depth of 20-feet from the ground surface or within 6.6 feet of ground water.

5. Mining. Mining on the property is prohibited.

6. Concentrating Solar Power Farm. The Port and City are prohibited from constructing and operation a CSP Solar Farm on the Property.

7. Noise and vibration levels. Due to the location of the Laser Interferometer Gravitational Wave Observatory (LIGO) and Pacific Northwest National Laboratory (PNNL) facilities, noise and vibration must be minimized or mitigated in any new facilities.

8. Electrical Field and Magnetic Interference. All activities that generate electrical field and magnetic inferences in excess of the EF/M Interference Standard are prohibited.

9. Radionuclide Emissions. All activities that cause airborne radionuclide emissions in excess of the Natural Occurrences and Radionuclide Emissions Standards are prohibited.

10. Periodic Discussions and Development Plans. The Port and City shall hold periodic meetings with the DOE, PNNL, LIGO, Tribes, concerning items 6, 7, and 8 above, as well as all development plans and land use actions.

11. Tribal Access. Access to the Premises prior to its development is required to members of the Confederated Tribes and Bands of the Yakama Nation, Confederated Tribes of the Umatilla Indian Reservation, the Nez Perce Tribe and the Wanapum Band of Indians (collectively "Tribes") for tribal activities.

12. Buildings and Natural Landscape. The height of buildings that shall not exceed the height limits as authorized pursuant to Chapter 23.28.030 of the Richland Municipal Code, as amended. In addition, a waiver or variance to the height limitation is not allowed. All building (including roofs shall be finished in colors that are non-reflective and emulate the natural surroundings, and landscaping shall consist of xeriscaping utilizing native plants to reduce the need for supplemental watering.

13. Bird-Friendly Design. Incorporate bird-friendly building design into the design for buildings, structures and improvements on the premises to the extent it is reasonably practical to do so.

14. Fire Protection. Within the immediate landscaped area (from the structure to approximately 30 feet), special consideration should be given that any combustible materials (e.g., lawn furniture, litter, and construction materials) should be removed or reduced in an effort to protect property (e.g., wildlands, buildings, and equipment) by minimizing fire risk.

15. Cultural Resource Protection. Requires compliance with all Washington State laws, as amended, regarding cultural resource protection.

16. Pre-Contact Archaeological Materials. The City and Port shall return any and all artifacts or human remains found on the premises to the DOW for Tribal consultation and reburial on the Hanford Site.

17. Annual Report. The City and Port shall provide joint annual reports to DOE identifying compliance with the deed agreement.

18. Cultural Recourse Protection Protocol. Implement the Cultural Resource Protection Protocol as identified in Attachment A of the Deed. The purpose is to carry out specific provisions of the MOA.

Environmental

As part of the conveyance of the property from the DOE to the City and Port, the U.S. Department of Energy Richland Operations Office prepared an Environmental Assessment (EA) of the site. The purpose of the EA was to analyze the potential environmental impacts of the proposed site being conveyed for the purpose of economic development. As a result, a Finding of No Significant Impact for the Proposed Conveyance of Land at the Hanford Site was issued on September 30, 2015. DOE reported in the FONSI that it determined the proposed action will not constitute a major Federal action significantly affecting the quality of the human environment and the preparation of a EIS is not required

EXISTING CONDITIONS

This section discusses existing facilities, owned by public entities, and provides information about the service provider, along with the location and capacity of the existing facilities.

Transportation

Streets

There is no existing roadway network internal to the proposed North Horn Rapids Area (NHRA). Only Stevens Drive, running north-south along the eastern side of the proposed area, and Horn Rapids Road along the southern side provide immediate access. Roadways that will provide service to the proposed NHRA are described below and shown in Figure 3.

Stevens Drive is a principal arterial roadway that serves the Hanford Area to the north of the NHRA. It has 6 lanes south of Horn Rapids Road where the speed limit is 55 MPH, and 4 lanes north of Horn Rapids Road where the speed limit is 60 MPH. There are acceleration and deceleration lanes at intersections. North of the Hanford 300 Area, Stevens Drive enters the Hanford Area and becomes Route 4 South.

Horn Rapids Road is a 2 lane minor arterial roadway that runs east-west along the southern edge of the NHRA. The speed limit is 50 MPH west of Stevens Drive and 35 MPH east of Stevens Drive.

Kingsgate Way is a north-south minor arterial roadway located that provides access to the southwestern portion of the NHRA. It has one lane in each direction and a two-way left turn lane. It has curb and gutter and a detached sidewalk on the east side just north of SR 240 along the RV Park frontage, but is a rural section further to the north. There are streetlights the full length of the roadway. It has a posted speed limit of 40 MPH. It provides access to residential development to the south of SR 240 but is discontinuous further south, with plans to extend it to Van Giesen Street (SR 224).

SR 240 is also known as the Vantage Highway west of Stevens Drive and is an east-west expressway that connects the City of Richland to areas to the west including the Hanford Site. It has a single through lane in each direction but at the intersection of Kingsgate Way it has deceleration lanes for right turns and, exclusive left turn lanes as well as acceleration lanes in both directions for vehicles turning onto the highway. A traffic signal will be constructed at the SR 240/Kingsgate Way intersection in 2017. The speed limit is 55 MPH. There are no sidewalk facilities as it has roadside ditches for storm water. The City has programmed a multi-use pathway on the north side from Stevens Drive to Kingsgate Way.

George Washington Way parallels Stevens Drive to the east and serves the Tri-Cities Research District, the Port of Benton and the Pacific Northwest National Laboratory and Washington State University Tri-Cities. It is a 5 lane principal arterial through the heart of Richland. North of Horn Rapids Road, George Washington Way curves to the west to join Stevens Drive. Northbound, as it approaches Stevens Drive the only movement allowed is the northbound merge. Southbound Stevens Drive provides a left turn lane to access George Washington Way. The PNNL plans to realign George Washington Way north of Horn Rapids Road. This would move the intersection with Stevens Drive approximately 0.3 miles north of the Bonneville Power Administration transmission lines.

Rail

The Department of Energy owns existing rail that parallels Stevens Drive on the eastern side of the NHRA north of Horn Rapids Road. The City of Richland has also constructed a rail spur that serves the Horn Rapids Industrial Park from the Port's mainline to serve the existing industrial park. .

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Richland Washington

North Horn Rapids Area
Master Plan

Figure 3
Existing Transportation Network

George Washington Way

Stevens Drive

Route 4 South

Horn Rapids Road

Battelle Blvd

Kingsgate Way

SR 240

Legend

- City Limits
- Existing UGA
- Proposed UGA
- Existing UGA To Be Removed
- Master Plan Area

0 2,500 5,000 Feet

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Sanitary Sewer Service

Currently, there is no sanitary sewer service in the NHRA. Sanitary sewer service in this area will be provided by the City of Richland. The City of Richland updated its General Sewer Plan (GSP) in 2016. The GSP update discusses the total capacity, utilized capacity, and remaining capacity of both the Wastewater Treatment Plant (WWTP) and the sanitary sewer collection system. The following is a summary of the WWTP capacity and the sanitary sewer collection system based upon this planning document.

Wastewater Treatment Plant

The City of Richland operates a wastewater treatment plant (WWTP) with primary sedimentation and secondary activated sludge treatment. Chlorine is injected prior to discharge to the Columbia River for disinfection. Solids are thickened with rotary drum thickener, anaerobically digested, dewatered on belt presses, and transported to the City composting facility to attain a Class A compost which is sold to the public through wholesale distributors.

The WWTP is sized for 11.4 million gallons per day (mgd) of sewer flow as noted in Table 1. According to the GSP, the maximum monthly flow for 2015 was 6.3 mgd (55% of rated capacity) and maximum monthly flow is projected to reach approximately 9 mgd (80% of rated capacity) in the next 20 years. The GSP identifies that Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS) loading are both currently at approximately 80% of rated capacity. The Washington State Department of Ecology (WDOE) recommends improvement planning begin once average flow/load exceeds 85% for three consecutive months or exceeds 100% design capacity for one month. Based upon this requirement, the GSP projects the need for a WWTP re-rating study to occur in 2020.

Table 1. Design Criteria – 2016 NPDES Permit

Parameter	Design Criteria	85% of Design
Average flow for maximum month	11.4 mgd	9.7 mgd
BOD_5 loading for maximum month	17,250 lbs/day	14,663 lbs/day
TSS loading for maximum month	21,200 lbs/day	18,020 lbs/day
NH3-N loading for maximum month	2,750 lbs/day	2,338 lbs/day

Collection System

The City of Richland sanitary sewer collection system consists of over 262 miles of pipe ranging in size from 6-inch to 54-inch in diameter. The total area that can be provided with public sewer service totals over 25,000 acres. The existing collection system also includes 14 sanitary sewer lift stations, which are classified as either local service or interceptor service depending on the area they serve.

The natural ground topography of the NHRA is a gentle slope of 0.5% towards the south. Therefore, the entire site will have only one drainage basin to be served by one sanitary sewer gravity interceptor pipe. There is an existing 24-inch diameter sewer interceptor (Logston Interceptor) that extends as far north as Battelle Boulevard. Figure 4 depicts the existing sanitary sewer collection system in the vicinity of the NHRA.

Potable Water Service

The NHRA is outside of the current water service area of the City of Richland water system. The City of Richland prepared an update to its Water System Plan (WSP) in 2016, which provides 20-year planning

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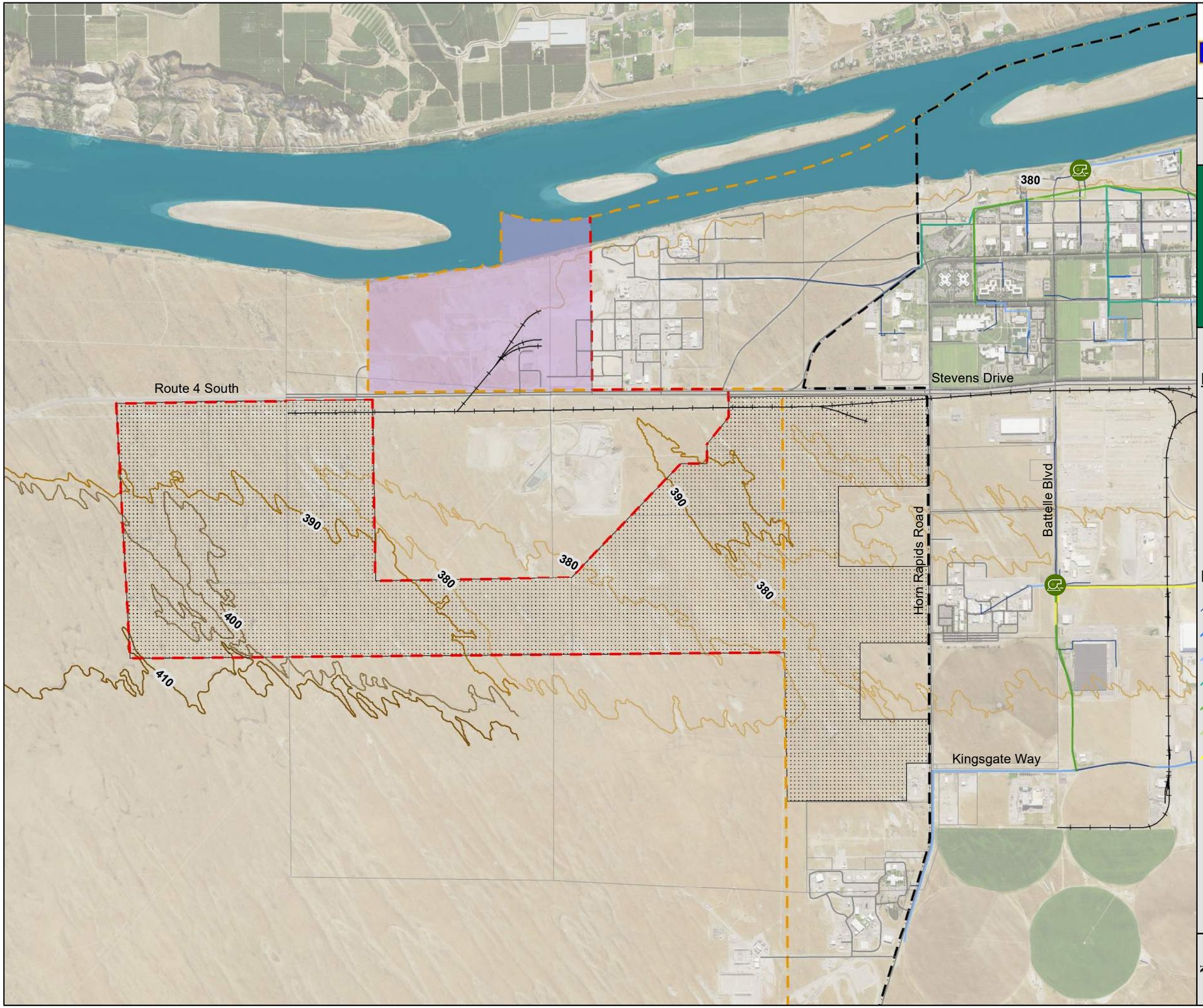
Richland Washington

North Horn Rapids Area
Master Plan

Figure 4

Existing Sanitary Sewer System



Legend

- City Limits
- Existing UGA
- Proposed UGA
- Existing UGA To Be Removed
- Master Plan Area
- Sewer Lift Station

Existing Pipe Size (in)

- Collector
- 10
- 12
- 15
- 18
- 21
- 24

0 2,000 4,000 Feet

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numbers for water supply, demand, and distribution. The following is a summary of the City's potable water source capacity and the distribution system based upon this planning document.

Source Capacity

According to the WSP, the City of Richland has a total available water right of 34,948 acre-feet per year and 43,786 gpm for instantaneous flow. This total available water right converts to a Maximum Day Demand (MDD) of 63.0 MGD. The 2015 population-based MDD is 38.4 MGD per the WSP. The planning period for the WSP limited the future demand projections to year 2035 when MDD is projected as 55.25 mgd.

The City of Richland potable water sources include a wellfield and the Columbia River Water Treatment Plant (WTP). According to the WSP update, the wellfield has a total of 15 MGD capacity while the WTP has a capacity of 36 MGD.

Distribution System

There are currently twelve pressure zones in the City's water distribution system that receive water service. The natural topography of the NHRA (elevation 410' to 380') places it within the City's Core 548 Pressure Zone which serves elevations 353'- 427'. There are existing Core 548 water pipes as far north as Horn Rapids Road. Figure 5 depicts the existing water distribution system near the NHRA.

Power

The City of Richland Energy Services currently has no electrical power services specified for the NHRA. There are existing electrical facilities along Horn Rapids Road (east/west) and Stevens Drive (north/south) that provide service to existing developed area. City of Richland Energy Services has the ability to provide electrical service to the NHRA. The Bonneville Power Administration (BPA) has an overhead transmission line that crosses the NHRA east to west, however, the BPA transmission line cannot be used for electrical services for the NHRA.

Surface and Storm Water Management

Currently, there are no storm water systems within the NHRA. There is a restriction of the placement of swales, ponds and other storm drainage facilities within the study area. The southerly restriction area is located 1,969 feet north of the centerline of Horn Rapids Road and extends 15,781 feet north of the centerline of Horn Rapids Road. This is noted in the property deed restrictions Exhibit H item 5. Refer to Figure 6 for a graphical representation of the restriction area.

Other Governmental Services

Natural Gas

The natural gas utility for the NHRA is Cascade Natural Gas Corporation (CNGC). CNGC has an existing 6-inch steel high-pressure main running north/south along Stevens Drive. There is also a 4-inch intermediate pressure main located along Horn Rapids Road (east/west). CNGC has stated that their existing natural gas services are currently 100% utilized and that no further natural gas services can be accounted for in the NHRA. CNGC is currently working on plans to provide additional natural gas services so that the NHRA can account for natural gas utility services. They have estimated additional natural gas services can be accounted for by the middle to end of 2017.

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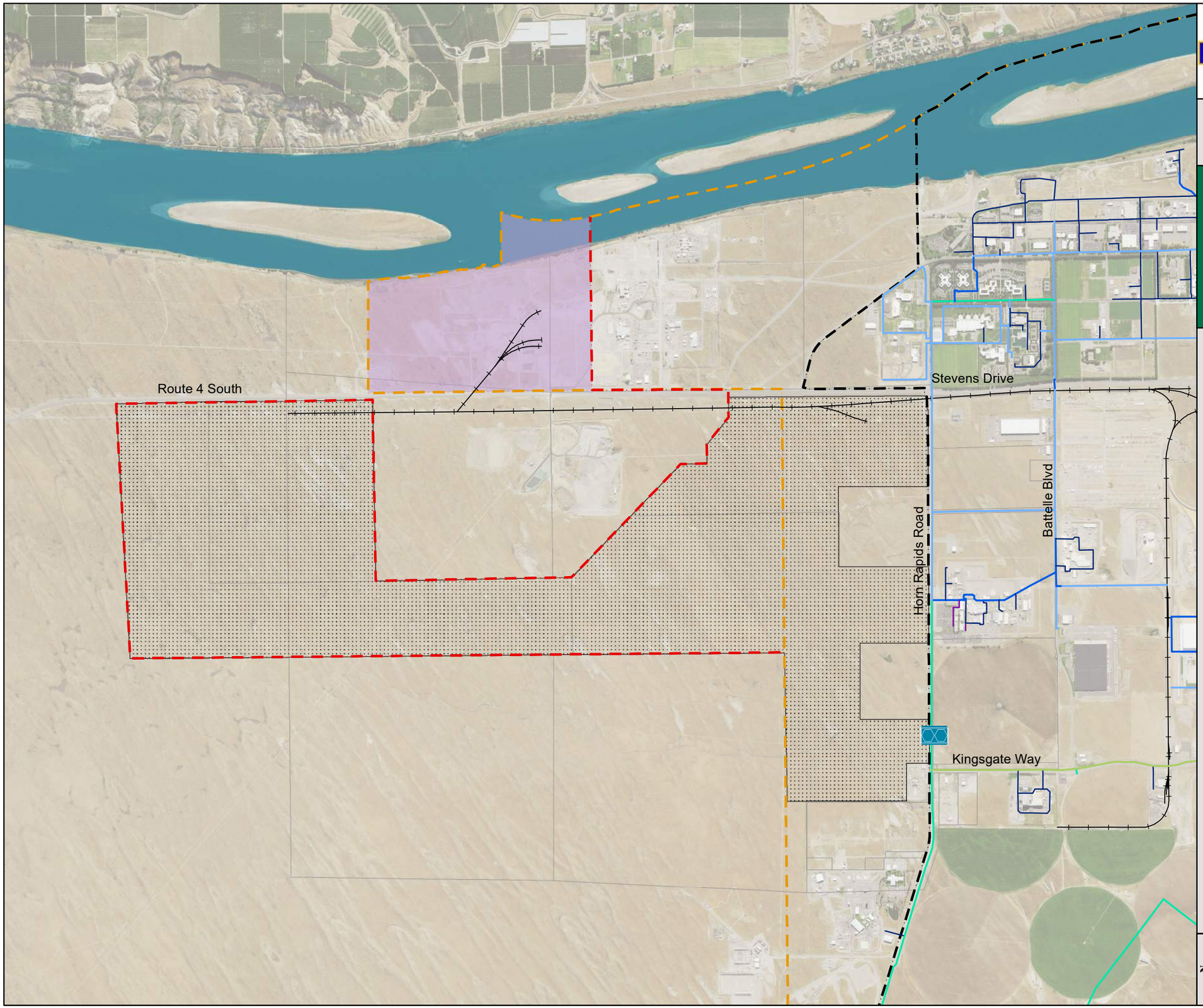
Richland Washington

North Horn Rapids Area
Master Plan

Figure 5

Existing Domestic Water System



Legend

- City Limits
- Existing UGA
- Proposed UGA
- Existing UGA To Be Removed
- Master Plan Area
- Booster Pump

Existing Pipe Size (in)

- 6
- 8
- 10
- 12
- 16
- 20

0 2,000 4,000 Feet

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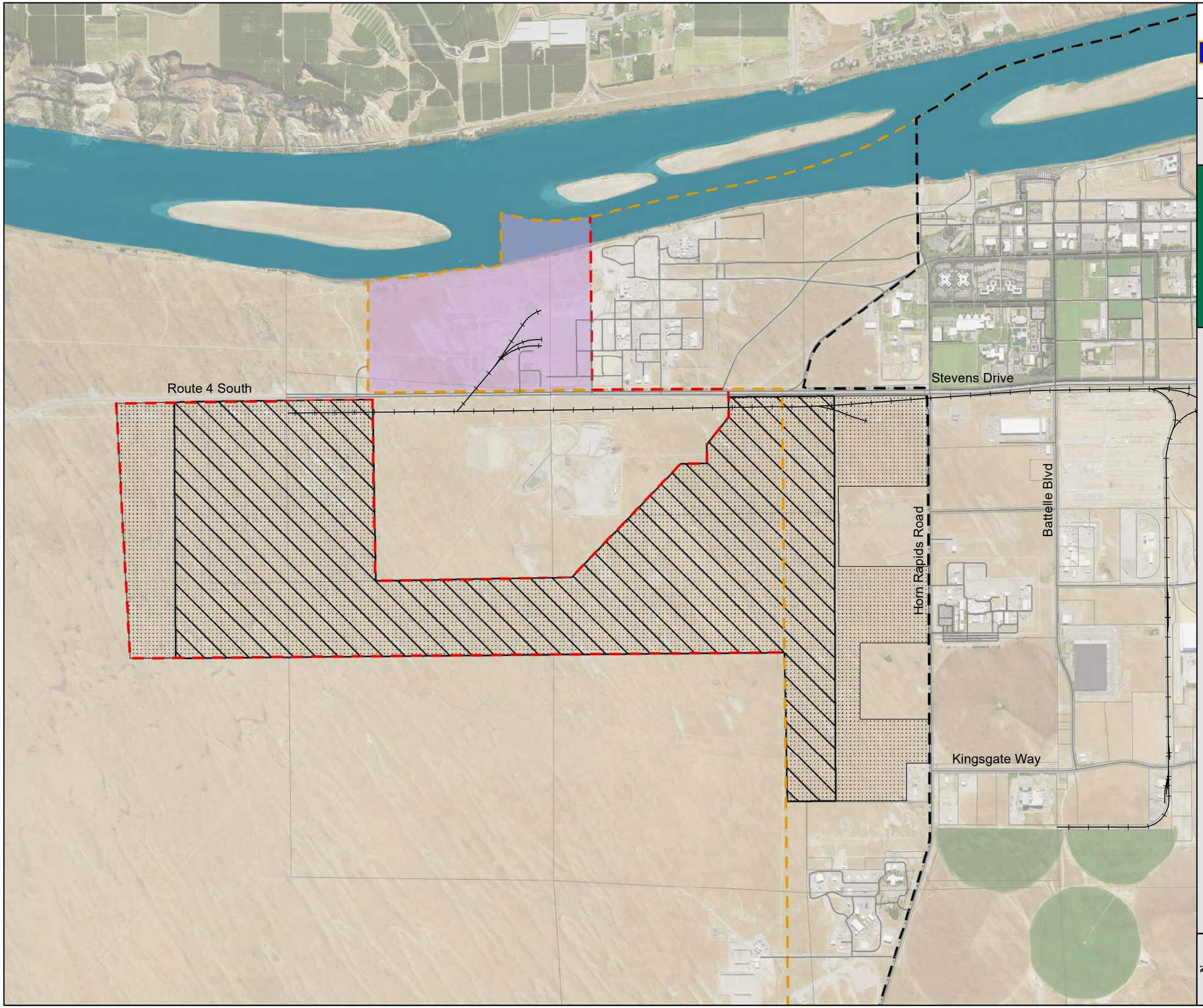
Richland Washington

North Horn Rapids Area
Master Plan

Figure 6
Stormwater Restriction Area



Legend

- City Limits
- Existing UGA
- Proposed UGA
- Existing UGA To Be Removed
- Master Plan Area
- Stormwater Restriction Area

0 2,000 4,000 Feet

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Telecommunications

Telecommunications includes the transmission of information by wire, radio, optical cable, electromagnetic, or other similar means. This includes telephone, cellular telephone and cable and satellite television.

Changes in technology are having a major impact on telecommunications. Much of these technologies are merging with much less distinction between data, video, and voice technologies. Some of these utilities are regulated by the Washington State Utilities and Transportation Commission to meet a specific level of service to their service areas.

In regards to landline telecommunication service, the NHRA is located in Frontier Communication's service area. There are existing communication services along Horn Rapids Road (east/west) and along Stevens Drive (north/south). Landline telecommunication service to the NHRA is not currently available and would require additions to Frontier's current network. Other landline telecommunication providers would need to make similar improvements. Service coverage for cellular telecommunication is expected to be available in the NHRA as nearby urban areas receive cellular service. Internet service to the NHRA would be limited to wireless internet service providers (ISPs) until a fiber optic network connection could be extended to the area.

U.S. Cellular, AT&T, Sprint, Verizon and Nextel currently provide cellular phone service within the Tri-Cities area. Due to the close proximity to urban areas, it is anticipated that all of these services will have acceptable reception.

Irrigation

Separate irrigation services are not provided by an irrigation district within the NHRA. All irrigation within the NHRA will need to be provided through the City of Richland Domestic Water System. It is noted that non-potable water is available with an existing irrigation pipeline at the corner of Stevens Drive and Horn Rapids Road. It's not anticipated that the targeted developments will need a high level of this service; however, if significant non-potable demands are requested by development irrigation service would be provided by this non-potable water system and most likely not from the domestic potable water system.

PARCEL CONCEPUTAL LAYOUT

The intent of the NHRAMP is to accommodate large industrial users. Parcel sizes considered should be approximately 200 acres or larger. Several options were prepared and discussed with stakeholders and partners in the development of this Master Plan. Concepts showed variations in lots sizes and in providing access to the parcels as well. Ultimately, a combination of the alternatives was selected as the preferred conceptual layout and is depicted in Figure 7. This conceptual parcel layout allows for 6 industrial sites.

This option provides the City and the Port of Benton the opportunity to create flexibility in the size of the lots so they are marketable to multiple users. If desired, the configuration allows multiple lots to be combined to serve an even larger user as well. Due to the larger lot sizes and configuration this option reduces the need for any internal roadways which in turn will lower some of the development cost of the site.

A transportation network that supports the industrial lots is discussed in the following chapter. The parcel layout shown is conceptual and can be modified as necessary. Parcels will need to be created through the City of Richland platting process.

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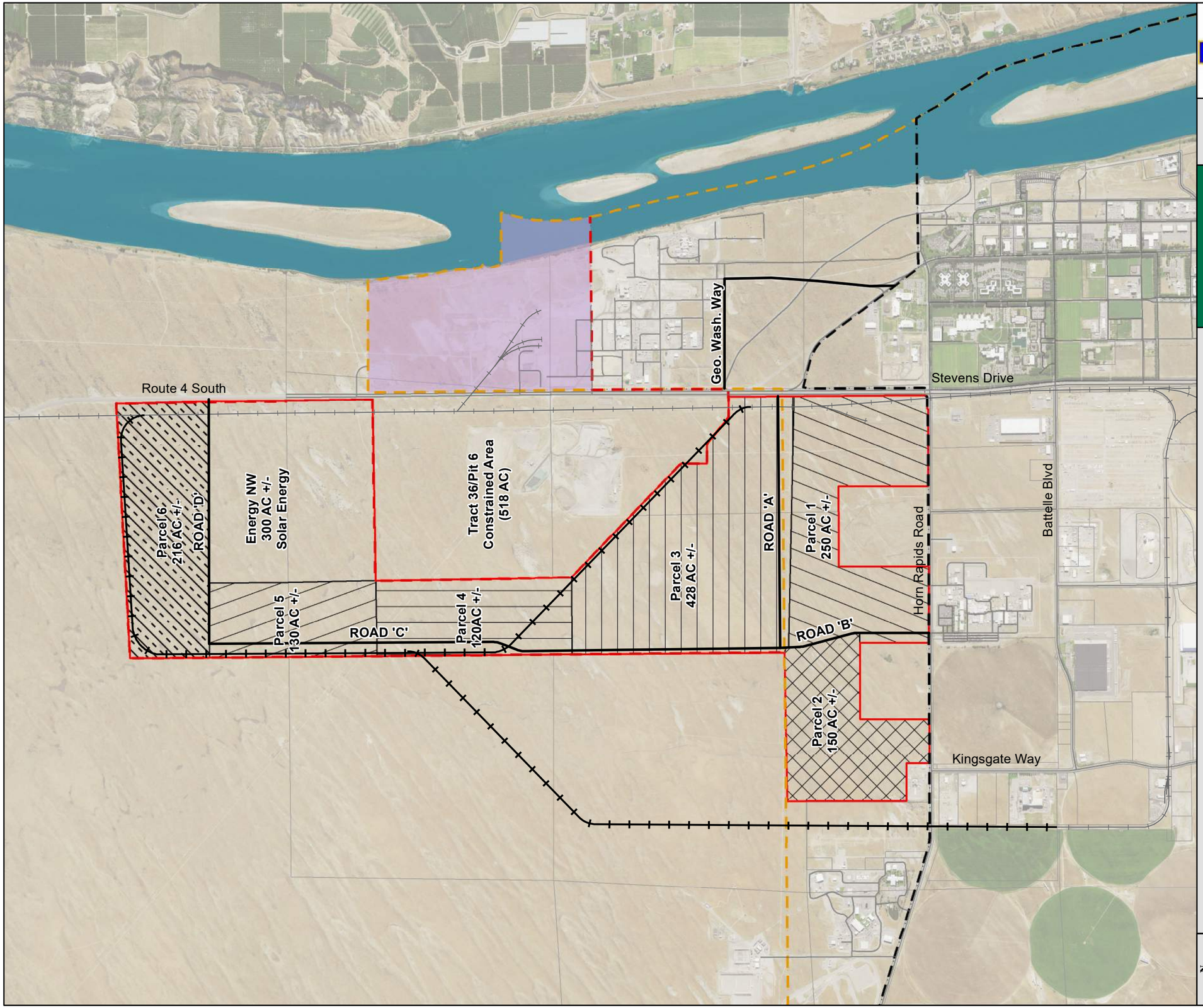
North Horn Rapids Area
Master Plan

Figure 7
Lot Layout



Legend

- City Limits
- Existing UGA
- Proposed UGA (1,187 acres)
- Existing UGA To Be Removed (283 acres)
- Master Plan Area (1,641 acres)

Lot Layout

- Parcel 1
- Parcel 2
- Parcel 3
- Parcel 4
- Parcel 5
- Parcel 6
- Proposed Roadway
- Proposed Railroad

0 2,000 4,000 Feet

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TRANSPORTATION FACILITIES

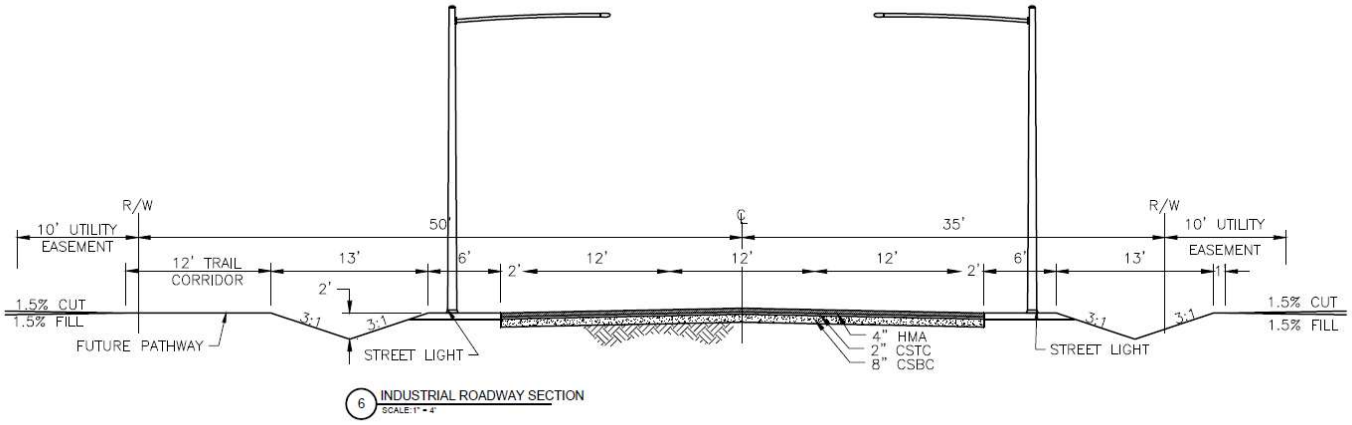
Planned Roadway Network

As mentioned earlier, the intended land use of the North Horn Rapids Area would be for industrial purposes. Currently, the City has very few sites which can accommodate large industrial type development greater than 50 acres, such as is common in the Horn Rapids Industrial Park immediately to the south Horn Rapids Road. Similarly, there are very few sites in the state that can accommodate industry with needs greater than 100 acres. The City and Port of Benton have been approached by businesses with needs similar to the AREVA site of 100 acres situated on Horn Rapids Road between Kingsgate Way and Stevens Drive. The intent of the North Horn Rapids Area Master Plan is to serve as many such businesses with large acreage needs as possible.

Since the intent for development is to be very large lots, a relatively small roadway network will adequately serve the area. It is conceivable that very large lot development would require little in the way of new roads. It was learned during the planning process that the Department of Energy Hanford Site has the discretion to close Stevens Drive north of Horn Rapids Road. Today this road exclusively serves the Hanford Site. With the potential constraint that new development of the NHRA could be prevented from using Stevens Drive for approximately 5 miles north of Horn Rapids Road, an alternative route serving the site is appropriate. As development occurs in the NHRA north of the George Washington Way intersection it may be important to transfer ownership or a right to use Stevens Drive/Route 4 through the NHRA.

Given the intent of the type of development, a relatively light roadway network is needed. Roadways would be constructed consistent with the Horn Rapids Industrial Park Industrial Roadway section shown below in Figure 8 which consists of an 85' right-of-way with a three lane street and roadside swales on both sides for collection and retention of storm water. The west or south side of the roadway has a trail corridor for potential future trail improvements. A 10' wide utility easement is located on both sides of the street, immediately outside of the right-of-way.

Figure 8. Industrial Roadway Section



The roadway network within the NHRA would consist of the roadways described below and shown in Figure 9.

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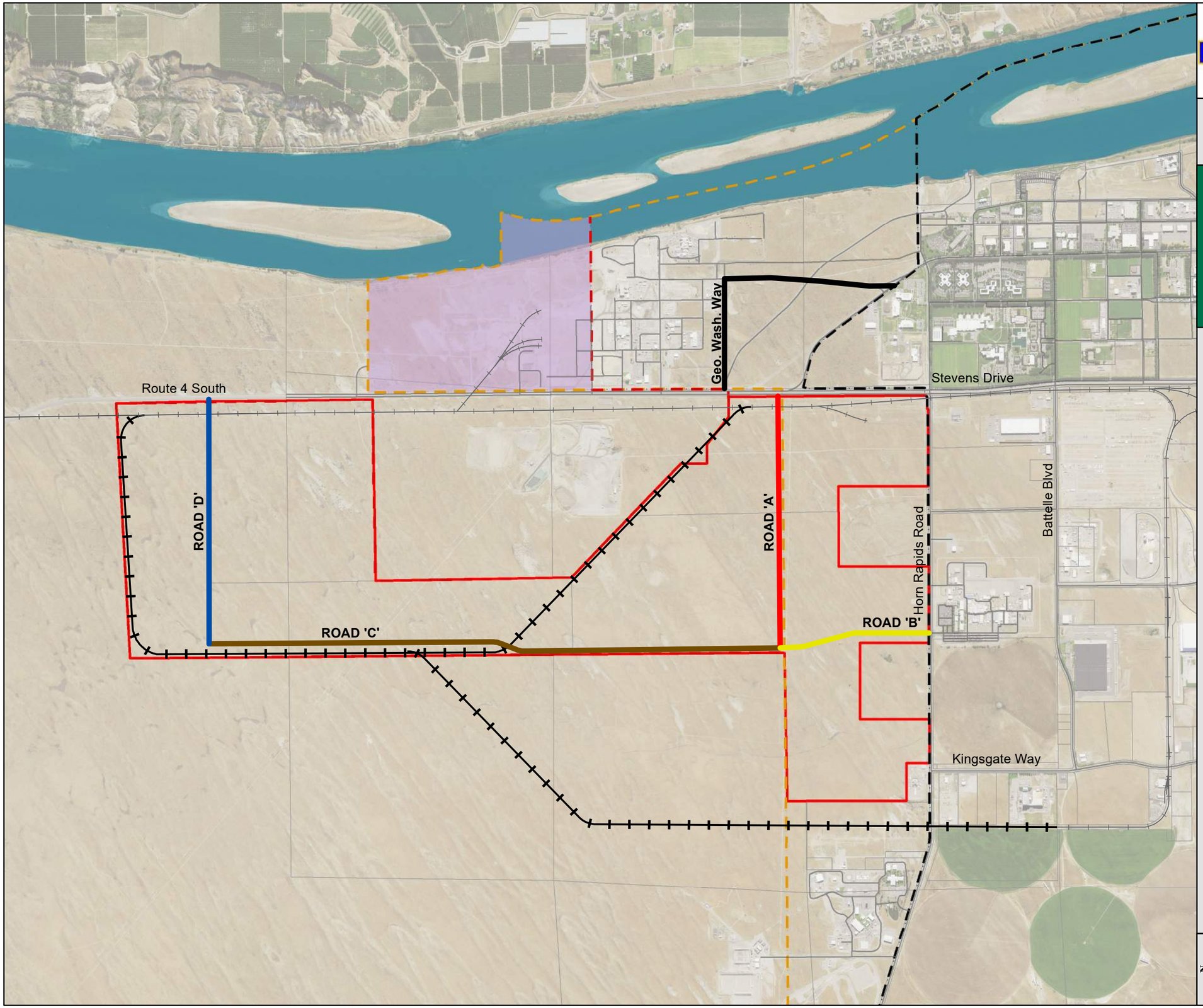
North Horn Rapids Area
Master Plan

Figure 9

Future Transportation Network



Legend

- City Limits
- Existing UGA
- Existing UGA To Be Removed (283 acres)
- Master Plan Area (1,641 acres)

Proposed Road

- Geo. Wash. Way
- ROAD 'A'
- ROAD 'B'
- ROAD 'C'
- ROAD 'D'

Railroad

- EXISTING
- PROPOSED

0 2,000 4,000 Feet

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- An east-west roadway, Road "A" connecting with Stevens Drive near its existing intersection with George Washington Way approximately 1.25-miles north of Horn Rapids Road, approximately 0.25 miles north of and parallel to the existing BPA power lines, and extending west approximately 5,000 lineal feet to the western side of the NHRA to connect with a new north-south roadway Road C. This location was chosen to coordinate with future plans of PNNL which anticipates removing the existing connection of George Washington Way to Stevens Drive and extending George Washington Way north to serve PNNL. A new road from PNNL development would connect to Stevens Drive north of the BPA power lines and a single intersection serving both sides of Stevens Drive would better serve the area for both capacity and safety purposes.

  At this new intersection on Stevens Drive it is anticipated that at some point in the future a traffic signal will be needed in order to provide adequate gaps in the Stevens Drive flow of traffic for other movements to occur. It is anticipated that this intersection would have exclusive left and right turn lanes on all approaches.

- A new north-south, roadway Road "B", beginning at Horn Rapids Road opposite the AREVA driveway, and extending north along the western boundary of the site approximately 3,200 lineal feet in order to preserve maximum lot size capabilities. This new road would connect to a new east-west Road "A".
- A new north-south roadway, Road "C" beginning at the intersection of Road "A" and Road "B" extending north along the western boundary of the site approximately 12,100 lineal feet up to Road "D".
- A new east-west roadway Road "D" would provide access to northern parcels and would be constructed approximately 5 miles north of Horn Rapids Road and 0.5 miles south of the northern boundary. It would extend westward approximately 5,000 lineal feet from Route 4 to connect with the new north-south Road "C".

A build-out scenario traffic analysis for general roadway capacity was examined to determine what potential large capacity capital projects might be anticipated. It is inherent in this analysis that intersection improvements will need to occur over time, but specific improvements for the 20-year period at the intersection level are difficult to determine for such a long-range forecast with so many variables.

The trip generation potential of such a large site could be substantial. To provide access for these new trips to the existing roadway network could be challenging with existing traffic volumes. However, part of the purpose of the transfer of the 1,341 acres from the Department of Energy to the City of Richland and the Port of Benton is to provide alternate opportunities for employment as the Hanford Site clean-up eventually draws to a close in the long term. As a result of this shift in employment, the southbound traffic volumes on Stevens Drive are likely to decrease somewhat, however the extent and timing of this shift is unknown.

More detailed evaluation will be required in the future, when specific site proposals are presented, to better understand future traffic patterns and impacts of proposed developments. However, it is anticipated that Stevens Drive would need to be widened to 6 lanes north from Horn Rapids road through the UGA Expansion area to the northernmost new access roadway. A traffic signal may be needed at that northernmost roadway as well in the long range future, which would provide gaps for other potential large parcel development on the west side of Stevens Drive. Traffic signalization may also be needed at the new north-south roadway at Horn Rapids Road.

North Richland Bridge

Some discussion of the North Richland Bridge is appropriate. In 2010 the Benton Franklin Council of Governments commissioned a study to examine potential future alignments of a new Columbia River Crossing. The study evaluated 10 alignments, with the result of the study being 3 alternatives that were recommended for future analysis. One of these alignments would cross in north Richland and is described as "A new span located just north of the Hanford 300 Area and connects to Columbia River Road and W Sagemoor Road on the east." During the course of the study concerns were raised by the City of Richland and the Port of Benton that an alignment that connected to Horn Rapids Road would negatively affect anticipated development along that corridor.

It is very likely that a North Richland Bridge would cross DOE land and then the NHRA. It is also anticipated that the connecting road to the bridge would be limited access. Three potential alignments for such a bridge connection are shown in Figure 9. Some considerations that should be taken into account for future studies of a North Richland Bridge include:

- With the existing railroad in close proximity to the west side of Stevens Drive, a grade separated interchange with Stevens Drive would likely be beneficial for both facilities.
- A strategic location for the connecting roadway to the bridge that will preserve the ability to have very large lots will be important for the success of the NHRA.
- A grade separation of the connecting road to the North Richland Bridge and the new north-south road (Road "C") and the future rail serving the site (without an interchange) will be required.

Rail

The Port of Benton recently contracted with BST Associates to prepare a Market Analysis for the Port of Benton Rail Line. A copy of this study is included in the Appendix. A brief summary is provided below.

Most of the domestic and international freight moved to or from the Tri-Cities area moves by truck. However, shippers in the Tri-Cities have an interest in increasing rail freight. The trucking industry is facing several challenges that will likely tighten the supply of drivers, and increase costs for local exporters. These challenges include new hours of service rules and mandated electronic logs. These will make it harder for a driver to complete a round trip to and from Seattle/Tacoma in a single work day. An overarching long-term concern is the growing shortage of drivers. Given these constraints it may be possible for a container shuttle service to operate between the Tri-Cities and the Puget Sound.

Rail service to the area is planned to connect to the rail line north of Horn Rapids Road and follow closely to the diagonal boundary headed to the northwest along the Pit 6 area until it reaches the western boundary of the NHRA, then head directly to the north to the northern boundary and proceed back to the east where it would connect to the rail line again, forming a loop as shown in Figure 9.

A long range rail connection is also shown in the figure that extends the City of Richland rail line that exists west of Kingsgate Way to the north across Horn Rapids Road and ultimately connects to the new loop internal to the NHRA.

UTILITY REQUIREMENTS

This section of the North Horn Rapids Area Master Plan (NHRAMP) presents capital improvement projects required by the City of Richland and others, to meet and maintain the existing level of service standards, based on the land use projections outlined.

Sanitary Sewer Service

Sanitary sewer service will be provided by the City of Richland. The following sections describe the projected flows and necessary expansion of two major facility categories of the sanitary sewer system: the collection system and the wastewater treatment plant. It is assumed that utilities will be extended to the northern boundary of the NHRA. Sanitary Sewer Facilities are shown in Figure 10.

Collection System

As previously noted, the natural ground topography of the UGA Study Area creates one singular sanitary sewer service area. A strategy for providing gravity sanitary sewer service to the NHRA was included in the 2015 GSP. The 24-inch diameter Logston Interceptor will need to be extended at minimum slope (0.10%) northward to the northern edge of the NHRA.

Wastewater Treatment Plant

For planning purposes, average daily sewer flow for the NHRA will be approximately 2.13 MGD for industrial use. The GSP identifies that peak month flows for the WWTP in 2036 will be approximately 9.1 MGD; therefore, the NHRA could add approximately 20% to the total peak monthly flows at the WWTP for 20-year planning purposes. This peak monthly flow will be 11.23 MGD - which approaches the current design capacity of the WWTP (11.4 MGD). The WWTP has available capacity for the buildout sanitary sewer flows from the NHRA; however, it may trigger the need for expansion planning to begin sooner than otherwise planned.

Potable Water Service

Potable water service will be provided by the City of Richland. The following sections describe the projected water demands and necessary expansion of the potable water system to serve the NHRA. Domestic Water Facilities are shown in Figure 11.

Estimated Water Demands

Master planning of potable water service for non-residential land uses is difficult because of the wide range of potential industrial water needs. For the purposes of this study, a gross-area demand of 1,250 gallons per acre per day (gpad) is assumed, which is consistent with the estimated sewer demand. It is recommended that each potential industrial user should be analyzed separately at the time of development to determine effects on the distribution system and source capacity.

2016-2022 with NHRA

The total area for the 6-year study area is 385 acres. For 6-year planning purposes, water demands for the NHRA will be approximately 0.48 mgd for the 385 acres of industrial use.

- Maximum Daily Demand = 1,250 gpad x 385 acres = 481,250 gpd (0.48 MGD)

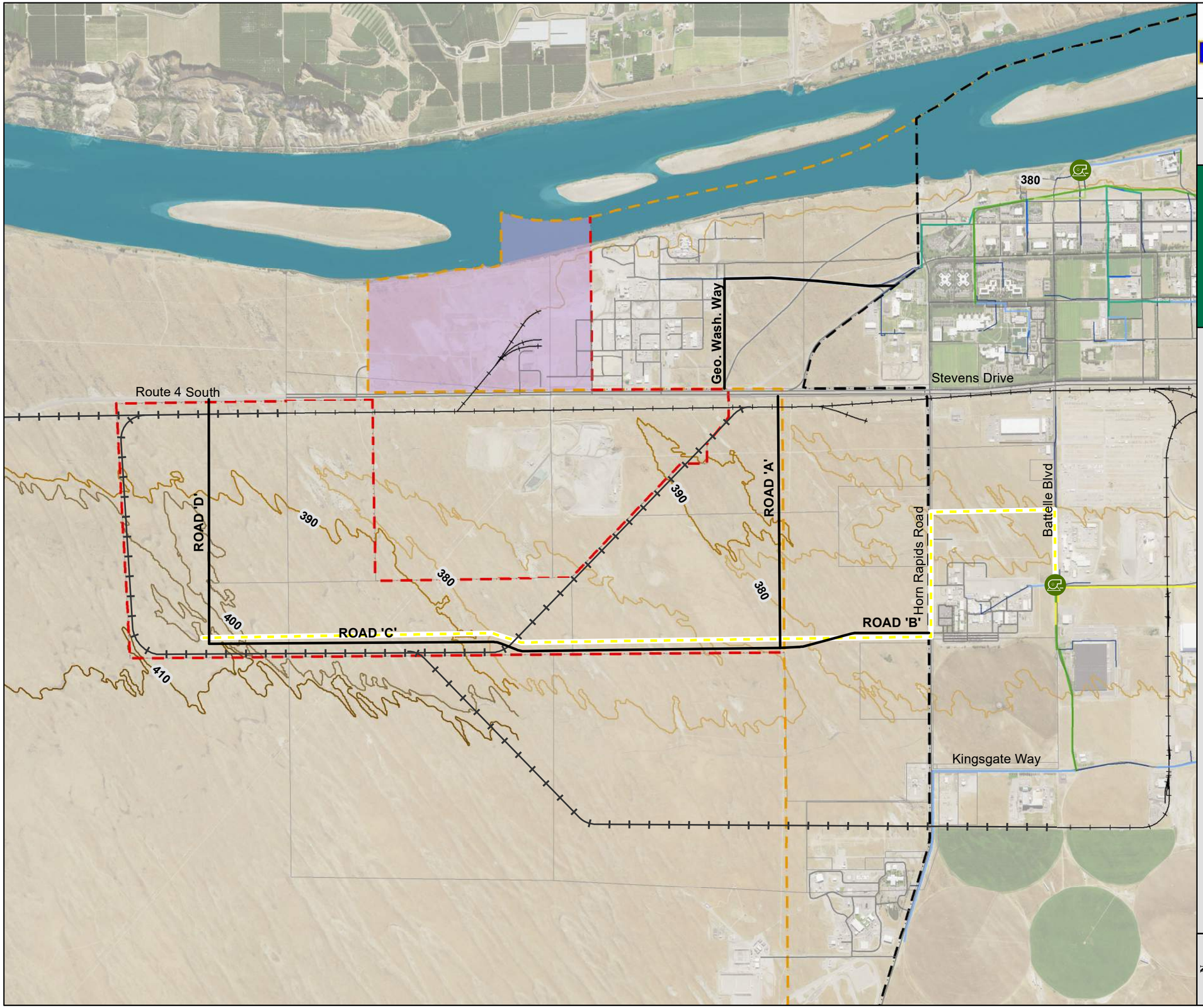
PORT OF BENTON

Richland Washington

North Horn Rapids Area
Master Plan

Figure 10

Future Sanitary Sewer Improvements



Legend

- City Limits
- Existing UGA
- Proposed UGA
- Existing UGA To Be Removed
- Property Lines
- Sewer Lift Station

Existing Pipe Size (in)	MP Pipe Size (in)
Collector	Collector
10	10
12	12
15	15
18	18
21	21
24	24
27	27
30	30
36	36
42	42
54	54

0 2,000 4,000 Feet

N E S W

Date: May 2, 2017

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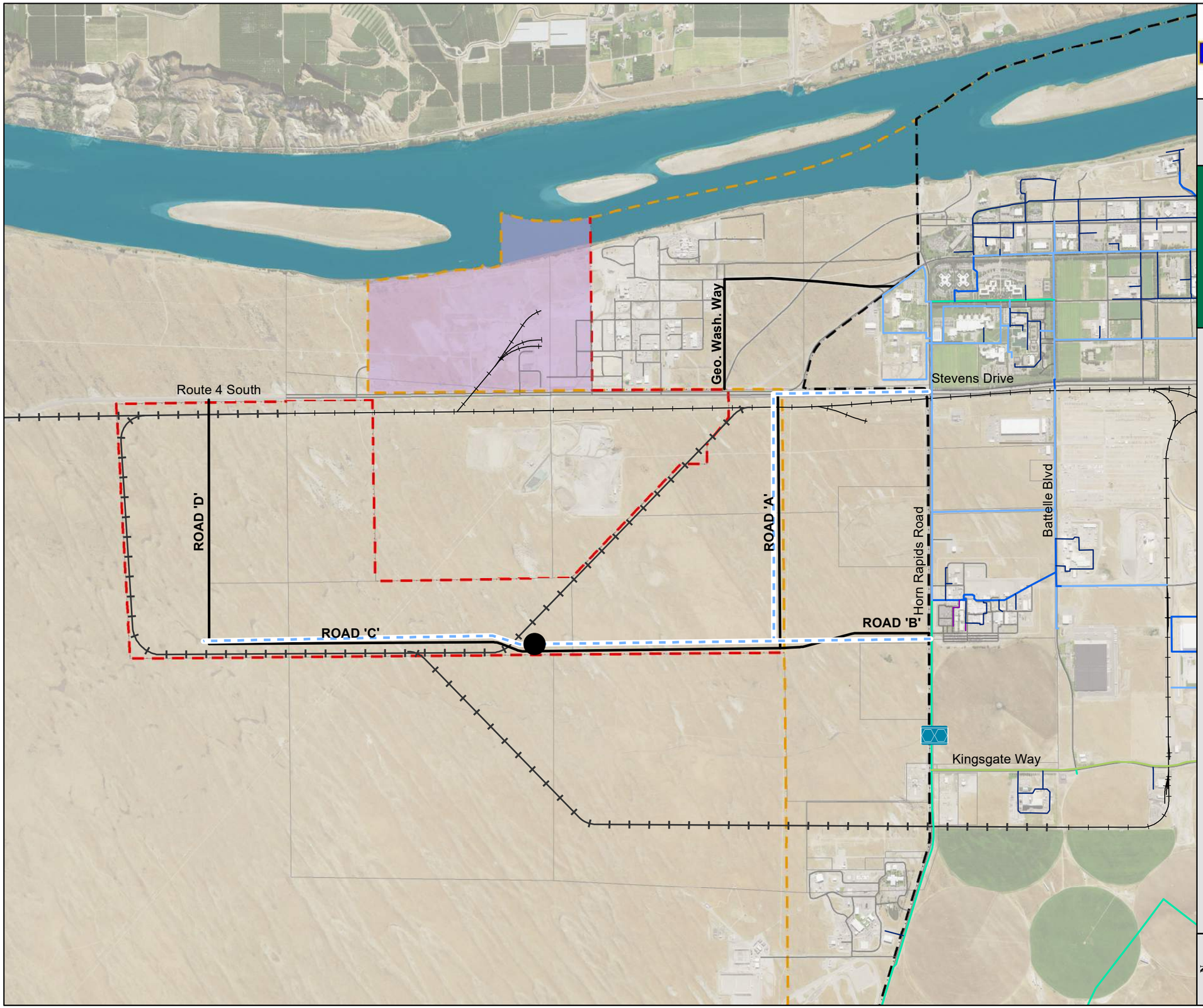
PORT OF BENTON

Richland Washington

North Horn Rapids Area
Master Plan

Figure 11

Future Domestic Water Facilities



Legend

- City Limits
- Existing UGA
- Proposed UGA
- Existing UGA To Be Removed
- Booster Pump
- 2 MG Resevoir (Proposed)

Existing Pipe Size (in)	MP Pipe Size (in)
6	6
8	8
10	10
12	12
14	14
16	16
18	18
20	20
24	24
27	27
30	30
36	36

0 2,000 4,000 Feet

N E S W

Date: May 2, 2017

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2016-2036 with NHRA

The 20-year planning period assumes full build-out of the NHRA. The total area is approximately 1,702 acres. Based upon the 1,250 gpad assumption the following is the estimated water demand for 20-year planning purposes:

- Maximum Daily Demand = 1,250 gpad x 1,702 acres = 2,127,500 gpd (2.13 MGD)

Facility Improvements

The following sections address the impacts to four major areas of the City of Richland's potable water system: system-wide water demands, source capacity, distribution system performance, and storage requirements. It should be noted that although 6-year planning and buildout infrastructure sizes are provided, any domestic water improvements to the NHRA that are constructed should be sized for the expected build-out demands for the study area, which are calculated to be the 20-year demands in this study.

System-Wide Water Demands

As previously identified, the total available water rights for the City allow for 54 MGD of maximum daily flow. Currently, the City uses 38 MGD maximum daily flow and plans to be using approximately 46 MGD in the year 2022 and 55 MGD in the year 2036. The six-year maximum daily demands for the NHRA are 0.48 MGD while buildout demands are 2.13 MGD. The addition of the 2.13 MGD peak flows at buildout for the NHRA will have little impact on the instantaneous water rights.

Encroachment toward the total available water right can be relieved through the use of the Quad-Cities water right. The Quad-Cities were issued a water right in 2003 that provides a maximum of 86 mgd to be developed and put into use by the Quad-Cities by 2051. The permit has specific requirements that limit water appropriations at various times per year and include mitigation of the consumptive portion of water use. Through the use of the Quad City water right, the City has adequate maximum day water rights for the Study Area.

Source Capacity

According to the WSP update, the City's two largest sources of water, the wellfield and the WTP, each pump directly into the Core 548 Zone and have a combined capacity of 51 MGD. Currently, the City uses 38 MGD maximum daily flow and plans to be using approximately 46 MGD in the year 2022 and 55 MGD in the year 2036. The six-year maximum daily demands for the NHRA are 0.48 MGD while buildout demands are 2.13 MGD. Therefore, there is adequate capacity for the 6-year projections but the addition of the NHRA may trigger the need for increased source capacity within the next 20 years.

Distribution System

A hydraulic analysis was performed in order to determine impacts on the existing distribution system as well as proposed sizing for distribution system expansion to serve the NHRA. This hydraulic analysis is documented in a letter from RH2 Engineering, Inc. dated April 23, 2015. The results from the analysis are incorporated and summarized below.

2016-2022 with NHRA

The NHRA will be served by the City's Core 548 Pressure Zone. Water supply will be provided directly from the WTP and wellfield sources. The closest Core 548 Zone transmission main is located on Horn Rapids Road.

A connection to the 16-inch Core 548 Zone transmission main in Horn Rapids Road is proposed to be extended on the west side of the NHRA. To ensure the reliability of service, a redundant source of water

is needed. A second service location, on the east side of the NHRA, would connect to the 12-inch transmission main in Horn Rapids Road. These two service connections must be looped within the NHRA in order to provide the required fire flow capacity as well as a reliable source of water. Figure 11 depicts the alignment proposed for the water transmission main extensions.

The hydraulic analysis indicates that the pipe loop alone will not provide the required fire flow for the NHRPMPA. An elevated onsite storage tank will be required in order to provide the required fire flow – as discussed below.

2016-2036 with NHRA

The distribution system improvements identified for 6-year improvements are also adequate to meet buildout needs. This is because the required fire flow dictates a minimum pipe size of a 12-inch loop to serve the NHRA.

Storage Capacity

The WSP indicates that the City has a surplus of storage in the Core 548 Zone for both 6-year and 20-year planning horizons. However, the hydraulic analysis indicates that onsite storage is needed at the NHRA in order to provide the required fire flow. Several alternative storage tank locations have been identified; however, the option that provides the most reliable service to the NHRA is an elevated tank located within the NHRA. The elevated tank could be located anywhere in the NHRA.

Reservoir storage has three main components: Standby Storage, Equalizing Storage, and Fire Flow Storage. Standby Storage provides a supply of water during emergency conditions such as a transmission main failure. Equalizing Storage ensures that peak instantaneous demands can be met at any time. Fire Flow Storage ensures meeting fire flow planning level requirements under all conditions including power outages and/or the loss of the source supply. Typically, fire flow storage is the largest driver for tank sizing. The WSP used assumptions of 4,000 gpm for four hours for industrial land use and 4,500 gpm for five hours for heavy industrial land use. To be conservative, the required fire flow storage for the UGA Study Area is planned for the heavy industrial requirement of 4,500 gpm for 5 hours, which is 1,350,000 gallons. The Total Required Storage value is the sum of each of the three reservoir storage components. These storage value calculations are based on the planning assumptions discussed in the WSP and can be further adjusted with a more specific study.

2016-2022 with NHRA

For 6-year planning, the NHRA will require a storage volume of 1.5 MG; however, it should be sized for 2 MG in order to serve the buildout demands of the Study Area.

2016-2036 with NHRA

For 20-year buildout planning, the NHRA will require a storage volume of 1.7 MG. A 2.0 MG tank was used for cost estimating purposes.

Power

The City of Richland Energy Services has reviewed the NHRA and have determined it will require additional electrical infrastructure. Additional electrical services will be necessary along the frontage of the proposed roadway network within the NHRA. Electrical services are to be looped from Horn Rapids Road to Stevens Drive. Until more specific power requirements of NHRA have been further identified, it is not possible to accurately predict total power demand. The City of Richland Energy Services has anticipated that a substation will be required further to the north of the NHRA and that the necessary infrastructure will be required to be installed as part of the NHRA. Electrical is shown in Figure 12.

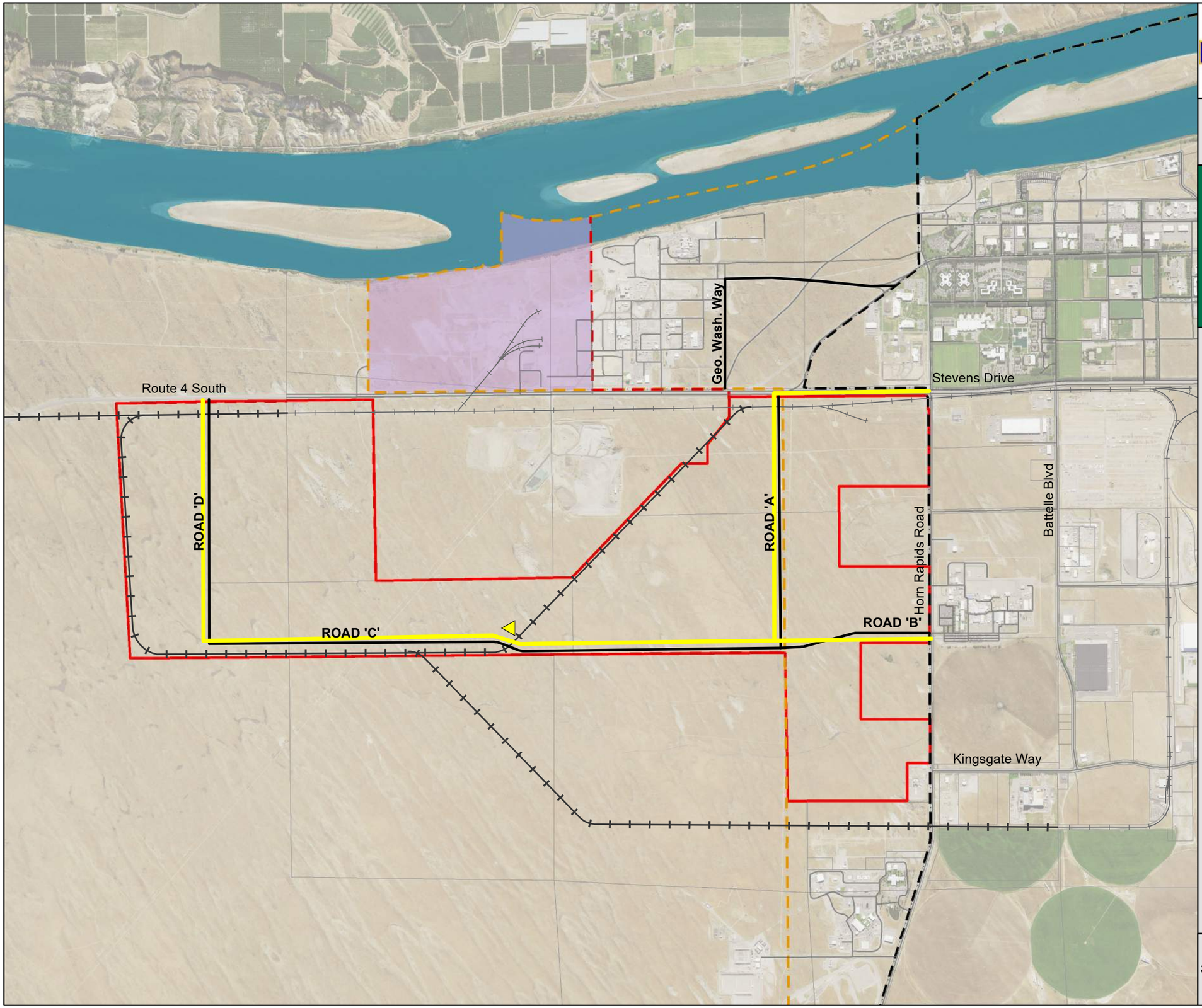
PORT OF BENTON

Richland Washington

North Horn Rapids Area
Master Plan

Figure 12

Future Primary Electrical Power



Legend

- City Limits
- Existing UGA
- Existing UGA To Be Removed (283 acres)
- Master Plan
- Proposed Roadway
- Proposed Railroad
- Proposed Sub Station
- Proposed Electrical

0 2,000 4,000 Feet

N E S W

Date: May 2, 2017

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Surface and Storm Water Management

The public roadway network within the NHRA shall have roadside ditches to convey and retain storm water runoff from the public roadway network. All storm water runoff shall be retained in the roadside ditches. Refer to the industrial roadway section shown in Figure 11 in the transportation chapter for the drainage ditch section. Storm water runoff from the public roadway network into roadside ditches are not considered a part of the storm water restriction as shown earlier in Figure 5; however, no underground infiltration facilities and/or large retention ponds will be allowed for the development of the public roadways. The roadway network shall avoid large drainage basins that would concentrate large amounts of storm water runoff.

The City of Richland has adapted the Storm Water Management Manual for Eastern Washington (SWMMEW) as the basis for storm water management. For hydrologic volume control, roadside ditches shall be designed based upon the following criteria: Washington, Region 2, Benton County; SCS Type 1A – 24 Hour storm for storm volume with a 25-year return period. The flow-rate of the public storm drainage system shall be designed using the 2-Year, 3-Hour short duration Eastern Washington storm for pipe and inlet sizing using SCS or Santa Barbara method. Refer to Section 3 – Design Guidelines item C-Storm Drainage Collection Systems of the City of Richland Public Infrastructure Construction Plan Requirements and Design Guidelines for additional storm water design information.

The NHRA has no defined upstream and/or downstream drainage channels. Therefore, no upstream and/or downstream storm water improvements are anticipated

Any storm water costs associated with the development of the public right of way facilities are included in the costs of those facilities in the streets and road section.

All development considered as private and/or non-public is not a part of the NHRAMP Study Area. All private and/or non-public storm water facilities shall be retained on-site and the private developer shall encumber all associated costs. Storm water restrictions will be applicable to all private and/or non-public developments. It is anticipated that private and/or non-public storm water facilities will be collected and conveyed on-site to lined evaporation ponds for those developments within the storm water restriction area. Maintenance and operation of the private storm water facilities will be provided by Owner/Developer.

Other Governmental Services

Natural Gas

Additional natural gas services are anticipated to be available by Cascade Natural Gas Company by the middle/ to end of 2017. At this time, it is difficult to identify the capacity needs for future development, therefore no estimated costs to extend natural gas to the NHRA are included in this plan. Costs to extend natural gas service would be incurred by CNGC and/or private development. The DOE has a plan to establish a Cascade Natural Gas line to service the central Hanford Site. This may be able to be used to support the NHRA as well.

Telecommunications

Frontier Communications can provide standard phone service to the NHRA. There are existing communication services along Horn Rapids Road (east/west) and along Stevens Drive (north/south). Communications services will need to be extended to the NHRA. Communication services will parallel the City of Richland Energy Services facilities along the proposed public roadway network frontage in the NHRA. Estimated costs to extend communication services in the NHRA are included in the streets and roads section.

U.S. Cellular, AT&T, Sprint, Verizon and Nextel currently provide cellular phone service within the Tri-Cities area. Due to the close proximity to urban areas, it is anticipated that all of these services will have acceptable reception.

Irrigation

All irrigation within the NHRA will need to be provided through the City of Richland Domestic Water System. It is noted that non-potable water is available with an existing irrigation pipeline at the corner of Stevens and Horn Rapids Road. It's not anticipated that the targeted developments will need this service; however, if a significant non-potable demands are requested by development irrigation service would be provided by this non-potable water system and most likely not from the domestic potable water system. No estimated costs to provide irrigation service to the NHRA from the existing non-potable water service are included in this plan since it is anticipated that minimal non-potable water service demand will be requested and would ultimately be provided by the domestic potable water system.

INFRASTRUCTURE COSTS AND FUNDING SOURCES

Infrastructure concepts were developed to help identify capital improvements that are needed to support the development of the NHRA. An engineer's option of probable cost based upon these infrastructure concepts have been prepared. These preliminary costs have been developed to assist future development decisions; however, final design may vary from the infrastructure concepts and ultimately may affect actual costs. These cost estimates are included in Appendix B.

Table 2. Engineer's Opinion of Probable Costs

Infrastructure Improvements	Estimated Cost
Road "A" (5,300 LF)	$3,147,329
Road "B" (3,200 LF)	$1,820,000
Road "C" (12,100 LF)	$6,776,000
Road "D" (5,000 LF)	$2,823,000
Kingsgate/HRR	$164,000
Domestic Water	$21,725,000
Sanitary Sewer	$4,256,000
Total	$40,711,329

Fire protection, law enforcement, parks and recreation and solid waste collection are funded as part of the City's adopted capital facilities budget. These services are not included in the infrastructure costs noted above. It is anticipated that generated tax dollars, once the sites have developed, will be utilized to help expand and support these services within the NHRA.

Revenue Sources

The following discusses the various revenue sources available to the City of Richland. Not all of these sources are currently being used by the City to fund capital improvements. Those that are being currently used are identified.

It is intended that a variety of funding sources will be used in order to implement the master plan. A range of ways to fund the basic infrastructure, with site specific infrastructure connections being the responsibility of the developer of the individual sites, could be available to the City, for example:

- Public/Private Development Agreements: New development agreements between the City and a developer specifying financing needs and responsibilities for infrastructure needs that serve a wider area than the developer is contemplating.

  Local Revitalization Financing (LRF). This is a method of distributing property tax collections within designated areas to finance infrastructure improvements within these designated areas. Under the LRF method, infrastructure is financed by the incremental increase in tax revenue that is made possible by infrastructure improvement within the designated area. The City of Richland currently utilizes this financing option for the Richland Revitalization Area for Industry, Science and Education (RAISE) area and anticipates that this will be a viable option for funding the infrastructure for this area in the future as well.

- Grant Opportunities: While no specific grant opportunities have been identified that would be a good match for needed improvements, over the build out period of development, grant opportunities will likely emerge.

- Local Improvement District (LID): The City can work with purchasers/developers to establish a local improvement district which includes an agreed upon repayment schedule based on agreed upon equitable criteria; the City sells bonds to cover the costs of infrastructure to be built within the district, and the owners/developers pay off the bonds through regular payments usually over a 10 to 20-year period.

- Tiger Grant/Fastlane Funding Program: The Transportation Investment Generating Economic Recovery, or TIGER Discretionary Grant program, provides a unique opportunity for the U.S. Department of Transportation to invest in road, rail, transit and port projects that promise to achieve critical national objectives. TIGER can provide capital funding directly to any public entity, including municipalities, counties, port authorities, tribal governments, MPOs, or others in contrast to traditional Federal programs which provide funding to very specific groups of applicants (mostly State DOTs and transit agencies). This flexibility allows TIGER and traditional state and local partners to work directly with a host of entities that own, operate and maintain much of our transportation infrastructure.

  The FASTLANE is another funding mechanism geared for transportation projects. FASTLANE program provides dedicated, discretionary funding for projects that address critical freight issues that affect highways and bridges.

- Other Projected Capital Facilities Revenue Sources: Revenues to fund capital improvements of sewers and water facilities will come from consumer utility rates, developer contributions and state and federal loans and grants. In addition, because the City of Richland and Port of Benton own the property, the revenue from the land sale can also be considered to pay for capital facility costs.

APPENDICES

Appendix A –

Port of Benton Rail Line Market Analysis

Port of Benton Rail Line Market Analysis FINAL REPORT

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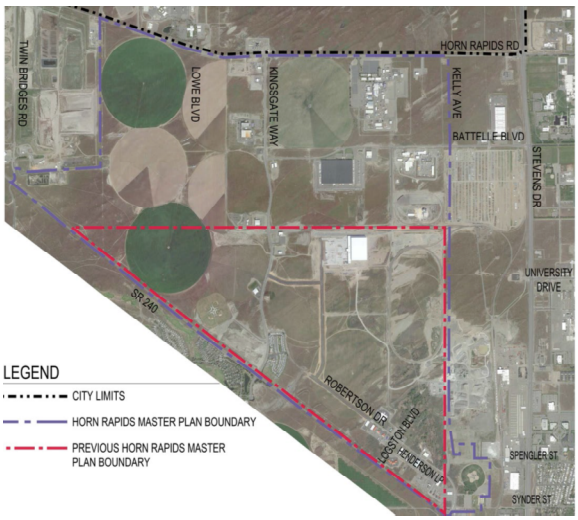
January 27, 2017



BST Associates
Market Research & Strategic Planning

Port of Benton Rail Line
Market Analysis
Final Report

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Market Analysis
Final Report

Executive Summary

The Port of Benton owns the rail line that serves the Horn Rapids Industrial Park within Richland, Washington. With the recent acquisition of 1,641 acres of additional industrial land from the Department of Energy (DOE), this area is poised to grow to nearly 2,500 acres of available industrial property in the UGA. BST Associates was retained by the Port of Benton to analyze the potential to develop additional rail cargo along this line. The analysis focuses on two primary rail markets – domestic transportation and international trade. In addition, BST Associates was tasked with determining the economic value to the Richland area from further development of industrial sites that rely on rail.

Transportation Modes

Most of the domestic and international freight moved to or from the Tri-Cities area moves by truck. However, shippers in the Tri-Cities have indicated an interest in increasing rail freight.

The trucking industry is facing several challenges that will likely tighten the supply of drivers, and increase costs for local exporters. These challenges include new hours of service rules and mandated electronic logs. These will make it harder for a driver to complete a round trip to and from Seattle/Tacoma in a single work day. An overarching long-term concern is the growing shortage of drivers. The American Trucking Association (ATA) estimated a national shortage of 48,000 drivers in 2015, with projections that the shortage could increase to 175,000 by 2025. This shortage of drivers is exacerbated during harvest season, when the demand for trucking peaks.

The number of import containers shipped by rail from Washington state has fallen in recent years due to several factors, including loss of import cargo to British Columbia, and an increase in transloading from import containers to domestic containers. Terminating intermodal volumes also declined, due partially to the impact of the recession. Terminating traffic was also negatively impacted by shipping lines choosing to re-route empty containers through other port regions, such as Southern California and British Columbia. The Burlington Northern Santa Fe Railway (BNSF) currently handles approximately two-thirds of Washington intermodal traffic and the Union Pacific Railroad (UP) handles one-third.

In the Tri-Cities, originating carload traffic has declined in recent years while terminating traffic has increased. The decline in originating traffic was due largely to a drop in forest products traffic, but was exacerbated by falling wheat volumes. Terminating traffic is mainly related to agricultural production and processing, led by animal feed and fertilizer. The new Central Washington Corn Processors within the City of Richland at the Horn Rapids Industrial Park is likely to increase rail receipts. Other commodity groups have seen stable volumes of rail receipts in the area, including cement, chemicals, paper, plastic and petroleum products.

There appear to be good opportunities to shift cargo from truck to rail, for intermodal rail service as well as for bulk cargoes.

Market Opportunities

The Horn Rapids Industrial Park already generates a substantial volume of domestic rail cargo, and is positioned to generate more. Existing rail cargoes include outbound shipments of

frozen potatoes (for domestic and overseas markets) and inbound receipts of feed grain, among other shipments and receipts. The Horn Rapids area is designated for industrial development, and offers the largest parcels currently available in the Tri-Cities. According to the Tri-City Development Council, approximately 30% of firms looking to locate in the Tri-Cities want rail access. The Port of Benton rail line offers direct service by two Class I railroads, as well as local service from the Port's shortline rail operator. With this rail access shippers can reach customers throughout North America. Manufacturers, food processors, and other land-intensive users can find the land and the rail service they need at Horn Rapids. Rail-related development is expected to generate land sales and/or leases of 74 to 354 acres at the Horn Rapids Industrial Park over the next 20 years.

For international trade, there is currently a substantial volume of containerized cargo moving between the Tri-Cities area and ports on Puget Sound. Most of this cargo consists of agricultural products grown and processed in the area, such as hay, frozen potatoes, and other products. Nearly all of these containers are now trucked through the Tri-Cities area to Puget Sound for export, while empty containers are trucked back to the Tri-Cities. Diverting the containers that are moving by truck represents a potential market for rail transportation.

Exporters face a number of existing and expected constraints that will negatively impact trucking. These include: road congestion in the Puget Sound region, driver shortages, limits on hours of service, and electronic logbooks, among other constraints. Given these constraints, it may be possible for a container shuttle service to operate between the Tri-Cities and the Puget Sound Ports.

In order to be successful, this container service will require adequate volume, consistent service, competitive pricing, and a long-term commitment from one or more railroads. The Stampede Pass rail line cannot currently accommodate double-stack container trains, so this traffic would need to be routed through the Columbia River Gorge or via Stevens Pass, which means containers on rail would move approximately twice as far as they now do by truck. We recommend several steps to further understand the potential for intermodal rail service:

- Begin discussions with the BNSF and UP to gauge their level of interest,
- Work with the Northwest Seaport Alliance to clarify potential cargo volumes,
- Work with potential users (shippers) to determine service requirements, and
- Develop a service cost analysis that compares road vs. rail container drayage.

Economic Contribution from Rail Industrial Development

The value of the Port of Benton railroad can be measured in a number of ways. At its most basic, it could be measured as the value of the land and the track structures. A recent appraisal concluded that the total value of the railroad is $25,600,000, including $10,890,000 for the land and $14,725,000 for the track structure

However, this method doesn't take into account the value that the railroad provides to shippers, as measured in transportation cost savings. It also doesn't include benefits that accrue to other stakeholders, such as the taxes generated, the jobs supported, or the environmental benefits of shifting cargo from truck to rail. BST Associates estimated the value that rail service on the Port of Benton rail line provides, as summarized in Table ES-1. Despite the fact that these results are based on conservative assumptions, it is clear that the value the railroad provides to the community is much greater than the appraised value of the property and tracks.

Based on average values, the different types of benefits include:

- Property sales to rail-oriented shippers - $6.77 million (low) to $11.94 million (high),

- Value of improvements (buildings, etc.) - $45.05 million (low) to $162.90 million,
- Sales tax on construction (no exemptions) - $3.87 million (low) to $14.01 million (high),
- Property taxes to:
  - City of Richland - $2.02 million (low) to $4.5 million (high),
  - Port of Benton - $0.31 million (low) to $0.69 million (high),
  - Other - $6.60 million (low) to $14.72 million (high), and
- Environmental benefits of $49.7 million (low) to $112.2 million (high).
- Summary total - $105.2 million (low, which is 4.1 times the appraised value of the railroad) to $304.6 million (high, which is 11.9 times the appraised value of the railroad).

Table ES-1 – Summary of Benefits from Rail-Related Development ($millions of 2016$)

Line	Category	Sum of Lines	7.0% Discount Rate	3.0% Discount Rate	Undisc.
	Rail-related Industrial Development				
1	Value of land sales		$6.77	$9.15	$11.94
2	Value of construction		$45.05	$92.85	$162.90
3	Total land and construction	Lines 1+2	$51.81	$101.99	$174.84
	Sales and Property Taxes				
	Sales tax on construction				
4	Assumes no exemption		$3.87	$7.99	$14.01
5	Assumes half is exempt		$1.94	$4.00	$7.01
6	Property tax – City of Richland		$2.02	$3.12	$4.50
7	Property tax – Port of Benton		$0.31	$0.48	$0.69
8	Property tax - Other		$6.60	$10.22	$14.72
9	Property tax – Total	Lines 6+7+8	$8.93	$13.82	$19.89
10	Total taxes w/o exemption	Lines 4+9	$12.80	$21.80	$33.89
11	Total taxes w/ exemption	Lines 5+9	$10.87	$17.81	$26.89
	Environmental Benefits				
12	Highway maintenance cost savings using rail vs truck		$3.80	$5.90	$8.50
13	Reduced severity of accidents due to VMT reduction		$3.30	$5.10	$7.40
14	Savings in operational cost of switching to rail		$33.90	$52.80	$76.50
15	GHG reduced (CO2 only)		$1.50	$2.40	$3.50
16	Total Environment Benefits	Lines 12-15	$42.50	$66.10	$95.90
	Grand Total				
17	w/o exemption	Lines 3+10+16	$107.11	$189.90	$304.63
18	with exemption	Lines 3+11+16	$105.18	$185.91	$297.63

Source: BST Associates

BST Associates estimated that rail-related development is expected to generate between 370 and 1,771 jobs, with annual payroll ranging from $14.3 million to $100.4 million. Based on wage data from the U.S. Bureau of Labor Statistics and the Washington Employment Security Department, the average annual wage for these jobs may range between $38,800 and $56,700. In comparison, the average annual wage in the region (for non-government jobs not directly related to Hanford or the PNNL) is $36,220.

Port of Benton Rail Line Economic Analysis

Final Report

Introduction

Purpose

The Port of Benton owns the rail line that serves the Horn Rapids Industrial Park in Richland, Washington. With the recent acquisition of 1,641 acres of additional industrial land from the United States Department of Energy (DOE), this area is poised to grow to nearly 2,500 acres of available industrial property in the UGA. BST Associates was retained by the Port of Benton to analyze the value that the rail line may provide in helping to support industrial development.

BST Associates analyzed two primary rail markets – domestic transportation and international trade. The Port rail line already handles a substantial volume of domestic cargo, and is positioned to attract more.

The line does not currently handle international cargo, but the Tri-Cities region does produce a high volume of containerized cargo. Of special interest to the Port of Benton and others is the potential to create a load center for shipping containerized cargo by rail between north Richland and the ports of Seattle and Tacoma.

BST Associates estimated the value of the railroad in a number of ways, including: taxes generated by industrial users (including property tax and sales tax), jobs and wages associated with the development, and environmental benefits from diverting cargo from truck to rail.

Description of Key Transportation and Industrial Assets

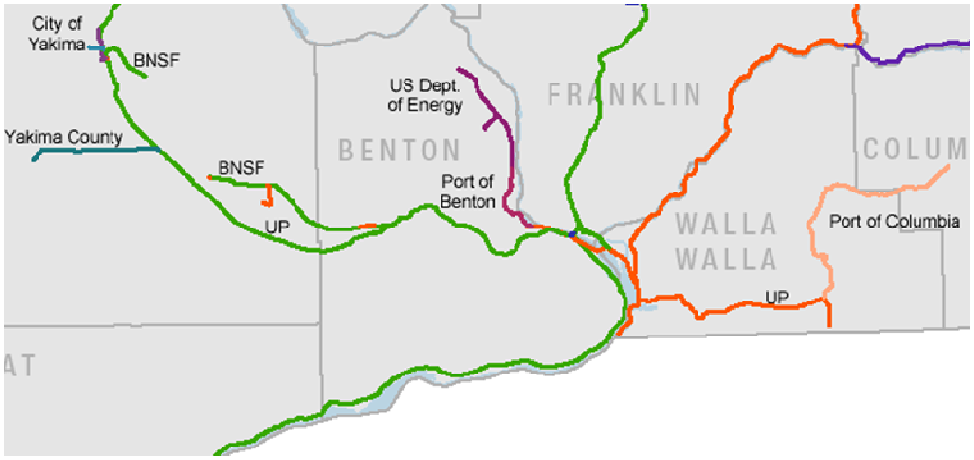
Rail service in the Tri-Cities area is provided by two Class I carriers and several shortline railroads.

One of the Class I carriers is the Burlington Northern Santa Fe Railway (BNSF), which has three major corridors that traverse the region. These lines all converge at the Pasco Yard, a major classification and sort yard. The Portland-Pasco Main Line runs along the Washington side of the Columba River from Vancouver to the Tri-Cities. This is the main corridor for BNSF unit trains of bulk cargoes, such as grain, oil, and coal. It also handles manifest trains, some intermodal trains, and one passenger train.

The Auburn-Pasco Main Line runs from Auburn over Stampede Pass to Ellensburg, and then follows the Yakima Valley to Pasco. Tunnels on the line do not have the clearance for double-stack container trains. Because of the tunnel clearance issue, double-stack trains must travel through the Columbia River Gorge and then up the I-5 corridor, a rail trip that is roughly twice as long as the truck route from Richland to Seattle/Tacoma. The line is mainly used for moving empty bulk unit trains eastward.

The Pasco-Spokane Main Line connects the Columbia Gorge route to the BNSF Great Northern Corridor, the BNSF northern route to the Midwest. Freight traffic consists of intermodal, forest and agricultural products, coal, chemicals and finished automobiles.

Figure 1 – Tri-Cities Area Rail Network



Source: WSDOT

The other Class I railroad is the Union Pacific Railroad (UP). The UP has a major yard in Hermiston, Oregon, where several mainline segments converge. The Ayer Subdivision runs between Hermiston, Oregon and Spokane. East of Spokane this line runs north through Idaho to the Canadian border, where it interchanges traffic with Canadian railroads. Freight traffic is forest products, agricultural products, potash, petroleum, and chemicals.

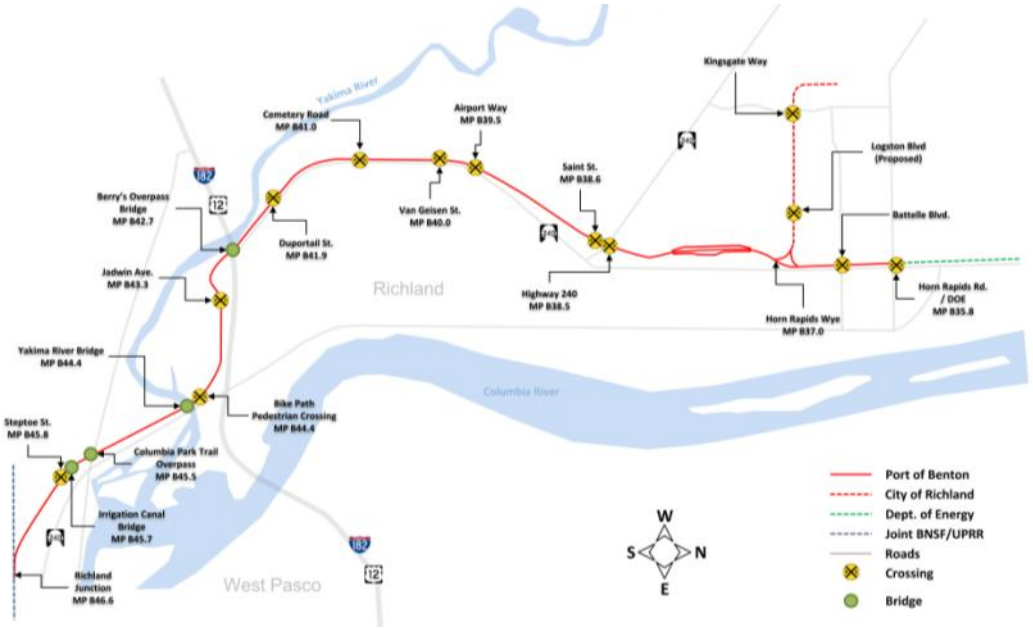
The UP Hermiston-Portland line follows the Oregon side of the Columbia River to Portland. This line carries intermodal traffic, grain, potash, petroleum, and other products. Traffic moving westward on the UP from the Tri-Cities must first move southeast to Hermiston, and then along the Hermiston-Portland line.

The UP has a 19-mile branch line that runs from Wallula to Kennewick. This line connects to the Port of Benton rail line at Richland Junction (in Kennewick).

The Port of Benton rail line runs between Richland Junction and Horn Rapids Road in north Richland, then continues north on the DOE track to the Hanford Nuclear Reservation. The line was originally built to serve the Hanford nuclear reservation and was owned by the DOE, which transferred the line to the Port of Benton in 1998. This line is leased to the Tri-City Railroad (TCRY), which operates and maintains it. Including the Richland Yard, the Port owns 16 miles of track from the end of the DOE rail line at Horn Rapids Road in Richland to the Richland Junction by Center Parkway in Kennewick (see Figure 1). This includes 10 miles of mainline and 6 miles of track in the Richland Yard.

The BNSF and UP are both able to interchange traffic with the TCRY at Richland Junction. In addition, as part of the federal land transfer from DOE, both the BNSF and UP have the option of directly providing service over the Port of Benton line. Few other sites in Eastern Washington offer shippers access to both Class I railroads.

Figure 2 – Port of Benton Rail Line



Horn Rapids Industrial Park

The Horn Rapids Industrial Park is approximately 2,466 acres of land that was originally part of the Hanford reservation. The City of Richland and Port of Benton now control the property, which has been envisioned as an employment center for the community. A portion of the property has been developed, and is home to a variety of industrial uses. Master planning is also underway for the additional 1,641 acres recently transferred from DOE.

Authorized uses for the new land, per the transfer agreement with DOE, include:

1. Warehousing and distribution (e.g., manufactured parts and materials distribution, food and agriculture; refrigerated warehousing and storage; material handling, packaging and crating; and logistics);
2. Research and development (e.g., scientific research; software; data security; computation; energy technology; environmental; and biotechnology);
3. Technology manufacturing (e.g., defense manufacturing; sensor manufacturing; medical device manufacturing; food processing; machinery manufacturing; advanced materials manufacturing; and carbon fiber manufacturing);
4. Food processing and agriculture (e.g., wine processing; food processing; agricultural products; and craft beer production);
5. Back office (e.g., call centers; administrative processing; data processing; information technology; remote sensing; professional services; and training); and
6. Energy (e.g., solar energy production; smart grid; and biofuels manufacturing).

Of these authorized uses, the most likely to use rail transportation are warehousing, distribution, food processing, and agriculture. Technology manufacturing and energy system manufacture/assembly may also represent a potential market for rail transportation.

Study Methodology

BST Associates completed the following steps in creating this analysis:

- Developed an assessment of transportation issues that impact shippers
- Analyzed how shippers select transportation modes
- Described important transportation trends in Washington State and in Benton-Franklin counties, with a focus on industries that utilize rail transportation
- Assessed the factors driving the economy of the Tri-Cities area
- Summarized expected employment growth by sector
- Estimated potential industrial development related to firms that ship by rail
- Discussed the potential to develop an inland port, which could be developed in concert with the Northwest Seaport Alliance

BST Associates also interviewed current customers of the Port of Benton, in addition to several other stakeholders and potential customers, including:

- Lamb-Weston
- Henningsen Cold Storage
- Perma-Fix Environmental Services
- Preferred Freezer Services
- DelHur Industries
- Central Washington Corn Processors
- Zen-Noh Hay
- City of Richland
- Tri-City Development Council
- Northwest Seaport Alliance

BST Associates also contacted the Tri-City Railroad, but was not able to schedule an interview.

All of the existing rail shippers that were interviewed plan to continue shipping via the Port's rail line. Several also expressed interest in additional rail services, such as a container shuttle service between Richland and Seattle/Tacoma.

Transportation Factors and Trends

This section provides a description of factors impacting shipper's selection of transport mode as well as a detailed assessment of transportation trends and opportunities for rail-related industrial development in Richland.

Transport Mode Decisions

In general, rail transportation provides lower-cost transportation for long-distance shipments and for bulk goods. Bulk unit trains of commodities such as coal or grain represent the lower-price end of rail service. Carload service (boxcars, gondolas, tank cars, etc.) falls between the slow bulk unit trains and the faster intermodal services in terms of price and service levels. Premium rail and intermodal service targets international containers and domestic containers and trailers, competes directly with trucking. In most recent years, intermodal service has been the fastest-growing segment of rail service.[1]

Shippers select the appropriate mode of transportation based upon several criteria:

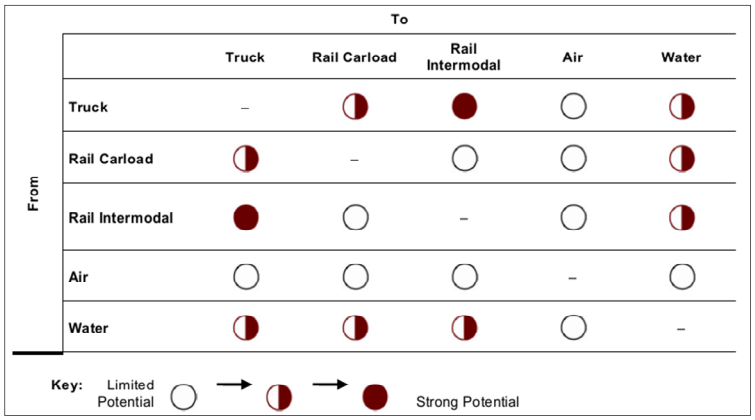
- Modal Characteristics: factors include capacity, trip time, reliability, equipment availability and customer service and handling quality
- Commodity Characteristics: factors include shipment size, package characteristics, shipment shelf life, shipment value and shipment density
- Shipper and Receiver Characteristics: main factor is access to modes
- Logistics Costs: factors include: order and handling costs, transportation charges, capital carrying cost in transit, intangible service costs, inventory costs, loss and damage costs and service reliability costs
- Additional Factors include: length of haul, shipment frequency and environmental sustainability

Most of the products shipped from or received at the Richland area are currently transported by truck. There are good opportunities to shift cargo from trucking to rail service, particularly for intermodal rail service but also for a shift from bulk cargoes from trucking and water service to rail service.[2]

[1] Source: Freight Transportation Modal Shares: Scenarios for a Low-Carbon Future, A Study Sponsored by U.S. Department of Energy Office of Energy Efficiency and Renewable Energy, March 2013, Prepared by Cambridge Systematics

[2] Ibid

Figure 3 – Freight Modal Shift Potential

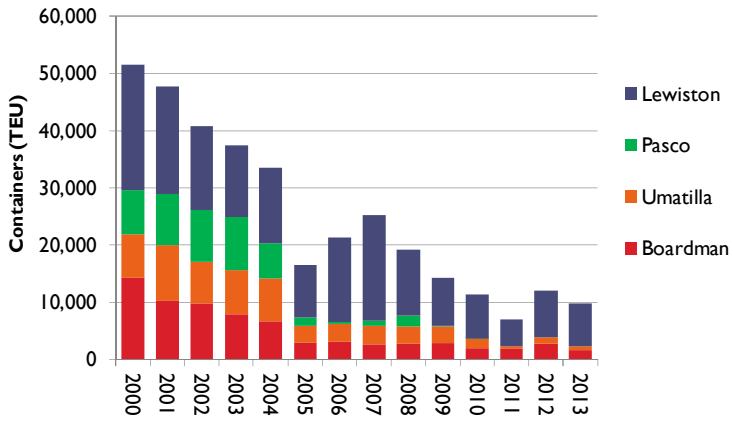


Issues Affecting Barge Service

For many years, containers were shipped by barge from the Port of Pasco to the Port of Portland for export. At its peak in 2002, this service moved 8,600 TEU. However, service issues in Portland (among other factors) led to a sharp drop in volumes. Volumes dropped to approximately 6,100 TEU in both 2003 and 2004, less than 1,000 TEU in 2006 and 2007, and in 2009 just 80 TEU moved through the Port of Pasco.

Pasco was not alone in losing barge container volumes. As shown in Figure 4, total barge volume on the Columbia/Snake River system dropped from 51,500 TEU in 2000 to 7,000 TEU in 2011. Volumes recovered slightly in 2012 and 2013, but when Portland lost its two largest container carriers in 2015, container barge service essentially ended. The Port of Lewiston and Port of Boardman have been working to revive the barge service, but without container shipping via Portland the long-term future of container barging is uncertain.

Figure 4 – Columbia/Snake River Barge Container Volume



Source: Port of Portland

Tri-Cities area shippers of containerized cargo now have the option of trucking to and from Seattle and Tacoma, or trucking to the Northwest Container Service facility at Boardman, Oregon, for loading onto trains bound for Seattle and Tacoma.

The regional agricultural industry provided the customer base for container barge service. Between 1997 and 2010, hay shippers were the largest volume shippers, with average volumes of 10,500 TEUs per year (approximately 5,250 containers), followed by potato products and paper

products at 15% apiece. Other barge shippers included producers of pulses, animal feed, wood pulp, onions, waste paper and wheat. (See Table 1).

Table 1 – Average Barge Container Volumes by Commodity (1997-2010) at upriver ports

Commodity	Peak TEU	Percent
Hay	10,500	38%
Potatoes, Frozen	4,100	15%
Paper	4,100	15%
Pulses	2,900	10%
Animal Feed	1,600	6%
Other	1,500	5%
Wood Pulp	1,200	4%
Onions	600	2%
Waste Paper	500	2%
Wheat	500	2%

Source: Port of Portland

Issues Affecting Trucking

The trucking industry is facing several changes that will likely tighten the supply of drivers and increase costs over time. These changes will impact both intermodal drayage and long-haul operators. For shippers in the Tri-Cities these changes will make it even harder than it is now for a driver to complete a round trip to and from Seattle/Tacoma in a single work day.

The biggest concern for the trucking industry is the federal electronic logging mandate (ELD) which will require truckers to utilize electronic logs (as opposed to paper logs) to document driver hours. The law, which is scheduled to take effect at the end of 2017, could reduce driver productivity. Werner, a major carrier with more than 7,000 trucks, measured productivity losses at 3% to 5% after initiating ELD. Smaller operators may be impacted even more, with some estimating as much as a 15% drop in productivity.

Hours of service regulations are the second major industry concern. These regulations limit the number of hours a truck driver may spend behind the wheel per day and per week, which may reduce truck drivers' earnings and impact overall supply chain efficiency.

An overarching long-term concern is the growing shortage of drivers. The American Trucking Association (ATA) estimated a national shortage of 48,000 drivers in 2015, with projections that the shortage could increase to 175,000 by 2025.

Replacing older trucks used in container drayage is likely to increase trucking costs. The Port of Seattle, Port of Tacoma, and Port Metro Vancouver are continuing their collaborative efforts on the Northwest Ports Clean Air Strategy to reduce emissions from shipping and port operations in the Georgia Basin–Puget Sound airshed. As part of this effort, beginning in 2018 all trucks serving the port terminals will be required to meet or surpass U.S. EPA emission standards or equivalent for model year 2007.

Seasonality also impacts the availability of trucks. Because the harvest season overlaps for the most important local crops (i.e. hay, potatoes, grapes, etc.), trucks and drivers are in short supply during harvest season. This impacts the agriculture industry all along the supply chain, from growers trying to move their harvest from farm to warehouse, to processors trying to move the finished product to market.

Changes in the container shipping industry will also impact drayage trucking. The deployment of ultra large container ships is forcing ports (including the Northwest Seaport Alliance) to plan for larger, more efficient terminals. These terminals are expected to accommodate a substantial increase in rail traffic. As an example, planning for redevelopment of Terminal 5 in Seattle assumes that 60% of the cargo will be transferred to/from rail on-dock, with an additional 20% drayed to off-dock facilities and 20% trucked to or from local or regional locations.

The use of rail is required to obtain the efficiencies of scale required to support the higher cargo volumes expected at NWSA container terminals. It is also driven by congestion and efforts to reduce truck emissions in Puget Sound, which impacts both the trucking industry and port operations. The combination of these factors supports the concept of development of an inland port to service the NWSA container terminals.

Rail Traffic Trends

The following section describes the type of railroad traffic originating or terminating in Washington State. The purpose of this analysis is to describe the trends in rail traffic and to identify industries that may benefit from rail service at Horn Rapids.

Originating Carload Traffic

Rail carload traffic includes most types of rail cars (boxcars, gondolas, center beam and other cars) but does not include intermodal traffic (includes containers and trailers), as documented by annual reports the Class I railroads file with the State of Washington.

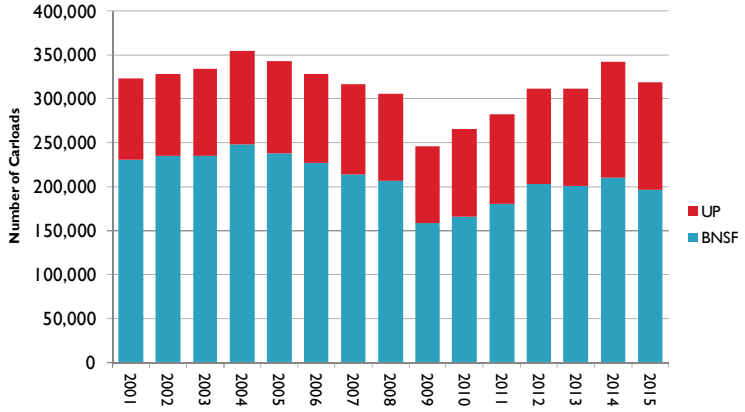
Carload traffic originating in Washington peaked in 2004 at more than 354,000 carloads, and then dropped each year until the height of the recession in 2009, when it bottomed out at 246,000 carloads (i.e. 30% below the peak). Following that low point originating carloads grew each year through 2014, reaching a peak of 342,000 carloads, but dropped to 319,000 carloads in 2015.

The BNSF is the larger of the two Class I railroad operating in Washington. The BNSF owns approximately 1,500 miles of track in Washington, compared to approximately 280 miles for the UP. In addition to owned track, both railroads have operating rights over some rail lines owned by other entities. BNSF operate on approximately 1,600 miles of track, and UP operates on approximately 560 miles of track.

Both railroads have operations in the Tri Cities. The UP owns a line running from Spokane to Wallula and into Oregon, with a branch that runs from Wallula to Kennewick. For the BNSF, a major yard is located at Pasco. Three BNSF mainline segments meet at or near this yard, including a line to Spokane, one to Portland and Vancouver via the Columbia River Gorge, and one to Seattle/Tacoma via Stampede Pass. Both of the railroads have the ability to serve the Horn Rapids area directly, or by interchanging traffic with the Tri-City Railroad. Tunnels on the Stampede Pass line do not currently have clearance for double-stack container trains, so this type of traffic moves via the Columbia River Gorge (on BNSF or UP) or Stevens pass (on BNSF).

On average, between 2001 and 2015, BNSF accounted for two-thirds of carloads originating on Class I railroads in Washington and UP accounted for one-third. However, during the period from 2001 to 2015, the BNSF share of the carload market fell by 10% from 72% in 2001 to 62% in 2015; UP market share grew from 28% in 2001 to 38% in 2015. (See Figure 5).

Figure 5 – Rail Traffic Carloads Originating in Washington



Source: Railroad annual state reports

Originating traffic was dominated by waste and scrap materials (includes municipal waste as well as scrap steel and like products). Lumber and wood products was the second largest commodity group, experiencing a significant drop from 55,000 carloads to 33,000 carloads between 2001 and 2015. Transportation equipment (includes imported autos moving through Pacific Northwest ports) was the third largest component of originating traffic and experienced annualized growth of 0.9% between 2001 and 2015. Originating carloads of food and kindred products was the fourth largest commodity group in 2015, experiencing a decline of more than 6,000 carloads between 2001 and 2015. The pulp, paper and allied products group experienced a decline of approximately 10,000 carloads. (See Table 2).

Table 2 – Rail Traffic Carloads Originating in Washington by Commodity

Originating Carloads	2001	2015	CAGR 2001-15
Waste and scrap materials	99,767	120,215	1.3%
Lumber & wood products	55,470	33,428	-3.6%
Transportation equipment	24,200	27,620	0.9%
Food and kindred products	24,667	18,250	-2.1%
Pulp, paper and allied products	27,468	17,391	-3.2%
Other	82,890	88,170	0.4%
Total carloads	314,462	305,074	-0.2%

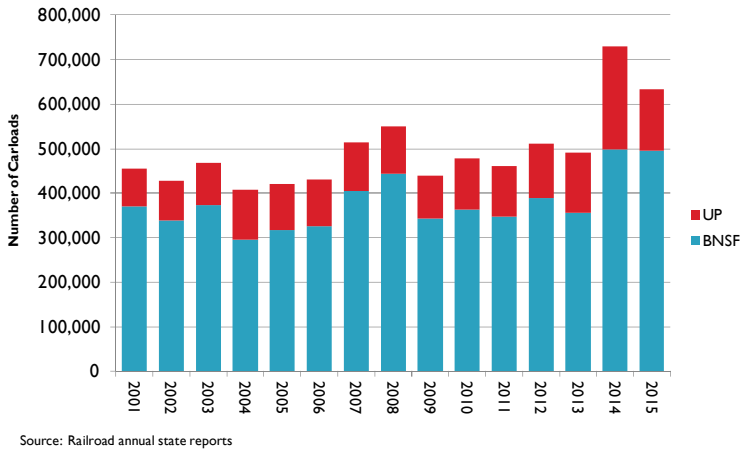
Source: Railroad annual state reports

Terminating Carload Traffic

From 2001 through 2010, terminating rail traffic volumes ranged from approximately 410,000 carloads to 470,000, except in 2007 and 2008. In those years terminating carload totals jumped to 515,000 and 551,000, respectively. Terminating traffic dropped sharply in 2009, at the height of the recession, and then recovered slowly. In 2014 and 2015, however, terminating traffic jumped dramatically, due primarily to crude oil traffic.

On average, between 2001 and 2015, BNSF accounted for three-quarters of carloads terminating on Class I railroads in Washington and UP accounted for one-quarter. However, BNSF's share of terminating carload traffic fell slightly from 81% in 2001 to 78% in 2015; UP gained market share from 19% in 2001 to 22% in 2015. (See Figure 6).

Figure 6 – Rail Traffic Carloads Terminating in Washington



Source: Railroad annual state reports

Farm products (dominated by wheat, corn and soybeans) is the largest component of terminating carload traffic, and is primarily bound for export. Crude petroleum moving by rail did not exist in 2001, but had the second-highest volume in 2015; most crude oil was destined for Washington State refineries. Food and kindred products (processed vegetables and fruits) was the third largest commodity group and grew at 2.2% per year, bound for both domestic and international markets. The fourth and fifth commodities were chemicals and allied products (includes bulk chemicals and fertilizers) and transportation equipment (autos and trucks et al). (See Table 3).

Table 3 – Rail Traffic Carloads Originating in Washington by Commodity

Originating Carloads	2001	2015	CAGR 2001-15
Farm products	157,488	275,844	4.1%
Crude petroleum	-	80,575	NM
Food and kindred products	39,564	53,313	2.2%
Chemicals and allied products	25,588	43,526	3.9%
Transportation equipment	25,693	35,012	2.2%
Other	204,383	143,891	-2.5%
Total carloads	452,716	632,161	2.4%

Source: Railroad annual state reports

Intermodal Traffic

Originating Intermodal Traffic

Originating intermodal traffic includes containerized cargo imported via Pacific Northwest ports and headed eastbound to destinations, as well as domestic cargo moving on rail in containers and trailers to domestic markets. Most of the intermodal units originating in Washington State are full containers.

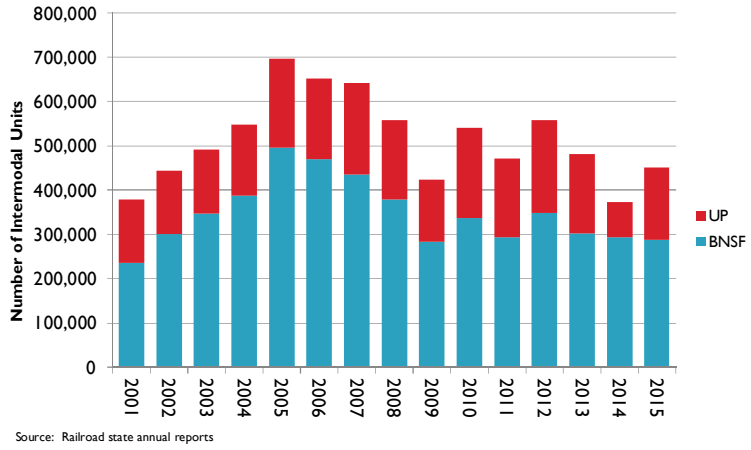
During the period from 2001 to 2015, two major shifts occurred; one related to international trade and one to container size. First, volumes of import containers surged dramatically through the NWSA ports, peaking in 2005 due to capacity constraints in Southern California that caused shippers and carriers to find alternative gateways. However, subsequent operational improvements in Southern California caused intermodal volumes to readjust away from NWSA ports.

At the same time, container ports in British Columbia began to take market share from Pacific Northwest ports, for imported containers bound for U.S. destinations in the Midwest and other U.S. regions. In 2005, B.C. ports had an 8% market share of imports in ocean containers moving through the Pacific Northwest (Washington, Oregon and British Columbia) bound for inland U.S. markets; by 2015, B.C. port market share had increased to 55%.

In addition, shippers began to utilize larger containers in North America (53-foot domestic containers) which have the capacity to accommodate the volume of 1.7 40-foot ocean containers. Because of this shift, a smaller number of intermodal containers are able to carry the same volume of cargo.

The effect of these two trends caused intermodal volumes to decline from the 2005 peak. BNSF and UP accounted for 69% and 31%, respectively, of the market share originating intermodal traffic. (See Figure 7).

Figure 7 – Rail Intermodal Units Originating in Washington



Source: Railroad state annual reports

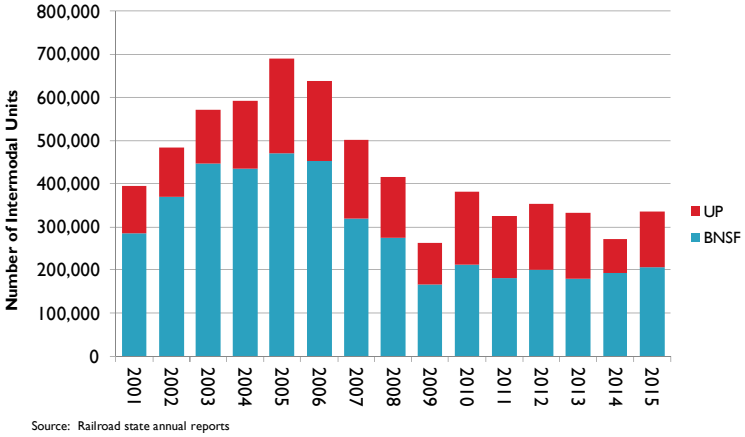
Terminating Intermodal Traffic

Terminating intermodal traffic volumes in Washington State also peaked in 2005 at 700,000 units, fell to their lowest point in 2009 during the recession and then climbed to around 300,000 units.

As with originating traffic, terminating volumes were also affected by a shipper preference for larger containers. Unlike originating traffic, however, the shift of terminating traffic market share to B.C. ports was much more limited. During the mid 2000s, the railroads changed their policies about the share of empty containers returning to Pacific Northwest ports. In 2005 and 2006, empty containers accounted for nearly 50% of the containers exported via NWSA ports. The share of empties declined to between 20% and 30% from 2007 to 2015.

On average, BNSF and UP accounted for 68% and 32% respectively of the market share terminating intermodal traffic. However, in the past few years, UP has gained market share (averaging 45% in the past five years). (See Figure 8).

Figure 8 – Rail Traffic Intermodal Units Terminating in Washington



Source: Railroad state annual reports

Industries That Use Rail

Approximately 12% of total freight tonnage originating in Washington is shipped by rail. This includes 9% moving by rail only and 3% moving by a combination of truck and rail. For the manufacturing sector the share moving by rail is higher; 14% of the tonnage from manufacturing moves by rail only, and an additional 3% moves by truck and rail. (See Table 4).

Rail is used most to move high tonnages over long distances. As shown in Table 4, across all freight types the average rail move is more than 1,400 miles, and for the manufacturing sector the average rail move is more than 1,600 miles. Combination truck/rail moves are even longer, averaging more than 2,200 miles for all sectors and 1,924 miles for manufacturing.

Table 4 – Freight Originating in Washington by Mode (2012)

Sector	Truck	Rail	Truck and rail	Water	Air (incl truck and air)	Other	All modes
Value ($ million)							
Total	150,146	8,840	7,119	4,548	56,529	69,719	296,901
Manufacturing	47,690	7,420	1,491	406	50,374	19,816	127,197
Wholesale	71,825	1,324	1,952	2,977	4,505	18,578	101,161
Other	30,631	96	3,676	1,165	1,650	31,325	68,543
Percent by mode							
Total	51%	3%	2%	2%	19%	23%	100%
Manufacturing	37%	6%	1%	0%	40%	16%	100%
Wholesale	71%	1%	2%	3%	4%	18%	100%
Other	45%	0%	5%	2%	2%	46%	100%
Tons (thousands)							
Total	127,349	16,706	6,253	10,087	96	22,647	183,138
Manufacturing	50,531	11,538	2,188	507	70	17,075	81,909
Wholesale	45,393	4,699	3,577	NM	21	12,839	66,529
Other	31,425	469	488	NM	5	2,313	34,700
Percent by mode							
Total	70%	9%	3%	6%	0%	12%	100%
Manufacturing	62%	14%	3%	1%	0%	21%	100%
Wholesale	68%	7%	5%	NM	0%	19%	100%
Other	91%	1%	1%	NM	0%	7%	100%
Ton-miles (millions)							
Total	23,939	9,891	4,934	5,037	129	2,841	46,771
Manufacturing	12,975	7,337	3,497	936	93	834	25,672
Wholesale	8,284	2,113	725	NM	30	4,489	15,641
Other	2,680	441	712	NM	6	1,619	5,458
Percent by mode							
Total	51%	21%	11%	11%	0%	6%	100%
Manufacturing	51%	29%	14%	4%	0%	3%	100%
Wholesale	53%	14%	5%	NM	0%	29%	100%
Other	49%	8%	13%	NM	0%	30%	100%
Average miles per shipment							
Total	437	1,444	2,253	1,464	1,550	NM	1,131
Manufacturing	371	1,644	1,924	1,863	1,546	NM	926
Wholesale	114	689	895	1,386	1,386	NM	376

Source: 2012 Commodity Flow Survey

Local Rail Cargo Trends

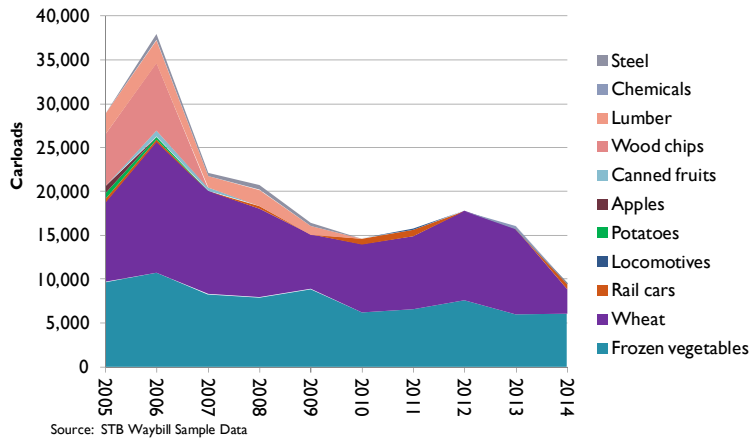
Waybill Sample Data from the Surface Transportation Board (STB) provides more detailed information on the area surrounding Richland. The Richland-Kennewick-Pasco Business Economic Area (BEA 169) includes eight counties in Washington: Adams, Benton, Chelan, Douglas, Franklin, Grant, Kittitas, and Okanogan.

Rail traffic originating in BEA 169 declined over the most recent decade for which data is available, dropping from a high of nearly 38,000 carloads in 2006 to less than 10,000 carloads in 2014. A large part of this decline was due to the loss of forest products; the combined volume of wood chips and lumber dropped from 10,300 carloads in 2006 to none from 2010 through 2014. (See Figure 9)

Originating carloads of frozen vegetables steadily declined, from approximately 10,700 carloads in 2006 to 6,000 carloads in 2014. Wheat carloads dropped from a high of 15,000

carloads in 2006 to 9,800 carloads in 2013. Wheat traffic dropped precipitously in 2014, but this may have been a result of a worker lockout at export grain terminals.

Figure 9 – Richland-Kennewick-Pasco Originating Rail Traffic

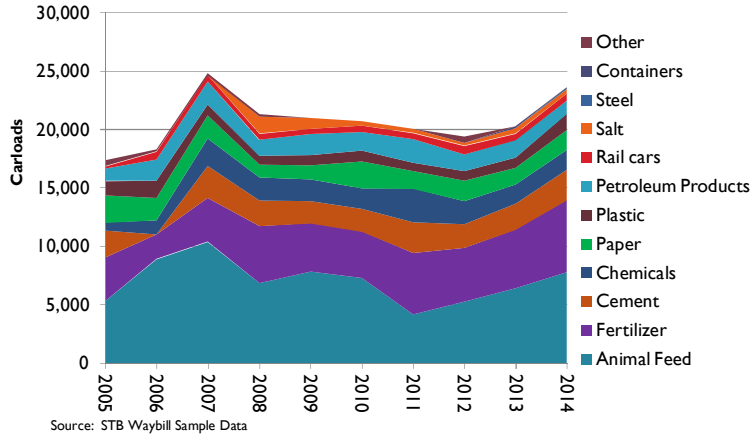


Rail traffic terminating in the Richland-Kennewick-Pasco BEA spiked immediately prior to the recession (in 2007), and then dropped in 2008. Between 2008 and 2012 terminating traffic declined slowly, but it grew quickly in both 2013 and 2014. Total terminating carloads in 2014 reached their highest level since the peak in 2007. (See Figure 10)

Most of the rail traffic terminating in the Richland-Kennewick-Pasco BEA is related to agricultural production and processing. Two commodity groups account for more than half of all terminating traffic: animal feed accounted for 7,800 terminating carloads in 2014, the highest volume of animal feed in five years. With the recent completion of the new rail loop and grain receiving terminal at Horn Rapids (owned by Central Washington Corn Processors, the volume of animal feed receipts is likely to grow. Fertilizer accounted 6,100 terminating carloads, or 26% of the total. Fertilizer traffic grew substantially between 2005 and 2014, increasing by 64%.

Terminating volumes of most other key commodity groups were relatively steady between 2008 and 2014. These other commodity groups included cement, chemicals, paper, plastic and petroleum products.

Figure 10 – Richland-Kennewick-Pasco Terminating Rail Traffic



Conclusions

There are good opportunities to shift cargo from trucking to rail service, particularly for intermodal rail service but also for a shift of bulk cargoes from trucking and water service to rail service. In recent years, intermodal service has been the fastest-growing segment of rail service.

For many years, exporters in the Tri-Cities area had the option of shipping containers by barge from Pasco to Portland, where they were loaded on ships for export. However, the loss of export container service at Portland forced barge lines to end the container barge service, and without container shipping via Portland the long-term future of container barging is uncertain. As a consequence, exporters in the Tri-Cities must now truck their containers to Seattle and Tacoma, or to the Northwest Container Service facility at Boardman, Oregon, for loading onto trains bound for Seattle and Tacoma.

The trucking industry is facing several challenges that will likely tighten the supply of drivers and increase costs for local exporters. These challenges include new hours of service rules and mandated electronic logs. Other of these will make it harder for a driver to complete round trip to and from Seattle/Tacoma in a single work day. A long-term concern is the growing shortage of drivers, which may grow from 48,000 drivers in 2015 to 175,000 by 2025. This shortage of drivers is exacerbated during harvest season, when the demand for trucking peaks.

The number of import containers shipped by rail from Washington has fallen in recent years due to several factors, including loss of import cargo to British Columbia, and an increase in transloading from import containers to domestic containers. Terminating intermodal volumes also declined, due partially to the impact of the recession. Terminating traffic was also impacted by shipping lines choosing to re-route empty containers through other port regions, such as Southern California and British Columbia. BNSF currently handles approximately two-thirds of Washington intermodal traffic and UP handles one-third.

In the Tri-Cities, originating carload traffic has declined in recent years while terminating traffic has increased. The decline in originating traffic was due largely to a drop in forest products traffic, but was exacerbated by falling wheat volumes, as well as a decline in carloads of frozen vegetables. Terminating traffic is mainly related to agricultural production and processing, led by animal feed and fertilizer. The new Central Washington Corn Processors within the City of Richland at the Horn Rapids Industrial Park is likely to increase rail receipts. Other commodity groups saw stable volume of rail receipts in the area, including cement, chemicals, paper, plastic and petroleum products.

Potential Rail Markets

Existing and future markets for the Port of Benton rail line can be divided into two main categories: domestic markets and port-related markets.

Domestic markets may include users who move raw materials or other inputs to the Richland area for use by local industry, as well as users whose locally-produced output is shipped to market by rail. One example of a current domestic user is Central Washington Corn Processors, which brings in train loads of feed grains to its facility at Horn Rapids, and then ships truckloads of grain to end users. Another example is Preferred Freezer Services, which ships refrigerated boxcars of frozen products from Horn Rapids to markets throughout North America.

Current port-related markets include local shippers whose products move to seaports for shipment overseas, including such products as hay and frozen potatoes. Potential future markets could include goods that are imported through seaports in the region, and that move to local distribution centers. The port-related cargo is primarily containerized cargo. The region currently produces a large volume of containerized cargo that is shipped through the ports of Seattle and Tacoma. Essentially all of this now moves via truck, but may represent a potential market for rail.

These opportunities are further explored in the following section.

Regional Economy

The economy of the Tri-Cities is based on a foundation of agriculture, the Hanford Nuclear Reservation, and the Pacific Northwest National Laboratory (PNNL); most other parts of the local economy rely on the strength of this foundation.

The basis of the local agriculture industry is crop production and animal production. Built on this base is an extensive network of food processors, transportation companies, and other related industry sectors.

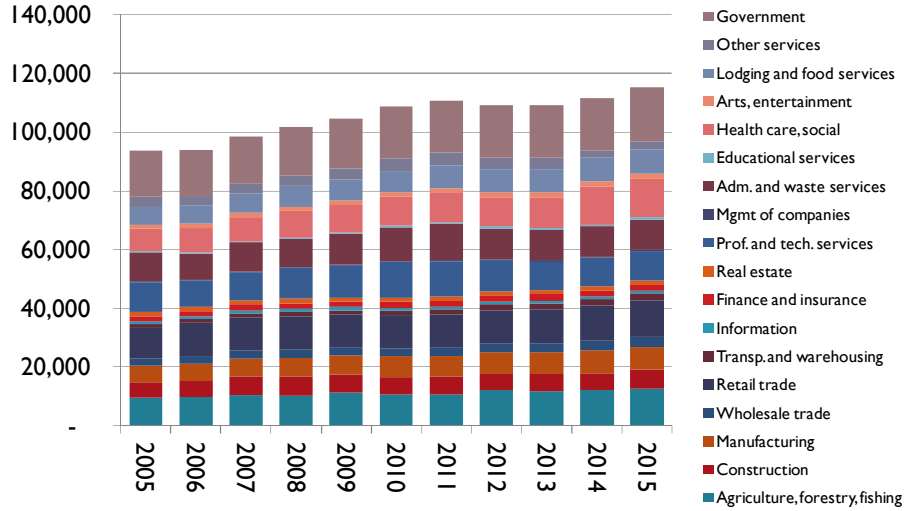
The Hanford Nuclear Reservation directly employs thousands on site, while contractors and suppliers working on or near the site employ thousands more. On-going federal investment has led to scientific diversification and nuclear and chemical cleanup, with skilled engineers and scientists following the jobs. The PNNL, located adjacent to the Hanford Reservation, is one of the main research facilities owned by the U.S. Department of Energy. It employs more than 4,400 workers, primarily scientists and engineers. Washington State University (WSU) also operates a branch campus nearby, and which offers advanced degrees. The Hanford complex has served as a research hub and business incubator that has spun off many new enterprises, including energy production and nuclear-fuel fabrication.

Other industry sectors depend, at least in part, on the health of agriculture, Hanford, and the PNNL. The construction, retail, health care, services, and other sectors all benefit from the jobs and income generated by these anchor industries. Recreational industries and tourist attractions are sectors that have been growing, along with the popularity of the regional wine industry.

As illustrated in Figure 11, the regional economy is diverse, but is anchored by the key sectors. The government sector accounts for the largest share of jobs (i.e. 16.1%) in the Tri-Cities, due mainly to employment at the Hanford Nuclear Reservation and PNNL. Agriculture, retail trade, and health services each account for approximately 11.0% of jobs. Administration and waste services accounts for 9.0%, as does professional services. Accommodations and food

service accounts for 7.3%), followed by manufacturing (6.8%), and construction (5.5%). Other sectors account for less than 3.0% each.

Figure 11 – Benton-Franklin Covered Employment



Source: Washington Employment Security Department QCEW data

Target Industries

The Benton-Franklin Council of Governments identified key industry sectors in the 2015 Comprehensive Economic Development Strategy (CEDS) Update. Six primary industry sectors were identified that offered the best opportunity for success in new business recruitment: Energy, logistics, food processing, machinery manufacturing, carbon fiber manufacturing, and training. The majority of these sectors could potentially locate in the Horn Rapids Industrial Park, and possibly use rail transportation.

Within each of these sectors the CEDS identified key clusters of industries in the Tri-Cities area. These included:

- Food processing – frozen fruit and vegetable manufacturing, frozen specialty food manufacturing dried and dehydrated food manufacturing, perishable prepared food manufacturing
- Machinery manufacturing - food processing equipment, winery equipment
- Logistics – related to agriculture, processed foods, wine and craft beer
- Energy – small modular nuclear reactors, smart grid
- Training – hazardous material handling, emergency response, and security

The Port of Benton rail line currently serves a number of customers in these clusters, most notably food processing (frozen food), and logistics (agriculture, processed foods). The rail line has the opportunity to support additional development of these clusters at the existing Horn Rapids Industrial Park and the expansion area.

Largest Employers

The Tri-City Development Council (TRIDEC) tracks the largest employers in the Tri-Cities area. According to the most recent list, there are 36,000 jobs at the top 30 largest employers. The list is dominated by firms related to operations on the Hanford Reservation and PNNL, and which together account for approximately 42% of jobs at the largest employers.

The industries that represent the strongest potential markets for the Horn Rapids area and the Port of Benton Railroad include food processing, manufacturing, and transportation. Combined, these three sectors account for 23% of the employment at the top 30 employers. (See Table 5)

Table 5 – Employment by Sector, Top 30 Employers

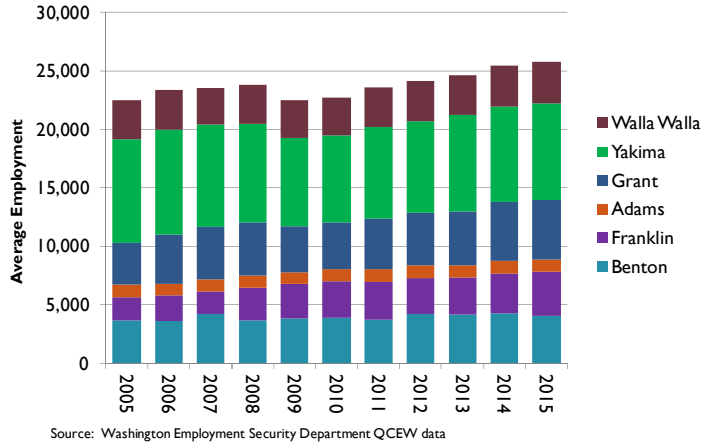
Sector	Jobs	Share of Total	Hanford
Food Processing	6,766	18.8%	
Education	6,531	18.1%	
Health Services	5,369	14.9%	
Research & Development	4,365	12.1%	Yes
Environmental Remediation Services	4,201	11.7%	Yes
Engineering & Construction	2,898	8.0%	Yes
Support Services, Hanford/DOE Site	1,928	5.4%	Yes
Manufacturing	1,172	3.3%	
Utilities	1,089	3.0%	Yes
Correctional Facility	800	2.2%	
U.S. Government	440	1.2%	Yes
Transportation	300	0.8%	
IT/R&D Services	150	0.4%	
Total	36,009	100.0%	14,921

Manufacturing Sector

According to data from the Washington Employment Security Department, between 2005 and 2015 the manufacturing sector added more than 3,000 jobs in Benton, Franklin, and neighboring counties. The region's manufacturing sector lost jobs during the height of the recession in (in 2008 and 2009), but by 2011 manufacturing employment had fully recovered, and it continued to grow through 2015. (See Figure 12)

For the region, growth in manufacturing employment averaged 1.3% per year between 2005 and 2015. The combined growth rate of Benton and Franklin Counties was much higher, averaging 3.2% per year, with no net loss of manufacturing jobs during the recession. Grant County also saw strong growth in manufacturing, despite several down years during the recession. Walla Walla County lost about 8% of manufacturing jobs during the recession but recovered by 2011, and has remained steady since. Yakima County has the largest manufacturing sector, but it was hit hard by the recession and has not fully recovered. Adams County changed very little between 2005 and 2015.

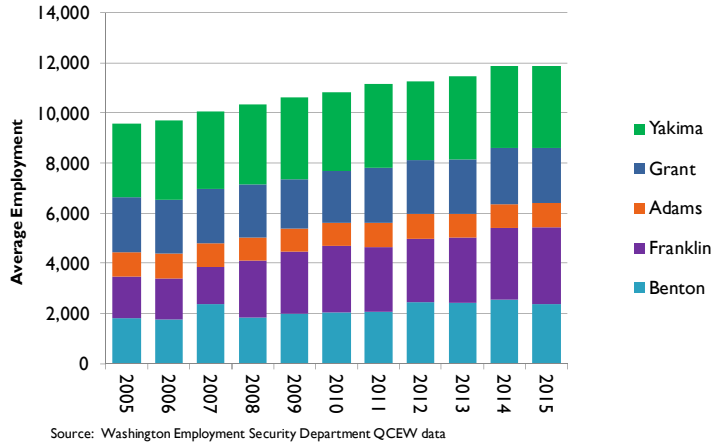
Figure 12 – Employment in All Manufacturing



Source: Washington Employment Security Department QCEW data

Food and beverage manufacturing is growing in the Benton-Franklin region, as well as in neighboring counties. The number of food and beverage manufacturing jobs in Benton County and Franklin County combined grew from less than 3,500 in 2005 to nearly 5,500 in 2015. Combined with neighboring counties, employment in food and beverage manufacturing grew from approximately 8,900 jobs in 2005 to 10,200 jobs in 2015. These figures exclude Walla Walla County, due to data anonymity rules. (See Figure 13)

Figure 13 – Employment in Food and Beverage Manufacturing



Source: Washington Employment Security Department QCEW data

BST Associates obtained data from Dun and Bradstreet for firms located in Benton County as well as those counties within approximately 50 miles of the Port of Benton Rail Line. This data included firms involved in manufacturing (i.e. SIC Codes 20 through 39); agriculture, forestry and fishing (SIC Codes 01 through 09); and selected transportation sectors (SIC Code 40 - railroad transportation, 42 - trucking & warehousing, 44 - water transportation, and 47 - transportation services).

The locations of these firms were plotted using GIS software, and then buffers of 25 miles and 50 miles were created around the Port rail line. The characteristics firms in these market regions are described below.

Within the 25-mile buffer, these firms had a reported total employment of 7,168. Of this total, 2,744 jobs (38% of the total) are in the food manufacturing sector. Firms in the 50-mile

buffer reported total employment of 16,193, of which 9,222 (or 57%) are in food manufacturing. (See Table 6)

Other manufacturing sectors do not employ as many workers as food manufacturing, but they produce more of the estimated sales volume. Within the 25-mile buffer, food manufacturing accounts for 25% of manufacturing sales, and within the 250-mile buffer it accounts for 40%. Average sales per employee are substantially higher at many of the other manufacturing sectors, when compared with food manufacturing.

Table 6 – Employment and Sales by Manufacturing Sectors, 25- and 50-Mile Buffers

		25 Mile Buffer		50 Mile Buffer	
SIC	**SIC Description**	**Emp.**	**Sales**	**Emp.**	**Sales**
20	Food & Kindred Products	3,744	$226,862,604	9,222	$963,836,596
34	Fabricated Metal Products	615	$326,353,922	1,009	$391,240,576
38	Instruments & Related Products	477	$97,602,114	491	$98,801,242
32	Stone, Clay, & Glass Products	412	$60,925,313	608	$76,560,240
35	Industrial Machinery & Equipment	388	$46,840,164	592	$68,941,798
27	Printing & Publishing	340	$18,083,308	642	$45,565,531
28	Chemical & Allied Products	265	$2,002,678	438	$11,231,527
36	Electronic & Other Electric Equipment	250	$24,703,515	273	$27,101,247
23	Apparel & Other Textile Products	192	$1,281,845	221	$3,538,058
39	Misc. Manuf. Industries	149	$14,853,607	363	$38,901,917
33	Primary Metal Industries	132	$58,597,635	270	$76,440,270
24	Lumber & Wood Products	98	$8,848,283	730	$68,778,516
26	Paper & Allied Products	47	$4,808,576	100	$11,104,481
37	Transportation Equipment	32	$3,775,055	766	$10,741,134
30	Rubber & Miscellaneous Plastics Products	12	$1,145,377	288	$8,283,382
22	Textile Mill Products	15	$1,060,661	107	$5,055,560
25	Furniture & Fixtures	3	$277,337	16	$856,337
29	Petroleum & Coal Products	3	$300,000	28	$4,900,019
31	Leather & Leather Products	3	$181,061	29	$3,287,772
	Total	7,168	$897,744,657	16,193	$1,915,166,203

Source: Dun & Bradstreet data, BST Associates

As shown in Table 7, recent forecasts by the Washington State Employment Security Department project growth of 18,200 non-farm jobs in Benton-Franklin counties between 2014 and 2024, with average annual growth of 1.6%. Industrial sectors are expected to account for approximately 19% of the non-farm jobs, with employment growing from 20,100 industrial jobs in 2014 to 23,000 industrial jobs in 2024, which equates to average growth of 1.4% per year and the addition of 2,900 jobs.

Growth is expected in all industrial sectors:

- Construction – 1,300 new jobs
- Manufacturing – 600 new jobs, centered in food processing (500 new jobs) and other durable manufacturing (100 jobs)
- Wholesale trade – 600 new jobs
- Transportation And Warehousing – 400 new jobs

Table 7 – Benton-Franklin County Employment Forecasts

	Employment			CAGR	New Jobs
Sector	2014	2019	2024	2014-24	2014-24
All Nonfarm Jobs	104,100	114,600	122,300	1.6%	18,200
Industrial Sectors					
Construction	6,300	7,300	7,600	1.9%	1,300
Manufacturing	7,800	8,200	8,400	0.7%	600
Durable Goods	1,400	1,500	1,500	0.7%	100
Wood Product Manufacturing	100	100	100	0.0%	-
Nonmetallic Mineral Product Manufacturing	200	200	200	0.0%	-
Primary Metal Manufacturing	200	200	200	0.0%	-
Fabricated Metal Product Manufacturing	200	200	200	0.0%	-
Machinery Manufacturing	100	100	100	0.0%	-
Computer And Electronic Product Manufacturing	200	200	200	0.0%	-
Other Transportation Equipment	100	100	100	0.0%	-
Other Durable Manufacturing	300	400	400	2.9%	100
Non Durable Goods	6,400	6,700	6,900	0.8%	500
Food Manufacturing	5,400	5,700	5,900	0.9%	500
Printing And Related Support Activities	100	100	100	0.0%	-
Other Non Durable	900	900	900	0.0%	-
Wholesale Trade	3,300	3,700	3,900	1.7%	600
Transportation, Warehousing And Utilities	2,700	3,000	3,100	1.4%	400
Utilities	200	200	200	0.0%	-
Transportation And Warehousing	2,500	2,800	2,900	1.5%	400
Sub-Total	20,100	22,200	23,000	1.4%	2,900
Percent of All Employment	19.3%	19.4%	18.8%		

Source: Employment Security Department/LMEA Industry employment projections, May 2016

Industrial Land Supply and Demand

The most recent analysis of industrial land in the Benton-Franklin region was commissioned by the City of Kennewick. This analysis examined the supply of industrial zoned land in the region and projected the demand for this type of land[3]; the report concluded that the Benton-Franklin area will need between 1,100 and 2,400 acres of land to meet employment forecasts. It also noted that there are few parcels bigger than 200 acres. The Horn Rapids Industrial Park and adjacent expansion area has the land supply, and the large parcels, to meet much of the future demand for industrial land.

The supply analysis developed by ECONorthwest shows that the region currently has a total of nearly 24,800 acres of industrial zoned land. Of this total, more than 8,500 acres is vacant. (See Table 8 and Figure 14).

[3] *City of Kennewick Industrial Zoned Land Assessment*, ECONorthwest, September 30, 2016

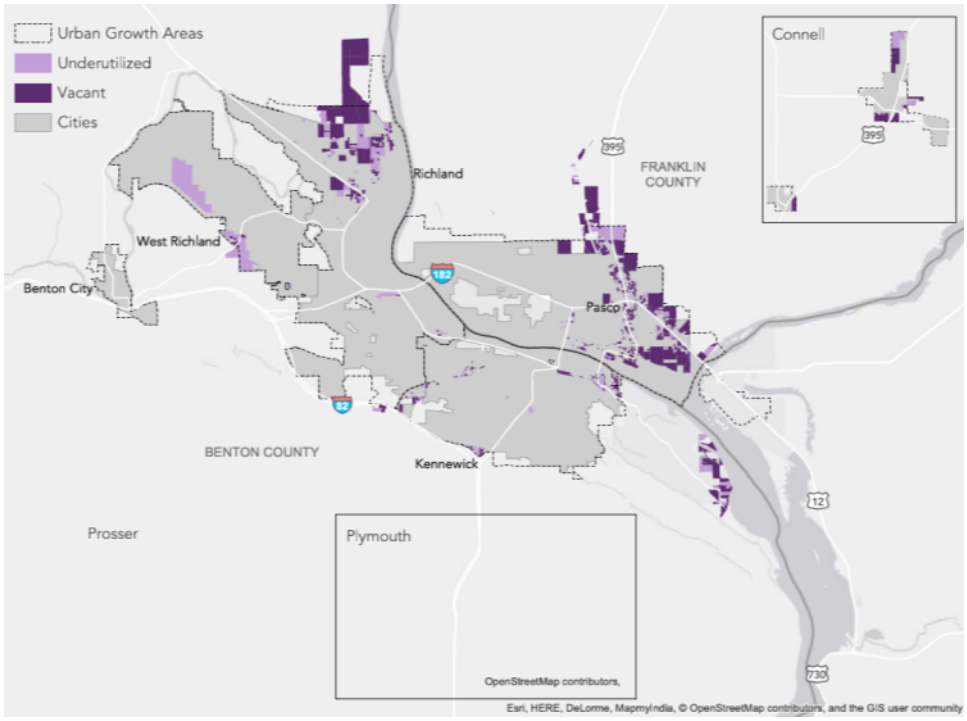
Table 8– Industrial Zoned Land Supply by Development Status

Status	Kennewick	West Richland	Richland	Pasco	Benton County	Franklin County	Total
Developed	256	17	1,279	1,481	2,642	1,809	4,451
Public Exempt	136	26	1,810	3,563	3,242	4,265	7,507
Underutilized	138	988	553	434	2,998	1,297	4,295
Vacant	199	47	967	2,189	4,266	4,265	8,530
Total	729	1,077	4,609	7,667	13,147	11,636	24,783

Source: Benton County, Franklin County, ECONorthwest

Several factors limit the potential use of much of this land. For example, in Benton County much of the industrial zoned land is not in the Urban Growth Area, which limits the development potential. The City of Richland and others are now working to expand the Richland UGA to include the 1,641 acres recently transferred from DOE, as part of the process to ready the land for development.

Figure 14 – Industrial Zoned Land Supply by Development Status



Source: Benton County, Franklin County, ECONorthwest

Another issue is that there are few large parcels (i.e. 200 acres or more) in the area that are ready for development. The Horn Rapids area (including the expansion area) will be able to offer parcels of this size. ECONorthwest classifies the most desirable sites as Tier 1 and Tier 2. Tier 1 sites are the most desirable (vacant, over five acres, within a half mile of a highway, no development constraints, and within an urban service area). Tier 2 sites include those up to one mile from a highway and also include underutilized sites. (See Table 9).

A total of 11 parcels over 50 acres in the region meet criteria for Tier 1. Only seven additional parcels met the criteria for Tier 2. Most of these parcels are within the City of Pasco, and only one Tier 1 parcel and four Tier 2 sites are within Benton County.

Table 9 – Developable Industrial Parcels by Size and Tier

	1,000 sq f- to 1 acre	1 to 5 acres	5 to 10 acres	10 to 20 acres	20 to 35 acres	35 to 50 acres	50 to 100 acres	100 to 200 acres	>200 acres
Underutilized	38	159	47	20	14	11	8`	5	3
Vacant	388	339	32	10	18	6	8	9	5
Tier 2	-	-	14	11	7	-	6	1	-
Tier 1	-	-	55	29	9	7	5	5	1

Source: Benton County, Franklin County, ECONorthwest

To estimate a range of aggregate future industrial land need, ECONorthwest used two approaches. The first approach is based on an extension of industrial development trends in the region. The second is based on an extension of industrial sector employment growth. Depending on the approach and assumed density, ECONorthwest estimates industrial land needs over the next 20 years could range from 500 to over 2,000 acres, or between 25 and 100 acres per year. (See Table 10)

Table 10 – Projected Industrial Land Acres Needed

Method	Assumed Annual Growth	Assumed Density	Annual Acres Developed	10-year Total Acres Developed	20-year Total Acres Developed
Development Trend	360,000 Building SF	0.07 FAR	118	1,181	2,361
	360,000 Building SF	0.15 FAR	55	551	1,102
Employment Trend	370 Industrial Jobs	5.00 Emp/Acre	74	740	1,480
	370 Industrial Jobs	15.00 Emp/Acre	25	247	493

Source: Benton County, Franklin County, Washington Employment Security Department, ECONorthwest

The ECONorthwest report noted several economic sectors with strong growth potential in the Tri-Cities. These sectors are similar to the ones noted in the Comprehensive Economic Development Strategy, and include:

- Food processing
- Advanced manufacturing
- Distribution and warehousing

Food processing has been one of the fastest growing industries in the Tri-Cities, especially in Pasco where Lamb Weston, Tyson, and several other food processing companies have facilities. Food processing uses require medium-to-large sites with good highway and/or railroad access. However, sizable development ready sites are becoming increasingly limited as there are few remaining sites over 40 acres with utilities included.

Associated with food processing is cold storage, which is also growing. The Preferred Freezer facility that opened at Horn Rapids in 2015 is the largest in North America. Preferred Freezer currently ships a large volume of cargo by rail, and is planning to expand the facility.

Advanced manufacturing is a new opportunity for the region, and is an area of emphasis for the Port of Benton. The PNNL leads the new Northwest Regional Manufacturing Center, the goal of which is to advance and implement smart manufacturing technologies. Partners in the Center include Washington State University, University of Washington, Oregon State University, Oregon BEST, Montana educational institutions, Bonneville Power Administration, industry partners and other organizations from across the Pacific Northwest. The presence of the

Hanford Nuclear Reservation and the PNNL are key, because of the intellectual talent they attract and the new technologies that spin off from their operations and research.

Distribution and warehousing is also growing in the Tri-Cities, due to the accessibility to major population centers in the Northwest. Distribution and warehousing facilities typically need large sites for structures and truck docking, maneuvering and storage. Easy access to major highways is an important factor for these uses as well. The Horn Rapids Industrial Park offers large sites with good highway access.

Summary of Industrial Development Opportunities

The Horn Rapids Industrial Park is well-positioned to absorb regional industrial growth. Over the next 20 years the demand for industrial land could be as much as nearly 2,400 acres. The largest amount of industrial land in the Benton-Franklin region is located at Horn Rapids, including the largest potential parcels.

The types of industries in the region that will drive the demand for industrial land typically need large parcels, good highway and/or rail access, and large-capacity utilities. An estimated 30% of firms looking to locate in the Benton-Franklin area list rail access as one of their needs. Horn Rapids has the large parcels and road/rail access to attract these firms.

In order to attract additional industries to the expansion area there is work that remains. This includes extending infrastructure to the newest parts of the property, and expanding the boundaries of the Urban Growth Area to include all of the property.

International Trade Opportunities

Shippers and others have expressed interest in the concept of developing an inland port at Horn Rapids. This would be an intermodal facility where containers are loaded and unloaded from trains.

Initially, the demand for the facility would be driven by locally-produced goods destined for the Ports of Seattle and Tacoma. Full containers would be loaded onto trains at Horn Rapids, and empty containers would be returned, reducing the need to move the containers by truck. In the long run infrastructure might be developed that would process inbound containers, such as import distribution centers and transload operations.

Various definitions exist for what an inland port actually is. A definition from the Texas Freight Advisory Committee[4], is that an inland port is "a site located away from traditional land and coastal borders with the vision to facilitate and process international trade through strategic investments in multi-modal transportation assets and by promoting value-added services as goods move through the supply chain". According to this definition, well-established inland ports:

- Tend to be large regional centers serving domestic and international markets;
- Facilitate international trade and expedite shipments in and out of the United States;
- Have multimodal capabilities and good access to interstate and state highway systems;
- Have Foreign Trade Zone status;
- Serve niche markets, which tend to involve higher-valued commodities; and
- Have access to sufficient labor and skills.

[4] Inland Ports: Economic Generators in Texas? August 22, 2013

Another definition comes from the industrial real estate firm Jones Lang LaSalle (JLL). According JLL[5], "an inland port is a hub designed to move international shipments more efficiently and effectively from maritime ports inland for distribution" elsewhere.

Benefits of Inland Ports

Inland ports can provide benefits for both the public and private sectors.

For the private sector, inland ports can facilitate a reduction in the number of intermediate links and the average length of haul for distribution, thereby streamlining shipping systems and reducing overall transportation costs.

Additional benefits include improved transit times, increased reliability, and the potential balancing of inbound and outbound freight movements to and from the inland port, thus reducing empty backhauls and decreasing transportation costs. Furthermore, multimodal options offer the private sector the flexibility to select the mode or combination of modes that best meets specific shipment requirements in terms of cost, speed, and reliability of service. Inland ports thus potentially facilitate more efficient and lower-cost supply chains when compared with more traditional supply chains. The effect of a reduction in costs (including transportation costs) is immediate because it influences the price of the output and thus the competitiveness of a company."[6]

For the public sector, creating an inland port can be a way to reduce the costs for regional companies, improving their bottom lines. In addition, inland ports can help to attract development, generating additional employment and income.

Rail-oriented economic development can also improve environmental conditions by reducing the number of truck trips in an area. This can generate benefits from time savings, reduction in accidents, and reduction of emissions.

Keys to Success

The BNSF has identified key factors that drive the success of inland ports. According to Vann Cunningham, BNSF Assistant Vice President Economic Development[7], the three key factors in determining the success of an intermodal rail facility are:

- Freight volume, density and balance,
- Proximity to other facilities, and
- Market coverage.

The consequences of a poor location include increased costs and decreased reliability. A poorly chosen location complicates the process of building and dismantling trains, increases the total transit time, and increases the costs of providing service.

According to the BNSF, inland ports must be located on key rail intermodal routes. These are the routes that connect major markets to major ports, have high capacity, and minimize route options and gateways in order to maximize traffic density and minimize route complexity.

Buy-in from one or more of the Class I railroads will be needed for an inland port to be successful at Horn Rapids. Several of the shippers interviewed for this analysis acknowledged

[5] JLL is a professional services and investment management firm specializing in real estate development

[6] Inland Ports: Economic Generators in Texas? August 22, 2013

[7] BNSF Inland Ports and High-Capacity, Asset-Intensive Transportation Networks, July 2012

that, while rail transportation is potentially attractive, without commitment from a railroad the service might not last.

Two examples discussed below are the Cold Train service that operated of Quincy, and the Railex service operated out of Wallula. In the case of Cold Train, the BNSF had little investment in the facility or the service, and stopped providing expedited service when sudden growth in other types of traffic caused service issues across the Northern Tier. In contrast, UP invested heavily in new railcars for the Railex service, and dedicated locomotive power to those trains. Also, in order to make the service successful, these trains are assigned the highest priority.

Shippers do not want to switch to a new mode of shipment if it won't last. These shippers have existing relationships with trucking firms, they have a good idea of how long it takes to move containers, and they know the cost.

Flexibility at the port end of the rail service is also critical. One of the shippers interviewed noted that their containers move via multiple shipping lines and terminals. A rail shuttle service running from Horn Rapids to only one port terminal would not necessarily meet the needs of this shipper.

The concept of shuttling empty containers from the ports to a storage yard at Horn Rapids is also attractive to shippers, but several factors would need to be addressed. According to one shipper, when their drayage drivers pick up an empty container at the ports they inspect it to make sure it is usable. Empty containers shuttled by rail back to the Tri-Cities would need to be inspected before they were loaded on the train, and somebody would need to be responsible for that.

Another factor is the ownership of the container. When drivers are responsible for picking up an empty container, they are able to drive to the appropriate terminal for the container. If empty containers were shuttled by rail to the Tri-Cities there would need to be enough containers from the right shipping lines.

Competing Rail Facilities

A new inland port at Horn Rapids may compete with several existing facilities in the region, including ones at Quincy, Wallula, and Boardman.

The Port of Quincy Intermodal Terminal was built to provide intermodal transportation solutions for shippers in Central Washington. The terminal currently includes 16 acres of land (with an additional 40 acres for expansion); 8,000 feet of storage rail siding on three tracks with easy access to the BNSF mainline; facilities for receiving and unloading of inbound railcars and both dry and refrigerated containers; and good highway access. Until recently Cold Train provided express refrigerated intermodal service for as many as 1,000 containers per month, using BNSF as the rail carrier. However, operations ended in 2014 due service issues with the BNSF.

The Railex facility in Wallula is designed to ship unit trains of refrigerated products from the Columbia Basin to the East Coast. As part of the development of the facility, the UP invested in a fleet of new, state-of-the-art refrigerated boxcars that are dedicated to this service. The facility has a two-mile rail loop that runs directly into the refrigerated warehouse, which allow product to be moved from cold storage to railcar under controlled conditions. It includes 19 enclosed refrigerated rail docks and 38 refrigerated truck docks. A new, 500,000 square foot wine warehouse was recently added to handle wines produced throughout the region.

Northwest Container Service (NWCS) operates a 20-acre intermodal yard at the Port of Boardman, and has the ability to expand to 30 acres. NWCS uses the UP to haul trains between Boardman and Portland, and between Portland and Seattle/Tacoma. Currently NWCS operates one train every two weeks between Boardman and Tacoma/Seattle ports, and five to six trains per week between Portland and Tacoma/Seattle. The facility is customs bonded, offers full service food grade inspection and cleaning, is a USDA approved site for fumigation. There is room for over 10,000 containers and chassis, and has refrigeration unit plugs for 24 containers.

NWSA Container traffic trends by trade route

Container volumes through NWSA container terminals declined slightly between 2005 and 2015, decreasing from 3.9 million TEUs in 2005 to 3.5 million TEUs in 2015, representing an annual loss of -1.1% per year. (See Table 11). It should be noted that container volumes were especially high in 2005 because cargo volumes were shifted from Southern California to Northwest ports due to capacity limitations in Southern California. Volumes also fell in 2009 as a result of the international recession, which impacted container trade at all port regions. The NWSA faces significant competition from other North American ports. A more detailed comparison of North American ports is provided below.

Table 11 – NWSA Container Trends 2005-2015 (1,000 TEUs)

	International					Domestic	
Year	Full Imports	Full Exports	Total Full	Empty	Sub-Total	Sub-Total	Total
2005	1,483	796	2,279	800	3,079	853	3,932
2006	1,504	786	2,290	814	3,104	862	3,965
2007	1,505	945	2,449	577	3,027	867	3,894
2008	1,313	885	2,197	475	2,673	841	3,514
2009	1,084	855	1,939	375	2,314	770	3,084
2010	1,373	873	2,246	538	2,784	783	3,567
2011	1,249	980	2,229	489	2,718	775	3,493
2012	1,340	975	2,314	464	2,778	786	3,564
2013	1,239	984	2,223	413	2,635	821	3,456
2014	1,217	908	2,125	432	2,557	837	3,394
2015	1,308	872	2,180	581	2,761	769	3,529
CAGR							
2005-15	-1.2%	0.9%	-0.4%	-3.2%	-1.1%	-1.0%	-1.1%

Source: Northwest Seaport Alliance

During the period from 2005 to 2015, trade with international countries (imports and exports as well as empty containers) accounted for approximately 77% of the container volume through NWSA container terminals, with domestic trade (primarily trade with Alaska and Hawaii) accounting for the remaining 23%.

Imports

Import containers carry a wide variety of products, including consumer goods (e.g., electronics, electrical machinery, toys and games, furniture, apparel, and footwear) and production inputs (e.g., vehicle parts, aircraft parts), among other cargoes. The value of

containerized imports transiting NWSA container terminals was $51 billion[8] in 2015. Containerized imports support jobs throughout the region.

Imports are dominated by Asian countries, which account for 97% of all full import[9] containers. In particular, China accounts for two-thirds of imports followed by Northeast Asia (Japan, Korea, Taiwan et al) at 19%, Southeast Asia (ASEAN countries) at 9% and South Asia (mainly India and Pakistan) at 1%. These imports are consumed locally as well shipped to inland markets by intermodal rail.

Europe, Latin America and the Caribbean and Oceania (Australia and New Zealand) each account for 1% of the import trade. Imports from these other trade routes are consumed/used within the region and does not typically move inland via intermodal rail.

- Asia
- China - 67%
    - Northeast Asia - 19%
    - Southeast Asia - 9%
    - South Asia - 1%
- Other
    - Europe - 1%
    - Latin America and the Caribbean - 1%
    - Oceania - 1%

In 2015, ports in the Seattle and Portland customs districts imported 22.6 million tons of goods (5.1 million to the Portland customs district and 17.5 million tons to Seattle customs district). Approximately 40% of these products moved in containers while 60% moved in liquid bulk or dry bulk form. Table 12 summarizes the major import classification groups in a descending order based upon the total tonnage moving through the Portland and Seattle customs districts, and provides a brief discussion on the potential to ship them to the Port of Benton.

[8] Source: WISERTrade

[9] Source: PIERS data

Table 12 – PNW Waterborne Imports 2015 by Customs District (1,000 Metric Tons of product imported into the Portland and Seattle Customs Districts)

	Total Tonnage			Containerized Tonnage			
Commodity Group	Portland	Seattle	Total	Portland	Seattle	Total	Opportunity for Port of Benton
Mineral products	1,888.0	6,788.1	8,676.1	27.7	117.3	145.0	Crude oil bound for Puget Sound refineries dominated the category. The construction market was the second largest component (specifically cement, stone, etc), which may represent an opportunity
Base metals and articles of base metal	1,232.5	1,696.1	2,928.7	37.9	1,208.0	1,246.0	This category primarily consists of iron and steel products. There are large volumes of these products imported to the Lower Columbia River ports; they are processed into a variety of products such as fencing, siding, roofing and other construction products; as well as inputs to fabricated metals manufacturers. These may also represent an opportunity for the Port of Benton.
Products of the chemical or Allied Industries	1,141.2	916.9	2,058.1	18.5	446.5	465.0	Chemical manufacturers and fertilizers produced and/or distributed within the region could be attracted to the Port of Benton.
Boilers, machinery (including nuclear), television image and sound recorders and parts	8.9	1,650.6	1,659.5	7.3	1,498.7	1,506.0	This category consists primarily of retail consumer goods, as well as equipment and machinery. Certain subsectors could potentially be attracted to Richland, particularly ag equipment or specialized industries (like Lampson) or activities related to Hanford (reactors and supporting equipment/machinery)
Vehicles, aircraft, vessels and associated transport equipment	474.5	911.9	1,386.5	4.8	544.2	549.0	This group primarily serves the auto and airplane industries as well as the rail industry. There may be opportunities to attract firms that focus on or support these industries. This would fall into the target industry of technology based manufacturing.
Miscellaneous manufactured articles	9.5	1,259.9	1,269.4	9.5	1,254.0	1,263.5	This group is a broad assembly of manufacturing industries. There may be opportunities.
Wood and articles of wood; cork; manufactures of straw, basket ware and wickerwork	150.0	859.1	1,009.2	8.0	439.2	447.2	Mainly consists of forest products (lumber, pulp and paper). Limited opportunity.
Plastics and articles thereof; rubber and articles thereof	8.2	791.0	799.2	8.2	776.8	785.0	The largest component of this group is tires, followed by miscellaneous groupings of plastic forms for manufacturers. It is unknown whether these industries could be attracted to Port of Benton.
Articles of stone, plaster, cement, asbestos, mica or similar materials; ceramic products; glass and glassware	32.7	615.5	648.1	32.7	545.3	577.9	This group includes stone articles (curbstones, concrete blocks etc) used in construction as well as glass products (safety glass and glass products used in laboratories et al. It is unknown whether these industries could be attracted to Port of Benton.
Textiles and articles	2.2	430.3	432.5	2.2	415.3	417.4	Focused on the garment industry, unlikely candidate for Port of Benton

	Total Tonnage			Containerized Tonnage			
Commodity Group	**Portland**	**Seattle**	**Total**	**Portland**	**Seattle**	**Total**	**Opportunity for Port of Benton**
Vegetable products	37.5	387.6	425.0	15.3	387.3	402.6	Focused on the nursery industry, unlikely candidate for Port of Benton
Prepared foodstuffs; beverages, spirits and vinegar; tobacco	6.9	412.4	419.3	6.9	366.9	373.8	Group used by wholesalers and manufacturers for a variety of food and related products; unlikely candidate for Port of Benton
Pulp of wood; recovered (waste and scrap), paper or paperboard et al	32.7	301.7	334.5	28.2	251.5	279.7	Materials used by paper recyclers and/or pulp mills; unlikely candidate
Footwear, headwear, umbrellas, walking-sticks, artificial flowers; articles of human hair	1.3	195.2	196.5	1.3	194.9	196.2	Mainly containerized clothing accessories; unlikely candidate unless import distribution center was attracted that managed these items.
Live animals and animal products	1.0	118.0	119.0	0.8	117.9	118.6	Limited volumes that would be unlikely to move by rail; it is unknown whether it could be attracted to Port of Benton
Raw hides and skins, leather, travel goods, handbags	0.2	68.4	68.6	0.2	67.7	67.9	Limited volumes that would be unlikely to move by rail; it is unknown whether it could be attracted to Port of Benton
Optical, photographic, precision, medical or surgical instruments; clocks and watches; musical instruments; parts of above	0.1	51.4	51.6	0.1	50.1	50.2	Limited volumes that would be unlikely to move by rail; it is unknown whether it could be attracted to Port of Benton
Works of art, collectors' pieces and antiques	0.5	38.3	38.8	0.4	36.6	37.0	Limited volumes that would be unlikely to move by rail; it is unknown whether it could be attracted to Port of Benton
Animal or vegetable fats and oils	1.3	33.3	34.6	1.3	19.5	20.8	Limited volumes that would be unlikely to move by rail; it is unknown whether it could be attracted to Port of Benton
Arms and ammunition; parts and accessories thereof	0.0	3.4	3.4	0.0	3.2	3.3	Limited volumes that would be unlikely to move by rail; it is unknown whether it could be attracted to Port of Benton
Imitation jewelry; coins	0.0	3.1	3.1	0.0	3.1	3.1	Limited volumes that would be unlikely to move by rail; it is unknown whether it could be attracted to Port of Benton
Total	5,029.3	17,532.3	22,561.7	211.3	8,743.9	8,955.1	

Exports

Exports consist of agricultural products (hay, oilseeds, grains, processed fruit and vegetables, meat and other products), forest products (lumber, logs, paper and other products), and other products (electrical machinery, inorganic chemicals, and other products) that are manufactured or produced in Washington, the Northwest region (Oregon and Idaho) as well as inland regions. The value of containerized imports transiting NWSA container terminals was $11 billion[10] in 2015. The containerized trade network that has developed to serve imports also provides exporters with access to a robust transportation system for shipping their products to overseas. These containerized exports support jobs throughout the state and region.

Most exports are destined for Asia, which accounts for 89% of all full export containers[11]. Northeast Asia (Japan, Korea, Taiwan) accounts for 49% of all exports followed by China at 25%, Southeast Asia (ASEAN countries) at 12% and South Asia (mainly India and Pakistan) at 3%.

Other trade routes account for the remaining 11%, with Europe accounting for 4% and, Latin America and the Caribbean and Oceania (Australia and New Zealand) each accounting for 2% of the export trade.

- Asia
    - Northeast Asia - 49%
    - China - 25%
    - Southeast Asia - 12%
    - South Asia - 3%
- Other
    - Europe - 4%
    - Africa & Middle East - 3%
    - Latin America & Caribbean - 2%
- Oceania - 2%

The Pacific Northwest is one of the most trade dependent regions of the United States. Export trade is a key driver of job growth and economic prosperity. More than 75% of all NWSA loaded exports originate in Washington, Oregon, or Idaho. This trade represents approximately $9 billion in cargo value, contributing more than 500,000 jobs to the Pacific Northwest, for more than 20,000 regional firms. (See Table 13).

Table 13 – Export Activity Connected with the Northwest Seaport Alliance

Category	Washington	Oregon	Idaho	Total PNW
Export Value ($ billlions)	$6.5	$1.9	$0.6	$9.0
% thru the NWSA	89%	62%	42%	80%
Jobs tied to trade	391,000	86,157	26,017	503,174
Exporting Companies	12,646	5,922	1,762	20,330

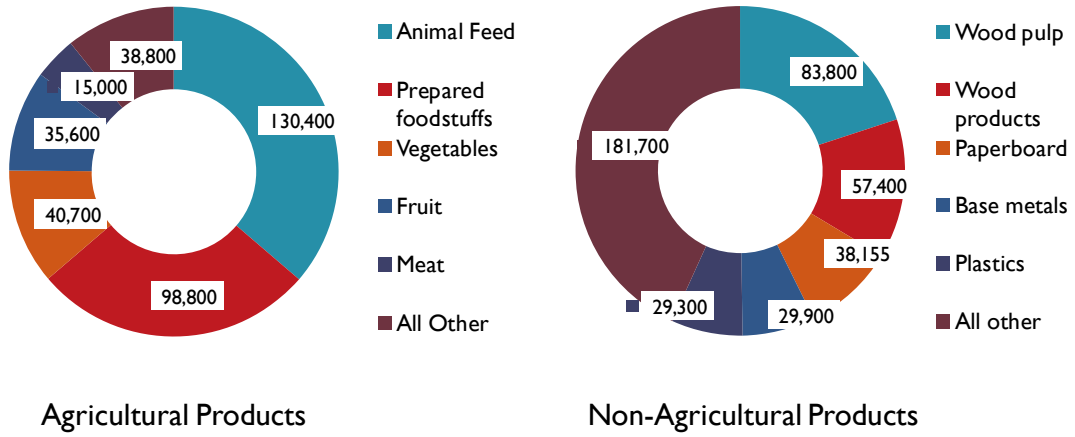
Source: The Northwest Seaport Alliance

[10] Source: WISERTrade

[11] Source: PIERS data

A variety of agricultural and non-agricultural commodities are exported by container through the NWSA container terminals. Key agricultural exports include: animal feed, prepared foodstuffs, vegetables, fruit and meat, among other products. Key non-agricultural exports include: wood pulp, wood products, paperboard, base metals and plastics, among other products. (See Figure 15).

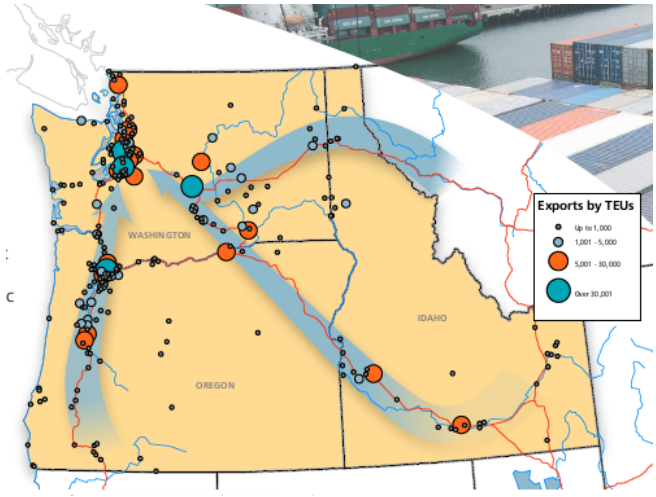
Figure 15 – Products Exported Through the Northwest Seaport Alliance (TEU)



Source: The Northwest Seaport Alliance

Figure 16 depicts where these industries are located. As shown, there is a strong cluster in Eastern Washington, as well as in Puget Sound, in Oregon along I-5 corridor, and in southern Idaho.

Figure 16 - Locations of PNW export companies by container volume



Source: Northwest Seaport Alliance

Examples of Inland Ports

Located outside crowded port areas, where land is scarce or not available at all, inland ports' advantages are well documented because of their positive impact on regional industrial

development and because they create space for more buildings in proximity to intermodal sites, thus relieving pressure in port areas and on roadways. [12]

Port of Quincy Intermodal Terminal

The purpose of the Port of Quincy Intermodal Terminal is to provide rail freight transportation solutions for the shippers of Central Washington, and is designed to be an inland intermodal solution for the congestion experienced in coastal ports. The terminal currently includes 16 acres of land (with an additional 40 acres for expansion); 8,000 feet of storage rail siding on three tracks with easy access to the BNSF mainline; facilities for receiving and unloading of inbound railcars and both dry and refrigerated containers; convenient access to I-90, Hwy 28 and Hwy 281; storage capacity for over 1,500 containers & chassis.

Until recently the Port of Quincy had a relationship with Cold Train that provided express intermodal service for Central Washington shippers to locations in the Midwest and East Coast. Service was provided by BNSF Railroad. At its peak, Cold Train Express Intermodal Service carried approximately 1,000 containers per month, with service provided six days of the week and with delivery times of three days from Quincy to eastbound intermodal locations. Operations ceased in August, 2014 due to service issues, and there is currently a lawsuit pending between the Cold Train and the BNSF parties.

Figure 17 – Port of Quincy Intermodal Terminal

BNSF Intermodal and Logistics Park KC, Kansas

This facility is a 1,500-acre master-planned distribution and warehouse development in Edgerton, Kansas, located southwest of downtown Kansas City. The primary purpose of the facility is to serve container traffic moving between the Ports of Los Angeles and Long Beach and the Midwest, and it is located on the main BNSF transcontinental line between Chicago and the ports of Los Angeles and Long Beach. The facility also offers domestic intermodal service and direct-rail/carload service in addition to international intermodal service.

The annual capacity of the intermodal yard is 500,000 container lifts, which could expand to 1.5 million containers at full build-out. The facility has capacity for 17 million square feet of

[12] Tim Feemster, Managing Principal, Foremost Quality Logistics, Intermodal Sites 2015; http://www.areadevelopment.com/logisticsInfrastructure/Intermodal-Sites-Q1-2015/10-inland-ports-to-watch-2829267.shtml

industrial buildings, and it currently has 6.5+ million square feet of new distribution facilities. The facility is owned by the BNSF Railway and Edgerton Land Holding Company.

Figure 18 – BNSF Intermodal and Logistics Park KC

Global Transportation Hub Authority

The Global Transportation Hub (GTH) is a new 1,800-acre facility located outside Regina, Saskatchewan. The purpose of the facility is to develop supply chain, logistics, and transportation infrastructure to supports global trade, and to spur economic development in the Regina region. The facility is owned by the Global Transportation Hub Authorty, an autonomous and self-governing inland port authority.

Since the facility was authorized in 2013 it has attracted $485 million in private investment and 750 jobs. The Canadian Pacific operates a 300-acre intermodal facility at GTH, designed to move some 250,000 containers annually. Other clients include: cross-dock and LTL transportation services, a large food retailer s distribution center, container services (storage, drayage, transport, maintenance and handling), and on-site repair and maintenance service for truck and trailer units, among others.

Figure 19 – Global Transportation Hub Authority

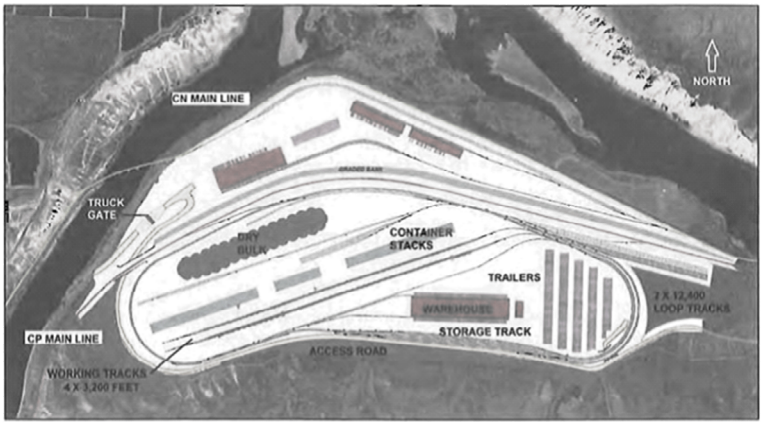
Ashcroft Terminal

Ashcroft Terminal is a privately owned facility located approximately 200 miles east of Vancouver, B.C. The purpose of the facility is to relieve truck traffic congestion and land development pressures in Vancouver, and to promote economic development in the Ashcroft area.

Ashcroft terminal has service from two Class I railroads, the Canadian National (CN) and Canadian Pacific (CP). Although the two railroads each own a main line between Ashcroft and Vancouver, this section is operated jointly in order to increase capacity. Ashcroft Terminal is located at the critical junction where this "co-production" begins and ends. Every piece of cargo moved by rail through any of the Vancouver marine terminals has to pass through the Ashcroft Terminal.

Ashcroft Terminal has 320 acres of industrial land, with an additional 350 acres of agricultural buffer land. Currently it has 32,000 ft. of rail servicing 18 users. Full Build out plans will see over 25 miles of internal track including a twinned 25,000 ft loop track directly off CP's mainline with a CN inter-switch

Figure 20 – Ashcroft Terminal

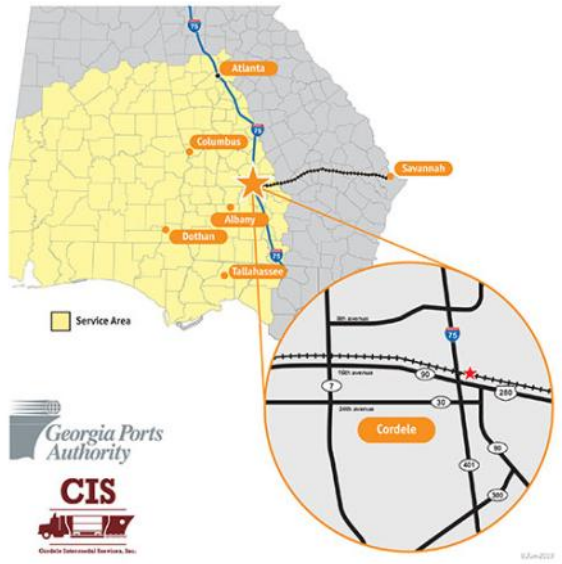


Cordele Inland Port, GA

The Cordele Inland Port is a privately owned facility 1,150-acre facility located in south central Georgia. The facility is designed to improve shipping services and reduce cost to and from firms in southwest Georgia, Alabama, Mississippi, and the panhandle of Florida.

Rail service to Cordele Inland Port is provided by Class I carrier CSX and by several shortline railroads. Major truck route (I-75, Georgia highways 300 and 280) are less than one mile away. Overnight rail service to the Georgia Ports Authority is provided three times per week via the shortline railroads, Heart of Georgia and Georgia Central. Maersk, Mediterranean Shipping and other steamship lines use the facility to position containers for quick delivery to cotton gins and peanut warehouses within a 250-mile radius. Full containers are returned to Cordele for rail shipment to the seaport.

Figure 21 – Cordele Inland Port

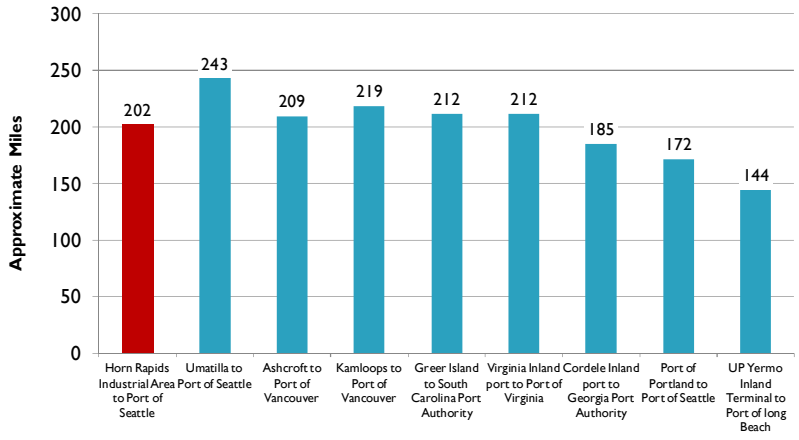


Distance to Inland Ports

The average distance from inland ports to the seaports they serve is approximately 200 miles, as illustrated in Figure 22. The distances range from 144 miles to 243 miles. By road, Horn Rapids is 200 miles from Seattle. However, because the Stampede Pass rail line cannot accommodate double-stack container trains, this traffic would need to be routed through the Columbia River Gorge. This means containers on rail would move approximately twice as far as they now do by truck.

Distances are included in the graph for Portland to Seattle and for Umatilla to Seattle; these are both locations where shippers can load containers on to rail for movement to Seattle.

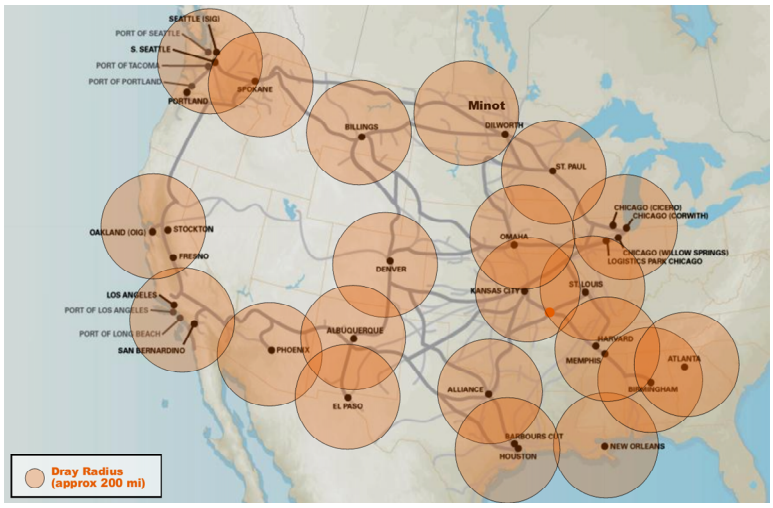
Figure 22 – Distance to Inland Ports



Source: Inland Intermodal Cargo Facility Study for the Corporation of Delta by Cargo Velocity Inc., August 15, 2014; BST Associates

Information from BNSF shows that 200 miles is the approximate market range for draying containers to intermodal ramps. The 200-mile dray radii for Seattle and Spokane ramps overlap the Horn Rapids area. (See Figure 23).

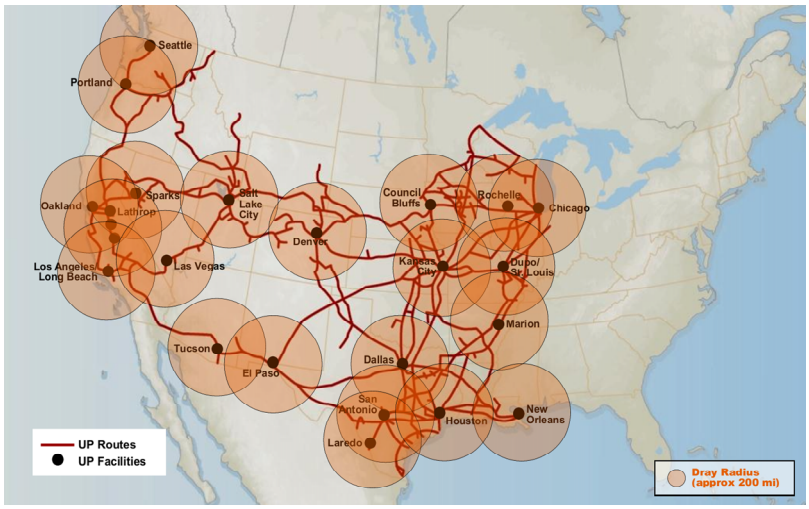
Figure 23 – Market Radius for BNSF Intermodal Ramps



Source: Inland Ports and High-Capacity, Asset-Intensive Transportation Networks, BNSF Railroad July 2012

The same document shows 200-mile dray radii for Union Pacific intermodal ramps in Portland and Seattle. Again, both of these ranges overlap the Horn Rapids area. (See Figure 24).

Figure 24 – Market Radius for UP Intermodal Ramps



Source: Inland Ports and High-Capacity, Asset-Intensive Transportation Networks, BNSF Railroad July 2012

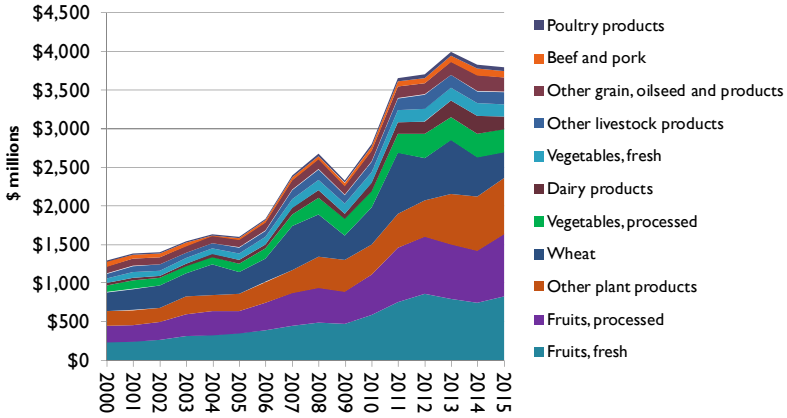
Washington Agricultural Exports

Exports of Washington agricultural products have seen tremendous growth over the past 15 years. According to data from the USDA, the export value of Washington agricultural products jumped from $1.3 billion in 2001 to $3.8 billion in 2015. Most of the export value is generated by products from eastern Washington, and these products represent potential opportunities for the Port of Benton.

Fresh fruits, processed fruits, and other plant products each account for approximately 20% of total export value. They also accounted for much of the growth, and each of these three commodity groups grew by 250% or more between 2001 and 2015.

Processed vegetables accounted for nearly 7.9% of exports in 2015, up from 6.9% in 2015, and their export value grew by nearly 240%. Dairy products' share of export value grew from 2.6% to 4.4%, and their value grew by more than 390%. (See Figure 25).

Figure 25 – Washington Agricultural Exports



Source: USDA Economic Research Service; USDA Foreign Agricultural Service

Conclusions

There is a substantial (and growing) volume of containerized cargo that moves between the Columbia Basin and the Ports of Seattle and Tacoma, the majority of which moves by truck. This typically involves a truck hauling a loaded container westbound and an empty container eastbound.

Several factors are likely to raise the cost of shipping containers by truck. These include a growing shortage of drivers, stricter regulation of driver time (hours of service), increasing congestion near the ports, and increasing competition for trucking services. These factors may increase the feasibility of an intermodal facility at Horn Rapids.

In order for an intermodal facility to be successful it will need to meet a number of criteria. Key among these are attracting a sufficient volume of cargo, and getting long-term service commitments from one or more railroads.

Thomas Keane, of New Harbor Consultants, produced a recent white paper on inland ports which included a list of 10 factors for inland port success[13]. These 10 factors are listed in Table 14, along with a brief analysis of how the Horn Rapids site meets these factors.

[13] Keane, Thomas, http://newharborllc.com/2016/08/05/inland-ports-on-track-for-growth/, downloaded 10-24-2016

Table 14 – Factors for Inland Port Success

		Horn Rapid Industrial Area Capability	
Criteria	**Requirements**	**Preliminary Finding**	**Discussion**
Demand	Can volumes reach 10,000-20,000+ lifts per year? Who are the anchor shippers?	Yes	The local area currently generates approximately 10,000+/- containers. Extending the region to 50 to 100 miles creates a market in excess of 20,000 containers. Local firms have indicated interest in an inland port if the service is reliable and cost competitive with trucking.
Port link	Are there close ties with a successful ocean container port, 200+ miles away?	Yes	NWSA staff has indicated interest in the project because it helps solidify market capture in the port's local hinterland and results in a shift from truck to rail which coincides with Port plans in Seattle and Tacoma.
Site	40+ acres for intermodal ramp, more for distribution facilities, near good highway access?	Yes	Horn Rapid Industrial area acreage exceeds 2,000 acres.
Rail	Situated on or near a mainline intermodal rail route, attractive to a Class I railroad?	Yes	Inland port would have access to BNSF and UP rail lines. The facility may be attractive to Class I railroads if intermodal volume can be attracted.
Cost	Competitive land, improvements, road links, operating costs, and taxes?	Yes	Horn Rapid Industrial area has competitive land values, operating costs and taxes but additional planning is required to bring the area into the UGA and to extend utilities and road access.
Labor	Access to a skilled, hardworking labor force?	Yes	The Tri-Cities area meets the requirements for a good labor force.
Business case	Value proposition that is attractive to a developer, railroad and tenants?	Maybe	Existing and potential tenants/users have indicated interest in the project. Further discussions needed with railroads and developers.
Environmental benefits	Can it replace truck with rail traffic, attractive in a congested region?	Maybe	A shift from truck to rail would provide environmental benefits for NWSA ports. May increase truck traffic in Richland area
Public support	Is there active involvement by local officials and support from the public?	Maybe	Local government is involved in development of the Horn Rapids Industrial Park. Level of public support it unknown.
Collaborative effort	Is strong leadership in place, with effective public-private collaboration?	Maybe	Port of Benton, Northwest Seaport Alliance, City of Richland are supportive, and leading the effort. Railroad collaboration will be needed.

Value of Rail-Related Industrial Development

This section provides an estimate of the contribution (value) of rail-related industrial development at Horn Rapids Industrial Park.

The value of the Port of Benton railroad can be measured in a number of ways. At its most basic, this could be measured as the value of the land and the track structures. However, this method doesn't take into account the value that the railroad provides to shippers, as measured in transportation cost savings. It also doesn't include benefits that accrue to other stakeholders, such as the taxes generated, the jobs supported, or the environmental benefits of shifting cargo from truck to rail. The following section provides estimates of the value generated by the railroad, including:

- Appraised value
- Value of development
- Taxes generated
- Employment
- Environmental benefits

Appraised Value

The Port of Benton recently retained a consultant to appraise the value of the Port's rail line, including land and structures[14]. This appraisal concluded that the total value of the railroad is $25,600,000, including $10,890,000 for the land and $14,725,000 for the track structure.

Value of Development

The value of the railroad as tool of economic development includes more than just the track structure and the land on which it sits. Access to rail transportation is a key site attribute for many firms; according to TRIDEC, approximately 30% of the firms seeking information on property in the region list rail access as one of their criteria. Using this figure, the value of development that depends on rail access can be estimated.

ECONorthwest estimated that regional demand for industrial land will range between 493 and 2,361 acres over 20 years. Assuming that 30% of this demand will require rail access, the total rail-related demand for land will range between 148 and 708 acres. Finally, assuming that the Port of Benton is able to capture half of this market (conservative estimate), the total amount of rail-related land with access to the Port of Benton railroad will range between 74 and 354 acres.

The value of development on this acreage can be estimated using comparable developments in the region.

Three recent developments at Horn Rapids have improvements (buildings and other physical plant) whose value ranges between $107,000 and $2,701,000 per acre. This is calculated by dividing the assessed value of improvements by the total acreage of the development. This wide range of values includes one development that has a very expensive structure on a relatively small acreage (Preferred Freezer), and one that has relatively little structure on a very large acreage. A third development at Horn Rapids, Ferguson Enterprises, has an improvement value of $365,000 per acre.

[14] *Market Value Estimate of the Real Estate and Track Structure Assets, port of Benton Track, Richland, Washington,* Kenneth Young & Associates, July 2016.

The Pasco Processing Center provides another set of property values for comparison. Assessor records for seven properties at the Pasco Processing Center show improvement values ranging between $184,000 and $1,296,000 per acre, with a weighted average value of $813,000 per acre.

Using the rail-related acreage estimates of 74 to 354 acres and the low and high value per acre of improvements, the total value of rail-related development over 20 years is estimated to range between $37.6 million and $288.2 million, as measure in 2016 dollars.

Taxes Generated

Property Tax

Improvements made on properties at Horn Rapids will generate property taxes for a number of different jurisdictions, including the City of Richland and the Port of Benton.

The City of Richland property tax rate for the Horn Rapids area is approximately $2.63 per $1,000 of assessed value. At full build-out, City property tax from rail related development may range between $99,000 and $757,000 per year.

Assuming that absorption of land occurs evenly across the next 20 years, the net present value of City property tax ranges between $720,000 and $5.52 million using a 3.0% discount rate, and between $465,000 and $3.57 million using a 7.0% discount rate. (See Table 15)

The Port of Benton property tax rate for the Horn Rapids area is approximately $0.40 per $1,000 of assessed value. At full build-out, Port property tax from rail related development may range between $15,000 and $115,000 per year.

Assuming that absorption of land occurs evenly across the next 20 years, the net present value of Port property tax ranges between $109,000 and $838,000 using a 3.0% discount rate, and between $71,000 and $541,000 using a 7.0% discount rate.

Other taxing authorities that will see increase property tax receipts include the State of Washington, Benton County, and the Richland School District. In total, property taxes generated by rail-related development may range from $4.59 million to $35.18 million in 2016 dollars. Using a 3.0% discount rate the net present value of property taxes may range from $3.19 million to $24.; using a 7.0% discount rate net present value may range from $2.06 million to $15.79 million.

Sales Tax

In Washington, most construction is subject to sales tax; the current sales tax rate in Richland is 8.6%. There is, however, an exception for machinery and equipment ("M & E") used directly in a manufacturing operation or research and development operation. The amount of sales tax that would be generated by development of industrial property was estimated under two scenarios: 1) the first scenario assumes that all construction will be subject to the sales tax, and 2) the second scenario assumes that half of the construction would be exempt from sales tax.

The sales tax estimates used the same development timing and values described above.

Under the low acreage/low value scenario, rail-related development at Horn Rapids may generate $3.23 million to $24.78 million in sales and use tax over 20 years (assuming no M & E exemption), and $1.62 million to $12.39 million (assuming half is exempt).

Using a discount rate of 3.0%, the net present value of sales tax may range from $1.84 million to $14.13 million (assuming no M & E exemption), and from $0.92 million to $7.07 million (assuming half is exempt).

Using a discount rate of 7.0%, the net present value of sales tax may range from $0.89 million to $6.85 million (assuming no M & E exemption), and from $0.45 million to $3.43 million (assuming half is exempt). (See Table 15)

Summary of Taxes

Total taxes generated by rail-related development over 20 years are projected to range from $10.87 million to $33.89 million. These figures are based on: 1) average land value per acre, 2) average value of improvements per acre, and 3) average number of acres absorbed.

These figures should be considered conservative. The primary reason for this is that the acres of absorption assumes that: 1) the Horn Rapids area will attract only 50% of rail-related development in the Benton-Franklin area, 2) only 30% of firms looking for property in the area are interested in rail service. Given the amount of land available, the size of parcels available, and rail service from multiple railroads, it is possible that the Horn Rapids area will attract more than 50% of rail-related development.

Table 15 – Summary of Benefits from Rail-Related Development ($millions of 2016$)

	Low			High			Average		
	Discount Rate			Discount Rate			Discount Rate		
Category	**7.0%**	**3.0%**	**Undisc.**	**7.0%**	**3.0%**	**Undisc.**	**7.0%**	**3.0%**	**Undisc.**
Value of land sales	$1.51	$2.04	$2.66	$12.02	$16.25	$21.21	$6.77	$9.15	$11.94
Value of construction	$10.4	$21.4	$37.6	$79.7	$164.3	$288.2	$45.05	$92.85	$162.90
Sales tax on construction									
Assumes no exemption	$0.89	$1.84	$3.23	$6.85	$14.13	$24.78	$3.87	$7.99	$14.01
Assumes half is exempt	$0.45	$0.92	$1.62	$3.43	$7.07	$12.39	$1.94	$4.00	$7.01
Property tax – City of Richland	$0.47	$0.72	$1.04	$3.57	$5.52	$7.95	$2.02	$3.12	$4.50
Property tax – Port of Benton	$0.07	$0.11	$0.16	$0.54	$0.84	$1.21	$0.31	$0.48	$0.69
Property tax - Other	$1.52	$2.36	$3.40	$11.68	$18.08	$26.03	$6.60	$10.22	$14.72
Property tax – Total	$2.06	$3.19	$4.59	$15.79	$24.44	$35.18	$8.93	$13.82	$19.89
Total taxes w/o exemption	$2.95	$5.03	$7.82	$22.64	$38.57	$59.96	$12.80	$21.80	$33.89
Total taxes w/ exemption	$2.51	$4.11	$6.21	$19.22	$31.51	$47.57	$10.87	$17.81	$26.89

Note: These estimates assume that development occurs evenly over 20 years. Low estimate uses low value per acre and low acres developed, high estimate uses high value per acre and high acres developed.
Source: BST Associates

Employment

As discussed above, ECONorthwest recently produced the "Industrial Zoned Land Assessment" for the City of Kennewick. This analysis used employment density ranging between five jobs per acre and 15 jobs per acres as a basis for estimating the acreage demand. Based on the employment growth trend in the region, the region is projected to gain an additional 7,400 industrial jobs over the next 20 years. Employment density of five jobs per acre is nearly identical to that seen at the recent Preferred Freezer development. In contrast, employment density at Central Washington Corn Processors is less than one job per acre, due to the amount of acreage used by the rail loop.

In the combined Benton and Franklin Counties, the average wage for across all covered industries[15] in 2015 was $47,420, and total employment was 115,480. The government sector accounted for approximately one out of six jobs, and the average annual wage in this sector was $55,820. The non-government sector accounted for five out of six jobs, with average annual wages of $45,810.

The non-government sector is made up of a wide variety of industries, and the average wage for each of these industries varies widely. One of the highest paid of these is NAICS Code 54 ("Professional and technical services"). Total employment in this sector was 9,980 in 2015, and the average annual wage of $92,230 was more than twice the regional average. Most of these jobs are tied to Hanford and the PNNL, and all but 400 of the jobs were in Benton County. Another sector tied closely to Hanford and the PNNL is NAICS Code 56 ("Administrative and waste services"). Total employment in this sector was 10,520, of which 9,360 jobs were in Benton County; the average wage for this sector was $73,340.

When the two Hanford-related sectors are omitted, the average non-government annual wage in the region is $36,220, with total employment of 76,440. The industry sectors targeted by TRIDEC pay wages that average higher, with average annual wages ranging from $38,800 to $56,700. These sectors include warehousing (NAICS Code 493), food manufacturing (NAICS Code 311), beverage manufacturing (NAICS Code 312), machinery manufacturing (NAICS Code 333), and chemical manufacturing (NAICS Code 333).

Table 16 provides a summary of potential employment and wages using five employees per acres, and Table 17 provides estimates of the types of occupations employed at each of these industries, and the average wages for those occupations. Summaries of key occupations are presented is the following section.

Annual wages in the warehousing sector average $38,800. The predominant category of occupation for the warehousing industry is "Transportation and material moving occupations", which accounts for 60.3% of jobs and pays an average of $34,000 per year. "Office and administrative support occupations" accounts for another 22.3% of warehousing jobs, and these jobs also pay an average of $34,000 per year. At the other end of the pay scale, "Management occupations" account for 3.5% of jobs in warehousing and pay $113,100 per year, and "Business and financial operations occupations" account for 2.0% of jobs in warehousing and pay $76,900 per year.

Annual wages in food manufacturing average $38,900. "Production occupations" account for 52.6% of jobs in the industry, and pay an average of $34,100 per year. "Transportation and material moving occupations" account for 17.1% of jobs, and pay $32,700 per year. "Management occupations" account for 3.3% of jobs and pay an average of $112,600, while "Business and financial operations occupations" account for 1.7% of jobs and pay $78,500.

Annual wages in beverage manufacturing average $42,800 per year. As in the food production industry, "Production occupations" account for the largest share of jobs (i.e. 29.5%), but this share is much lower than in food production. Average pay for production occupations is $38,700 per year. "Transportation occupations" account for 18.1% of jobs and pay $35,600 per year. "Sales and related occupations" is a relatively large category of jobs (i.e. 13.8%), and pays

[15] The Quarterly Census of Employment and Wages Program is a cooperative program involving the Bureau of Labor Statistics (BLS) of the U.S. Department of Labor and the State Employment Security Agencies (SESAs). The QCEW program produces a comprehensive tabulation of employment and wage information for workers covered by State unemployment insurance (UI) laws and Federal workers covered by the Unemployment Compensation for Federal Employees (UCFE) program.

an average of $39,400. In this industry 7.3% of jobs are in "Installation, maintenance, and repair occupations", which pay $50,500 per year. The beverage manufacturing industry has a higher share of jobs in "Management occupations" (i.e. 5.4%), compared with both the food manufacturing and warehousing industries. These jobs pay an average of $113,700 per year, while "Business and financial operations occupations" pay $70,800 per year and account for 2.7% of jobs.

Annual wages in the machinery manufacturing industry average $55,400 per year. In the machinery manufacturing industry, "Production occupations" account for more than half of all jobs (i.e. 52.6%), but these production jobs pay more ($42,400) than production jobs in food manufacturing or beverage manufacturing. Machinery manufacturing also has a larger share of jobs at higher pay levels, including "Architecture and engineering occupations" (i.e. 10.1% of jobs, $91,600 average wages), "Management occupations" (6.6% of jobs, $119,400 average wages), and "Business and financial operations occupations" (4.5% of jobs, $74900 average wages).

Annual wages in the chemical manufacturing industry average $56,700 per year. While the largest share of jobs are in production occupations, the chemical manufacturing industry also employs a variety of higher-paying occupations. For example, "Life, physical, and social science occupations" account for 9.4% jobs, with average pay of $85,800 per year. Jobs in this occupation category include chemists, chemical technicians, and biologists. "Management occupations" account for 8.5% of jobs, and pay an average of $114,900 per year, "Architecture and engineering occupations" account for 5.7% of jobs and pay $94,900 per year, and "Business and financial operations occupations" account for 5.6% of jobs and pay $77,000. "Installation, maintenance, and repair occupations" account for 6.8% of jobs, and pay $52,700 per year.

At full development, potential rail-related employment at Horn Rapids is estimated to range between 370 and 1,771, using an average of five employees per acre. Depending on the types of industries that locate at Horn Rapids, 370 jobs could generate total annual payroll of $14.3 million to $21.0 million, while 1,771 jobs could generate annual payroll of $68.7 million to $100.4 million.

Table 16 – Estimated Employment and Wages from Rail-Related Development

Sector	Jobs (Low)	Annual Wages	Total Wages ($millions)	Jobs (High	Annual Wages	Total Wages ($millions)
Warehousing	370	$38,800	$14.3	1,771	$38,800	$68.7
Food Mfg.	370	$38,900	$14.4	1,771	$38,900	$68.9
Beverage Mfg.	370	$42,800	$15.8	1,771	$42,800	$75.8
Machinery Mfg.	370	$55,400	$20.5	1,771	$55,400	$98.1
Chemical Mfg.	370	$56,700	$21.0	1,771	$56,700	$100.4

Table 17 – Occupations and Average Wages for Selected Industries in the Benton-Franklin Area

	Share of Jobs					Average Annual Wage				
Occupation category	Warehousing	Food Mfg.	Beverage Mfg.	Machinery Mfg.	Chemical Mfg.	Warehousing	Food Mfg.	Beverage Mfg.	Machinery Mfg.	Chemical Mfg.
Management occupations	3.5%	3.3%	5.4%	6.6%	8.5%	$113,100	$112,600	$113,700	$119,400	$114,900
Business and financial operations occupations	2.0%	1.7%	2.7%	4.5%	5.6%	$76,900	$78,500	$70,800	$74,900	$77,000
Computer and mathematical occupations	0.5%	0.3%	0.3%	2.0%	2.0%	$72,900	$66,500	$64,100	$77,000	$72,300
Architecture and engineering occupations	0.2%	0.5%	0.6%	10.1%	5.7%	$97,500	$96,900	$94,400	$91,600	$94,900
Life, physical, and social science occupations	0.0%	1.0%	0.8%	0.2%	9.4%	$-	$58,000	$78,600	$84,600	$85,800
Community and social service occupations	0.0%	0.0%	0.0%	0.0%	0.0%	$-	$48,000	$-	$-	$-
Legal occupations	0.0%	0.0%	0.0%	0.1%	0.1%	$-	$95,000	$-	$78,100	$86,500
Arts, design, entertainment, sports, and media occupations	0.1%	0.1%	1.6%	0.4%	0.3%	$36,300	$45,600	$28,900	$61,100	$62,100
Healthcare practitioners and technical occupations	0.1%	0.2%	0.1%	0.1%	0.7%	$89,100	$82,500	$93,000	$88,300	$82,500
Healthcare support occupations	0.0%	0.0%	0.0%	0.0%	0.1%	$-	$-	$-	$33,400	$25,600
Protective service occupations	0.7%	0.1%	0.1%	0.0%	0.2%	$38,700	$39,800	$39,800	$39,800	$42,300
Food preparation and serving related occupations	0.1%	2.3%	5.1%	0.0%	0.0%	$-	$24,200	$26,200	$-	$27,800
Building and grounds cleaning and maintenance occupations	1.0%	1.5%	1.0%	0.5%	0.5%	$29,300	$29,400	$29,200	$29,100	$29,300
Personal care and service occupations	0.0%	0.0%	0.2%	0.0%	0.0%	$-	$23,100	$23,000	$-	$25,500
Sales and related occupations	1.7%	3.9%	13.8%	3.6%	2.6%	$43,200	$35,700	$39,400	$55,300	$56,900
Office and administrative support occupations	22.3%	6.6%	9.9%	10.1%	9.7%	$34,000	$37,100	$36,000	$38,500	$39,100
Farming, fishing, and forestry occupations	0.1%	1.2%	2.9%	0.0%	0.0%	$36,400	$31,500	$29,500	$34,900	$34,900
Construction and extraction occupations	0.1%	0.3%	0.4%	1.2%	0.6%	$59,200	$69,600	$70,200	$72,700	$69,300
Installation, maintenance, and repair occupations	3.2%	5.9%	7.3%	4.5%	6.8%	$49,700	$50,900	$50,500	$53,100	$52,700
Production occupations	4.0%	54.1%	29.5%	52.6%	41.2%	$38,300	$34,100	$38,700	$42,400	$37,100
Transportation and material moving occupations	60.3%	17.1%	18.1%	3.5%	6.0%	$34,000	$32,700	$35,600	$33,200	$34,800
Total, all occupations	100.0%	100.0%	100.0%	100.0%	100.0%	$38,800	$38,900	$42,800	$55,400	$56,700

Source: Source: Employment Projections program, U.S. Department of Labor, U.S. Bureau of Labor Statistics, and 2016 Occupational Employment and Wage Estimates from Washington Employment Security Dept.

Environmental Benefits

Shifting containerized export cargo that originates in the region around Richland from truck to rail is likely to generate a variety of environmental benefits, including:

- Reduced operating costs
- Reduced highway maintenance
- Reduced accidents
- Reduced emissions

Each of these benefits can be quantified following standard methodology. Details are provided in the following sections.

Key Inputs

Estimation of the environmental benefits of substituting rail for truck movement uses several key inputs. For the purpose of this analysis, the following factors were assumed:

- The intermodal yard will begin operating in January 2018.
- A full intermodal train is assumed to carry 440 TEU (twenty-foot equivalent units), or 220 FEU (forty-foot equivalent units.
- One train will operate per week initially with an increased number of trains per week as demand warrants.
- Volumes will ramp up over time, growing from 30% of train capacity in 2018 to 75% of capacity in 2023, and to 100% of capacity in 2028.
- The average truck distance from Richland to Seattle-Tacoma is 229 miles.
- The average truck distance to Richland from local producers is 40 miles.
- The average rail distance from Richland to Seattle-Tacoma is 346 miles.
- Trucks move one ton of freight 240 miles per gallon of fuel.
- Trains move one ton of freight 640 miles per gallon of fuel.
- Trucks and trains both move full containers from Richland to Seattle-Tacoma and empty containers back.

Reduced Highway Maintenance

Based on the assumptions outlined above, total truck miles saved are projected to grow from approximately 1.3 million round-trip miles in 2018 (first year of operation) to 4.3 million miles per year at full operation (years 2028 through 2037).

According to WSDOT, diverting cargo from trucks to rail will reduce highway maintenance costs by $0.12 per mile. Using this figure, road maintenance savings grow from approximately $155,000 in 2018 to nearly $518,000 per year at full operation, as measured in 2016 dollars. Total highway maintenance savings from 2018 through 2037 is estimated to be approximately $8.5 million, prior to discounting for inflation. Using a discount rate of 3% the net present value of highway maintenance savings is estimated to be approximately $5.9 million, and using a discount rate of 7% it is estimated to be $3.8 million.[16]

Reduced Accidents

The value of reduced accidents can be calculated using a method similar to that used for calculated the value of reduced highway maintenance. Guidance from the USDOT recommends using a factor of 1.08 fatal accidents per 100 million miles of truck travel, and an average value of $9,600,000 per fatality.

As described above, round-trip truck miles saved are projected to grow from approximately 1.3 million miles in 2018 to 4.3 million miles per year from 2028 through 2037. Using these figures with the accident rate and value per fatality from USDOT, the value of reduced accidents is estimated to grow from approximately $134,000 in 2018 to $447,000 per year at full operation, as measured in 2016 dollars. The net present value of reduced accidents associated with a shift from truck to rail from 2018 through 2037 is estimated to be approximately $7.4 million, prior to discounting for inflation. Using a discount rate of 3% the net present value of reduced accidents

[16] USDOT recommends discounting at 3% and 7% as a part of the Tiger Grant program.

is estimated to be approximately $5.1 million, and using a discount rate of 7% it is estimated to be $3.3 million.

Savings in Operational Costs

The savings in operational costs are based upon the cost of operations per mile, which is estimated at $0.10 per mile for trucks and $0.029 per mile for rail. The net present value of savings in operational costs is estimated to be approximately $76.5 million, prior to discounting for inflation. Using a discount rate of 3% the net present value of operational savings is estimated to be approximately $52.8 million, and using a discount rate of 7% it is estimated to be $33.9 million.

Reduced Emissions

Using guidance from the USDOT, the value of the reduced emissions of carbon dioxide can be estimated. The value of reduced emissions is estimated to be approximately $3.5 million, prior to discounting for inflation. Using a discount rate of 3% the net present value of reduced emissions is estimated to be $2.4 million, and using a discount rate of 7% it is estimated to be $1.5 million.

Summary of Benefits from Inland Port Assuming One Train per Week

As shown in Table 18, the total of benefits associated one unit train per week is estimated to be $95.9 million (undiscounted), $66.1 million (discounted at 3%) and $42.5 million (discounted at 7%). If two unit trains were operated, the benefits would be twice the values in Table 18.

These benefits should be considered conservative, due primarily to the level of container traffic used in the model. This container traffic was assumed to originate in the Tri-Cities area, and did not include traffic originating farther away. For example, shippers in the Lewiston area might be able to truck product to the Horn Rapids area for rail shipment to Seattle/Tacoma, rather than trucking the product the entire distance.

Table 18 – Summary of Environmental Benefits ($millions of 2016$)

	Discount Rate		
Category	**7.0%**	**3.0%**	**Undiscounted**
Highway maintenance cost savings using rail vs truck	$3.8	$5.9	$8.5
Reduced severity of accidents due to VMT reduction	$3.3	$5.1	$7.4
Savings in operational cost of switching to rail	$33.9	$52.8	$76.5
GHG reduced (CO2 only)	$1.5	$2.4	$3.5
Total	$42.5	$66.1	$95.9

Source: BST Associates

The total value of the benefits generated by the Port of Benton rail line is much greater than the line's appraised value of $25.6 million. As detailed in Table 19, at a minimum these benefits may be worth $142.4 million, but may be as high as $304.6 in 2016 dollars.

Even when these values are discounted over time the totals remain higher than the appraised value of the rail line. Using a very conservative discount rate of 7.0% and the lowest value estimates, the total value of all benefits is $56.9 million. Using a discount rate of 3.0% and the lowest value estimates the total value of all benefits is $93.7 million.

In addition to these benefits, rail-related development at Horn Rapids may support between 370 and 1,771 jobs. Total annual payroll from these jobs may range from $14.3 million to $100.4 million.

Table 19 – Summary of Rail Benefits ($millions of 2016$)

	Low			High			Average		
	Discount Rate			Discount Rate			Discount Rate		
Category	**7.0%**	**3.0%**	**Undisc.**	**7.0%**	**3.0%**	**Undisc.**	**7.0%**	**3.0%**	**Undisc.**
Rail-Related Development									
Value of land sales	$1.51	$2.04	$2.66	$12.02	$16.25	$21.21	$6.77	$9.15	$11.94
Value of construction	$10.4	$21.4	$37.6	$79.7	$164.3	$288.2	$45.05	$92.85	$162.90
Total land and construction	$11.91	$23.44	$40.26	$91.72	$180.55	$309.41	$51.81	$101.99	$174.84
Tax Benefits									
Sales tax on construction									
Assumes no exemption	$0.89	$1.84	$3.23	$6.85	$14.13	$24.78	$3.87	$7.99	$14.01
Assumes half is exempt	$0.45	$0.92	$1.62	$3.43	$7.07	$12.39	$1.94	$4.00	$7.01
Property tax									
City of Richland	$0.47	$0.72	$1.04	$3.57	$5.52	$7.95	$2.02	$3.12	$4.50
Port of Benton	$0.07	$0.11	$0.16	$0.54	$0.84	$1.21	$0.31	$0.48	$0.69
Other	$1.52	$2.36	$3.40	$11.68	$18.08	$26.03	$6.60	$10.22	$14.72
Total	$2.06	$3.19	$4.59	$15.79	$24.44	$35.18	$8.93	$13.82	$19.89
Total taxes w/o exemption	$2.95	$5.03	$7.82	$22.64	$38.57	$59.96	$12.80	$21.80	$33.89
Total taxes w/ exemption	$2.51	$4.11	$6.21	$19.22	$31.51	$47.57	$10.87	$17.81	$26.89
Environmental Benefits									
Highway maintenance cost savings using rail vs truck	$3.80	$5.90	$8.50	$3.80	$5.90	$8.50	$3.80	$5.90	$8.50
Reduced severity of accidents due to VMT reduction	$3.30	$5.10	$7.40	$3.30	$5.10	$7.40	$3.30	$5.10	$7.40
Savings in operational cost of switching to rail	$33.90	$52.80	$76.50	$33.90	$52.80	$76.50	$33.90	$52.80	$76.50
GHG reduced (CO2 only)	$1.50	$2.40	$3.50	$1.50	$2.40	$3.50	$1.50	$2.40	$3.50
Total Environment Benefits	$42.50	$66.10	$95.90	$42.50	$66.10	$95.90	$42.50	$66.10	$95.90
Grand Total									
w/o exemption	$57.36	$94.57	$143.98	$156.86	$285.22	$465.27	$107.11	$189.90	$304.63
with exemption	$56.92	$93.65	$142.37	$153.44	$278.16	$452.88	$105.18	$185.91	$297.63

Appendix B –

Engineers Opinion of Probable Cost for Infrastructure

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

2810 W. Clearwater Ave. Suite 201, Kennewick, WA 99336

PROJECT: Port of Benton
2017 NHRAMP

DATE: 2-Apr-17

DESCRIPTION: Road "A" - 5,300 Lineal Feet

J-U-B PROJ. NO.: 30-16-045

ITEM No.	DESCRIPTION	SCHEDULE OF VALUES			
		QTY	UNIT	UNIT PRICE	TOTAL COST
1.00	Mobilization			8.0%	$ 90,233
2.00	Clearing and Grubbing	12	AC	$ 1,500	$ 18,251
3.00	Hydroseeding	6	AC	$ 1,500	$ 9,125
4.00	Earthwork	15,704	CY	$ 10	$ 157,037
5.00	4-Inch HMA	5,312	TON	$ 92	$ 488,684
6.00	Soil Residual Herbacide	32,978	SY	$ 1	$ 32,978
7.00	SPCC	1	EA	$ 2,000	$ 2,000
8.00	2-Inch Crushed Surfacing Top Course	3,644	TON	$ 20	$ 72,881
9.00	8-Inch Crushed Surfacing Base Course	10,258	TON	$ 18	$ 184,652
10.00	Roadway Striping	21,200	LF	$ 2	$ 42,400
11.00	Roadway Monument Case and Cover	2	EA	$ 750	$ 1,500
12.00	Roadway Signage	6	EA	$ 400	$ 2,400
13.00	Temporary Erosion and Sediment Controls	1	LS	$ 10,000	$ 10,000
14.00	Street Lighting System	1	LS	$ 106,000	$ 106,000
15.00	Construction Staking	1	LS	3.0%	$ 33,837
16.00	Materials Testing	1	LS	2.0%	$ 22,558
17.00	City of Richland ROW Permit Fee	1	LS	5.0%	$ 56,395
18.00	Primary Electrical Service	1	LS	$ 318,000	$ 318,000
19.00	Telecommunications	1	LS	$ 106,000	$ 106,000
20.00	Rail Crossing	1	EA	$ 100,000	$ 100,000
				ESTIMATED CONSTRUCTION SUBTOTAL [45]	**$ 1,854,931**
				Contingency [1]	**$ 463,733**
				Planning, Engineering, & Administrative Costs [2]	**$ 579,666**
				Washington State Sales Tax	**$ 249,000**
				TOTAL PROBABLE COST IN 2016 DOLLARS [345]	**$ 3,147,329**

1 Estimated at 25% of construction subtotal

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 25% of construction subtotal, including contingency

3 Costs are in 2016 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes.

4 Excludes Stevens Drive and Georege Washington Way Intersection Improvements

5 No easement acquisition or legal costs are included.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

2810 W. Clearwater Ave. Suite 201, Kennewick, WA 99336

PROJECT: Port of Benton
2017 NHRAMP

DATE: 2-Apr-17

DESCRIPTION: Road "B" - 3,200 Lineal Feet

J-U-B PROJ. NO.: 30-16-045

ITEM No.	DESCRIPTION	SCHEDULE OF VALUES QTY	UNIT	UNIT PRICE	TOTAL COST
1.00	Mobilization			8.0%	$ 55,248
2.00	Clearing and Grubbing	7	AC	$ 1,500	$ 11,019
3.00	Hydroseeding	4	AC	$ 1,500	$ 5,510
4.00	Earthwork	9,481	CY	$ 10	$ 94,815
5.00	4-Inch HMA	3,207	TON	$ 92	$ 295,054
6.00	Soil Residual Herbacide	19,911	SY	$ 1	$ 19,911
7.00	SPCC	1	EA	$ 1,500	$ 1,500
8.00	2-Inch Crushed Surfacing Top Course	2,200	TON	$ 20	$ 44,004
9.00	8-Inch Crushed Surfacing Base Course	6,194	TON	$ 18	$ 111,488
10.00	Roadway Striping	12,800	LF	$ 2	$ 25,600
11.00	Roadway Monument Case and Cover	6	EA	$ 750	$ 4,500
12.00	Roadway Signage	8	EA	$ 400	$ 3,200
13.00	Temporary Erosion and Sediment Controls	1	LS	$ 10,000	$ 10,000
14.00	Street Lighting System	1	LS	$ 64,000	$ 64,000
15.00	Construction Staking	1	LS	3.0%	$ 22,375
16.00	Materials Testing	1	LS	2.0%	$ 13,812
17.00	City of Richland ROW Permit Fee	1	LS	5.0%	$ 34,530
18.00	Primary Electrical Service	1	LS	$ 192,000	$ 192,000
19.00	Telecommunications	1	LS	$ 64,000	$ 64,000
				ESTIMATED CONSTRUCTION SUBTOTAL [45]	**$ 1,073,000**
				Contingency [1]	**$ 268,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 335,000**
				Washington State Sales Tax	**$ 144,000**
				TOTAL PROBABLE COST IN 2016 DOLLARS [345]	**$ 1,820,000**

1 Estimated at 25% of construction subtotal

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 25% of construction subtotal, including contingency

3 Costs are in 2016 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes.

4 Excludes Kingsgate Way and Horn Rapids Road Intersection Improvements

5 No easement acquisition or legal costs are included.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

2810 W. Clearwater Ave. Suite 201, Kennewick, WA 99336

PROJECT: Port of Benton
2017 NHRAMP

DATE: 2-Apr-17

DESCRIPTION: Road "C" - 12,100 Lineal Feet

J-U-B PROJ. NO.: 30-16-045

ITEM No.	DESCRIPTION	SCHEDULE OF VALUES QTY	UNIT	UNIT PRICE	TOTAL COST
1.00	Mobilization			8.0%	$ 204,635
2.00	Clearing and Grubbing	28	AC	$ 1,500	$ 41,667
3.00	Hydroseeding	14	AC	$ 1,500	$ 20,833
4.00	Earthwork	35,852	CY	$ 10	$ 358,519
5.00	4-Inch HMA	12,127	TON	$ 92	$ 1,115,674
6.00	Soil Residual Herbacide	75,289	SY	$ 1	$ 75,289
7.00	SPCC	1	EA	$ 1,500	$ 1,500
8.00	2-Inch Crushed Surfacing Top Course	8,319	TON	$ 20	$ 166,388
9.00	8-Inch Crushed Surfacing Base Course	23,420	TON	$ 18	$ 421,564
10.00	Roadway Striping	48,400	LF	$ 2	$ 96,800
11.00	Roadway Monument Case and Cover	6	EA	$ 750	$ 4,500
12.00	Roadway Signage	8	EA	$ 400	$ 3,200
13.00	Temporary Erosion and Sediment Controls	1	LS	$ 10,000	$ 10,000
14.00	Street Lighting System	1	LS	$ 242,000	$ 242,000
15.00	Construction Staking	1	LS	3.0%	$ 82,877
16.00	Materials Testing	1	LS	2.0%	$ 51,159
17.00	City of Richland ROW Permit Fee	1	LS	5.0%	$ 127,897
18.00	Primary Electrical Service	1	LS	$ 726,000	$ 726,000
19.00	Telecommunications	1	LS	$ 242,000	$ 242,000
				ESTIMATED CONSTRUCTION SUBTOTAL [4,5]	**$ 3,993,000**
				Contingency [1]	**$ 998,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 1,248,000**
				Washington State Sales Tax	**$ 537,000**
				TOTAL PROBABLE COST IN 2016 DOLLARS [3,4,5]	**$ 6,776,000**

1 Estimated at 25% of construction subtotal

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 25% of construction subtotal, including contingency

3 Costs are in 2016 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes.

4 Excludes Kingsgate Way and Horn Rapids Road Intersection Improvements

5 No easement acquisition or legal costs are included.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

2810 W. Clearwater Ave. Suite 201, Kennewick, WA 99336

PROJECT: Port of Benton
2017 NHRAMP

DATE: 2-Apr-17

DESCRIPTION: Road "D" - 5,000 Lineal Feet

J-U-B PROJ. NO.: 30-16-045

ITEM No.	DESCRIPTION	SCHEDULE OF VALUES QTY	UNIT	UNIT PRICE	TOTAL COST
1.00	Mobilization			8.0%	$ 85,461
2.00	Clearing and Grubbing	11	AC	$ 1,500	$ 17,218
3.00	Hydroseeding	6	AC	$ 1,500	$ 8,609
4.00	Earthwork	14,815	CY	$ 10	$ 148,148
5.00	4-Inch HMA	5,011	TON	$ 92	$ 461,022
6.00	Soil Residual Herbacide	31,111	SY	$ 1	$ 31,111
7.00	SPCC	1	EA	$ 1,500	$ 1,500
8.00	2-Inch Crushed Surfacing Top Course	3,438	TON	$ 20	$ 68,756
9.00	8-Inch Crushed Surfacing Base Course	9,678	TON	$ 18	$ 174,200
10.00	Roadway Striping	20,000	LF	$ 2	$ 40,000
11.00	Roadway Monument Case and Cover	6	EA	$ 750	$ 4,500
12.00	Roadway Signage	8	EA	$ 400	$ 3,200
13.00	Temporary Erosion and Sediment Controls	1	LS	$ 10,000	$ 10,000
14.00	Street Lighting System	1	LS	$ 100,000	$ 100,000
15.00	Construction Staking	1	LS	3.0%	$ 34,612
16.00	Materials Testing	1	LS	2.0%	$ 21,365
17.00	City of Richland ROW Permit Fee	1	LS	5.0%	$ 53,413
18.00	Primary Electrical Service	1	LS	$ 300,000	$ 300,000
19.00	Telecommunications	1	LS	$ 100,000	$ 100,000
				ESTIMATED CONSTRUCTION SUBTOTAL [45]	**$ 1,663,000**
				Contingency [1]	**$ 416,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 520,000**
				Washington State Sales Tax	**$ 224,000**
				TOTAL PROBABLE COST IN 2016 DOLLARS [345]	**$ 2,823,000**

1 Estimated at 25% of construction subtotal

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 25% of construction subtotal, including contingency

3 Costs are in 2016 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes.

4 Excludes Kingsgate Way and Horn Rapids Road Intersection Improvements

5 No easement acquisition or legal costs are included.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

2810 W. Clearwater Ave. Suite 201, Kennewick, WA 99336

PROJECT: Port of Benton
2017 NHRAMP

DATE: 28-Sep-16

DESCRIPTION: Kingsgate Way and Horn Rapids Road Intersection

J-U-B PROJ. NO.: 30-16-045

ITEM No.	DESCRIPTION	SCHEDULE OF VALUES QTY	UNIT	UNIT PRICE	TOTAL COST
1.00	Mobilization			8.0%	$ 3,213
2.00	Clearing and Grubbing	1	AC	$ 1,500	$ 1,500
3.00	Hydroseeding	1	AC	$ 1,500	$ 1,500
4.00	Earthwork	500	CY	$ 12	$ 6,000
5.00	4-Inch HMA	50	TON	$ 100	$ 5,011
6.00	Soil Residual Herbacide	311	SY	$ 2	$ 622
7.00	SPCC	1	EA	$ 1,500	$ 1,500
8.00	2-Inch Crushed Surfacing Top Course	34	TON	$ 28	$ 963
9.00	8-Inch Crushed Surfacing Base Course	97	TON	$ 26	$ 2,516
10.00	Roadway Striping	1,400	LF	$ 2	$ 2,800
11.00	Roadway Monument Case and Cover	1	EA	$ 750	$ 750
12.00	Roadway Signage	4	EA	$ 500	$ 2,000
13.00	Temporary Erosion and Sediment Controls	1	LS	$ 5,000	$ 5,000
14.00	Street Lighting System	1	LS	$ 10,000	$ 10,000
15.00	Demolition	1	LS	$ 20,000	$ 20,000
16.00	Fence Relocation	1	LS	$ 15,000	$ 15,000
17.00	Traffic Control	1	LS	$ 10,000	$ 10,000
18.00	Construction Staking	1	LS	3.0%	$ 2,465
19.00	Materials Testing	1	LS	3.0%	$ 2,285
20.00	City of Richland ROW Permit Fee	1	LS	5.0%	$ 3,808
				ESTIMATED CONSTRUCTION SUBTOTAL [45]	**$ 97,000**
				Contingency [1]	**$ 24,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 30,000**
				Washington State Sales Tax	**$ 13,000**
				TOTAL PROBABLE COST IN 2016 DOLLARS [345]	**$ 164,000**

1 Estimated at 25% of construction subtotal

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 25% of construction subtotal, including contingency

3 Costs are in 2016 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes.

4 No easement acquisition or legal costs are included.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

2810 W. Clearwater Ave. Suite 201, Kennewick, WA 99336

PROJECT: Port of Benton
2017 NHRAMP

DATE: 2-Apr-17

DESCRIPTION: Sewer Main Extention

J-U-B PROJ. NO.: 30-16-045

ITEM No.	DESCRIPTION	SCHEDULE OF VALUES QTY	UNIT	UNIT PRICE	TOTAL COST
1.00	**Mobilization**			8.0%	$ 178,000
2.00	**Construction Traffic Control**			5.0%	$ 111,000
3.00	**Gravity Sewer Pipe**				
3.01	8" PVC Gravity Sewer Pipe	400	LF	$ 16	$ 6,400
3.02	10" PVC Gravity Sewer Pipe		LF	$ 18	$ -
3.03	12" PVC Gravity Sewer Pipe		LF	$ 20	$ -
3.04	15" PVC Gravity Sewer Pipe		LF	$ 30	$ -
3.05	18" PVC Gravity Sewer Pipe		LF	$ 40	$ -
3.06	21" PVC Gravity Sewer Pipe		LF	$ 50	$ -
3.07	24" PVC Gravity Sewer Pipe	17,000	LF	$ 65	$ 1,105,000
3.08	30" PVC Gravity Sewer Pipe		LF	$ 80	$ -
3.09	36" PVC Gravity Sewer Pipe		LF	$ 110	$ -
3.10	Import Bedding and Foundation Material		LF	$ 15	$ -
4.00	**Gravity Trench Excav./Backfill**				
4.01	4-10 ft.		LF	$ 20	$ -
4.02	4-10 ft. Alley		LF	$ 25	$ -
4.03	10-16 ft.	17,400	LF	$ 30	$ 522,000
4.04	10-16 ft. Alley		LF	$ 40	$ -
4.05	16-20 ft.		LF	$ 50	$ -
4.06	16-20 ft. Alley		LF	$ 60	$ -
4.07	20-24 ft.		LF	$ 70	$ -
4.08	24-28 ft.		LF	$ 100	$ -
4.09	28-30 ft.		LF	$ 150	$ -
4.10	Import Backfill and Foundation Material		CY	$ 25	$ -
5.00	**Surface Repair**				
5.01	Natural Ground	17,400	LF	$ 20	$ 348,000
5.02	Gravel Roadway		LF	$ 25	$ -
5.03	Asphalt - Trench Patch width per City Standards (Required for 4-16' Depth Sewer)		LF	$ 35	$ -
5.04	Asphalt - ½ Street width per City Standards (Required for 16-20' Depth Sewer)		LF	$ 50	$ -
5.05	Asphalt - Full Street width per City Standards (Required for 20-30' Depth Sewer)		LF	$ 80	$ -
6.00	**Manholes**				
6.01	48" Manholes, 4-10 ft.		EA	$ 3,500	$ -
6.02	48" Manholes, 10-16 ft.	46	EA	$ 4,000	$ 184,000
6.03	48" Manholes, 16-20 ft.		EA	$ 5,500	$ -
6.04	60" Manholes, 7-16 ft.		EA	$ 7,500	$ -
6.05	60" Manholes, 16-24 ft.		EA	$ 15,000	$ -
6.06	60" Manholes, 24-30 ft.		EA	$ 18,000	$ -
7.00	**Project Specific Considerations**				
8.00	**Miscellaneous Other**				
8.01	Bypass Pumping			0.0%	$ -
8.03	Bonding / Admin			2.5%	$ 54,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 2,508,000**
				Contingency [1]	**$ 627,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 784,000**
				Washington State Sales Tax	**$ 337,000**
				TOTAL PROBABLE COST IN 2015 DOLLARS [3]	**$ 4,256,000**

1 Estimated at 25% of construction subtotal

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 25% of construction subtotal, including contingency

3 Costs are in 2015 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.

ENGINEER'S OPINION OF PROBABLE COST

J-U-B ENGINEERS, INC.

2810 W. Clearwater Ave. Suite 201, Kennewick, WA 99336

PROJECT: Port of Benton
2017 NHRAMP

DATE: 2-Apr-17

DESCRIPTION: Water Main Extention

J-U-B PROJ. NO.: 30-16-045

ITEM No.	DESCRIPTION	SCHEDULE OF VALUES QTY	UNIT	UNIT PRICE	TOTAL COST
1.00	**Mobilization**			8.0%	$ 906,000
2.00	**Construction Traffic Control**			5.0%	$ 567,000
3.00	**Water Pipe**				
3.01	12" PVC Water Pipe	28,000	LF	$ 91	$ 2,548,000
3.02	8" DI Water Pipe	600	LF	$ 42	$ 25,200
3.03	6" DI Water Pipe	2,800	LF	$ 30	$ 84,000
3.04	Fire Hydrant Assembly	47	EA	$ 3,200	$ 149,333
3.05	8" Gate Valve	6	EA	$ 1,500	$ 9,000
3.06	12" Butterfly Valve	25	EA	$ 2,500	$ 62,500
4.00	**Trench Excav./Backfill**				
4.01	4-10 ft.	30,800	LF	$ 20	$ 616,000
4.02	4-10 ft. Alley		LF	$ 25	$ -
4.03	10-16 ft.		LF	$ 30	$ -
4.04	10-16 ft. Alley		LF	$ 40	$ -
4.05	16-20 ft.		LF	$ 50	$ -
4.06	16-20 ft. Alley		LF	$ 60	$ -
4.07	20-24 ft.		LF	$ 70	$ -
4.08	24-28 ft.		LF	$ 100	$ -
4.09	28-30 ft.		LF	$ 150	$ -
4.10	Import Backfill and Foundation Material		CY	$ 25	$ -
5.00	**Surface Repair**				
5.01	Natural Ground	28,000	LF	$ 20	$ 560,000
5.02	Gravel Roadway		LF	$ 25	$ -
5.03	Asphalt - Trench Patch width per City Standards (Required for 4-16' Depth Se		LF	$ 35	$ -
5.04	Asphalt - ½ Street width per City Standards (Required for 16-20' Depth Sewe		LF	$ 50	$ -
5.05	Asphalt - Full Street width per City Standards (Required for 20-30' Depth Sew		LF	$ 80	$ -
6.00	**Project Specific Considerations**				
6.01	2 MG Storage Reservoir	2,000,000	GAL	$ 2.00	$ 7,000,000
7.00	**Miscellaneous Other**				
7.01	Bypass Pumping			0.0%	$ -
7.02	Bonding / Admin			2.5%	$ 276,000
				ESTIMATED CONSTRUCTION SUBTOTAL	**$ 12,803,000**
				Contingency [1]	**$ 3,201,000**
				Planning, Engineering, & Administrative Costs [2]	**$ 4,001,000**
				Washington State Sales Tax	**$ 1,720,000**
				TOTAL PROBABLE COST IN 2015 DOLLARS [3]	**$ 21,725,000**

1 Estimated at 25% of construction subtotal

2 Planning, Engineering, & Administrative costs include: Geotechnical Evaluations, Design, Survey, Construction Management, O&M Manuals, Record Drawings, and Administration. Estimated at 25% of construction subtotal, including contingency

3 Costs are in 2015 dollars and should be inflated appropriately to the mid-point of construction for budgeting purposes. No easement acquisition or legal costs are included.