Remediation Work Plan

Wishram, Washington

BNSF Railway Company

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Kennedy/Jenks Consultants

REMEDIATION WORK PLAN
WISHRAM, WASHINGTON

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EXECUTIVE SUMMARY

This Work Plan describes remediation activities to be conducted at the BNSF Railway Company (BNSF) Wishram Railyard (site) located in Wishram, Washington (refer to Figure 1). Results of investigations conducted in 2003/2004 indicate that petroleum hydrocarbons are present in soil and groundwater in three localized areas at the site at concentrations greater than Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) cleanup levels. The three affected areas include 1) a vacant lot next to the maintenance shop, 2) the former fueling island, and 3) the former location of a small powerhouse (refer to Figure 2). Remediation in each area will include excavation and offsite disposal of petroleum-containing soil, in situ enhanced natural attenuation of petroleum hydrocarbons in groundwater using oxygen release compound (ORC), and recovery of non-aqueous phase liquids (NAPL) using recovery wells and skimmer pumps (if NAPL cannot be removed during excavation).

Excavation will include removal of concrete foundations, petroleum-containing soil, and piping related to former fueling operations. Spur tracks located near the former fueling island are scheduled for removal by BNSF prior to the anticipated time of excavation. Confirmation soil samples will be collected from each excavation and submitted for laboratory analysis. Soil samples will also be collected from "clean" stockpiled materials and from soil disposed offsite.

Excavations will be backfilled with "clean" overburden and imported pit-run and compacted to 95% of ASTM D1557 Modified proctor. Backfill may also include broken concrete derived from the foundations in the excavation areas. ORC will be applied directly to the bottoms of excavations prior to backfilling and will be applied to the saturated zone downgradient of each area using a direct-push drill rig.

Up to two recovery wells may be installed in each area if NAPL cannot be removed during excavation. Belt-skimming devices will be installed in each recovery well, and recovered NAPL will be disposed offsite at a licensed treatment and disposal facility.

Groundwater monitoring using existing monitoring wells and recovery wells (if installed) will be performed beginning approximately 6 months after the initial ORC treatment. The remediation project will be considered complete when NAPL is no longer evident in recovery wells and upon completion of four consecutive quarterly groundwater monitoring events. At project completion, monitoring and recovery wells and one abandoned water supply well at the site will be decommissioned in accordance with Ecology standards. A final remediation report will be prepared and submitted to BNSF and Ecology.

1.0 INTRODUCTION

Kennedy/Jenks Consultants has prepared this remediation work plan on behalf of BNSF Railway Company (BNSF) to address petroleum hydrocarbons in soil and groundwater near the western end of the BNSF Railyard in Wishram, Washington (the site). This work plan was developed based on the results of an underground storage tank (UST) site assessment and removal completed in April 2002 and a soil and groundwater assessment conducted between September 2003 and July 2004.

A report describing the April 2002 removal of a 30,000-gallon fuel oil UST from the site was submitted to the Washington State Department of Ecology (Ecology) in October 2003 (Kennedy/Jenks Consultants 2003), and additional UST site assessment activities were documented in a separate UST Site Assessment Report (Kennedy/Jenks Consultants 2004a). A report for the soil and groundwater assessment performed in 2003/2004 was submitted to BNSF in August 2004 (Kennedy/Jenks Consultants 2004b). The analytical results for the area where remedial activities will be implemented (the site) are summarized in Section 3.0 of this work plan.

1.1 WORK PLAN ORGANIZATION

This work plan is organized as follows:

- Section 2.0 describes the site, including site history and hydrogeologic conditions.
- Section 3.0 summarizes previous site assessment activities and findings.
- Section 4.0 describes the remediation work plan for each of three remediation areas.
- Section 5.0 provides the Sampling and Analysis Plan for the remediation areas.

- Section 6.0 cites the Health and Safety Plan for the remediation project.

- Section 7.0 lists the references cited in this work plan.

2.0 SITE LOCATION AND DESCRIPTION

2.1 SITE LOCATION

The town of Wishram is located in Klickitat County, Washington, approximately 13 miles northeast of The Dalles, Oregon, and 0.75 mile south of Washington State Route 14 (Figure 1). The BNSF railyard extends for approximately 1 mile along the southern boundary of the town, along the northern shoreline of the Columbia River. The site, near the western end of the railyard, lies primarily within the southwestern quarter of the southwestern quarter of Section 17, Township 2 North, Range 15, east of the Willamette Meridian (W.M.), extending between 40 and 100 feet into the southeastern quarter of Section 18, Township 2 North, Range 15, east of the W.M.

For the purposes of this work plan, the site includes three separate remediation areas, shown on Figure 2:

1. Maintenance Shop Area
2. Former Fueling Island Area
3. Former Powerhouse Area.

2.2 SITE DESCRIPTION AND HISTORY

The site, shown on Figure 2, is approximately 400 feet long by 400 feet wide and encompasses slightly less than 3 acres. It is bounded by the town of Wishram to the north, railyard right-of-way to the east and west, and the Columbia River to the south and southwest. A berm along the site's southern boundary rises 3 to 4 feet higher than the railyard ground surface, then descends approximately 15 feet to the river's edge. Apart from the berm, the site is relatively flat and lies at an elevation of approximately 175 feet above mean sea level (msl). Current onsite structures include a small building used as an office and tool storage (maintenance shop), two mainline tracks, and two switching spurs. Portions of these switching spurs, including those located in the work area, are scheduled for removal by BNSF in July 2005, prior to the anticipated time of excavation.

Between the 1940s and 1970s, diesel fuel for locomotive fueling was stored in two 100,000-gallon aboveground storage tanks (ASTs) located approximately 100 feet north of the site on a parcel currently owned and occupied by the Wishram Post Office (BNSF 1960, Staubach 2004). The former fueling island (an approximately 8-foot-wide by 115-foot-long concrete slab structure) is located south of the existing mainline tracks, several hundred feet south of the former AST location (refer to Figure 2). The foundation of a pumphouse formerly associated with transferring fuel from the ASTs to the fueling island is located in the site's northwestern corner, approximately 80 feet west of the maintenance shop (Figure 2).

The results of an underground utility survey conducted in February 2005 indicate underground piping may extend approximately 100 feet southeast from the former pumphouse toward the former fueling island located on the southern side of the mainline tracks (no pipes were detected north of the pumphouse foundation). During the utility survey, it was not possible to trace the piping under the mainline tracks, but it is assumed that the pipes continue southward under the tracks. Additional underground piping and appurtenances extend up to 100 feet south of the former fueling island toward the southernmost switching spur. The locations of underground piping identified in the February 2005 survey are shown on Figure 2.

Concrete foundations in the southeastern corner of the site appear to have been associated with a small powerhouse that is identified on historical railyard station maps. In addition, a 15-inch-diameter well casing (reportedly 399 feet deep) surrounded by a concrete pad is present, approximately 100 feet southeast of the former powerhouse foundation, on top of the shoreline berm (Figure 2).

2.3 HYDROGEOLOGY

The town of Wishram and the site are located on coalescing alluvial fan and dune deposits that form an approximately 0.75-mile-wide by 2-mile-long, relatively flat piece of land adjacent to the Columbia River shoreline (Figures 1 and 2). The deposits are composed of fine to medium sand, range from approximately 15 to 40 feet thick, and overlie Columbia Plateau basalt. Based on the results of previous soil borings, the depth of basalt bedrock appears to range from approximately 40 feet below ground surface (bgs) near the Columbia River shoreline to a depth of approximately 15 feet bgs near the site's northern boundary (Figure 2). It is assumed that the upper surface of the bedrock is relatively uneven, similar to the upper surface of basalt outcrops in the general area.

North and west of the town of Wishram, the basalt bedrock crops out in nearly vertical cliffs that rise approximately 600 feet to the Columbia Plateau. A relatively narrow, steep-sided canyon cuts through the basalt cliffs near the northwestern corner of the town, descending from a large spring near the top of the Columbia Plateau. An intermittent stream, originating at the spring and periodically flowing out of the canyon, is directed to an outfall on the Columbia River through a ditch that was constructed to circumnavigate the western end of the town and railyard. Wishram obtains its potable water supply from the spring.

Groundwater is locally present beneath parts of the site at depths ranging from approximately 9 to 13 feet bgs. During the September 2003 UST site assessment, groundwater was not encountered above bedrock (15 feet bgs) in soil borings advanced near the site's northern boundary, but it was encountered at approximately 12 to 15 feet bgs in soil borings and monitoring wells completed south of the mainline railroad tracks (Figure 2). During the wet season in February and April 2004, groundwater was encountered above bedrock in the majority of soil borings advanced north of the mainline tracks, as well as in borings advanced closer to the river. The groundwater elevation increased approximately 6 feet between the dry and wet season monitoring events, suggesting the occurrence of seasonal groundwater flow from the north and/or seasonal recharge from the Columbia River.

The results of groundwater monitoring suggest that groundwater flows south-southwest, toward the river, with a gradient of approximately 0.006 feet per foot (ft/ft). However, seasonal recharge from the north and/or from the Columbia River may cause appreciable variation in the hydraulic gradient throughout the year.

3.0 SITE ASSESSMENT SUMMARY

As described in Section 1.0, descriptions and results of site assessments conducted at the railyard between 2002 and 2004 were provided to BNSF under separate cover (Kennedy/Jenks Consultants 2003, 2004a, 2004b). The following summary of soil and groundwater analytical results focuses on specific locations at the site where remediation activities will be implemented.

3.1 MAINTENANCE SHOP

Sampling was conducted west of the maintenance shop to evaluate the potential presence of petroleum hydrocarbons in soil and groundwater near the former pumphouse foundation and the former location of two 500-gallon USTs that were reportedly removed from this area in the 1980s (Figures 2 and 3). Results were as follows:

- Soil boring WSB-04-2 was completed a few feet northeast of the pumphouse foundation. Soil samples collected from 2 and 12 feet bgs did not contain petroleum hydrocarbons at concentrations exceeding laboratory reporting limits (Table 1).

- Soil boring WSB-04-6 was completed to a depth of 16 feet bgs, southwest of the former pumphouse. A soil sample collected from 8 feet bgs did not contain diesel- or oil-range hydrocarbons or polycyclic aromatic hydrocarbons (PAHs) at concentrations greater than laboratory reporting limits (Table 1), but an odor and sheen were observed at this depth. A groundwater sample from the soil boring contained gasoline-range hydrocarbons at a concentration of 390 micrograms per liter (µg/L), ethylbenzene at 5.10 µg/L, and total xylenes at 18.2 µg/L. All of these concentrations are below Washington State Department of Ecology Model Toxics Control Act (MTCA) Method A groundwater cleanup levels (Table 2).

- Soil boring WSB-04-7 and monitoring well WMW-7 were completed between the pumphouse foundation and the former location of the 500-gallon USTs (Figure 2). Subsurface soil in both locations exhibited an odor and sheen. NAPL was encountered in soil in the boring advanced for monitoring well WMW-7. A soil sample collected at 12 feet bgs from soil boring WSB-04-7 contained diesel-, oil-, and gasoline-range hydrocarbons at concentrations below MTCA Method A soil cleanup levels for industrial properties (MTCA Method A cleanup levels) (Table 1). Carcinogenic PAHs (cPAHs) were not detected in the samples at concentrations exceeding laboratory reporting limits. A groundwater sample collected from monitoring well WMW-7 contained gasoline- and diesel-range hydrocarbons at concentrations of 1,790 and 1,220 µg/L, respectively, which exceed MTCA Method A cleanup levels for groundwater (Table 3). Approximately 0.07 feet (less than 1 inch) of light NAPL was encountered in monitoring well MW-7 during the July 2004 monitoring event.

- In September 2003, petroleum hydrocarbons and naphthalene were detected at concentrations exceeding MTCA Method A soil cleanup levels for industrial properties at soil boring location WSB-2, southwest of the former location of the boiler house UST (Table 1). Multiple soil borings (WSB-1, WSB-3, WSB-04-14, WSB-04-15, refer to Figure 1) were sampled in this area, but only the sample from soil boring WSB-2 exhibited the elevated petroleum hydrocarbon concentrations (refer to Table 1). Therefore, it is assumed that the detected potential chemicals of concern (COCs) at this location are representative of only a very localized (de minimis) quantity of affected soil that remained in place after the UST was removed (Kennedy/Jenks Consultants 2003, 2004a), and these COCs are not addressed in this Work Plan.

3.2 FORMER FUELING ISLAND AND 5,000-GALLON LUBRICATING OIL ABOVEGROUND STORAGE TANK (AST)

Soil and/or direct-push groundwater samples were collected from nine soil borings advanced around and downgradient of the former fueling island and former location of a 5,000-gallon lubricating oil AST (Figures 2 and 4). These soil borings included WSB-4, WSB-6, WSB-7, WSB-04-9, WSB-04-26, WSB-04-16, WSB-04-12, WSB-04-29, and WSB-04-38. Groundwater monitoring was also conducted in this area at five monitoring wells (WMW-1 and WMW-3 through WMW-6) from September 2003 to April 2004. The following is a summary of the analytical results:

- Soil encountered between 3 and 16 feet bgs in a boring completed next to the northern side of the fueling island (WSB-04-9) exhibited an odor and sheen. In a soil sample collected from 5 feet bgs, diesel-, oil-, and gasoline-range hydrocarbons were detected at 12,100 milligrams per kilogram (mg/kg), 604 mg/kg, and 1,210 mg/kg, respectively. The diesel- and gasoline-range hydrocarbon concentrations exceed MTCA Method A cleanup levels. In a soil sample collected from 10 feet bgs, diesel-, oil-, and gasoline-range hydrocarbons were detected at 24, 602, and 977 mg/kg, respectively. Only the gasoline-range hydrocarbon concentration in this sample exceeded the MTCA Method A cleanup level. Ethylbenzene and xylenes were detected at concentrations below MTCA Method A cleanup levels in both samples (Table 1).

- At soil boring location WSB-04-26, soil from between approximately 8 and 16 feet bgs exhibited an odor and sheen. In a soil sample collected from 10 feet bgs, diesel-, oil-, and gasoline-range hydrocarbons were detected at concentrations of 21,100, 14,000, and 606 mg/kg, respectively, which are all above MTCA Method A cleanup levels. Toluene, ethylbenzene, and xylenes were detected in this sample at concentrations below MTCA Method A cleanup levels. A direct-push groundwater sample collected from soil boring WSB-04-26 contained diesel- and gasoline-range hydrocarbons at concentrations of 483 and 140 µg/L, respectively, which are below MTCA Method A cleanup levels. Ethylbenzene and xylenes were also detected in the groundwater sample at trace concentrations (Table 2).

- Soil retrieved from borings WSB-7 and WSB-16 and the soil boring drilled for monitoring well MW-3, approximately 50 feet south (assumed downgradient) of the eastern end of the fueling island, exhibited a slight odor. A sample collected from soil boring WSB-7 from 10 feet bgs contained diesel- and oil-range hydrocarbons at concentrations of 240 and 72.3 mg/kg, respectively, which are below MTCA Method A cleanup levels.

- Soil samples collected southeast of the fueling island from borings WSB-04-12 and WSB-29 (Figure 2) did not contain diesel-, oil-, or gasoline-range hydrocarbons at concentrations greater than the laboratory reporting limit. In addition, the soil sample collected from 10 feet bgs at soil boring location WSB-04-12 did contain PAHs and cPAHs at low concentrations, below MTCA Method A cleanup levels (Table 1).

- Soil samples from downgradient borings WSB-4, WSB-6, WSB-04-25, and WSB-04-38 (Figures 2 and 4) did not contain diesel- and oil-range hydrocarbons at concentrations exceeding MTCA Method A cleanup levels.

- Two groundwater monitoring events have been conducted at wells WMW-1, WMW-3, and WMW-4 (Figure 2). Wells WMW-5 and WMW-6 were sampled once in April 2004, shortly after they were installed. Petroleum hydrocarbons, volatile organic compounds (VOCs), and/or cPAHs were not detected at concentrations greater than MTCA Method A cleanup levels for groundwater in samples collected from the monitoring wells closest to the fueling island (WMW-3 and WMW-6). Diesel-range hydrocarbons were detected at a concentration slightly greater than the MTCA Method A cleanup level for groundwater in a sample collected from monitoring well WMW-1 in September 2003. A sample collected from this same well in April 2004 contained gasoline- and diesel-range hydrocarbons, xylenes, n-propylbenzene, and 1,2,4-trimethylbenzene, but at concentrations below MTCA Method A cleanup levels. Diesel-range hydrocarbons were detected at a concentration of 409 µg/L in the groundwater sample collected from well WMW-4 in

September 2003. No analytes were detected at concentrations above laboratory reporting limits in the sample collected from this well in April 2004 (Table 3).

- Total Resource Conversation and Recovery Act (RCRA) metals (unfiltered samples) analyses were conducted for groundwater samples collected in April 2004 from wells WMW-3, WMW-5, and WMW-6. Arsenic was detected at a concentration of 8.54 µg/L in the sample from well WMW-3 and at a concentration of 7.03 µg/L in the sample from well WMW-5. Both concentrations were slightly greater than the MTCA Method A cleanup level of 5 µg/L. In the sample from well WMW-6, the detected total arsenic concentration was 4.30 µg/L. Based on the total arsenic concentrations detected, it is expected that dissolved arsenic concentrations in groundwater will be below MTCA Method A cleanup levels (Table 3).

These field observations and analytical data suggest that diesel-, oil-, and/or gasoline-range hydrocarbons are present in soil at concentrations greater than MTCA Method A cleanup levels in a narrow area between the western end of the fueling island and the former location of the lubricating oil UST (soil borings WSB-04-9 and WSB-04-26).

3.3 FORMER POWERHOUSE

Remnants of the former powerhouse include partially buried concrete footings and slab foundations as shown on Figure 2. One soil boring (WSB-5) and one monitoring well (WMW-2) were advanced within the foundation perimeter in September 2003. In April 2004, soil boring WSB-04-37 was drilled adjacent to the eastern side of the foundation, and soil boring WSB-04-38 was advanced approximately 20 feet north of the former building.

Soil samples retrieved from between approximately 3 and 10 feet bgs from borings WSB-5 and WMW-2 contained wood and metal debris coated with a viscous petroleum compound. A sample collected from 10 feet bgs from soil boring WSB-5 contained diesel- and oil-range hydrocarbons at concentrations of 21,000 and 21,600 mg/kg, respectively. Soil collected from soil boring WSB-04-37, just outside and east of the foundation perimeter, exhibited a strong odor and sheen, but no debris and no visible evidence of petroleum. A sample from 7 feet bgs from soil boring WSB-04-37 contained diesel- and oil-range hydrocarbons at concentrations of 2,490 and 3,740 mg/kg, respectively. No evidence of petroleum hydrocarbons was observed in samples collected from soil boring WSB-04-38, 20 feet to the north (Table 1). These observations and data suggest that the buried debris and petroleum compounds observed in the former powerhouse borings appear to be localized.

A groundwater sample collected from monitoring well WMW-2 on 18 September 2003 contained diesel- and oil-range hydrocarbons, benzene, and cPAHs at concentrations exceeding MTCA Method A cleanup levels for groundwater, as well as low concentrations of toluene, ethylbenzene, and xylenes (Table 3). In April 2004, a sample from this same well contained 750 µg/L of gasoline-range hydrocarbons, 844 µg/L of diesel-range hydrocarbons, 17.4 µg/L of benzene, 18.4 µg/L of arsenic, and low concentrations of ethylbenzene, toluene, and xylenes. NAPL was also encountered in the well during sampling. In April 2004, only the diesel-range hydrocarbon, benzene, and arsenic concentrations exceeded MTCA Method A cleanup levels for groundwater.

Petroleum hydrocarbons and BTEX observed in groundwater at monitoring well WMW-2 appear to be localized. Groundwater samples collected upgradient of the powerhouse, from monitoring well locations WMW-3, WMW-5, and WSB-04-27, and from monitoring well WSB-04-34 east of the powerhouse, did not contain petroleum hydrocarbons at concentrations approaching the concentrations observed at monitoring well WMW-2 (Table 3). Furthermore, monitoring well WMW-2 was the only location where benzene was detected during the site assessment.

4.0 REMEDIATION WORK PLAN

The objectives of the remedial actions discussed below are to remove, to the extent practicable, petroleum-containing soil and NAPL, and to enhance natural attenuation of petroleum hydrocarbons in groundwater using oxygen-release compound (ORC).

The remediation alternative selected for the site includes the following activities:

- Removing petroleum-containing soil, to the extent practicable, from the three affected areas (maintenance shop, former fueling island, and former powerhouse areas).

- Removing NAPL that is potentially present in areas that are not accessible to excavation (e.g., under mainline tracks) using recovery wells and belt-skimmers.

- Enhancing natural attenuation of dissolved petroleum hydrocarbon in groundwater using ORC.

- Decommissioning an unused water supply well, recovery wells (if installed), and monitoring wells upon project completion.

Specific remediation tasks are described below. Sampling, analysis, and reporting activities for the project are described in Section 5.0, and a site-specific health and safety plan (HASP) is provided in Section 6.0.

4.1 SOIL EXCAVATION AND OFFSITE DISPOSAL

To the extent practicable, soil that contains NAPL and/or concentrations of petroleum hydrocarbons exceeding MTCA Method A cleanup levels for soil at industrial properties will be excavated to the depth of the water table or bedrock, whichever is shallower, and disposed of offsite at an appropriate landfill facility. The anticipated extent of excavation in each area is shown on Figures 3 through 5. The actual volume of soil removed will be based on field conditions and the results of confirmation soil sampling.

A contractor will conduct excavation, soil transport, backfill, and related tasks. A geologist licensed in the State of Washington will perform the following:

- Prepare soil disposal profiles that include laboratory analytical data from the 2003/2004 site assessment, soil stockpile samples, and additional laboratory results as requested by the landfill.

- Observe excavation, concrete and piping removal, and backfill activities to monitor conformance with the Work Plan. The onsite geologist/UST site assessor will evaluate excavation limits, monitor ORC placement, and observe backfill and compaction.

Excavation tasks for each area are described below.

4.1.1 Maintenance Shop

Excavation west of the maintenance shop will include removing soil from around monitoring well MW-7 and soil boring location WSB-04-7 and removing the former pumphouse foundation and piping (Figure 3). Specific tasks include the following:

- Temporary chain-link fence panels will be erected around the excavation boundary (Figure 3) as well as an area west of the excavation boundary for stockpiling soil. Caution tape, traffic barriers, or other markers will be placed appropriately at the ingress/egress of the work zone to discourage pedestrians from entering equipment traffic areas. After each work day, all fence panels will be secured to discourage entry into the work zone.

- Ecology blocks will be placed on the gravel roadway north of the former pumphouse foundation to prohibit vehicular traffic from the excavation area.

- Prior to beginning excavation, the contractor will perform underground utility locating tasks, including notification of the One-Call service center and coordination with BNSF personnel regarding onsite utilities.

- Soil excavation will begin at a point approximately 20 feet west of the southwestern corner of the maintenance shop, north of the underground signal utility, and will continue westward based on field screening results. The contractor will observe the area prior to excavation to assure that equipment will be kept a safe distance from overhead and underground utilities and will begin the excavation at an appropriate location.

- Portions of the excavation that are close to buildings, telephone poles, manholes, or other potentially affected structures will be excavated with a 2:1 slope, and portions of the excavation near roadways will be excavated with a 1:1 slope to minimize the potential of undermining the structures. In addition, the margins of the excavations will be at least 5 feet from these structures.

- Clean surface soil (as identified by field screening) will be cut back and stockpiled west of the excavation boundary. Subsurface soil will be excavated from east to west and field-screened for the presence of petroleum hydrocarbons by an onsite geologist using a photoionization detector (PID). Petroleum-containing soil will either be loaded directly into trucks for offsite disposal or stockpiled on visqueen until transport trucks become available. At no time will the excavation extend south of the boundary shown on Figure 3.

- Monitoring well MW-7 will be removed. The well monument, casing, and concrete seal will be disposed of along with petroleum-containing soil.

- Steel piping protruding from the pumphouse foundation will be observed for the presence of liquid. If present, liquid will be pumped out of the pipes and temporarily stored onsite in DOT-approved, 55-gallon, bung-top, steel drums. At project completion, the containerized liquid will be transported offsite to an appropriate treatment, storage, and disposal (TSD) facility along with any other liquids (e.g., decontamination water) that are generated.

- The concrete pumphouse foundation will be broken into smaller sections and separated from steel piping and rebar to the extent practicable. The concrete will be temporarily stockpiled separately from soil. Concrete removed during the project will be disposed of at an appropriate offsite facility or used as backfill materials (pending approval from BNSF). Concrete materials that are stained or show other evidence of COCs will not be used as backfill and will be disposed of at an appropriate offsite facility.

- A trench will be excavated along the length of the piping, extending southward from the pumphouse foundation to a point located north of the underground signal wiring shown on Figure 3. Soil removed from the trench will be field-screened using a PID and temporarily stored in two stockpiles (clean and petroleum-containing, if encountered). Petroleum-containing soil will be loaded into trucks as available.

- The pipe will be cut off at the southern end of the trench, and the end of the pipe remaining in the ground (extending beneath signal wires and mainline tracks) will be capped. If additional liquid is encountered in the excavated piping, it will be pumped into storage drums. Pipe that is removed from the ground will be steam-cleaned and transported offsite to an appropriate recycling facility.

- Prior to placing clean fill, approximately 100 pounds of ORC will be mixed with clean soil in the bottom of the excavation. The amount of ORC applied will be based on the size of the excavation and calculated according to the manufacturer's recommendations.

- The final excavation will be backfilled using clean stockpiled soil and imported clean fill. Imported quarry spalls or broken concrete (up to 6 inches in size) derived from demolished concrete pads (if clean) will be placed at a thickness of approximately 1 foot at the bottom of the excavation. Soil will be placed in lifts and compacted, and the ground surface will be graded to approximate surrounding conditions. The amount of imported, clean backfill that is needed will be identified in the field based on the final size of the excavation and the volume of clean soil available onsite.

- Backfill will be compacted to 95% of ASTM D1557 Modified Proctor. A geotechnical engineer retained by the contractor will evaluate stockpiled and imported fill materials prior to placement and perform compaction testing after placement and compaction of fill materials.

4.1.2 Former Fueling Island

The anticipated excavation boundary around the former fueling island (Figure 4) encompasses a concrete fueling pad and three piping corridors. Track spurs located south of the former fueling island are scheduled for removal by BNSF in July 2005, prior to the anticipated time of excavation. Based on site assessment results, it is anticipated that soil requiring offsite disposal will include only that present beneath the fueling island and within a narrow corridor extending from the fueling island to the former location of the lubricating oil tank. Excavation activities will include the following:

- Fencing and barricades will be erected as described above.

- The concrete fueling island pad will be broken into manageable pieces and transported to a construction debris landfill or concrete recycling facility, or used as backfill (if clean).

- Prior to beginning excavation, the contractor will perform underground utility locating tasks, including notification of the One-Call service center and coordination with BNSF personnel.

- Soil excavation will begin at the western end of the fueling island and continue southwest, following the piping that extends toward the former location of the lubricating oil tank. Soil will be removed from either side of the pipe as necessary, based on field observations and screening. The pipe will be removed, steam-cleaned, and transported to an offsite metal recycling facility. Any liquid in the pipe will be handled as described above for the maintenance shop area.

- The two pipe runs extending from the center and eastern end of the fueling island will be removed. Pipe removal procedures will be the same as those described above.

- Excavation in the vicinity of existing structures will be performed as described in Section 4.1.1.

- Before excavated areas are backfilled, ORC will be mixed with saturated soil in the bottom of the excavations. The amount of ORC used will range from 100 to 200 pounds based on the manufacturer's recommendations.

- Backfilling and compaction will be performed as described in Section 4.1.1 to 95% of ASTM D1557 Modified Proctor.

4.1.3 Former Powerhouse

Excavation activities in the location of the former powerhouse (Figure 5) will include the following:

- Fencing and barricades will be erected as described above.

- Concrete foundations and footings will be broken into manageable pieces and transported to an offsite construction debris or recycling facility or used as backfill material (if clean).

- Prior to beginning excavation, the contractor will perform underground utility locating tasks as described above.

- Soil excavation will begin at the location of monitoring well MW-2. The well casing will be removed and disposed of with petroleum-affected soil. The excavation will be expanded outward from monitoring well MW-2 based on field observations but will not extend southward beyond the northern toe of the shoreline berm. The excavation will be extended to a depth of approximately 10 feet bgs (the water table). Soil will be stockpiled on visqueen or loaded directly into trucks or railcars for transport to an offsite disposal facility.

- Excavation areas adjoining the existing roadway (northern side of the excavation) will be excavated with a 1:1 slope.

- Backfilling and compaction will be performed as described in Section 4.1.1 to 95% of ASTM D1557 Modified Proctor.

4.2 NAPL RECOVERY

One or two recovery wells with belt-skimming devices will be installed in each area where NAPL is encountered during excavation, but cannot be removed because of obstructions (e.g., the shoreline berm, tracks, buildings, etc.). The anticipated approximate locations where recovery wells may be installed are shown on Figures 2 through 5. The actual locations of recovery wells (if installed) will be based on field conditions encountered during excavation activities. If observations indicate NAPL is not present in the maintenance shop or fueling island areas, recovery wells will not be installed. It is unlikely that excavation will adequately remove the NAPL present in the former location of the powerhouse. Therefore, it is assumed that a recovery well will be necessary in this location.

4.2.1 Well Installation

A drilling company licensed in the State of Washington will conduct drilling and recovery well installation activities. The contracted drilling company will be responsible for obtaining applicable permits (start cards) for the wells.

Hollow-stem auger (HSA) drilling techniques, using minimum 12-inch outer diameter auger flights, will be used to advance well borings and install the recovery wells. Soil samples will be collected with a split-spoon sampler during drilling to evaluate the depth to groundwater, depth and thickness of NAPL, and total depth of the well.

The driller will advance the well boring to the depth selected by the onsite geologist and install the recovery well in accordance with WAC 173-160, Minimum Standards for Construction and Maintenance of Wells (Ecology 1998). At the maintenance shop and former fueling island, recovery wells will be installed within or slightly south (downgradient) of LNAPL with screens placed between approximately 6 and 16 feet bgs. The well(s) beneath the former powerhouse foundation will be installed with a screen extending from approximately 10 to 40 feet bgs.

The wells will consist of threaded, 6-inch diameter, schedule-40 polyvinyl chloride (PVC) screen and riser pipe inserted into the boring through the center of the auger flight string. The screens will be 10 to 30 feet long, 0.020-inch factory-slotted, and fitted with a 1-foot-long sump and threaded bottom cap. The riser pipe (blank PVC casing) will be long enough to extend from the top of the screened casing to approximately 3 feet above the ground surface. The drilling contractor will provide all well construction materials.

Filter pack and well seal materials will be placed around the PVC well casing as the auger flights are withdrawn. Filter pack material will consist of clean, size 10/20, silica sand and will be placed from the bottom of the screen to 2 or 3 feet above the screened interval. A well seal consisting of bentonite chips will be placed around the riser pipe extending from the top of the sand filter pack to within 1.5 feet of the ground surface. Portland cement will be placed in the upper 1.5 feet of the well boring.

A 6-foot-long steel casing will be set in the Portland cement around the well casing at a depth of approximately 3 feet bgs. The aboveground portion of this casing will serve as the well monument and will be fortified with an approximately 4-square-foot (2 feet by 2 feet) concrete pad. Three steel bollards will be installed around the well monument. A steel tag inscribed with the Ecology number assigned to the well (based on start card designations) will be placed around the PVC casing inside the monument or on top of the outer protective casing.

The contractor will develop the well to remove fine-grained materials from the casing and surrounding filter pack material. Well development will be performed by pumping water from multiple depths over the length of the screened interval using a submersible impeller pump and periodically surging the well with a surge block. This process will continue until visual observations indicate that the water removed from the well is generally free of suspended sediment. Development water purged from the well will be stored onsite in 55-gallon steel drums until laboratory analytical results for groundwater are received and disposal options are evaluated.

A licensed geologist will observe the contractor's work, evaluate the depth of recovery well sump and screen placement, and log recovery well construction details. A staff scientist or engineer will conduct operation and maintenance of recovery wells to maintain belt skimmers and monitor NAPL recovery volumes.

4.2.2 NAPL Recovery Devices

A belt-skimming device (with appropriate belt materials for the product present) will be installed in each recovery well. Piping will direct recovered product from the skimmer to a 55-gallon drum placed next to the well head. It is assumed that electrical power for the skimmers will be derived from existing drops at nearby power poles or from the maintenance shop.

The recovery wells will be monitored on a weekly basis for the first 2 months after installation to observe the amount of product recovered and establish a schedule for product collection and disposal. An oil recovery service will be contracted to periodically pump out the drums and transport the material to an offsite recycling facility.

4.3 ENHANCED NATURAL ATTENUATION

Enhanced natural attenuation techniques will be implemented to address dissolved petroleum hydrocarbons in groundwater after soil excavation (as described above) and after recovery wells are no longer removing a substantial quantity of product. ORC will be injected into the saturated zone using direct-push drilling methods, within and/or downgradient of the excavated areas.

ORC application zones, shown on Figures 2 through 5, will include injection points spaced at approximately 20-foot intervals. Downgradient of the maintenance shop area and former fueling island, ORC will be injected between approximately 10 and 15 feet bgs at a rate of approximately 10 to 15 pounds per boring. In the powerhouse area, ORC will be injected to depths ranging from 10 to 40 feet bgs at a rate of approximately 20 to 30 pounds per boring.

A licensed geologist will monitor ORC injection activities. It is assumed that two injection events will be conducted and a total of approximately 2,000 pounds of ORC will be used. It is assumed that the drilling contractor performing ORC injection will procure all ORC used during the project (approximately 2,300 pounds).

4.4 WELL DECOMMISSIONING

The unused water supply well located southeast of the former powerhouse will be decommissioned, when feasible, during the remediation project. Monitoring and recovery wells will be decommissioned at project completion. This work will be conducted by a licensed well driller in accordance with Ecology Minimum Standards for Construction and

Maintenance of Wells [Washington Administrative Code (WAC) 173-162]. A licensed geologist will observe and log well decommissioning procedures to monitor conformance with the work plan and WAC 173-162 Minimum Standards.

The water supply well casing will be perforated and backfilled with bentonite grout. Monitoring and recovery wells will be overdrilled using hollow-stem auger techniques, and the borings will be backfilled with bentonite chips or grout, as required by WAC 173-162.

5.0 REMEDIATION SAMPLING AND ANALYSIS PLAN

Sampling and monitoring will be conducted during the remediation project to assess the effectiveness of each remediation technique. Confirmation soil samples will be collected from each excavation prior to backfilling; groundwater monitoring will be conducted during the effective period of ORC to evaluate groundwater oxygen concentrations and other parameters indicative of natural attenuation; and groundwater sampling and analysis will be conducted after remediation tasks are complete to evaluate groundwater conditions. Specific analyses anticipated are discussed below. Analytical methods and required containers, preservatives, and hold times are summarized on Table 4.

5.1 EXCAVATION CONFIRMATION SOIL SAMPLING

Soil samples will be collected from completed excavations and soil stockpiles (as required for disposal). The number and distribution of samples collected will be based on sampling methodologies presented in Ecology's *Guidance for Remediation of Petroleum Contaminated Soils* (Ecology 1995).

5.1.1 Sampling Procedures

As excavation proceeds in each location, the onsite geologist will use a PID, sheen testing, and visual and olfactory observation to field-screen excavated soil for the presence of COCs. When field screening indicates "clean" results for sidewall and bottom soil, excavation will stop and confirmation samples will be collected. The geologist will direct the excavator operator to scrape a small volume of soil from the sidewall or bottom of the excavation from as many locations as necessary. The soil will be transferred from the excavator bucket directly to laboratory-provided containers using a clean, stainless-steel spoon. Soil samples for analysis of VOC analytes and for gasoline-range hydrocarbons will be collected using EPA 5035 sampling methodology.

If the soil disposal landfill requires analytical results for soil in addition to existing data, samples will be collected from soil removed from the excavation. The number of samples required will be based on landfill requirements or Ecology guidance.

5.1.2 Laboratory Analysis

Laboratory analytical methods, including container requirements, preservatives, and hold times, are listed in Table 4.

Samples collected from excavations and stockpiles in the maintenance shop and former fueling island areas will be submitted for analysis of diesel- and oil-range hydrocarbons using the Northwest Total Petroleum Hydrocarbons Diesel Extended (NWTPH-Dx) Method (with silica gel cleanup) and gasoline, benzene, toluene, ethylbenzene, and xylenes (BTEX) by the Northwest Total Petroleum Hydrocarbons Gasoline Extended (NWTPH-Gx) Method/EPA Method 8021B.

Confirmation and stockpile samples collected from the former powerhouse area will be analyzed for petroleum hydrocarbons using the NWTPH-Dx, NWTPH-Gx, and EPA 8021B Methods. In addition, samples will be analyzed for semivolatile organic compounds (SVOCs) using EPA Method 8270C and metals using EPA 6000/7000 Series Methods.

In addition, approximately 5% of the confirmation samples from all three remediation areas will be submitted for analysis of VOCs (specifically for 1-2 dibromoethane, 1-2 dichloroethane, MTBE, and halogenated VOCs) by EPA Method 8260B and polychlorinated biphenyls (PCBs) by EPA Method 8082. Approximately 5% of the samples collected from the maintenance shop and former fueling island areas will also be submitted for laboratory analysis of total lead and PAHs. These additional analyses are based on Ecology's sampling requirements for testing of petroleum releases (WAC 173-340-900, Table 830-1).

5.2 ORC EFFECTIVENESS MONITORING

Monitoring of indicators of natural attenuation will be conducted once every 2 months throughout the effective period of the ORC (approximately 1 year) to evaluate the potential need for supplemental ORC injections. Monitoring at each well will consist of the following:

- Measuring the groundwater depth and elevation
- Observation for the presence of NAPL (recovery wells)
- Purging the well using minimal drawdown techniques
- Measuring the groundwater temperature, pH, oxidation/reduction potential (ORP), Eh, and dissolved oxygen (DO) concentration.

5.3 POST-REMEDIATION GROUNDWATER SAMPLING AND ANALYSIS

Groundwater sampling and analysis will be conducted quarterly, beginning between 6 months and 1 year after the initial ORC injection. Wells used for monitoring will include MW-6, MW-4, MW-1 and one recovery well in the former powerhouse area. These wells are or will be located in a direction presumed to be downgradient from petroleum-affected areas, between petroleum-affected areas and the Columbia River. Monitoring will be conducted west of the maintenance shop only if a recovery well is installed in this area as part of the remediation.

After approximately 1 year of quarterly groundwater monitoring, the monitoring interval will be evaluated. If COC concentrations are above MTCA Method A cleanup levels for groundwater after the initial four quarterly monitoring events, subsequent semiannual monitoring is suggested. Monitoring will continue until four consecutive sets of monitoring results indicate that COC concentrations in groundwater are below MTCA Method A cleanup levels for groundwater.

5.3.1 Purging and Sampling Procedures

Groundwater purging and sampling will be conducted using low-flow (minimal drawdown) procedures recommended in EPA publication 540/S-95/504 (EPA 1996) to collect samples that are representative of site conditions.

Purging and sampling will be conducted using a peristaltic pump fitted with polyethylene tubing that extends to approximately 3 feet below the elevation of the potentiometric surface (as measured at the time of sampling). The pump discharge tube will be connected to a flow-through cell containing a water quality parameter probe capable of measuring temperature, specific conductance, pH, ORP, DO, and turbidity. Purging will consist of drawing water from the well at a rate ranging from 0.1 liter per minute (L/min) to 0.5 L/min (or at a rate that does not draw down the water level) until successive water quality parameter measurements (at 3- to 5-minute intervals) for temperature, pH, and specific conductance stabilize. Stabilization will be indicated as follows: $\pm$ 10 percent for temperature, $\pm$ 0.1 for pH, and $\pm$ 3 percent for specific conductance. Field purging and sampling measurements will be recorded on a groundwater monitoring well sampling log form. Copies of the sampling logs will be included in the investigation report.

After water quality parameters stabilize (or after approximately 30 minutes), the pump discharge tube will be disconnected from the flow-through cell, and water for the samples will be discharged directly into certified-clean, laboratory-provided, sample containers as described in Table 4. The pump discharge rate will not be adjusted from the purge rate during sampling. Samples collected for analysis of dissolved metals will be filtered using an inline, high-volume, 0.45 micron nitrocellulose filter.

5.3.2 Laboratory Analysis

Groundwater samples will be submitted for laboratory analysis of diesel-, oil-, and gasoline-range hydrocarbons using the NWTPH-Dx and NWTPH-Gx Methods, BTEX using

EPA Method 8021B, SVOCs using EPA Method 8270C, and dissolved metals using EPA 6000/7000 Series Methods.

5.4 SAMPLE HANDLING

Sample handling and documentation refers to sample container labeling, chain-of-custody procedures, sample packaging and shipping, and laboratory documentation. These procedures are summarized below.

5.4.1 Sample Identification and Labeling

Table 4 lists sample analyses, method numbers, containers, preservation methods, and holding times associated with each analysis to be performed. Sample labels for the containers will be filled out with waterproof ink at the time of sample collection. Sample jars submitted for offsite laboratory analysis will be labeled with the following information:

- Job site – BNSF Wishram
- Sample Identification including location and type or depth
- Requested analyses
- Preservative
- Sampling date and time
- Sampler's initials.

5.4.2 Chain-of-Custody Procedures

Each sample container will be placed in a chilled cooler as soon as the sample is collected. At that time, the sample identification, date, time, number of containers filled, and analyses requested will be recorded on a chain-of-custody form. Prior to shipping the samples offsite, a member of the sampling team will review the chain-of-custody form and bottle labels to assure that all required entries are filled. That person will then sign and date the chain-of-custody form and enter the time the batch is released to the lab or shipping agency. When more than one form is needed, the pages will be numbered sequentially. If multiple coolers are needed for shipping a single batch of samples, one chain-of-custody form can be placed inside one cooler. However, a label must be attached to each cooler in the batch indicating the total number of shipping containers and which container contains the original chain-of-custody form.

Throughout the sampling activities and during transport to the laboratory, the samples will be maintained in the secure custody of sampling, field laboratory, shipping agency, and/or offsite laboratory personnel. Kennedy/Jenks Consultants will retain copies of all chain-of-custody records. Original chain-of-custody records will remain with the sample during storage, shipping, and analysis and will be forwarded with the data packages to Kennedy/Jenks Consultants for data quality review.

5.4.3 Sample Shipping

Sample containers will be packed securely inside plastic coolers during sampling activities and during transport to the laboratory. Each sample container will be wrapped with padded packaging material and placed on absorbent pads or other suitable packing material that has been placed in the bottom of the cooler. Crushed ice will be placed inside Ziploc® bags in the cooler to keep samples cold (approximately 4 degrees Celsius). Packing material will be added to fill the cooler completely and secure sample containers in an upright position.

The original chain-of-custody records will be enclosed in plastic and taped to the inside of the cooler lid. The cooler will be closed, fiber or duct tape will be wrapped around the cooler, and "This End Up" and "Fragile Glass" labels will be attached to the cooler. A custody seal will be adhered to one side of the cooler, then placed over the lid and adhered to the other side so that the custody seal must be broken to open the cooler. To prevent damage to the seal during shipping, clear tape will be placed over the seal for protection. Use of custody seals will help document that samples are not tampered with after collection.

5.4.4 Field Logs

Field activities will be documented in a weatherproof notebook and recorded photographically as appropriate. Field book entries will include lists of all samples collected, including the date, time, sample matrix, and depth, and other observations as appropriate.

Soil borings and monitoring well construction details will be documented on weather-resistant soil boring log forms. Likewise, groundwater purging and sampling and monitoring well measurements of depth to water and/or NAPL thickness will be documented on a weather-resistant field sampling log.

5.4.5 Laboratory Documentation

The sample custodian at the laboratory will sign the chain-of-custody record upon receipt of the samples and note the condition of the each sample. The custody seals on coolers and sample containers will also be inspected. Any discrepancies will be reported to Kennedy/Jenks Consultants and appropriate corrective actions will be requested at that time.

5.5 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

Field procedures implemented for assessing data quality will include collection of blind duplicate samples and transport of VOC and temperature blanks. If a batch of samples shipped to the laboratory contains groundwater samples for VOC analysis, all VOC sample containers will be placed into one cooler with one trip blank. This procedure will minimize the number of trip blanks that must be analyzed. One temperature blank will be placed inside each cooler shipped to the laboratory.

Field personnel will verify that sampling procedures are carried out as described in this work plan. In addition, personnel will verify that samples are properly documented in field logbooks and chain-of-custody records are complete, accurate, and signed prior to submitting samples to the laboratory.

5.5.1 Laboratory Reporting Limits

Reporting limits, the lowest detectable concentrations that will be reported by the laboratory for COCs, will be below applicable regulatory criteria, to the extent practicable.

5.5.2 Laboratory Data Review

The laboratory will evaluate analytical data quality based on the following criteria:

- Holding times
- Matrix spike and matrix spike duplicate results
- Surrogate results
- Calibration data using check compound and system performance check with compound analysis results
- Laboratory blank sample analysis results
- Interference check sample analysis results

- Laboratory check sample analysis results
- Comparison of calibration and sample analysis
- Linearity of response and linear range
- Analytical results of internal standards and surrogates, and the calculation of percent recoveries
- Detection limits obtained
- Accuracy and precision of matrix spike/matrix spike duplicate analysis
- Comparison of the percentage of missing or undetected substances among duplicate samples.

The laboratory will evaluate specified method- or laboratory-established control limits for surrogate analysis, matrix spike/matrix spike duplicate analysis, duplicate analysis, and other analyses with control limits according to the laboratory's QA manual.

5.5.3 Laboratory Reporting and QA/QC Review

The laboratories performing analyses for this project will be required to submit data supported by sufficient backup information and QA results to enable reviewers to evaluate the quality of the data. A data package will consist of the following information, when applicable:

- A transmittal letter with a summary of the laboratory's QA/QC review
- Environmental sample results (including dates of extraction/preparation and analysis)

- Blank data results (e.g., reagent blanks)

- Spike and spike duplicate results, concentrations of spiking compound, percent recovery, and control limits

- Duplicate result, relative percent difference, and control limits

- Chromatograms

- A sheet describing all qualifier flags assigned to data

- A copy of the original chain-of-custody record.

Upon receipt of analytical results, Kennedy/Jenks Consultants will conduct a limited data QA review verifying that:

- Holding times were met.

- No analytes were present in method blanks and a blank was analyzed with each sample batch.

- Laboratory check sample results met control limits.

- Matrix spike and matrix spike duplicates were analyzed for each batch of samples, and control limits were met.

- Duplicate analyses were conducted with each batch and control limits were met.

Upon completion of the QA review, a QA summary report will be prepared and submitted along with the site characterization report.

5.5.4 Corrective Action

Deviations from established QA criteria or from procedures outlined in this work plan may require corrective action for both field and laboratory activities. Field personnel will be responsible for corrective actions during field operations. Any corrective actions taken will be noted in the field logbook and documented in a report to the project manager. The report will include a description of the problem, time of problem, and an explanation of the corrective action taken. The laboratory will be responsible for implementing corrective action for analytical procedures. For the specific analytical methods, corrective action procedures are described in the individual methods or are in the laboratory's QA manual. If QC data are unacceptable, the cause will be determined and corrected. Corrective actions that affect the integrity of analytical data will require reanalysis of the affected sample or flagging of these data in the final data report.

5.6 REPORTING

During the project, Kennedy/Jenks will prepare and submit to BNSF the following reports:

- One letter progress report will be prepared and submitted to BNSF after completion of soil removal/disposal, NAPL recovery, and ORC injection.

- One report will be prepared upon the completion of the remediation project and after four quarterly groundwater monitoring events. If quarterly groundwater monitoring results indicate no detections greater than MTCA Method A cleanup levels for groundwater, the final report will be submitted to the Ecology Central Region Office.

6.0 HEALTH AND SAFETY

A copy of Kennedy/Jenks Consultant's Site HASP for this remediation work plan is provided in Appendix A. The HASP applies to Kennedy/Jenks Consultants personnel performing contractor oversight, confirmation sampling, monitoring well installation, abandonment, and sampling, and other site activities related to the work plan.

The selected remediation contractor will prepare a HASP for its personnel, which must be approved by BNSF before onsite work can begin. All persons working onsite must have completed the BNSF Contractor Orientation course.

7.0 REFERENCES

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Tables

TABLE 1

SUMMARY OF ANALYTICAL RESULTS FOR SOIL
REMEDIATION AREAS
BNSF Wishram Railyard

Location	WSB-1		WSB-2		WSB-3		WSB-4	WSB-5	WSB-6		WSB-7	WSB-04-2		WSB-04-6	MTCA Method
Depth	10	15	8	14	10	16	10	10	10	14	10	2	12	8	A[a]
Petroleum Hydrocarbons (mg/kg)															
Diesel[b]	47.6	<25.0[c]	**6,900**	**15,700**	<25.0	<25.0	<25.0	**21,000**	<25.0	265	240	<25.0	<25.0	<25.0	2,000
Oil[b]	359	<50.0	**4,710**	**10,500**	<50.0	<50.0	<50.0	**21,600**	<50.0	75.4	72.3	<50.0	<50.0	<50.0	2,000
Gasoline[d]	NA[e]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4.00	NA	100/30[f]
BTEX (mg/kg)[g]															
Benzene	<0.0044	<0.0044	<0.0088	<0.0088	<0.0044	<0.0044	<0.0088	<0.0088	<0.0044	<0.0044	<0.0044	NA	<0.0044	NA	0.03
Toluene	<0.050	<0.050	<0.100	<0.100	<0.050	<0.050	<0.100	0.153	<0.050	<0.050	<0.050	NA	<0.050	NA	7
Ethylbenzene	<0.050	<0.050	0.178	0.687	<0.050	<0.050	0.299	0.221	<0.050	<0.050	<0.050	NA	<0.050	NA	6
Total Xylenes	<0.100	<0.100	<0.200	0.739	<0.100	<0.100	1.36	1.65	<0.100	<0.100	<0.100	NA	<0.100	NA	9
PAHs/cPAHs (mg/kg)[h]															
Naphthalene	NA	NA	NA	**23.8**	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0134	5
2-Methylnaphthalene	NA	NA	NA	61.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0134	--[i]
Phenanthrene	NA	NA	NA	41.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0134	--
Anthracene	NA	NA	NA	<16.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0134	--
Fluoranthene	NA	NA	NA	<16.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0134	--
Pyrene	NA	NA	NA	18.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0134	--
Benzo(g,h,i)perylene	NA	NA	NA	<16.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.0134	--
Benzo(a)anthracene	NA	NA	NA	<16.5	NA	NA	<0.0134	NA	NA	NA	NA	NA	NA	<0.0134	--
Chrysene	NA	NA	NA	<16.5	NA	NA	<0.0134	NA	NA	NA	NA	NA	NA	<0.0134	--
Benzo(b)fluoranthene	NA	NA	NA	<16.5	NA	NA	<0.0134	NA	NA	NA	NA	NA	NA	<0.0134	--
Benzo(k)fluoranthene	NA	NA	NA	<16.5	NA	NA	<0.0134	NA	NA	NA	NA	NA	NA	<0.0134	--
Benzo(a)pyrene	NA	NA	NA	<16.5	NA	NA	<0.0134	NA	NA	NA	NA	NA	NA	<0.0134	--
Indeno(1,2,3-cd)pyrene	NA	NA	NA	<16.5	NA	NA	<0.0134	NA	NA	NA	NA	NA	NA	<0.0134	--
Total cPAHs[j]															0.1
Metals (mg/kg)[k]															
Arsenic	NA	NA	4.30	5.27	NA	NA	NA	9.35	NA	NA	NA	NA	NA	NA	20
Barium	NA	NA	4,680	6,500	NA	NA	NA	6,340	NA	NA	NA	NA	NA	NA	--
Cadmium	NA	NA	<0.289[d]	<0.385	NA	NA	NA	0.345	NA	NA	NA	NA	NA	NA	2
Total Chromium	NA	NA	12.3	11.7	NA	NA	NA	19.0	NA	NA	NA	NA	NA	NA	2000[l]
Hexavalent Chromium[m]	NA	NA	NA[e]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19
Lead	NA	NA	387	37.1	NA	NA	NA	29.4	NA	NA	NA	NA	NA	NA	1,000
Mercury	NA	NA	0.148	<0.0781	NA	NA	NA	0.0709	NA	NA	NA	NA	NA	NA	2
Selenium	NA	NA	0.457	0.411	NA	NA	NA	0.836	NA	NA	NA	NA	NA	NA	--
Silver	NA	NA	<0.500	<0.431	NA	NA	NA	<0.500	NA	NA	NA	NA	NA	NA	--

Notes:

(a) The Washington State Department of Ecology Model Toxics Control Act (MTCA) Method A Soil Cleanup Levelsfor Industrial Properties. MTCA Cleanup Regulation Chapter 173-340 Washington Administrative Code (12 February 2001).
(b) Diesel- and oil-range hydrocarbons by the Northwest Total Petroleum Hydrocarbons Diesel Extended(NWTPH-Dx) Method with silica gel cleanup.
(c) "<" indicates analyte was not detected at a concentration greater than the specified laboratory reporting limit. The method detection limit (MDL) is reported for benzene.
(d) Gasoline-range hydrocarbons by the Northwest Total Petroleum Hydrocarbons Gasoline Extended Method (NWTPH-Gx).
(e) "NA" indicates not analyzed.
(f) The MTCA Method A cleanup level for gasoline is 100 mg/kg where benzene is not present and 30 mg/kg for gasoline mixtures that include benzene.
(g) BTEX analyzed by either EPA Method 8021B or EPA Method 8260B.
(h) PAHs and cPAHs analyzed by EPA method 8270M-SIM.
(i) "--" indicates a MTCA Method A cleanup level is not available.
(j) Total cPAH value is equal to the sum of individual analyte concentrations multiplied by toxicity equivalency factors (TEFs) as described in WAC 173-340-708(8). Where analytes were not detected, but there is potential for their presence based on PAH results, a concentration equal to 0.5 the reporting limit was multiplied by the TEF. The total value was compared to the MTCA Method B cleanup level for benzo(a)pyrene of 2 mg/kg.
(k) Total Metals by EPA 6020/6000/7000 Series Methods.
(l) MTCA Method A value is for the predominant chromium III species.
(m) Hexavalent chromium analyzed by EPA Method Method 3060A.

Bold values exceed the MTCA Method A Soil Cleanup Level for Industrial Properties.
Only detected compounds are summarized in the table.

TABLE 1

SUMMARY OF ANALYTICAL RESULTS FOR SOIL REMEDIATION AREAS
BNSF Wishram Railyard

Location	WSB-04-7	WSB-04-9		WSB-04-12		WSB-04-25		WSB-04-26		WSB-04-29			WSB-04-34	WSB-04-37	WSB-04-38	MTCA
Depth	12	5	10	5	10	5	10	2	10	2	5	10	5	7	10	Method A[a]
Petroleum Hydrocarbons (mg/kg)																
Diesel[b]	1,070	**12,100**	24	<25.0[c]	<25.0	<25.0	<25.0	<25.0	**21,100**	<25.0	<25.0	<25.0	<25.0	**2,490**	<25.0	2,000
Oil[b]	165	604	602	<50.0	<50.0	<50.0	<50.0	<50.0	**14,000**	<50.0	<50.0	<50.0	<50.0	**3,740**	<50.0	2,000
Gasoline[d]	40.5	**1,210**	**977**	<4.00	<4.00	NA[e]	NA	NA	**606**	NA	NA	NA	NA	NA	NA	100/30[f]
BTEX (mg/kg)[g]																
Benzene	<0.0075	<0.0044	<0.0044	<0.0044	<0.0044	NA	NA	NA	0.0393	NA	NA	NA	NA	NA	NA	0.03
Toluene	<0.050	<0.050	<0.050	<0.050	0.012	NA	NA	NA	0.087	NA	NA	NA	NA	NA	NA	7
Ethylbenzene	<0.050	0.286	2.030	<0.050	<0.050	NA	NA	NA	0.623	NA	NA	NA	NA	NA	NA	6
Total Xylenes	<0.05	0.514	2.980	<0.100	<0.100	NA	NA	NA	1.470	NA	NA	NA	NA	NA	NA	9
PAHs/cPAHs (mg/kg)[h]																
Naphthalene	NA	NA	NA	<0.0134	<0.0134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5
2-Methylnaphthalene	NA	NA	NA	<0.0134	<0.0134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	–[i]
Phenanthrene	NA	NA	NA	<0.0134	0.0261	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
Anthracene	NA	NA	NA	<0.0134	<0.0134	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
Fluoranthene	NA	NA	NA	<0.0134	0.047	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
Pyrene	NA	NA	NA	<0.0134	0.0474	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
Benzo(g,h,i)perylene	NA	NA	NA	<0.0134	0.0218	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
Benzo(a)anthracene	<0.0134	NA	NA	<0.0134	0.0262	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
Chrysene	<0.0134	NA	NA	<0.0134	0.0390	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
Benzo(b)fluoranthene	<0.0134	NA	NA	<0.0134	0.0463	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
Benzo(k)fluoranthene	<0.0134	NA	NA	<0.0134	0.0336	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
Benzo(a)pyrene	<0.0134	NA	NA	<0.0134	0.0365	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
Indeno(1,2,3-cd)pyrene	<0.0134	NA	NA	<0.0134	0.0197	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	–
Total cPAHs[j]					0.049											2
Metals (mg/kg)[k]																
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20
Barium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2
Total Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2000[l]
Hexavalent Chromium[m]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,000
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	--

Notes:

(a) The Washington State Department of Ecology Model Toxics Control Act (MTCA) Method A Soil Cleanup Levelsfor Industrial Properties. MTCA Cleanup Regulation Chapter 173-340 Washington Administrative Code (12 February 2001).
(b) Diesel- and oil-range hydrocarbons by the Northwest Total Petroleum Hydrocarbons Diesel Extended(NWTPH-Dx) Method with silica gel cleanup.
© "<" indicates analyte was not detected at a concentration greater than the specified laboratory reporting limit. The method detection limit (MDL) is reported for benzene.
(d) Gasoline-range hydrocarbons by the Northwest Total Petroleum Hydrocarbons Gasoline Extended Method (NWTPH-Gx).
(e) "NA" indicates not analyzed.
(f) The MTCA Method A cleanup level for gasoline is 100 mg/kg where benzene is not present and 30 mg/kg for gasoline mixtures that include benzene.
(g) BTEX analyzed by either EPA Method 8021B or EPA Method 8260B.
(h) PAHs and cPAHs analyzed by EPA method 8270M-SIM.
(i) "–" indicates a MTCA Method A cleanup level is not available.
(j) Total cPAH value is equal to the sum of individual analyte concentrations multiplied by toxicity equivalency factors (TEFs) as described in WAC 173-340-708(8). Where analytes were not detected, but there is potential for their presence based on PAH results, a concentration equal to 0.5 the reporting limit was multiplied by the TEF. The total value was compared to the MTCA Method B cleanup level for benzo(a)pyrene of 2 mg/kg.
(k) Total Metals by EPA 6020/6000/7000 Series Methods.
(l) MTCA Method A value is for the predominant chromium III species.
(m) Hexavalent chromium analyzed by EPA Method Method 3060A.

Bold values exceed the MTCA Method A Soil Cleanup Level for Industrial Properties.
Only detected compounds are summarized in the table.

TABLE 2

DIRECT PUSH GROUNDWATER ANALYTICAL RESULTS
REMEDIATION AREAS
BNSF Wishram Railyard

Sample	WSB-04-6	WSB-04-16	WSB-04-25	WSB-04-26	WSB-04-27	WSB-04-34	MTCA Method A[a] (µg/L)
Date	2/26/2004	2/26/2004	2/26/2004	2/25/2004	2/26/2004	2/25/2004	
Petroleum Hydrocarbons (µg/L)[b]							
Diesel	NA[c]	<417[d]	NA	483	NA	<250	500
Oil	NA	<833	NA	<500	NA	<500	500
Gasoline	390	<80.0	<80.0	140	<80.0	<80.0	800
BTEX - VOCs (µg/L)[e]							
Benzene	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	5
Toluene	<0.500	<0.500	<0.500	<0.500	<0.500	1.57(2.14)[f]	1,000
Ethylbenzene	5.10	<0.500	<0.500	0.709	<0.500	<0.500	700
Total Xylenes	18.2	<1.00	<1.00	6.40	<1.00	<1.00	1,000
Metals (µg/L)[g]							
Arsenic	NA	NA	NA	NA	NA	**6.48**	5
Barium	NA	NA	NA	NA	NA	13.4	--[h]
Cadmium	NA	NA	NA	NA	NA	<1.0	5
Chromium	NA	NA	NA	NA	NA	10.4	50
Lead	NA	NA	NA	NA	NA	6.33	15
Mercury	NA	NA	NA	NA	NA	<0.20	2
Selenium	NA	NA	NA	NA	NA	1.46	--
Silver	NA	NA	NA	NA	NA	<1.0	--

Notes:

(a) The Washington State Department of Ecology Model Toxics Control Act (MTCA) Method A Cleanup Level for Groundwater. MTCA Cleanup Regulation Chapter 173-340 Washington Administrative Code. Amended 12 February 2001.

(b) Analyses:
- Diesel- and oil-range hydrocarbons by the Northwest Total Petroleum Hydrocarbons Diesel Extended (NWTPH-Dx) Method with silica gel cleanup.
- Gasoline-range hydrocarbons by the Northwest Total Petroleum Hydrocarbons Gasoline Extended Method (NWTPH-Gx).

(c) "NA" indicates not analyzed.

(d) "<" indicates analyte was not detected at a concentration greater than the specified laboratory reporting limit.

(e) Benzene, toluene, ethylbenzene and xylenes analyzed by EPA Method 8021B, except where noted.

(f) The second concentration was detected during VOC analysis by EPA Method 8260B.

(g) Total Metals by EPA 6020/6000/7000 Series Methods.

(h) "--" indicates a MTCA Method A cleanup level is not available.

Bold value exceeds the MTCA Method A groundwater cleanup level.

TABLE 3

GROUNDWATER ANALYTICAL RESULTS FOR MONITORING WELLS
BNSF Wishram Railyard

Sample ID	WMW-1		WMW-2		WMW-3		WMW-4		WMW-5	WMW-6	WMW-7	MTCA
Date	9/17/2003	4/15/2004	9/18/2003	4/15/2004	9/17/2003	4/16/2004	9/18/2003	4/15/2004	4/16/2004	4/16/2004	4/16/2004	Method A[a]
Petroleum Hydrocarbons (µg/L)[b]												
Gasoline-Range Hydrocarbons	NA[c]	329	NA	750	NA	NA	NA	<80.0[d]	<80.0	212	**1,790**	800
Diesel-Range Hydrocarbons	**593 [605][e]**	426	**4,170**	**844**	253	<250	409	<250	<250 [<250]	454	**1,220**	500
Oil-Range Hydrocarbons	<500 [<500]	<500	**2,450**	<500	<500	<500	<500	<500	<500 [<500]	<500	<500	500
BTEX (µg/L)[f]												
Benzene	<0.500 [0.500]	<0.500	**5.71**	**17.4**	<0.500	NA	<0.500	<0.500	<0.500 [<0.500]	<0.500	<5.00 [g]	5
Toluene	<0.500 [0.500]	<0.500	23.5	3.66	<0.500	NA	<0.500	<0.500	<0.500 [<0.500]	<0.500	<5.00 [g]	1,000
Ethylbenzene	<0.500 [0.500]	<0.500	5.84	17.4	<0.500	NA	<0.500	<0.500	<0.500 [<0.500]	<0.500	<5.00 [g]	700
Total Xylenes	<1.00 [1.02]	2.33	11.8	37.2	<1.00	NA	<1.00	<1.50	<1.50 [<1.50]	<1.50	<15.0 [g]	1,000
VOCs (µg/L)[h]												
n-Propylbenzene	NA	1.63	NA	NA	NA	NA	NA	NA	<1.00 (<1.00]	NA	<1.00	--[i]
1,2,4-Trimethylbenzene	NA	15.0	NA	NA	NA	NA	NA	NA	<1.00 [<1.00]	NA	11.2	--
sec-Butylbenzene	NA	<1.00	NA	NA	NA	NA	NA	NA	<1.00 [<1.00]	NA	3.47	--
PAHs/cPAHs (µg/L)[j]												
Acenaphthene	NA	NA	NA	<10.0	NA	NA	NA	NA	<0.100 [<0.100]	<0.400	1.65	--
Fluorene	NA	NA	NA	<10.0	NA	NA	NA	NA	<0.100 [<0.100]	<0.400	0.839	--
Benzo(a)anthracene	<0.100 [<0.100]	NA	0.304	<10.0	<0.100	NA	<0.100	NA	<0.100 [<0.100]	<0.400	<0.400	
Benzo(a)pyrene	<0.100 [<0.100]	NA	<0.200	<10.0	<0.100	NA	<0.100	NA	<0.100 [<0.100]	<0.400	<0.400	
Benzo(b)fluoranthene	<0.100 [<0.100]	NA	<0.200	<10.0	<0.100	NA	<0.100	NA	<0.100 [<0.100]	<0.400	<0.400	
Benzo(k)fluoranthene	<0.100 [<0.100]	NA	<0.200	<10.0	<0.100	NA	<0.100	NA	<0.100 [<0.100]	<0.400	<0.400	0.1[k]
Chrysene	<0.100 [<0.100]	NA	0.516	<10.0	<0.100	NA	<0.100	NA	<0.100 [<0.100]	<0.400	<0.400	
Dibenz(a,h)anthracene	<0.200 [<0.200]	NA	<0.400	<20.0	<0.200	NA	<0.200	NA	<0.200 [<0.200]	<0.800	<0.800	
Indeno(1,2,3-cd)pyrene	<0.100 [<0.100]	NA	<0.200	<10.0	<0.100	NA	<0.100	NA	<0.100 [<0.100]	<0.400	<0.400	
Total cPAHs[k]			**0.25**									
Metals (µg/L)[l]												
Arsenic	NA	NA	NA	**18.4**	NA	**8.54**	NA	NA	**7.03 (7.05)**	4.30	NA	5
Barium	NA	NA	NA	16.4	NA	55.9	NA	NA	58.0 [58.0]	122	NA	--
Cadmium	NA	NA	NA	<1.0	NA	<1.0	NA	NA	<1.0 [<1.0]	<1.0	NA	5
Chromium (total)	NA	NA	NA	4.39	NA	<1.0	NA	NA	<1.0 [<1.0]	<1.0	NA	50
Lead	NA	NA	NA	<1.0	NA	<1.0	NA	NA	<1.0 [<1.0]	<1.0	NA	15
Mercury	NA	NA	NA	<0.20	NA	<0.20	NA	NA	<0.20 [<0.20]	<0.20	NA	2
Selenium	NA	NA	NA	4.28	NA	<1.0	NA	NA	<1.0 [<1.0]	1.51	NA	--
Silver	NA	NA	NA	<1.0	NA	<1.0	NA	NA	<1.0 [<1.0]	<1.0	NA	--
Water Quality Parameters												
Groundwater Elevation (feet)[m]	78.47	83.89	NM[n]	84.15	78.5	84.55	78.51	83.92	84.32	84.46	85.52	--
Temperature (°C)	19.8	17.2	14.9	NM	20.0	17.4	18.3	15.9	15.9	17.5	16.4	--
pH (standard units)	6.8	7.4	7.5	NM	7.4	7.5	7.5	7.7	7.7	7.1	7.2	--
Specific Conductance (mS/cm)	1,561	1,375	3,018	NM	980	1,106	969	920	416	1,009	1,397	--
Dissolved Oxygen (mg/L)	0.37	0.35	0.78	NM	0.56	0.62	0.42	0.36	0.79	0.97	1.41	--
Eh (millivolts)	330	117	200	NM	310	222	320	200	261	211	236	--

TABLE 3

GROUNDWATER ANALYTICAL RESULTS FOR MONITORING WELLS
BNSF Wishram Railyard

Notes:

(a) Values are from The Washington State Department of Ecology Model Toxics Control Act (MTCA) Method A Cleanup Level for Groundwater unless otherwise stated. MTCA Cleanup Regulation Chapter 173-340 Washington Administrative Code. Amended 12 February 2001.

(b) Analyses:
- Diesel- and oil-range hydrocarbons by the Northwest Total Petroleum Hydrocarbons Diesel Extended (NWTPH-Dx) Method with silica gel cleanup.
- Gasoline-range hydrocarbons by the Northwest Total Petroleum Hydrocarbons Gasoline Extended Method (NWTPH-Gx).

(c) "NA" indicates not analyzed.

(d) "<" Indicates analyte was not detected at a concentration greater than the specified reporting limit.

(e) "[ ]" indicates result for field blind duplicate analysis.

(f) BTEX analyzed by EPA Method 8021B.

(g) Reporting limit raised because of dilution necessary for analysis.

(h) VOCs analyzed by EPA Method 8260B.

(i) "–" indicates that a MTCA Method A cleanup level is not available for the analyte or field measured parameter.

(j) PAHs and cPAHs analyzed by EPA Method 8270M-SIM.

(k) Total cPAH value is equal to the sum of individual analyte concentrations multiplied by toxicity equivalency factors (TEFs) as described in WAC 173-340-708(8). Where analytes were not detected, but there is potential for their presence based on PAH results, a concentration equal to 0.5 the reporting limit was multiplied by the TEF. The total value was compared to the MTCA Method B cleanup level for benzo(a)pyrene of 0.1 µg/L.

(l) Metals analyzed by EPA 6000/7000 series methods.

(m) Monitoring well casings were surveyed relative to a benchmark established at the railyard for the site assessment. The benchmark was assigned an arbitrary elevation of 100 feet.

(n) "NM" indicates not measured.

Bold values exceed the MTCA Method A groundwater cleanup level.

Table includes only those analytes that were detected in one or more samples.

TABLE 4

ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES
BNSF Wishram Railyard

Analyte	Analytical Method	Container	Preservative	Holding Time
Soil				
Diesel/Oil	NWTPH-Dx	1 - 4 oz. cwm glass	4 °C	14 days
Gasoline[(a)]	NWTPH-Gx	2 - 40 ml VOA with methanol 1 - 2 oz cwm glass w/teflon-lined lid	Methanol in VOAs, 4 °C	14 days
BTEX[(a)]	EPA Method 8021B	2 - 40 ml VOA with methanol 1 - 2 oz cwm glass w/teflon-lined lid	Methanol in VOAs, 4 °C	14 days
VOCs[(a)]	EPA Method 8260B	2 - 40 ml VOA with stir bar 1 - 40 ml VOA with methanol 1 - 2 oz cwm glass w/teflon-lined lid	Methanol in one VOA, 4 °C	48 hours to lab then 14 days
SVOCs/PAHs/cPAHs	EPA Method 8270C	1 - 8 oz. cwm glass	4 °C	14 days
PCBs	EPA Method 8082	1 - 8 oz. cwm glass	4 °C	14 days
Priority Pollutiant Metals	EPA 6000/7000 Series Methods	1 - 8 oz. cwm glass	4 °C	6 months
TCLP Metals	EPA Method 1311/ICP MS 6020/200.8	1 - 8 oz. cwm glass	4 °C	30 days
Groundwater				
Diesel/Oil	NWTPH-Dx	2 - 500 ml amber glass	1 M HCl, 4 °C	14 days
Gasoline	NWTPH-Gx	2 - 40 ml VOA vials	1 M HCl, 4 °C	14 days
BTEX	EPA Method 8021B	2 - 40 ml VOA vials	1 M HCl, 4 °C	14 days
VOCs	EPA Method 8260B	3 - 40 ml VOA vials	1 M HCl, 4 °C	14 days
SVOCs/PAHs/cPAHs	EPA Method 8270C	2 - 1 L amber glass	4 °C	7 days
Priority Pollutant Metals	EPA 6000/7000 Series Methods	1 - 500 ml HDPE	1 M HNO_3, 4 °C	6 months / Hg: 28 days

Notes:

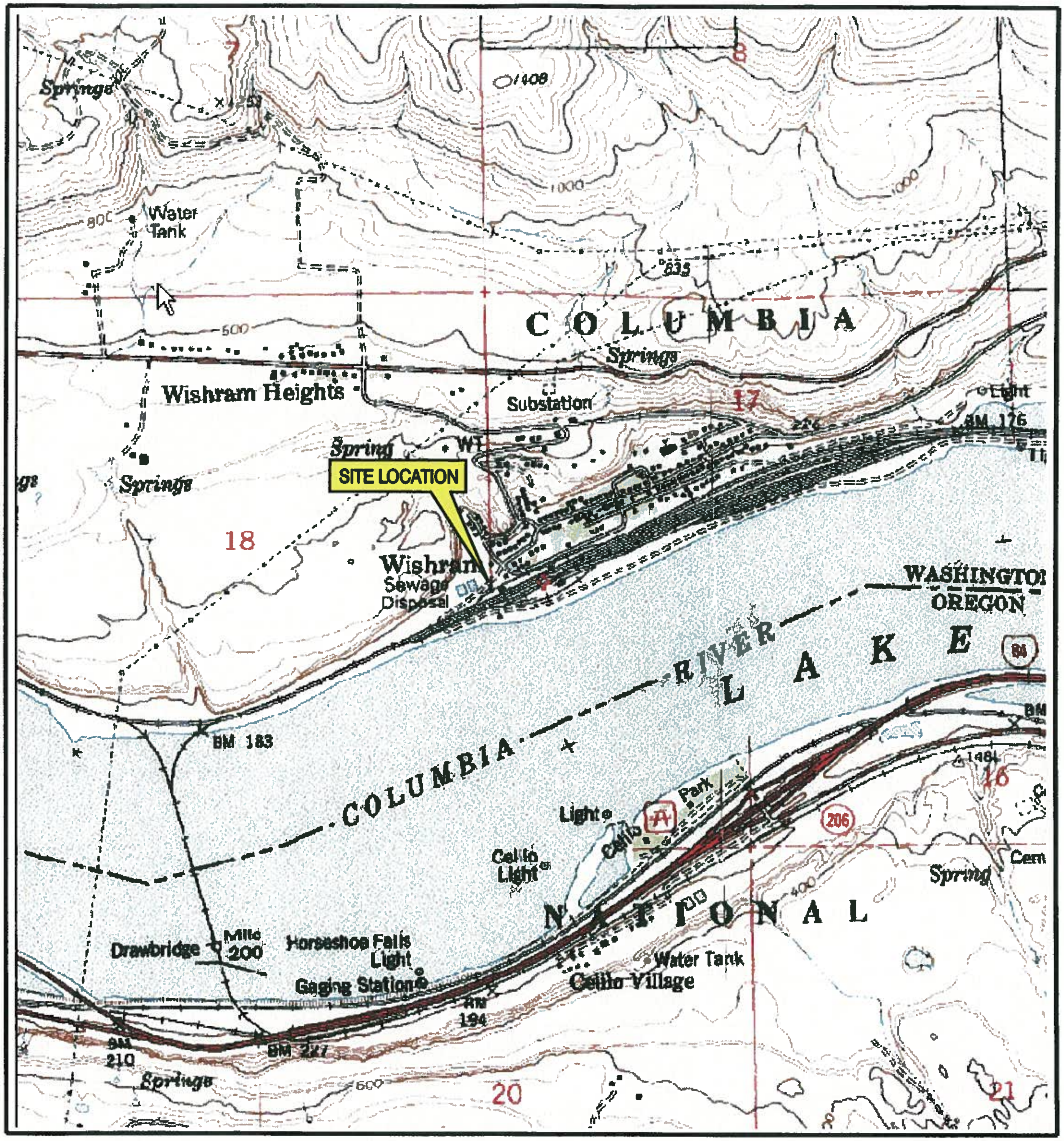
(a) Soil samples for VOC, BTEX, and NWTPX-Gx analysis will be collected using EPA Method 5035 methodology.

"cwm" = clear wide-mouth

"VOA" = volatile organics analysis

HCl and HNO3 preservatives added to achieve a pH<2.

Figures



N

0 2000 4000

APPROXIMATE SCALE IN FEET

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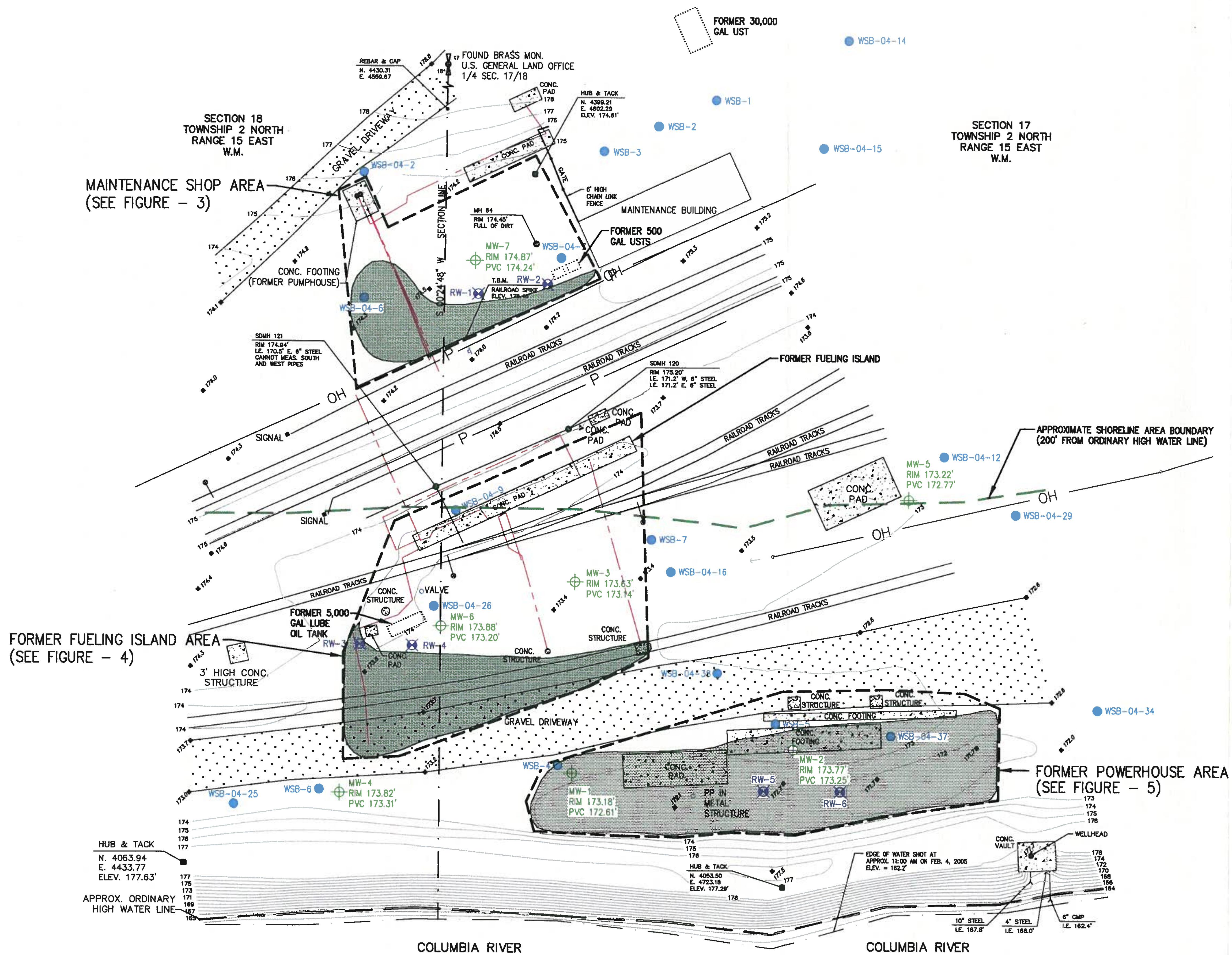
BNSF RAILWAY COMPANY
WISHRAM, WA

SITE LOCATION MAP

036026.01/FIG_1.CDR

FIGURE 1



LEGEND

- SPOT ELEVATION
- UNDERGROUND POWER
- OVERHEAD POWER
- POWER POLE
- GUY WIRE ANCHOR
- RAILROAD SWITCH
- UNDERGROUND PIPE
- REMEDIATION AREA
- MONITORING WELL
- SOIL BORING LOCATION
- POTENTIAL RECOVERY WELL LOCATION
- ORC INJECTION / DIRECT PLACEMENT ZONE
- TOPOGRAPHIC CONTOUR LINE, CONTOUR INTERVAL 1 FOOT

VERTICAL DATUM NAVD 1988

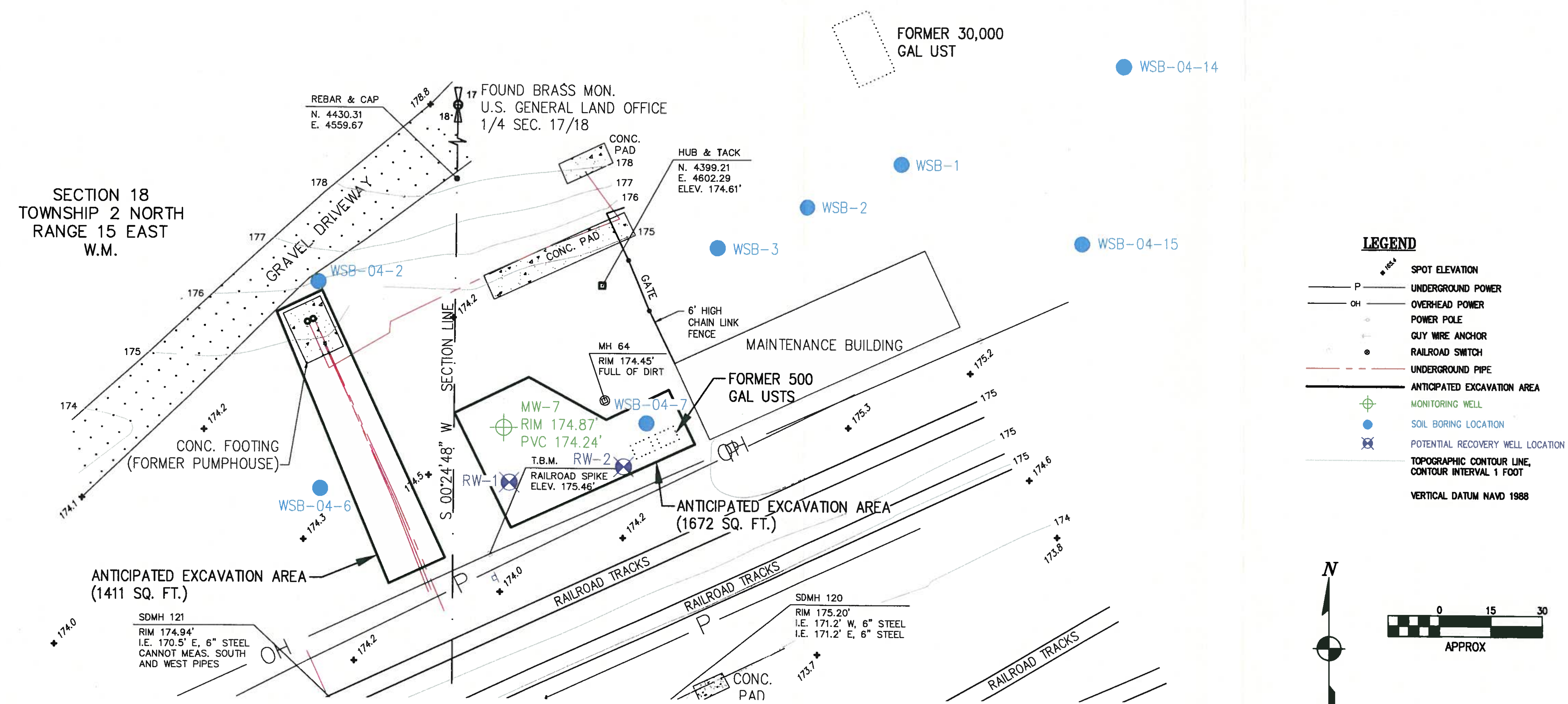
Kennedy/Jenks Consultants

BNSF RAILWAY COMPANY
WISHRAM, WA

SITE OVERVIEW

036026.01–Wishram\FIG–2

FIGURE - 2



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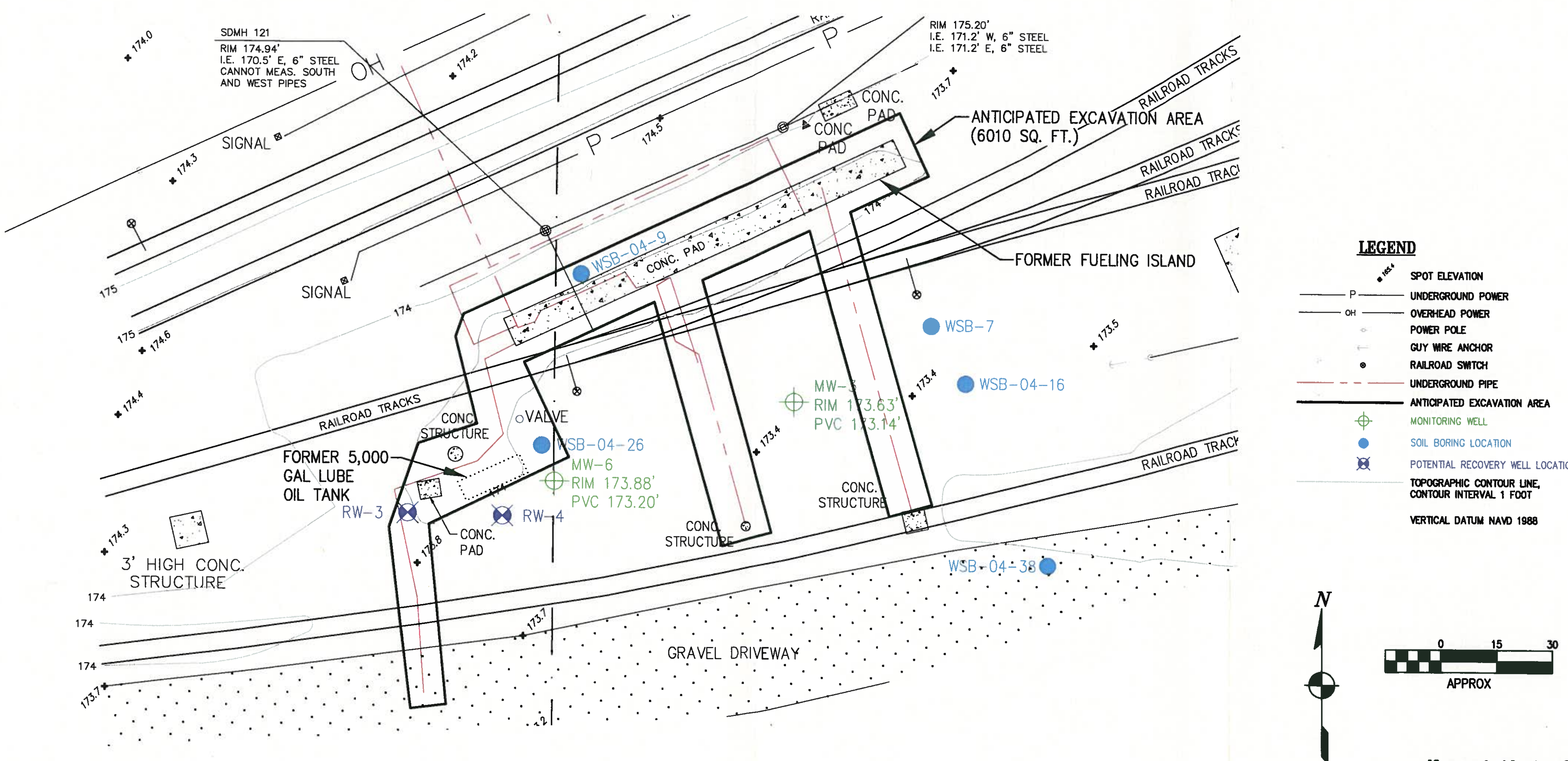
WISHRAM, WA

MAINTENANCE SHOP AREA

036026.01-Wishram\FIG-3

FIGURE - 3



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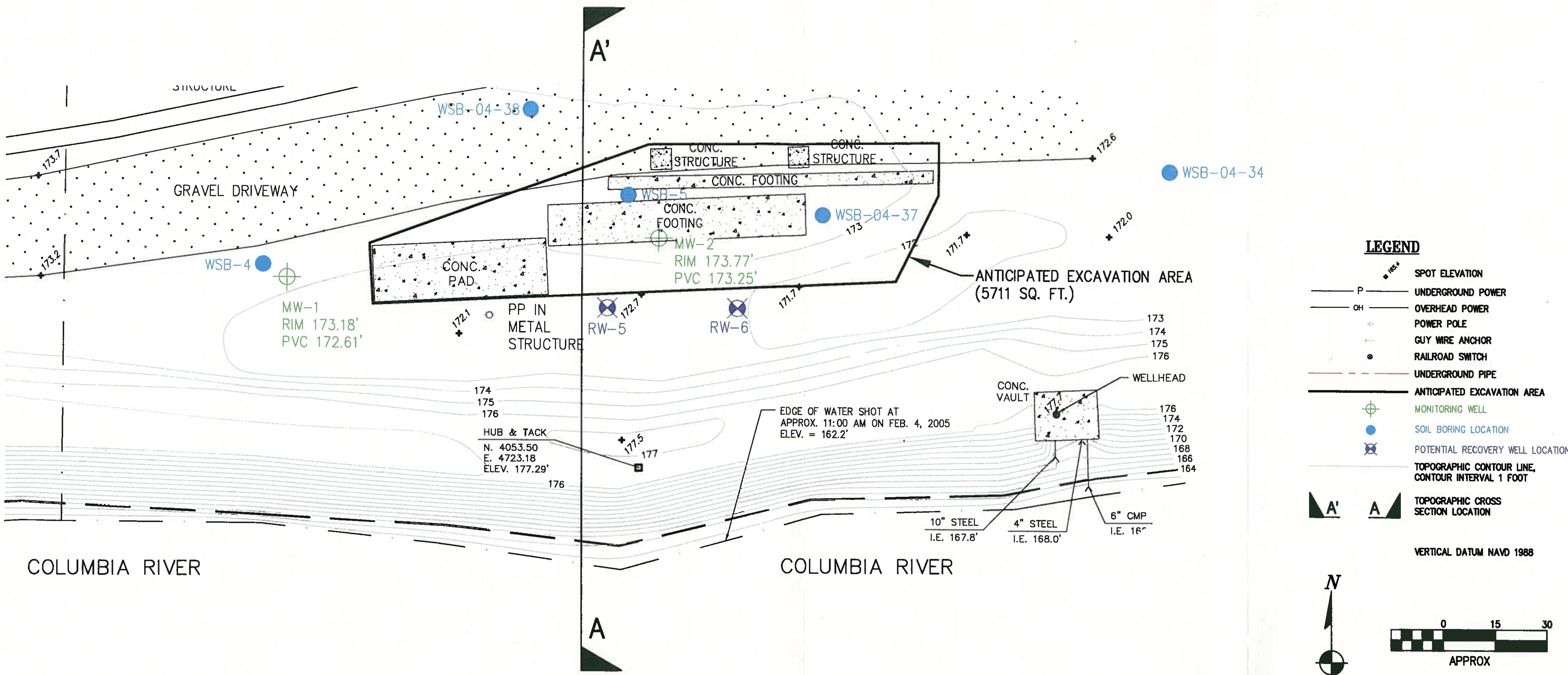
WISHRAM, WA

FORMER FUELING ISLAND AREA

036026.01–Wishram\FIG-4

FIGURE - 4



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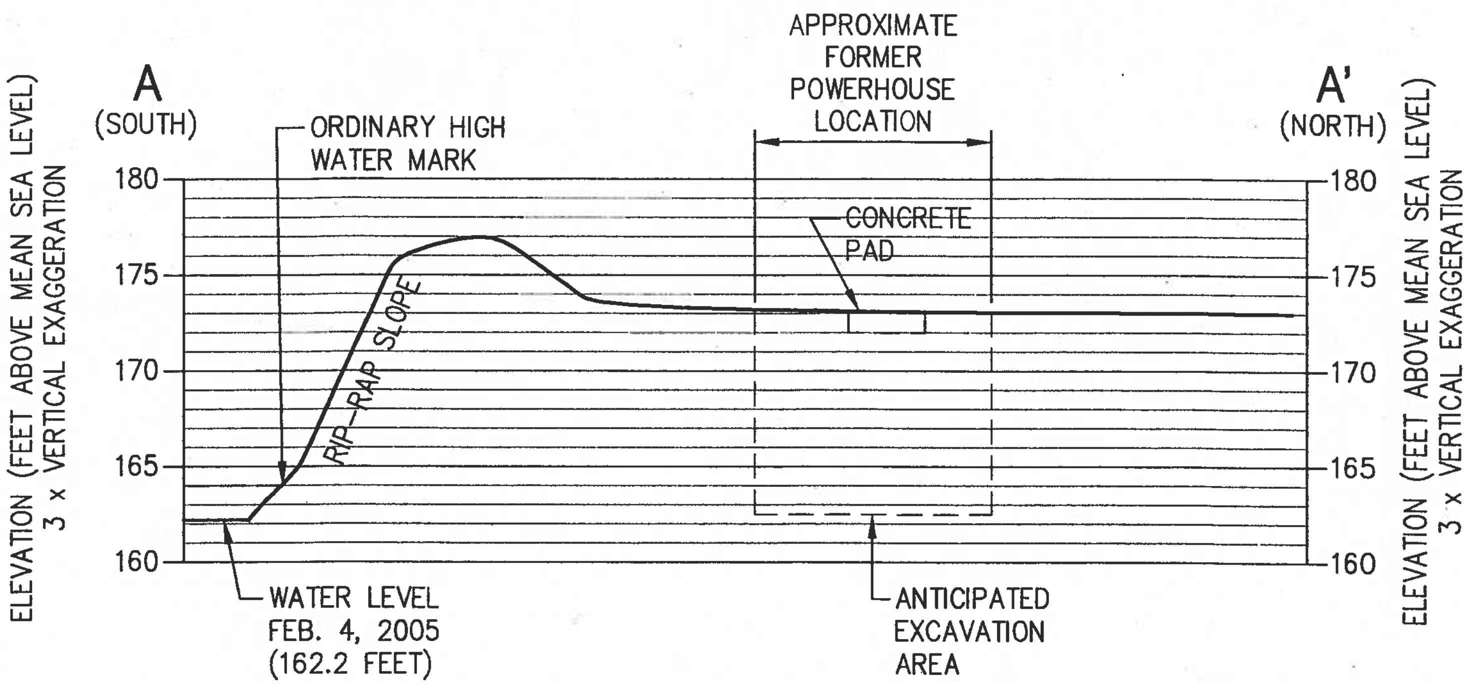
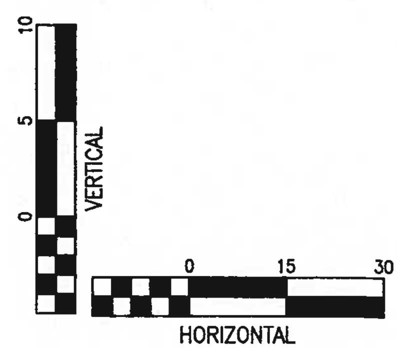
BNSF RAILWAY COMPANY
WISHRAM, WA

FORMER POWERHOUSE AREA

036026.01-Wishram\FIG-5

FIGURE - 5





SCALE: HORIZONTAL SCALE: 1" = 30'-0"
VERTICAL SCALE: 1" = 10'-0"

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WISHRAM, WA

REPRESENTATIVE CROSS SECTION A-A'

036026.01-Wishram\FIG-6

FIGURE - 6

Appendix A

Kennedy/Jenks Consultants
Site Health and Safety Plan

Project No.: 036026.01 **Date:** March 31, 2005

Site/Project Name: BNSF Wishram Remediation

Site Address/Location: 500 Bridgeway Road, Wishram, Washington

Client: BNSF Railway Company

Client's Health and Safety Representative: **Name** Mr. Bruce Sheppard
Phone 206-625-6035

Site Contact: **Name** Mr. Jack Ripplinger, Roadmaster
Phone 509-493-1490

Site Activities Planned

Activity	Location	Date
Observation of soil excavation activities, collection of confirmation soil samples	Site Wide	2005
Well installation / abandonment	Site Wide	2005
Groundwater monitoring	Site Wide	2005-2006
Product recovery well monitoring	Site Wide	2005-2006

Estimate of Direct Exposure to K/J Personnel: ____ **High** ____ **Med** X **Low** ____ **None**

Physical Description of the Facility (attach map)

The site includes a depot building (BNSF and Amtrack), maintenance building, and several small ancillary structures. A main BNSF rail line (two tracks, potentially active at all times) is present onsite, as are a limited number of side spurs (two in work area, currently inactive). The work area is approximately 3 acres, and is roughly rectangular in shape.

Operational Description of the Facility

The main BNSF rail line is potentially active at all times, spur tracks located in the work area are currently inactive, but other spurs onsite are active. Other operations include Amtrack service/depot, rail car storage, rail car switching (light to moderate switching activity).

Site Status: X **Active** ____ **Inactive** ____ **Abandoned** ____ **Unknown**

Hazard Assessment

Chemical State: X Liquid X Solid ___ Gas ___ Other ___ Unknown

Chemical Characteristics: ___ Corrosive X Flammable ___ Toxic X Volatile ___ Inert ___ Other

Chemicals of Concern (attach MSDSs if available)

Chemical Name	Physical/Chemical Characteristics	Regulatory Standards	Exposure Routes/Symptoms
Petroleum Hydrocarbons (diesel and oil)	Liquid petroleum with a characteristic odor, combustible, flammable	None established	Inhalation, ingestion, absorption, skin/eye contact; headache, irritation of the eyes, nose, and respiratory system.
Arsenic	Naturally occurring element combined with oxygen, chlorine and sulfur forms inorganic arsenic.	TWA – 10 µg/m^3 (OSHA)	Inhalation, ingestion, skin/eye contact; skin irritation, sore throat, irritated lungs, nausea and vomiting, abnormal heart rhythm.
Lead	Naturally occurring bluish-gray metal, used in manufacturing, comes from burning fossil fuels, mining, paint.	TWA – 1.5 µg/m^3 over 3 months (EPA)	Inhalation, ingestion, contact/Eye irritant, abdominal pain, weakness, kidney disease.
TPH - Gasoline	Liquid petroleum	See BTEX	Inhalation, absorption, ingestion, contact, headache, irritation of the eyes, nose, and respiratory system
Benzene	Colorless to light yellow liquid with an aromatic odor	TWA 0.1 ppm (NIOSH) PEL 1 ppm (OSHA) STEL 1 ppm (NIOSH)	Inhalation, Absorption, Ingestion, Contact/Irritation of the eyes, nose and respiratory system; giddiness; headache, nausea, staggered gait; fatigue, anorexia, dermatitis; depression, carcinogen
Toluene	Colorless liquid with a sweet, pungent benzene-like odor	TWA 100 ppm (NIOSH) PEL 200 ppm (OSHA) STEL 150 ppm (NIOSH)	Inhalation, Absorption, Ingestion, Contact/Fatigue, Weakness; confusion, euphoria, dizziness, headache; dilated pupils, lacrimation; nervousness, muscle fatigue, insomnia; paresthesia; dermatitis
Ethylbenzene	Colorless liquid with an aromatic odor	100 ppm (PEL) 125 ppm (STEL)	Inhalation, Ingestion, Contact/Irritation of the eyes and mucous membranes; headache; dermatitis; narcosis, coma

Xylenes	Colorless liquids with an aromatic odor	100 ppm (PEL) 150 ppm (STEL)	Inhalation, Absorption, Ingestion, Contact/Dizziness, excitement, drowsiness, incoordination, staggering gait; irritation of the eyes, nose, and throat; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis
Polycyclic Aromatic Hydrocarbons	Colorless, white, or pale yellow-green.	TWA – 0.2 mg/m^3 (OSHA)	Inhalation, ingestion, skin/eye contact, skin irritation.

Hazards of Concern

X **Heat Stress**	X **Cold Stress**	___ **Explosive/Flammable**	___ **Oxygen Deficient**
X **Excessive Noise**	___ **Inorganic Chemicals**	X **Organic Chemicals**	___ **Other**

Describe Potential Environmental Hazards

Possible direct contact with contaminants in subsurface soil and groundwater, ingestion of contaminants, inhalation of contaminants if dust is generated during excavation.

Describe Potential Worker Hazards

Working in the vicinity of heavy construction equipment including, but not limited to, excavators, loaders, and dump trucks.

Working in the vicinity of open excavations (no entry of unshored excavations >4 feet in depth).

Working in the vicinity of active rail lines (all personnel will have completed the BNSF Contractor Orientation course).

General construction area hazards such as noise, tripping, falling, and movement of vehicles.

Working in the vicinity of drilling equipment, including noise and moving/rotating parts.

Potential underground utilities.

Working within 25 feet of active rail lines (A BNSF flagger will be required for this activity).

Activity Considerations

Will site representative be present? X **Yes** ___ **No**

Exact Location of Chemicals: X **Known** X **Assumed** ___ **Unknown**

Identify Nearest Offsite Population: X **Residential** X **Industrial** ___ **Rural** ___ **Urban**

Describe Nearest Offsite Population

The nearest residences in the town of Wishram are several hundred feet away. A building on the BNSF property, within 100 feet of proposed activities, is used as a garage (no staff) by the Wishram Fire Department. The Wishram Post Office is located within 100 feet of the work area.

Safety Considerations

If there is more than one level of hazard, or if there are multiple "sites" within a site, a separate page should be completed to show specific safety considerations for each location.

Work Location: BNSF Wishram Yard, 500 Main Street, Wishram, WA

Objective of Work: Site remediation including excavation of soil and groundwater treatment

Level of Protection Planned: ___ **Level C** X **Level D**

Possible Modifications: None anticipated, primary contaminants are diesel and oil. Respirator may be worn if warranted by field conditions, but is not considered likely.

Monitoring Equipment: X **OVA/hnu** ___ **O_2 Meter** ___ **Explosimeter** ___ **H_2S Meter** X **Other**

Action Guidelines

	Explosimeter	O - 10% LEL 10- 20% LEL > 20% LEL	No explosive hazard Potential explosive hazard; notify SSO Explosive hazard; evacuate area
	O2 Meter	21% O2 <21% O2 <19.5% O2	Normal Oxygen deficient; notify SSO Evacuate area
Other	OVA	Sustained reading 10ppm above background in breathing zone.	Evacuate work area, evaluate situation. Wear respirator with organic vapor filter if necessary (not anticipated).
	Visual observation	Excessive dust in work area	Cease work. Evaluate dust control measures. Wear respirator with particulate filter (or dust mask) if necessary.

Type of Personal Protective Equipment to be Used

Foot: Lace-up work boots with steel-toe, steel shank, and defined heel extending above the ankle. Work boots shall conform to ANSI Z41.1.

Clothing: Reflective orange vest with reflective stripe worn as an outer layer.

Hand: Work or impermeable gloves as required.

Respiratory: Respirator with organic vapor cartridge if warranted by field conditions. Respirator with particulate filter (or dust mask) if warranted by excessive dust in work area.

Eye/Face: Safety Glasses with permanently affixed side shields. Safety glasses shall conform to ANSI Z87.1.

Additional Gear: Hearing protection as required.

BSNF Contractor Orientation Card on person at all times.

Cell Phone.

Work Party

Name	Responsibility	Level of Protection
Dean Malte	Site Safety Supervisor	D
Galen Davis	Project Manager	D
Other Kennedy/Jenks Personnel	Contractor oversight, sampling, monitoring	D
Drilling Contractor	Well installation / abandonment	D

Site Entry Procedures

Enter site from main street. Don all protective equipment (as required) before entering site. Check in with BNSF personnel at Depot Building.

Criteria for Changing Protection

Level D equipment will be worn at all times while onsite. Use of respirator or dust mask based on criteria given above.

Decontamination Procedures

Disposable PPE (if donned) will be removed at the end of each day and disposed of as non-hazardous waste. Site personnel will wash hands and/or other exposed dermal surfaces prior to eating, drinking, or smoking.

Work Limitations (time of day, conditions, etc.)

Work will be conducted during daylight hours only. Work will not be performed within 25 feet of track without a BNSF flagger present.

Disposal of Disposable Materials, Drill Spoils, Decon Water

If drill cuttings and monitoring well purge water (or decon water) are generated, they will be stored onsite in 55-gallon steel drums pending analysis of samples. Upon receipt of analytical data, the drummed media will be disposed offsite by a licensed disposal contractor. Disposable field materials (gloves, baggies, tubing, etc.) will be disposed as municipal waste.

Locations of Nearest... (locate on map):

Telephone: Cellular phone with K/J personnel; BNSF Maintenance Building; BNSF/Amtrack Depot Building

Running Water Source: BNSF Maintenance Building

Public Road: Main Street

Rest Room: BNSF Maintenance Building / portable toilet in work area

Emergency Planning

Calling Card Number: ______________________

Telephone Numbers

	Name	*Telephone Number*
Local Police:		911
Local Ambulance:		911
Local Fire Department:		911
Local Hospital:	Mid-Columbia Medical Center	541-296-1111
Hospital Address:	1700 E 19th St, The Dalles, OR 97058	
Client Contact:	Bruce Sheppard / Jack Ripplinger	206-625-6035 / 509-493-1490
Site Telephone:	Cellular Only	varies with personnel
K/J Corporate Physician:	ADP	800-229-3674
EPA/DOE Name:		
Poison Control Center:	Washington Poison Center	206-526-2121
Local K/J Office:	Federal Way, WA	253-874-0555
K/J Corporate Safety Officer:	Bert Drews	415-243-2526
Regional IS Manager:	Ty Schreiner	253-874-0555
Regional Safety Supervisor:	John P. Jindra	253-874-0555
Project Manager:	Galen Davis	253-874-0555
Site Safety Officer:	Dean Malte	253-874-0555

Provide Directions to Nearest Medical Facility (attach map)

Follow **Map 1** to Highway 14 (several streets are unmarked).

Travel west on Highway 14 for 7 miles to Highway 197.

Turn South on Highway 197 and cross Columbia River **(MAP 2)**.

Exit to West on Highway 30 toward The Dalles city center **(MAP 3)**.

Turn south on Brewery Grade and travel east to Dry Hollow Road **(MAP 4)**.

South on Dry Hollow Road to East 17th Street.

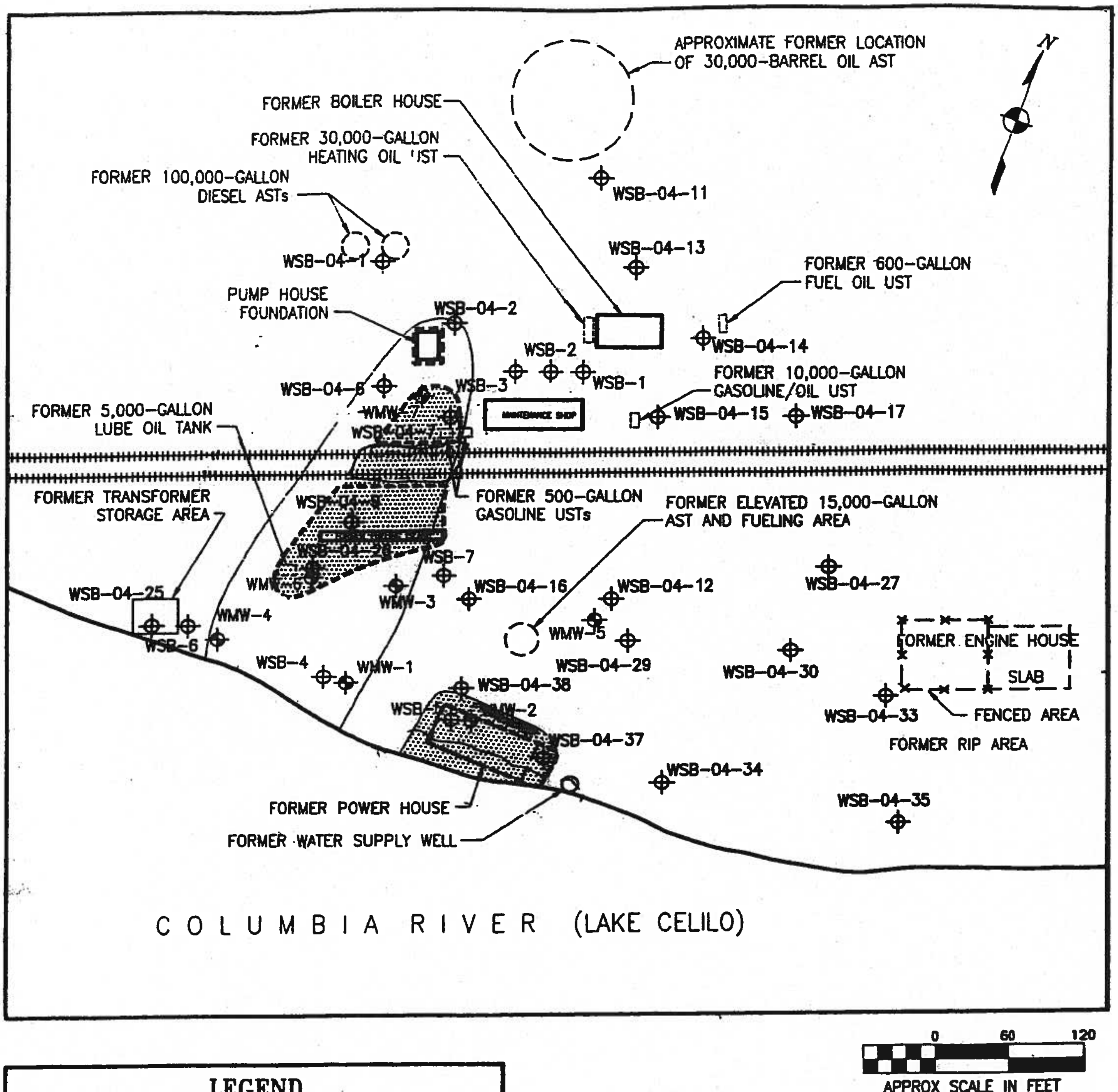
East on East 17th Street to Nevada Street

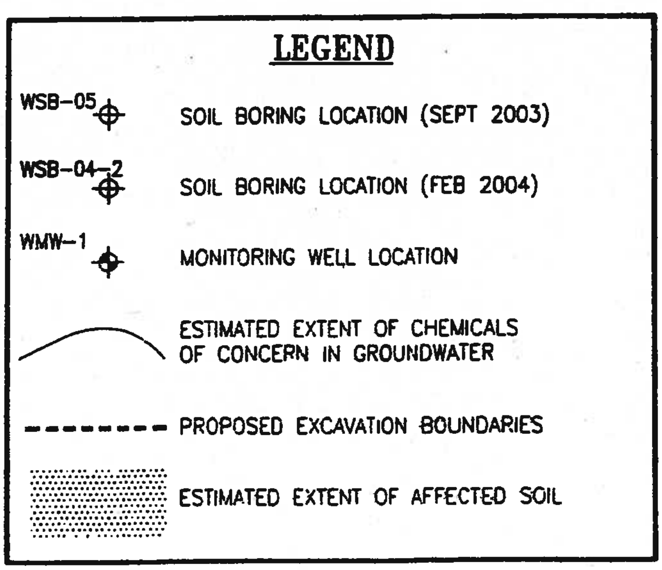
South on Nevada Street to intersection with East 19th Street. Hospital is at intersection.

Approvals

	Signature	Date
Site Safety Officer:	[signature]	4/1/05
Project Manager:	[signature]	4/1/05
Regional Safety Supervisor:	[signature]	4/1/05

cc: Project File
Regional Safety Supervisor
Assistant Corporate Safety Manager





Kennedy/Jenks Consultants

THE BURLINGTON NORTHERN AND SANTA FE RAILWAY CO.
WISHRAM, WA

PROPOSED REMEDIATION AREAS

036026.00\Fig-1_9-2004

FIGURE 1

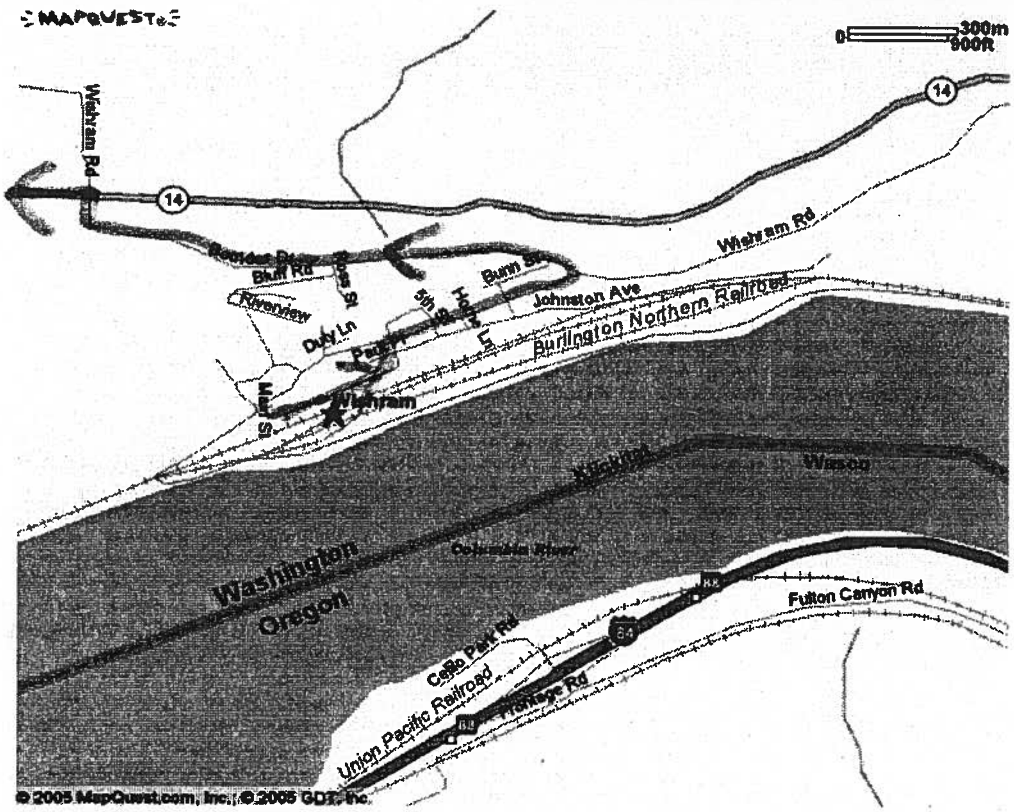
MAPQUEST.

Send To Printer Back to Map

Wishram WA
US

Notes:

MAP 1

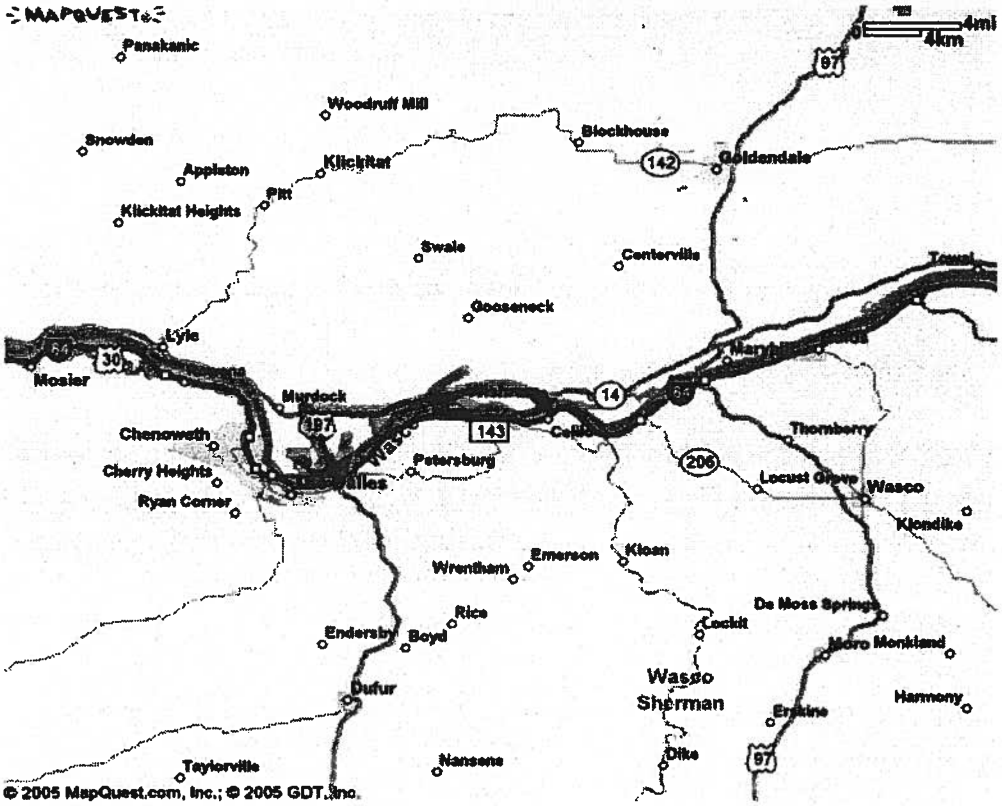


Send To Printer Back to Map

Wishram WA
US

Notes:

MAP 2



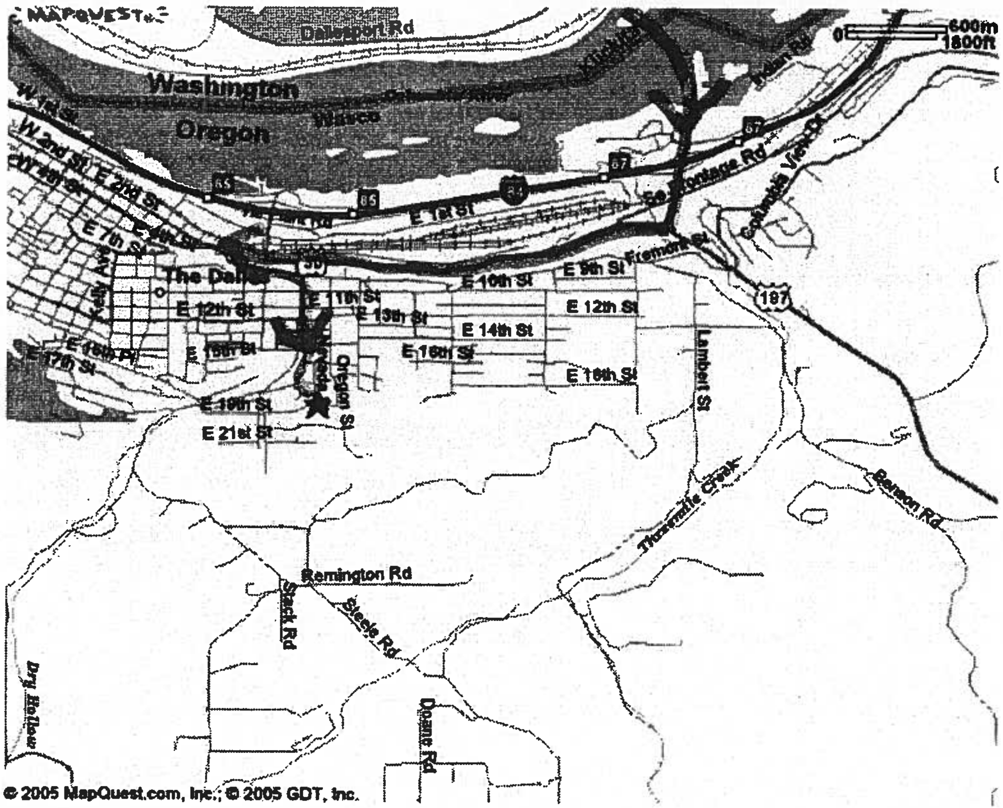
MAPQUEST.

Send To Printer Back to Map

1700 E 19th St
The Dalles OR
97058-3317 US

Notes:

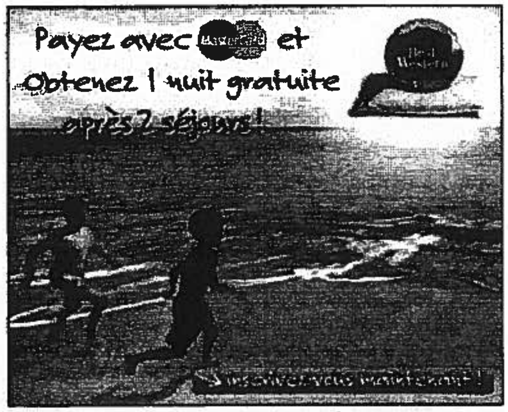
MAP 3



MAPQUEST.

Send To Printer Back to Map

1700 E 19th St
The Dalles OR
97058-3317 US



Notes:

MAP 4