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2015 AS-BUILT COMPLETION REPORT

HOT WATER FLUSHING SYSTEM AND SUPPLEMENTAL EXCAVATION
SKYKOMISH SCHOOL
BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON
CONSENT DECREE NO. 07-2-33672-9 SEA

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(Provided on compact disc in print copy)

ACRONYMS AND ABBREVIATIONS

ADA	Americans with Disabilities Act
AECOM	AECOM Environmental
As-Built Report	*2015 As-Built Completion Report, BNSF Former Maintenance and Fueling Facility, Skykomish, Washington* dated April 21, 2016 prepared by Farallon Consulting, L.L.C. (this report)
BNSF	BNSF Railway Company
CAP	Cleanup Action Plan dated October 2007, prepared by the Washington State Department of Ecology
Design Modification letter	letter regarding Injection and Monitoring Well Construction Variances from Design, Skykomish School Hot Water Flush System Project, Skykomish Washington dated August 26, 2015 prepared by Trihydro Corporation
Ecology	Washington State Department of Ecology
Farallon	Farallon Consulting, L.L.C.
Glacier	Glacier Environmental Services, Inc.
HCC	hydraulic control and containment
HWF	hot water flushing
HWF Design Report	*Hot Water Flushing Design Report*, *Skykomish School*, *105 6th Street*, *Skykomish*, *Washington* dated June 6, 2011 prepared by Farallon Consulting, L.L.C. (Farallon) and Aquifer Solutions, Inc.
MarVac	Marine Vacuum Service, Inc.
mg/kg	milligrams per kilogram
MSE	mechanically stabilized earth
NAPL	nonaqueous-phase liquid
PID	photoionization detector
PLC	programmable logic controller
RL	remediation level
ROW	right-of-way
School	Skykomish School building
SGP	soil gas probe
SHF	soil handling facility
Site	BNSF Railway Company Former Maintenance and Fueling Facility in Skykomish, Washington
SVE	soil vapor extraction
Town	Town of Skykomish, Washington

Trihydro	Trihydro Corporation
VOC	volatile organic compound
2010 CMP	*2010 Compliance Monitoring Plan Update, BNSF Former Maintenance and Fueling Facility, Skykomish, Washington* dated April 30, 2010 prepared by AECOM Environment
2010 EDR	*Engineering Design Report, BNSF Former Maintenance and Fueling Facility – Skykomish, Washington* dated May 3, 2010 prepared by AECOM Environment
2015 ANO	Hot Water Flushing Air, Noise, and Odor Monitoring Plan, 2015 to 2019 dated February 10, 2015 prepared by EMB Consulting
2015 CMP	*Addendum #3 to 2010 Compliance Monitoring Plan Update, BNSF Former Maintenance and Fueling Facility, Skykomish, Washington* dated February 17, 2015 prepared by Farallon Consulting, L.L.C.
2015 CPS	*Technical Specifications – Skykomish School HWF Remediation, Skykomish, Washington* dated January 16, 2015 prepared by Farallon Consulting, L.L.C.
2015 TEP	*Technical Execution Plan, Skykomish School HWF Treatment System, Skykomish, Washington* dated May 2015, prepared by Glacier Environmental Services, Inc.

1.0 INTRODUCTION

This 2015 As-Built Completion Report (As-Built Report) prepared pursuant to the requirements of Section 400 of Chapter 173-340 of the Washington Administrative Code describes the 2015 remediation construction activities completed at the Skykomish School (School) for the BNSF Railway Company (BNSF) as part of the remedial action underway at the BNSF Former Maintenance and Fueling Facility in Skykomish, Washington (herein referred to as the Site).The location of the remediation construction activities defined as the Hot Water Flushing System at the School and 2015 Supplemental Excavation Area are shown on Figure 1. The School is defined as the area beneath and adjacent to all sides of the School building within the sheet pile barrier wall, as shown on Figure 2. Site remediation activities are being conducted in accordance with the *Cleanup Action Plan for BNSF Former Maintenance and Fueling Facility, Skykomish, Washington* dated October 18, 2007, prepared by the Washington State Department of Ecology (Ecology) (2007) (CAP). The remediation activities completed at the Site in 2015 were approved by Ecology and undertaken by BNSF pursuant to Consent Decree No. 07-2-33672-9 SEA between BNSF and Ecology, and are part of an integrated and comprehensive remedial action for the Site. The overall cleanup approach for the Site is described in the Master Engineering Design Report (The RETEC Group, Inc. 2008).

1.1 BACKGROUND

Soil and groundwater beneath the School will be treated by HWF with the treatment goal of removing separate-phase mobile liquid petroleum components, and/or nonaqueous-phase liquid (NAPL) to the extent technically possible. An area south of the School building within Railroad Avenue was excavated to remove petroleum hydrocarbons exceeding the 3,400 milligram per kilogram (mg/kg) Remediation Level (RL) established by Ecology in the CAP. The portion of the cleanup discussed in this As-Built Report was originally described in the Hot Water Flushing Design Report dated June 6, 2011 prepared by Farallon Consulting, L.L.C. (Farallon) and Aquifer Solutions, Inc. (2011) (HWF Design Report). The HWF Design Report presents the design basis and details for HWF treatment.

The HWF scope as described in the HWF Design Report remained ostensibly unchanged, with the exception of the northeastern and northwestern corners, where cleanup was set back farther from the School building based on the limits of previous excavations completed in 2010 and 2013 (Figure 2). In addition to the HWF System, the 2015 scope of work included a supplemental excavation in Railroad Avenue south of the School building. This supplemental excavation was originally described in the 2010 EDR, but had not yet been completed. Construction plans and specifications detailing the remediation of the School are included in the 2015 Technical Specifications – Skykomish School HWF Remediation dated January, 16, prepared by Farallon (2015a) (2015 CPS).

The remediation and compliance monitoring work is described in the Compliance Monitoring Plan Update dated April 30, 2010, prepared by AECOM (2010a) (2010 CMP); and Addendum #3 to 2010 Compliance Monitoring Plan Update dated February 17, 2015, prepared by Farallon (2015b) (2015

CMP). This As-Built Report summarizes the HWF construction activities completed at the School and supplemental excavation south of the School within Railroad Avenue in 2015, and the monitoring activities completed in association with the School remediation. Site photographs of the 2015 construction activities are provided in a photolog located in Appendix A.

The remainder of this As-Built Report is organized into the following sections:

- **Section 2**: **Project Management and Organization.** This section describes the roles and responsibilities of the general contractor, and the consultants and contractors to BNSF, Farallon, the Town of Skykomish, and Skykomish School District for the completion of the 2015 remediation activities.
- **Section 3: Site Preparation.** This section describes the general Site preparation activities that were completed prior to the start of construction, including meetings, temporary facilities and controls, surveying, utility potholing, protection monitoring, and settlement and vibration monitoring.
- **Section 4**: **Supplemental Excavation Activities.** This section describes the 2015 supplemental excavation activities, overburden sampling and text pit excavation, excavation of petroleum-contaminated soil, and handling and disposal of stockpile soil.
- **Section 5**: **Hot Water Flushing System Construction Activities.** This section describes construction of the HWF System elements at the School.
- **Section 6**: **Restoration Activities.** This section describes the restoration activities that were conducted following the 2015 remediation construction activities, including backfill, placement, and compaction, School building utility improvements, town sewer improvements, and restoration of the School building interior, School exterior, and play structure.
- **Section 7: Work to be Completed after 2015.** This section describes the remaining remediation activities described in the planning documents that were begun and/or will be completed after 2015, including operation of the hydraulic control and containment system, cleanup beneath the School, and utility and Town of Skykomish (Town) restoration.
- **Section 8: Summary and Conclusions.** This section provides an overview of the 2015 remediation activities at the Site, and includes Farallon's conclusions pertaining to the activities and work completed.
- **Section 9: References.** This section lists the documents cited in this report.

2.0 PROJECT MANAGEMENT AND ORGANIZATION

Farallon was selected by BNSF to provide design, bidding, and construction management services for the School remediation. In this capacity, Farallon served as the BNSF liaison with contractors, the Town, the Skykomish School District, and local stakeholders. During excavation and construction activities, Farallon provided weekly status updates to BNSF, the Skykomish School District, the Town, and Ecology representatives. Copies of the 2015 Weekly Status Updates are provided in Appendix B. Ecology retained responsibility for regulatory oversight of the remediation project. Brief descriptions of the roles of each contractor, subcontractor, and consultant involved in the 2015 remediation activities are provided below.

2.1 GENERAL CONTRACTOR

Glacier Environmental Services, Inc. (Glacier) was selected by BNSF to perform the construction activities in accordance with the 2015 CPS, and the development and implementation of the 2015 Technical Execution Plan dated May 2015 prepared by Glacier (2015) (2015 TEP). Glacier performed excavation, backfilling, and grading of excavated areas; loading of excavated material for disposal; treatment system installation; restoration; and infrastructure improvements.

Subcontractors to Glacier and the services they provided included the following:

- Pacific Surveying and Engineering: land surveying;
- Holt Services, Inc (Holt).: well installation;
- Salinas Construction: concrete floor and sidewalk placement, and saw cutting;
- Lakeridge Paving Company: asphalt paving;
- Malcom Drilling Company, Inc.: permeation grouting;
- Marine Vacuum Service, Inc. (MarVac): oil recovery;
- GeoTest Services, Inc.: compaction testing;
- Cadman, Inc.: Backfill materials supply and hauling;
- Garner's Northwest Landscaping: Irrigation system, topsoil, and sod installation;
- Bravo Environmental: sewer line survey and vacuum excavation;
- S&M Electrical: electrical conduit installation;
- Elcon Corporation: electrical surveying;
- Don Townsend: welding;
- Blue Iron: sheet pile wall installation;
- Precision Concrete: interior paint restoration; and

- Superior Cleaning and Restoration: interior cleaning.

2.2 CONSULTANTS AND CONTRACTORS TO BNSF

The following firms provided the services indicated below under contract to BNSF in support of this project:

- Farallon: project management and engineering design of remediation construction plans and specifications; construction management; compliance monitoring in accordance with the 2010 CMP, the 2015 CMP, and the 2015 CPS; and BNSF liaison activities with contractors, the Town, and local stakeholders;
- TestAmerica Laboratories, Inc.: laboratory analysis of soil samples;
- McMillen Jacobs Associates (MJA): geotechnical design, construction observation, settlement monitoring, and submittal review;
- Republic Services, Inc.: disposal of contaminated soil.

2.3 SUBCONSULTANTS TO FARALLON

The following firms provided the services indicated below under contract to Farallon in support of this project:

- EMB Consulting (2015): development and implementation of the *Hot Water Flushing Air, Noise, and Odor Monitoring Plan 2015 to 2019* (2015 ANO);
- Sayler Data Solutions, Inc.: third-party data validation services;
- Trihydro Corporation (Trihydro): HWF System design, construction observation and support, and submittal review;
- Swenson Say Faget Structural Engineering: construction support and floor restoration assessment and design services;
- Travis Fitzmaurice Associates: electrical engineering design for remediation site improvements;
- NAC Architecture: architectural design for School building interior improvements; and
- HV Engineering: fuel tank and School building heating system evaluations.

2.4 CONSULTANTS TO TOWN OF SKYKOMISH

Gray & Osborne Inc. provided design and construction observation services for the sanitary sewer installations.

2.5 CONSULTANTS TO SKYKOMISH SCHOOL DISTRICT

The following firms provided the services indicated below under contract to Skykomish School District in support of this project:

- Ameresco, Inc.: design and construction of School building heating system upgrades;
- Broadview Associates: consulting services and review of the 2015 CPS;
- Bassetti Architects: consulting services and review of the 2015 CPS;
- Magnusson Klemencic Associates: consulting services and review of the 2015 CPS;
- BRC Acoustics and Audiovisual Design, Inc.: consulting services and review of the 2015 CPS;
- Wood Harbinger, Inc.: consulting services and review of the 2015 CPS;
- Environmental Consulting Services, Inc.: consulting services and review of the 2015 CPS; and
- The Migizi Group: consulting services and review of the 2015 CPS.

2.6 CONTRACTORS TO THE SKYKOMISH SCHOOL DISTRICT

Holmberg Company provided mechanical contracting services under contract to the Skykomish School District for installation of a new heating system.

3.0 SITE PREPARATION

This section describes the general site preparation activities that were completed prior to the start of construction for the BNSF HWF System installation, and supplemental excavation in Railroad Avenue.

3.1 PRE-CONSTRUCTION MEETING

A pre-construction meeting was held in the Town on June 18, 2015 prior to mobilization. Meeting attendees included representatives of BNSF, Farallon, Glacier, Skykomish School District, the Town, the Skykomish Fire Department, MJA, EMB Consulting, Trihydro, and Ecology. The following topics were discussed during the meeting:

- Site health and safety;
- Roles and responsibilities;
- Key site documents;
- Communication protocols;
- Daily health and safety briefings;
- Project contacts;
- Submittal procedures; and
- The anticipated construction schedule.

3.2 HEALTH AND SAFETY MEETINGS

Daily health and safety meetings were conducted prior to commencement of work. All workers present at the School attended the meetings and signed the daily health and safety briefing form. Any workers or site visitors arriving after the daily meeting were briefed at the job trailer during site check-in.

3.3 TEMPORARY FACILITIES AND CONTROLS

Temporary facilities and controls implemented at the School were outlined in the 2015 CPS and the 2015 TEP. The TEP documents temporary facilities and controls employed during the project work to define the limits of work, control surface water runoff during construction operations, coordinate vehicle traffic, and maintain security at the School.

3.3.1 Construction Trailer

Glacier provided a construction trailer that was located south of the School across Railroad Avenue. The construction trailer included separate field offices for the Glacier Site Superintendent and the Farallon Project Engineer, and a meeting room for daily health and safety meetings.

Portable toilet facilities were provided at the Soil Handling Facility (SHF), located in the BNSF railyard, and in the School during construction activities (Figure 1).

3.3.2 Temporary Erosion and Sediment Controls

Temporary erosion and sediment controls were implemented prior to breaking ground for the construction activities. Catch basin inserts were installed in stormwater catch basins along West River Drive, Sixth Street, and Railroad Avenue.

3.3.3 Temporary Traffic and Access Control

3.3.3.1 Street Traffic Controls

Railroad Avenue between Sixth Street and the Shawver Property, and Sixth Street between Railroad Avenue and West River Drive were closed during the summer construction period. To minimize truck traffic on Town streets, Glacier transferred soil from the School to the SHF, described in Section 3.3.6, Soil Handling Facility (Figure 1).

3.3.3.2 Railroad Flagger Traffic Controls

BNSF provided a railroad flagger during sheet pile preparation in the BNSF railyard. Because forklifts moving the steel sheet piles in the railyard had the potential to foul the railroad tracks, impacted tracks were locked out during this work. The BNSF railroad flagger was in continuous contact with the Glacier crew at the School, including during morning check-ins.

A BNSF railroad flagger was used also during sheet pile installation along Railroad Avenue because of the crane's potential to foul tracks during sheet pile staging in Railroad Avenue. The BNSF railroad flagger was in continuous contact with the Glacier crew at the School and with the crane operator, including during morning check-ins. During non-construction hours, the crane boom was lowered and secured.

3.3.4 Temporary Site Security

A 6-foot-high temporary fence was installed around the School to maintain security throughout the duration of the project. The fence was installed to allow ingress and egress via the doors on the eastern side of the School building. Signage was posted along the fence directing visitors to the job trailer for Site orientation and safety briefing. Access gates and doors to the School building were locked daily following work completion.

3.3.5 Construction Water Storage Facility

A 20,000-gallon temporary storage tank was set up at the SHF for collection of runoff from the soil stockpile. Stockpile runoff was pumped to the temporary storage tank to allow for settling. Following completion of loadout of contaminated soil from the SHF, the water in the storage tank was pumped into tanker trucks and transported off the Site for disposal.

3.3.6 Soil Handling Facility

The SHF is located in BNSF railyard and is covered by asphalt pavement placed over a high-density polyethylene liner (Figure 1). The eastern end of the SHF is surrounded by two rows of ecology blocks to contain stockpiled contaminated soil. A surface water collection sump was installed at the low point of the SHF to collect runoff from within the footprint of the SHF. A small trash pump conveyed surface water from the sump to the Construction Water Storage Facility.

3.4 SURVEYING

In accordance with the 2015 CPS, Pacific Surveying and Engineering conducted a topographical land survey of the School prior to commencement of construction.

In accordance with the 2015 CPS, Bravo Environmental conducted a baseline video survey of the sewer pipe beneath the School building prior to commencement of construction. The baseline sewer survey identified one break in the sewer line west of the entrance to the School building boiler room. This section of sewer pipe was replaced with new high-density polyethylene sewer pipe and as described in the 2015 CPS.

3.4.1 Baseline Electrical Surveying

In accordance with the 2015 CPS, Elcon Corporation conducted a baseline survey of the School building electrical system prior to commencement of construction.

3.4.2 Pre-Construction Video Surveying

In accordance with the 2015 CPS, Glacier conducted a baseline video survey of the School building interior and exterior, and of the adjacent teacherage prior to commencement of construction.

3.5 UTILITY POTHOLING

Glacier provided a one-call utility locate of the School prior to commencement of construction activities to locate utilities at the School, in Railroad Avenue, and Sixth Street. Bravo Environmental provided potholing using a vactor truck to verify utility locations. Well locations were potholed prior to drilling. The School building water service line and electrical utility lines also were potholed to confirm depths and locations.

Glacier and MarVac performed potholing using a vactor truck to determine the location, depth, and condition of existing sewer pipe beneath Sixth Street and Railroad Avenue south of the School.

3.6 PROTECTION MONITORING

Protection monitoring was performed during construction activities conducted at the School, as defined in the 2010 CMP and 2015 CMP. The 2015 ANO presented the methods and procedures to be used for the baseline and protection monitoring to be performed during the 2015 to 2019 remediation and construction activities conducted at the School.

3.6.1 Air Monitoring

In accordance with the 2015 ANO, air monitoring was conducted at the School by EMB Consulting and Farallon. Prior to commencement of remediation and construction activities, air samples were collected inside the School building to establish baseline petroleum concentrations. During the remediation and construction activities, air samples were collected as part of protection monitoring to measure concentrations of respirable dust, lead, arsenic, petroleum, and diesel exhaust. In addition, three photoionization detectors (PIDs) were operated continuously inside the School building to monitor volatile organic compound (VOC) levels during construction. Air monitoring activities were documented in weekly Air and Noise Monitoring Reports.

On July 23, 2015, the VOCs exceeded the lower limit as measured by the PID located in the School building cafeteria. Further investigation determined that the custodian was painting the cafeteria and Holmberg Company was gluing pipe fittings near the location of the PID at the time of the exceedance. To mitigate the exceedance, windows in the School building were opened, additional fans were turned on, and the custodian was asked to refrain from painting. The Skykomish School District and Ecology were notified of this event as required by the 2015 ANO.

Weekly Air and Noise Monitoring Reports are provided in Appendix C.

3.6.2 Noise Monitoring

In accordance with the 2015 ANO, noise monitoring was conducted at the School by EMB Consulting and Farallon. Prior to commencement of remediation and construction activities, noise monitoring was performed to establish baseline noise levels. Measurements were collected inside and outside the School building. During remediation and construction activities, noise measurements were collected outside the building and outside the Community Center, located across Sixth Avenue from the School. Noise monitoring activities were documented in weekly Air and Noise Monitoring Reports. During the 2015 construction activities, no noise levels were measured at or above the project action limits specified in the 2015 ANO. Air and Noise Monitoring Reports are provided in Appendix C.

3.6.3 Weather Monitoring

Weather monitoring was conducted by EMB Consulting and Farallon in accordance with the 2015 ANO. A weather station in Index, Washington recorded daily temperature, wind speed and direction, and precipitation. Recorded weather data are summarized in the Air and Noise Monitoring Reports provided in Appendix C.

3.7 SETTLEMENT AND VIBRATION MONITORING

In accordance with the 2015 CPS, structure settlement tiltmeters were placed on the School building and teacherage, as shown in the 2015 CPS. In addition, MJA set up vibration monitors at heavy construction activities near the School building.

During construction activities, MJA monitored the tiltmeters using an on-site datalogger. The tiltmeter and vibration monitoring data were reviewed by MJA and summarized in daily reports provided to Farallon. Following the construction activities, MJA (2015) provided Farallon with a technical memorandum summarizing MJA tasks conducted as part of the summer 2015 work season, which is provided in Appendix D.

4.0 SUPPLEMENTAL EXCAVATION ACTIVITIES

This section describes the supplemental excavation activities of remaining soil containing petroleum hydrocarbons that were conducted south of the School within Railroad Avenue. Remaining soil containing petroleum hydrocarbons exceeding RL was excavated in 2015. A summary of the overburden sampling, confirmation soil sampling, excavation activities, and removal of the geomembrane liner are discussed herein.

4.1 OVERBURDEN SAMPLING AND TEST PIT EXCAVATION

Prior to excavation, the area within the estimated excavation boundaries was divided into approximately 25- by 25-foot grids that were measured off School building corners and marked using construction staking and marking paint, in accordance with the 2015 CMP (Figure 3). Samples were collected from the approximate center of each grid at a depth approximately halfway between the vertical delineation limit and the ground surface (approximately 2.5 feet below ground surface [bgs]). The sample locations for the overburden soil area are depicted on Figure 3. Soil samples were collected directly from the excavator bucket. The overburden soil samples were analyzed for total petroleum hydrocarbons as diesel-range organics and as oil-range organics (collectively referred to herein as NWTPH-Dx) by Northwest Method NWTPH-Dx. No odor or staining was noted in the overburden soil samples. Based on the sum of the concentrations detected in the overburden soil samples, NWTPH-Dx was not detected at concentrations at or exceeding the level established for reuse of 1,870 milligrams per kilogram (mg/kg). The overburden soil sample analytical results are summarized in Table 1. Following receipt of the laboratory analytical results for the overburden soil samples, the overburden soil was excavated, loaded, and stockpiled in designated areas adjacent to the SHF pending reuse or disposal.

Laboratory analytical reports and data validation reports for overburden soil samples are located in Appendix E and Appendix F, respectively.

4.2 PETROLEUM-CONTAMINATED SOIL EXCAVATION

As required by the CAP, soil contaminated with NWTPH-Dx at concentrations exceeding the RL of 3,400 mg/kg in the area south of the School was to be excavated and disposed of at a Subtitle D waste disposal facility. During the 2010 Railroad Avenue ROW excavation conducted as part of the 2010 construction activities, NWTPH-Dx was detected at a concentration exceeding the RL of 3,400 mg/kg in a soil sample collected from the sidewall of grid AS2 (Figure 3).

On June 22 and 23, 2015, a supplemental excavation was conducted in grid location AS2. The eastern and northern excavation boundaries were defined by the 2010 Railroad Avenue ROW excavation bottom extent and the HWF sheet pile barrier wall, respectively. The southern and western excavation limits were field-determined based on observations of staining, odor, or the presences of light nonaqueous-phase liquid.

4.2.1 Supplemental Excavation Confirmation Sampling

In accordance with the 2015 CMP, performance soil samples were collected from the excavation bottom and sidewalls. The bottom performance sample was collected from the approximate center of the excavation at an elevation of 912 feet above mean sea level. The bottom sample was collected at an elevation similar to that for the 2010 Railroad Avenue ROW excavation. The southern and western sidewall performance samples were collected on the center of the respective sidewalls at an elevation of 916 feet above mean sea level. Soil along the northern excavation slope was not removed or sampled because soil along the northern sidewall is in the HWF treatment area. No samples were collected from the eastern excavation slope. The eastern slope consisted of structural fill placed during the 2010 Railroad Avenue ROW excavation. Following collection of soil confirmation samples, the final excavation elevations were surveyed by a licensed surveyor. The locations of soil samples collected at the final limits of the excavation are shown on Figure 3.

NWTPH-Dx was not detected at concentrations exceeding the RL of 3,400 mg/kg in the three confirmation soil samples collected. Confirmation soil sample results are summarized in Table 2. Laboratory analytical reports and data validation reports for confirmation soil samples are located in Appendix E and Appendix F, respectively.

4.2.2 Removal of Geomembrane Liner

The geomembrane liner installed during the 2010 Railroad Avenue ROW excavation was removed from the eastern excavation slope where encountered in the excavation. A geomembrane liner was determined to be unnecessary for the 2015 supplemental excavation, based on results from confirmation soil samples collected along the western and southern excavation sidewalls indicating concentrations of NWTPH-Dx less than the RL. A sheet pile barrier wall was installed along the northern excavation bottom toe; no performance samples were collected from the northern excavation slope.

4.3 STOCKPILE SOIL HANDLING AND DISPOSAL

Soil generated from the supplemental excavation was loaded and temporarily stockpiled in the SHF. Overburden and petroleum-contaminated soil was stockpiled separately in the SHF. NWTPH-Dx was not detected at concentrations at or exceeding the level established for reuse of 1,870 milligrams per kilogram (mg/kg) in the overburden samples. Overburden soil from the supplemental excavation was used for backfill at select locations at the School for 2015 HWF construction. Petroleum-contaminated soil stockpiled in the SHF was loaded and transported to the Republic Services Inc. transfer facility at 3rd Avenue and Lander in Seattle, Washington. Republic Services Inc. loaded the soil onto railcars and transported it to a Subtitle D waste disposal facility in Roosevelt, Washington. Approximately 600 tons of petroleum-contaminated soil from the supplemental excavation was transported to the disposal facility. Soil disposal documentation from Republic Services Inc. is provided in Appendix G.

Soil with boulders and cobbles excavated during sheet pile installation was stockpiled at the SHF and sampled in accordance with the 2015 CMP. Although NWTPH-Dx was not detected at concentrations at or exceeding the level established for reuse of 1,870 mg/kg in any of the stockpile samples (Table 3), the cobbley nature of this soil renders it unsuitable for reuse on the School as backfill. This stockpile of soil with boulders and cobbles remains covered at the SHF for future use by BNSF.

Laboratory analytical reports and data validation reports for stockpile soil samples are located in Appendix E and Appendix F, respectively.

5.0 HOT WATER FLUSHING SYSTEM CONSTRUCTION ACTIVITIES

A summary of the HWF treatment objectives and construction activities conducted in 2015 is described in the following sections.

5.1 REMEDIATION DESIGN BASIS AND OBJECTIVES

As described in the HWF Design Report, the HWF System was designed to treat soil and groundwater beneath the School with the treatment goal of removing separate-phase mobile liquid petroleum components, and/or NAPL. This goal was established by Ecology in the CAP, and will be accomplished by creating a closed-loop subsurface groundwater recirculation system and heating the groundwater to reduce NAPL viscosity, thereby mobilizing NAPL for recovery via a groundwater extraction system. If present, volatile petroleum constituents will be recovered via soil vapor extraction (SVE), which will be implemented during treatment operations to reduce the potential for vapor intrusion into the School building.

The objective of the overall HWF System is to meet established treatment goals and to reduce the amount of petroleum beneath the School to the extent technically possible. To achieve this objective, a HWF System will be constructed at the School consisting of the following major elements:

- Groundwater recirculation and NAPL recovery;
- Subsurface heating;
- SVE/subslab depressurization; and
- Subsurface sheet pile barrier.

5.2 HOT WATER FLUSHING SYSTEM 2015 SCOPE OF WORK

The 2015 CPS describes the scope of work for the HWF System construction and operation, of which only the below-grade portion of the HWF equipment and the monitoring system equipment were scheduled for completion during 2015. The following HWF System work components were completed during 2015:

- Well installations, including injection wells, groundwater monitoring wells, soil vapor extractions wells, air inlet wells, and recovery wells;
- Hydraulic containment installation, including sheet pile barrier wall installation, in-situ grout connection of the sheet pile wall to an existing mechanically stabilized earth (MSE) wall, and placement of geomembrane liner;
- Recovery trench construction;
- Below-grade HWF System installation, including injection system piping, extraction system piping and vaults, and soil vapor extraction system piping;
- Treatment area cap installation;

- Installation, setup, and commissioning of the School monitoring system; and
- Treatment facility site preparation.

The remaining scope of the 2015 CPS, including aboveground HWF System equipment installation and system operation, will be completed after 2015.

5.3 WELL INSTALLATIONS

A total of 26 injection wells, 21 groundwater monitoring wells, 6 SVE wells, 7 air inlet wells, and 10 recovery wells were installed by Holt as part of the HWF System construction. The locations of the wells are shown on Figure 4.

Soil cuttings from the well installation activities were transported to the SHF and disposed of as petroleum-contaminated soil in an off-site subtitle D landfill.

5.3.1 Injection Well Installations

As part of the HWF System, 26 injection wells were installed at the School. All exterior injection wells were installed using a sonic drill rig in accordance with the 2015 CPS. A total of 10 interior injection wells were installed using a track-mounted limited-access auger drill rig to depths ranging between 5 feet and 12 feet bgs. Injection wells INJ-8 through INJ-11 and INJ-15 were installed at shallower depths due to drill rig refusal. To make up for the reduced length of injection well screen, two additional injection wells were installed to maintain the design injection capacity. This design modification is summarized in the letter regarding Injection and Monitoring Well Construction Variances from Design, Skykomish School Hot Water Flush System Project, Skykomish Washington dated August 26, 2015 prepared by Trihydro (2015) (Design Modification Letter), provided in Appendix H. Injection well construction logs are provided in Appendix I.

5.3.2 Groundwater Monitoring Well Installations

As part of the subsurface groundwater monitoring system, 21 groundwater monitoring wells were installed at the School. All exterior groundwater monitoring wells were installed in accordance with the 2015 CPS. Monitoring wells GWM-1 and GWM-2 were installed following construction of the recovery trench using a truck-mounted hollow-stem auger drill rig, as described in Section 5.4, Recovery Trench Excavation. All other exterior groundwater monitoring wells were installed using a sonic drill rig. The five interior monitoring wells were installed using a track-mounted limited-access auger drill rig to depths ranging between 4 feet and 10 feet bgs. Monitoring wells GWM-3, GWM-4, and GWM-5 were installed at a shallower depth due to drill rig refusal. This design modification is summarized in the Design Modification letter provided in Appendix H. Following well installation, Holt developed each of the groundwater monitoring wells. The monitoring well construction logs are provided in Appendix J.

5.3.3 Soil Vapor Extraction Well Installations

As part of the SVE and subsurface depressurization system, six SVE wells were installed in the School building interior in accordance with the 2015 CPS using a track-mounted limited-access auger drill rig. The SVE well construction logs are provided in Appendix K.

5.3.4 Air Inlet Well Installations

As part of the SVE system, seven air inlet wells were installed exterior of the School building, in accordance with the 2015 CPS using a track-mounted sonic drill rig. The air inlet well construction logs are provided in Appendix L.

5.3.5 Recovery Well Installations

As part of the subsurface groundwater flushing system, 10 recovery wells were installed in the recovery trench adjacent to the School building in accordance with the 2015 CPS using a truck-mounted hollow-stem auger drill rig. The recovery wells were installed along the centerline of the recovery trench as shown in Figure 4. The recovery well construction logs are provided in Appendix M.

5.4 HYDRAULIC CONTAINMENT INSTALLATION

To provide hydraulic control and prevent contaminated groundwater or NAPL from migrating from the School, a sheet pile barrier wall was installed around the footprint of the School in accordance with the 2015 CPS. The sheet pile barrier wall was tied into the MSE wall that was installed along the northern perimeter of the School between the School building and the teacherage during 2006 construction. A geomembrane liner and permeation grout injection was used to join the sheet pile barrier wall to the MSE wall. The following sections describe the elements of the hydraulic containment installation.

5.4.1 Sheet Pile Wall Installation

Sheet pile wall installation was performed by Blue Iron using the nonvibratory method Giken Super Crush Piler SCU-400M. Steel sheets in the BNSF railyard remaining from the 2008 construction phase of the cleanup were prepared and cut to length prior to delivery to the School. Any holes in the sheet piles were patched using remnant material from spare steel sheets.

MJA provided on-site observation of the sheet pile installation, which was delayed initially by boulders in the subsurface that impeded sheet pile installation and damaged installation equipment. To maintain the installation schedule, Blue Iron worked double shifts to complete installation of the sheet pile. In addition, Glacier excavated in advance of the sheet pile installation equipment to remove large cobbles or boulders encountered. Soil, cobbles, and boulders removed from the sheet pile excavation that did not have petroleum odor or staining were stockpiled in the SHF for further characterization and disposal. Soil, cobbles, and boulders removed from the sheet pile excavation with petroleum odor or staining were stockpiled with other contaminated soil in the

SHF to be disposed of at a Subtitle D Landfill. Stockpile soil handling and disposal is described in Section 4.3.

A total of 157 sheets were installed to the design depth of approximately 30 feet bgs. A summary of the sheet pile installation is provided in the technical memorandum prepared by MJA (2015), provided in Appendix D.

5.4.2 Permeation Grout Injection

Permeation grout injection was used to tie the MSE wall to the sheet pile wall at junction points northeast of the School building in Sixth Street and northwest of the School building near the wood shed (Figure 4). Permeation grout injection was performed by Malcom Drilling Company, Inc. and documented by MJA. Grout columns were spaced evenly between the edge of the exposed MSE wall and the edge of the sheet pile barrier wall to complete the containment installation. A summary of the permeation grouting injection is provided in the technical memorandum prepared by MJA (2015), provided in Appendix D.

5.4.3 Installation of Geomembrane Liner

An 18-foot-long section of geomembrane liner was installed northeast of the School. Prior to permeation grout injection, Glacier exposed both ends of the MSE wall, and located the MSE wall liner that was placed south of the wall in 2006. After the eastern junction point of the MSE wall had been exposed, it was discovered that a short section of the 2006 MSE wall liner (running east-west) had been removed during the 2010 excavation and replaced with a new liner (2010 liner) (running north-south). To ensure containment at this junction point, Glacier installed an additional geomembrane liner (2015 liner) to overlap the existing liners to the sheet pile containment wall and the MSE wall. The location of the 2015 geomembrane liner is shown on the HWF System Layout As-Built provided in Appendix N.

5.5 RECOVERY TRENCH EXCAVATION

Excavation of the recovery trench to the design depth of 15 feet bgs was conducted from July 20 to July 29, 2015. The design depth was reached at all locations along the trench, with the exception of a portion northeast of the School. Although the design width of the recovery trench was between 2 and 3 feet, the actual recovery trench width was approximately 8 feet, due primarily to the soil conditions in the excavation sidewalls along the recovery trench.

The recovery trench in the northeastern area was limited by the northeastern corner of the School building foundation and the MSE wall liner. Care was taken not to damage the existing liner or undermine the School building foundation. MJA provided observation of the excavation of the recovery trench. The trench portion northeast of the School building was excavated to a depth of 10 to 13 feet below grade, the depth determined by MJA to be technically possible (Figure 4).

Approximately 2,000 tons of soil excavated from the recovery trench was transported to the SHF and temporary stockpiled before being disposed of with other petroleum-contaminated soil at a subtitled D landfill.

Following excavation, the recovery trench was backfilled with 1,439 tons of pea gravel in accordance with the 2015 CPS.

5.6 HOT WATER FLUSHING SYSTEM

The below-grade portion of the HWF System was installed during the 2015 construction season in accordance with the 2015 CPS. In addition to the system wells, hydraulic containment, and recovery trench described above, the hot water flushing system elements installed included injection system piping, extraction system piping and vaults, SVE system piping, a treatment area cap, monitoring system components, and a treatment area pad.

5.6.1 INJECTION SYSTEM PIPING

Injection system piping consisted of 1.5-inch-diameter carbon steel pipe wrapped in 0.75-inch-thick insulation in accordance with the 2015 CPS. The injection piping was installed with seven different mainlines to cover seven injection zones and to connect the injection wells to the HWF System treatment compound.

Injection system connector piping was installed a minimum of 24 inches bgs. Each of the seven injection zones was pressure-tested in accordance with the 2015 CPS. Injection mainline piping was temporarily capped south of Railroad Avenue, and will be tied into the aboveground HWF treatment equipment scheduled for installation during 2016 construction.

5.6.2 EXTRACTION SYSTEM PIPING AND VAULTS

The groundwater extraction system piping consisted of 3-inch diameter carbon steel header pipe in accordance with the 2015 CPS. The extraction system piping is located along the eastern side of the School building and connects the 10 recovery wells to the HWF System treatment compound. Extraction system piping was pressure-tested in accordance with the 2015 CPS prior to backfill placement.

Ten extraction well vaults with locking lids were installed along the center line of the recovery trench. All vaults were installed at a depth of 42 inches bgs. Recovery well extraction pumps, oil skimmers, and control equipment will be installed during 2016 construction.

5.6.3 SOIL VAPOR EXTRACTION SYSTEM PIPING

SVE system piping consisted of five SVE mainline 3-inch diameter chlorinated polyvinyl chloride pipes connecting six SVE wells and one underground horizontal subslab depressurization pipe to the HWF System treatment compound. All SVE system piping was sloped away from the SVE wells toward the HWF System treatment compound. The horizontal subslab depressurization pipe was installed 24 inches below the existing floor elevation, and extends the length of the HWF System trench in School building basement hallway (Figure 4).

5.7 TREATMENT AREA CAP

A temporary cap was installed inside the treatment area to reduce the potential for intrusion of volatiles from the contaminant plume into the School building during treatment. The temporary cap consisted of 17,650 square feet of 20-millimeter geomembrane liner sloped to drain way from the School building. A perforated underdrain pipe was installed along the sheet pile wall to collect runoff from the cap surface (Drainage System As-Built, Appendix O). To cap the School building interior, basement floor cracks were filled with a polyurea filler, and a geomembrane liner was placed over unpaved areas under the School building stairwells.

5.8 MONITORING SYSTEM COMPONENTS

A temporary monitoring system was installed at the School in accordance with the 2015 CMP to provide real-time monitoring of differential subslab pressure beneath the School building, VOCs inside the School building, and groundwater temperature and elevations across the School. The temporary monitoring system consists of the following elements:

- Three RaeGuard 2 stationary PIDs;
- Six soil gas probes (SGPs);
- Twenty-one groundwater level and temperature elements; and
- A programmable logic controller (PLC).

Commissioning of the monitoring system was completed following installation during fall 2015.

Photoionization Detectors

The three PIDs were installed in the School building's ground floor cafeteria, kindergarten classroom, and first floor main office in accordance with the 2015 CPS and the 2015 ANO (Figure 4). The PIDs were factory-calibrated, and were field-verified following installation.

The PIDs are set to measure and log 1-minute averages on a continuous basis. PID readings are displayed in real time via the PLC, and are logged in the PLC data log every minute. During HWF System operation, the PLC will notify the Skykomish School District and Farallon if VOCs exceed the action levels outlined in Section 3.2 of the 2015 ANO.

Soil Gas Probes

Six SGPs were installed in six locations in the School building basement in accordance with the 2015 CPS and the 2015 ANO (Figure 4). The SGPs were field-calibrated following installation.

The SGPs are set to continuously measure the subslab-to-interior-pressure differential. SGP readings are displayed in real-time via the PLC, and logged in the PLC data logger every hour.

The SGPs will be used to monitor SVE system operational effectiveness, as described in the 2015 CMP.

<u>Groundwater Level and Temperature Elements</u>

The groundwater level and temperature elements were installed in all 21 groundwater monitoring wells at the School, as described in the 2015 CPS. The elements for monitoring wells GWM-1 through GWM-7 were connected to the PLC. The remaining monitoring wells were installed with standalone Level TROLL data loggers. Following installation, the elements were calibrated and field-verified.

The seven monitoring wells that connect to the PLC continuously record groundwater level and temperature readings, which are displayed in real time via the PLC, and are logged every 30 and 60 minutes, respectively.

The groundwater monitoring temperature and level elements will be used to monitor groundwater beneath the School, along the hydraulic containment wall, and inside the recovery trench during HWF System operation to help balance and maintain operational effectiveness.

5.9 TREATMENT EQUIPMENT PAD

The treatment equipment pad containing the HWF System equipment consists of a 21-foot-wide self-draining gravel pad south of the School adjacent to Railroad Avenue, as shown on Figure 4. An ecology block wall was constructed along the southern wall of the treatment equipment pad to provide wall support. Overburden soil removed during the construction of the treatment equipment pad was stockpiled adjacent to the SHF and sampled in accordance with the 2015 CMP.

A temporary shed was installed during fall 2015 to house the monitoring system PLC. This shed will be replaced with HWF System equipment enclosures during 2016 construction.

6.0 RESTORATION ACTIVITIES

Restoration activities were performed in accordance with the 2015 CPS. To ensure that materials and equipment used for restoration activities were within the requirements outlined in 2015 CPS the contractor provided material and equipment submittals prior to performing work for review by the Project Engineer. All project submittals and submittal review forms are provided in Appendix P.

6.1 BACKFILL, PLACEMENT, AND COMPACTION

Structural excavations were completed at the School during the supplemental excavation; utility improvements; and HWF System installation including treatment piping and features, sheet pile containment walls, and the treatment liner system. Backfill, placement, and compaction of the structural excavations included the following features:

- **Supplemental Soil Excavation**—The excavation was backfilled with stabilization aggregate to water-level depth, and with structural fill to the surface. The excavation was backfilled in 12-inch lifts, and compacted to a firm and unyielding condition.
- **Utility Trenches**—Gravel backfill for pipe zone bedding per Washington State Department of Transportation (WSDOT) Standard Specifications Section 9-03.12(3) was placed into the pipe zone in accordance with the contract plans and specifications. Structural fill was placed above in 12-inch lifts, and compacted to a firm and unyielding condition.
- **Treatment Features and Piping**—Gravel backfill for pipe zone bedding per WSDOT Standard Specifications Section 9-03.12(3) was placed into pipe zones and around structural features and vaults in accordance with the contract plans and specifications.
- **Sheet Pile Wall**—Pre-excavation was performed along the sheet pile wall alignment to remove large boulders and loosen consolidated cobble obstructions. Following pre-excavation, soil without large boulders was replaced in the trench, and compacted in 12-inch lifts to a firm and unyielding condition.
- **Treatment Liner**—Surface areas in the sheet pile wall containment area were excavated to a depth of approximately 12 inches below finish grade. Native subgrade soil was graded to conform with the contract plans and specifications, and large boulders and cobbles were removed. The geomembrane treatment liner was placed over the subgrade and covered with 6 inches of crushed surfacing base course per WSDOT Standard Specifications Section 9-03.9(3). Landscaped areas include a geofabric liner and 6 inches of topsoil. Paved areas include 2 inches of crushed surfacing top course and 4 inches of hot mix asphalt or concrete pavements.

6.2 SCHOOL UTILITY IMPROVEMENTS

Utility improvements for this project include domestic water, sanitary sewer, and storm drainage systems completed within the boundaries of the School, the adjacent Sixth Street ROW, and the Railroad Avenue ROW. As-built plans for the utility work completed in 2015 are provided in Appendix Q.

6.2.1 Drainage System Improvements

Nine new catch basin structures were added to collect surface runoff and convey drainage away from the School. Perforated underdrains were placed along the perimeter of the sheet pile wall to help capture surface water that infiltrates landscaped areas, and to intercept subsurface flows that otherwise might overtop the sheet pile wall. Additional drainage features were added along the Sixth Street ROW to provide positive gutter flow along the new asphalt sidewalk and rolled curb. The conveyance features were sized using the 2012 Western Washington Hydrology Model to calculate flow rates. Storm drainage improvements are shown on as-built plan sheet C-107 provided in Appendix O.

6.2.2 Water Service Replacement

The following domestic water service upgrades were installed:

- A new 3-inch diameter ductile iron water line was installed to replace the existing water line to the School building. Following installation, the new water line was disinfected and pressure-tested in accordance with the 2015 CPS. The new water service connection is an upgrade to replace the existing domestic service connection.
- A section of the existing 3-inch diameter sprinkler main was replaced to provide for the sheet pile wall installation. Following installation of the sheet pile wall, the section of the sprinkler main was reinstalled through a penetration in the sheet pile wall, and was sealed. Romac restraining couplings were used to reconnect the sprinkler main at both ends.

6.2.3 Sewer System Upgrades

Sanitary sewer improvements were designed by the Town's consultant Gray & Osborne Inc. (as-built plan sheet C-105, Appendix Q). The following upgrades were installed at the School and adjacent rights-of-way:

- New sewer pipe connections were provided to replace the existing sewer pipe leading from the School building to the septic tank located west of the School (As-Built Plan Sheet C-105, Appendix Q). Existing piping was removed, and new piping and connections were installed.
- A new sewer line was constructed to provide a connection from the teacherage to the sanitary sewer main in Sixth Street. The sanitary sewer line from the teacherage has not been connected to this system yet pending completion of sewer improvements in Sixth Street, scheduled to be completed in the summer of 2016.

6.2.4 Sheet Pile Wall Utility Crossings

Construction of the sheet pile wall required that penetrations be constructed through the containment wall to retain existing utility lines servicing the School building and adjacent roadway drainage on Sixth Street. The wall penetrations used a pipe sleeve of appropriate diameter to contain the utility lines. Following installation, the annular spaces around the utility lines were filled with foam to seal the containment wall. Location of wall penetrations are shown on As-Built Plan Sheet C-105 in Appendix Q.

6.3 TOWN SEWER IMPROVEMENTS

The Town required that improvements be made to its sanitary sewer system in conjunction with the remedial construction activities conducted during the summer of 2015. The Town's consultant Gray & Osborne Inc. provided the engineering design for the sewer system upgrades related to adjacent roadways, including the following:

- The 4-inch diameter polyvinyl chloridesanitary sewer main in Railroad Avenue was moved to route the pipe alignment around the new treatment compound on the southern side of the Railroad Avenue ROW. The new pipe configuration is shown on As-Built Plan Sheet C-105 in Appendix Q.
- As part of the Town sewer improvements, it was intended that the sanitary sewer main in Sixth Street be constructed to provide sewer service for the teacherage and private residences on Sixth Street. During construction potholing, it was discovered that portions of the sewer main that were thought to exist had not been constructed, and that construction of the system was not possible without redesigning the system. The Town provided a new design for the sewer alignment, but too late to complete the work before the 2015 school year began. A decision was made to postpone construction of the new sewer main until summer of 2016. The proposed 4-inch diameter polyvinyl chloride sanitary sewer main is shown on As-Built Plan Sheet C-105 in Appendix Q, and is scheduled to be constructed in the summer of 2016.

6.4 SCHOOL BUILDING INTERIOR RESTORATION

Remediation designs included installation of treatment and monitoring features under the School building, including injection wells, monitoring wells, SVE wells and attendant piping and monitoring equipment. Interior construction in the School building primarily included environmental drilling and trenching to install piping and wells and associated access vaults. Following installation of treatment features, the trenches were backfilled with gravel borrow, and the concrete floor was restored to match existing floors. Flooring materials were applied to match existing features, including linoleum tile and flooring paint.

PIDs and pressure-monitoring equipment was placed at various locations in the School building and mounted to interior walls as described in Section 5.7. Minor impacts to wall surfaces were restored by patching and painting to match existing surfaces.

6.5 EXTERIOR SURFACE RESTORATION

Restored exterior surfaces included landscaped areas (sod), asphalt, and concrete pavements. Due to the temporary nature of the treatment system, landscaped areas were restored with grass sod on all areas of the School that did not receive pavements. Sod tiles were placed over 6 inches of topsoil, fertilized, overseeded, and watered to establish healthy grass growth.

All areas in the sheet pile containment area are underlain with a 20-mil geomembrane treatment liner to capture vapors from HWF operation. A minimum of 6 inches of crushed surfacing base course was applied and compacted directly above the treatment liner, and provides a base for all surface improvements.

Concrete pavement was placed at select locations to provide an attractive and durable surface at the main School building entrances and in the playground area. Concrete flatwork included 4 inches of 3,000-pounds-per-square-inch concrete over 6 inches of crushed surfacing base course. All exterior concrete flatwork in the sheet pile containment area will be removed following treatment activities to allow for removal of the treatment liner. Final restoration of the School will include new concrete pavement for all walkways.

Asphalt pavement was placed for all other hard surfaces and access ways around the School, as follows:

- Sidewalks were constructed at a 5-foot nominal width along Sixth Street and along Railroad Avenue. The asphalt section consisted of 4 inches of hot-mix asphalt concrete over 2 inches of crushed surfacing top course over 6 inches of crushed surfacing base course. Sidewalks were sloped toward the street at an approximately 2 percent slope. A rolled asphalt curb was used to transition from the sidewalk elevation to roadway gutters. Following completion of the treatment activities, the asphalt sidewalks will be removed and replaced with concrete curb, gutter, and sidewalk during final restoration. Paint striping was applied along the rolled curbs to demarcate fire lanes, bus parking areas, and handicap parking zones.
- Roadway surfaces impacted during construction were replaced with new hot-mix asphalt concrete to match the line and grade of existing roadways. Asphalt was applied in 2-inch lifts to a minimum thickness of 4 inches over 2 inches of compacted crushed surfacing top course over 6 inches of compacted crushed surfacing base course. Tack coating was used for all transition areas to inhibit raveling at the pavement joints.
- A 20- by 30-foot asphalt pad was constructed in the playground for play activities. The asphalt pad included 4 inches of asphalt over 6 inches of compacted crushed surfacing base course.

Gravel surfacing was applied in the treatment compound using 6 inches of crushed surfacing base course compacted over native subgrade. The gravel treatment pad is sloped at an approximately 2 percent slope toward Railroad Avenue to allow for surface water drainage.

6.6 PLAY STRUCTURE RESTORATION

A new playground area with a play structure was constructed to replace the wooden structure removed during construction activities. Configuration of the playground was coordinated with the Skykomish School District to include a 2,900-square-foot play area for the new play structure. The play area configuration is shown on As-Built Plan Sheet C-109 in Appendix N. Wooden beams were placed to delineate the rectangular area, and a minimum of 10 inches of ADA-compliant wood chip surfacing was placed to provide cushioning around the entire play structure.

Additional playground improvements included a concrete walkway from the School building to the playground for access of play areas. Concrete flatwork includes 4 inches of 3,000-pounds-per-square-inch concrete over 6 inches of compacted crushed surfacing base course. Three catch basin structures were placed in the concrete pavement areas to provide for positive drainage away from the play areas.

7.0 WORK TO BE COMPLETED AFTER 2015

This section describes the remediation activities identified in the 2010 EDR and the 2015 CPS that either were not completed during the 2015 construction season or were scheduled for a later time. Subsequent as-built report documentation will describe the completion of these activities.

7.1 HYDRAULIC CONTROL AND CONTAINMENT SYSTEM OPERATION

The hydraulic control and containment (HCC) system is operated on a 24-hour/7-day-per-week basis, in accordance with the Operation and Maintenance Manual for the Hydraulic Control and Containment System (AECOM 2011). The 2015 HCC system operations covered the period from January 1 through December 31, 2015. The 2015 HCC System Operations Report will be completed by Farallon in 2016.

7.2 CLEANUP BENEATH THE SCHOOL

The final phase of cleanup in the Town involves remediation of petroleum-contaminated soil and groundwater beneath the School. The final phase of cleanup will be accomplished through the HWF remediation system, which will be operated to reduce the amount of petroleum beneath the School to the extent technically possible.

The operating schedule of the HWF remediation system consists of system start-up during June 2016. The first season of HWF will occur from June through August 2016, followed by cold water flushing in fall of 2016. The cold water flushing system will be operated until approximately November, at which time the system will be shut down to protect the equipment from cold winter temperatures and high groundwater events. The cold water system will be restarted around mid-February of 2017, after the winter storm period. Data collected from each HWF event will be evaluated to determine whether subsequent HWF events will be required.

7.3 UTILITY AND TOWN RESTORATION

Final Town ROW restoration was completed east of Sixth Street during the 2011 construction season. Permanent storm sewer, sanitary sewer, water lines, electrical utilities, roadways, sidewalks, and landscaping were installed east of Sixth Street.

The sanitary sewer in the Sixth Street ROW will be installed, and the Teacherage, Mackner, and Moore properties will be connected to the Town's sanitary sewer system during the summer of 2016. This scope of work was not completed during 2015 for reasons described in Section 6.3, Town Sewer Improvements.

Final surface restoration of the School, the Sixth Street ROW, and the Railroad Avenue ROW is anticipated to be completed following completion of the remedial work at the School.

8.0 SUMMARY AND CONCLUSIONS

During 2015, soil excavation, loading, transport, and disposal activities occurred at the School on behalf of BNSF. During the 2015 remediation activities, a total of 3,277 tons of petroleum-contaminated soil was excavated from the School and transported to the Republic Services, Inc. Subtitle D landfill in Roosevelt, Washington for disposal.

The only remaining soil and groundwater requiring remediation at the Site, as described in the 2010 EDR, is beneath the School. Remediation of this remaining petroleum-contaminated soil and groundwater is planned to begin in the summer of 2016 during operation of the HWF System. The HWF System will be operated during the summer season to reduce the amount of petroleum beneath the School to the extent technically possible. Cold water flushing will occur continuously at all other times of the year, excluding shutdown periods during the winter. The shutdown period is dependent on the occurrence of winter storm events, anticipated to be from November through mid-February.

9.0 REFERENCES

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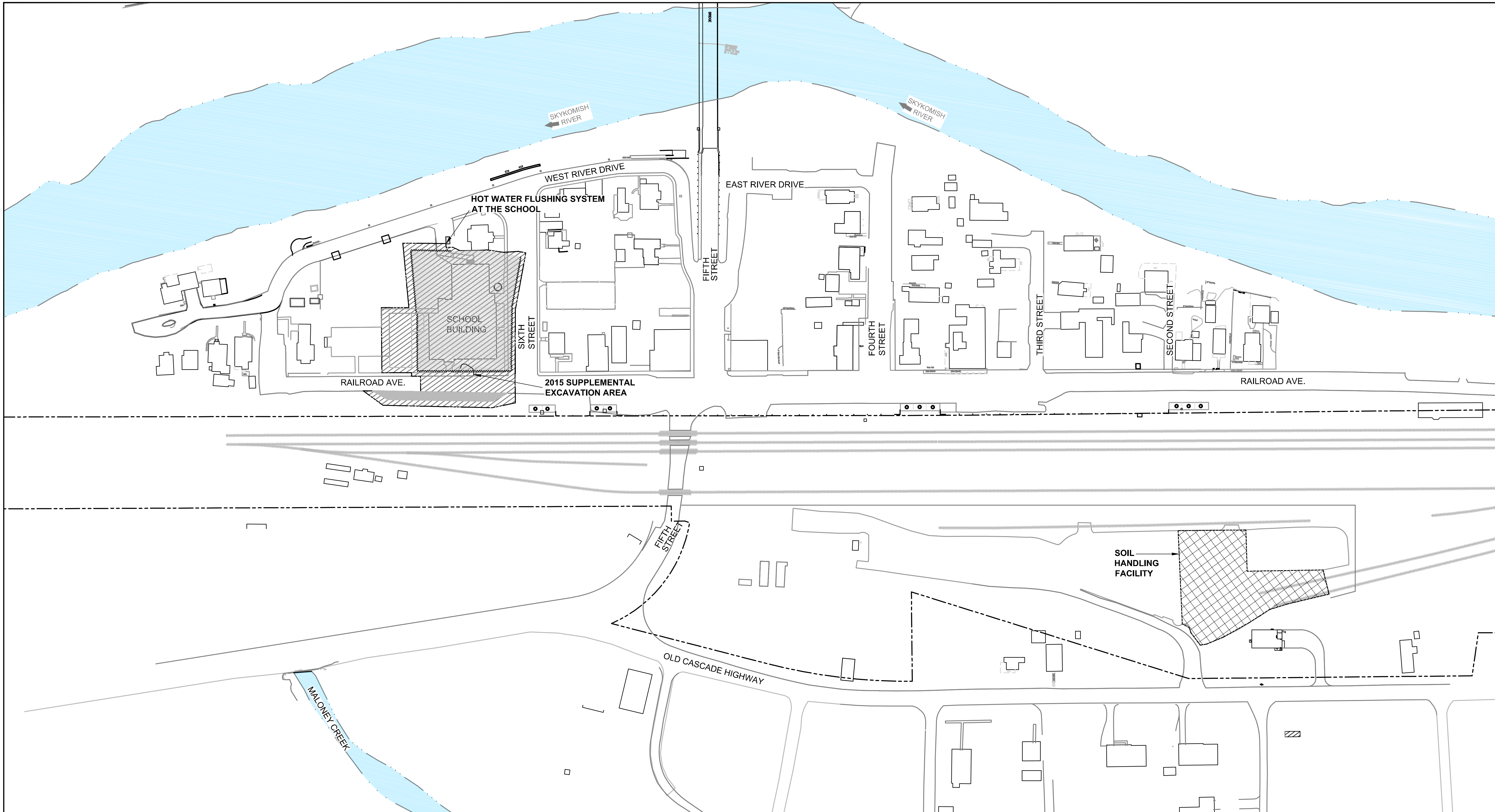
FIGURES

2015 AS-BUILT COMPLETION REPORT
BNSF Former Maintenance and Fueling Facility
Skykomish, Washington
Consent Decree No. 07-2-33672-9 SEA

Farallon PN: 683-057



LEGEND

- BNSF PROPERTY LINE
- HOT WATER FLUSHING SYSTEM AT THE SCHOOL
- SCHOOL
- SOIL HANDLING FACILITY LIMITS

0 200
SCALE IN FEET

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Washington
Issaquah | Bellingham | Seattle

Oregon
Portland | Bend | Baker City

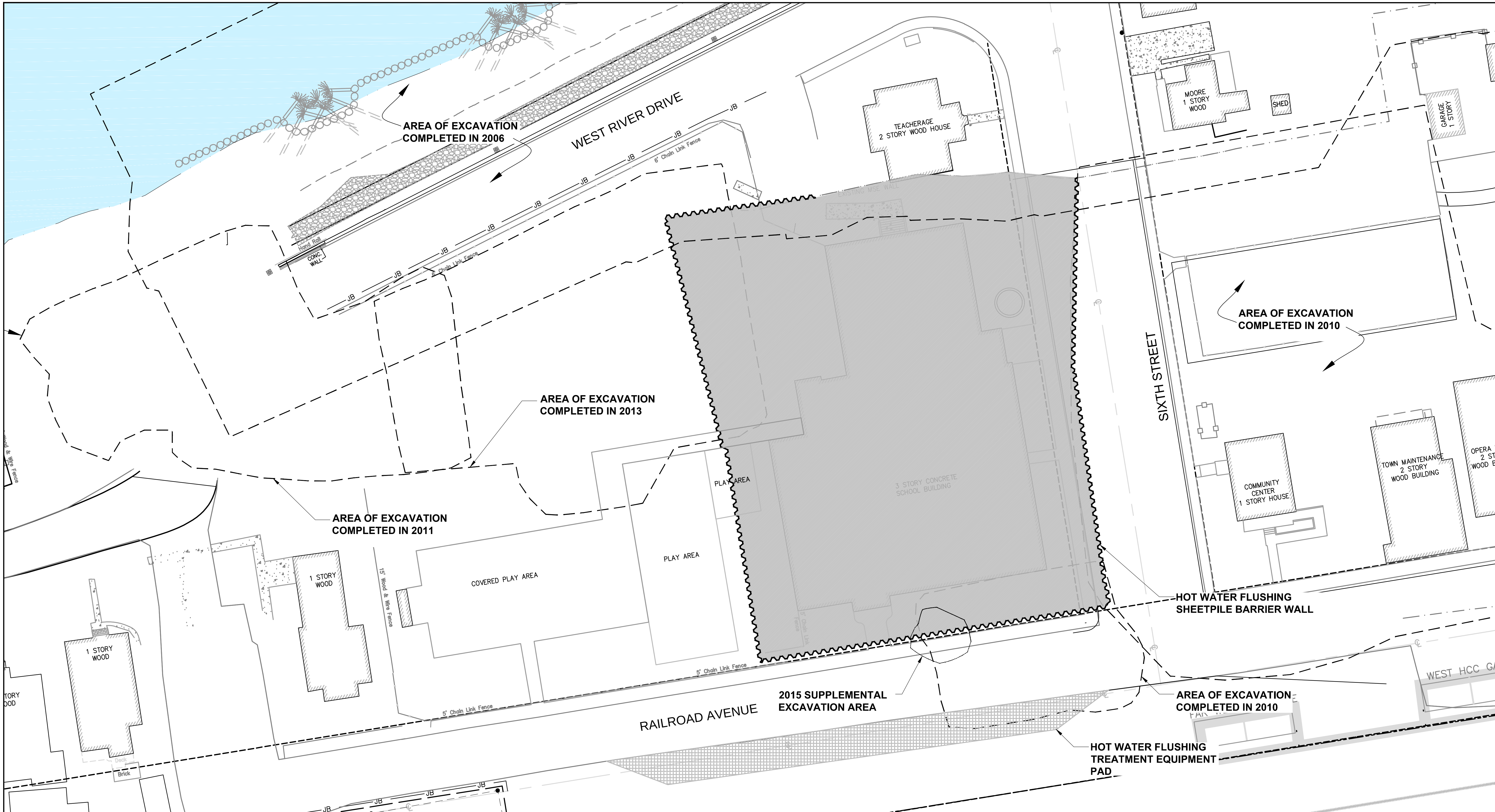
California
Oakland | Sacramento | Irvine

FIGURE 1

TOWN OF SKYKOMISH OVERVIEW
2015 AS-BUILT COMPLETION REPORT
BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON

FARALLON PN: 683-057

Drawn By: ROL Checked By: AEV Date: 02/22/2016 Disk Reference: 683057 AS



LEGEND

- EXTENT OF PREVIOUS EXCAVATIONS
- SHEETPILE BARRIER WALL
- MSE WALL
- SCHOOL

0 40
SCALE IN FEET

N

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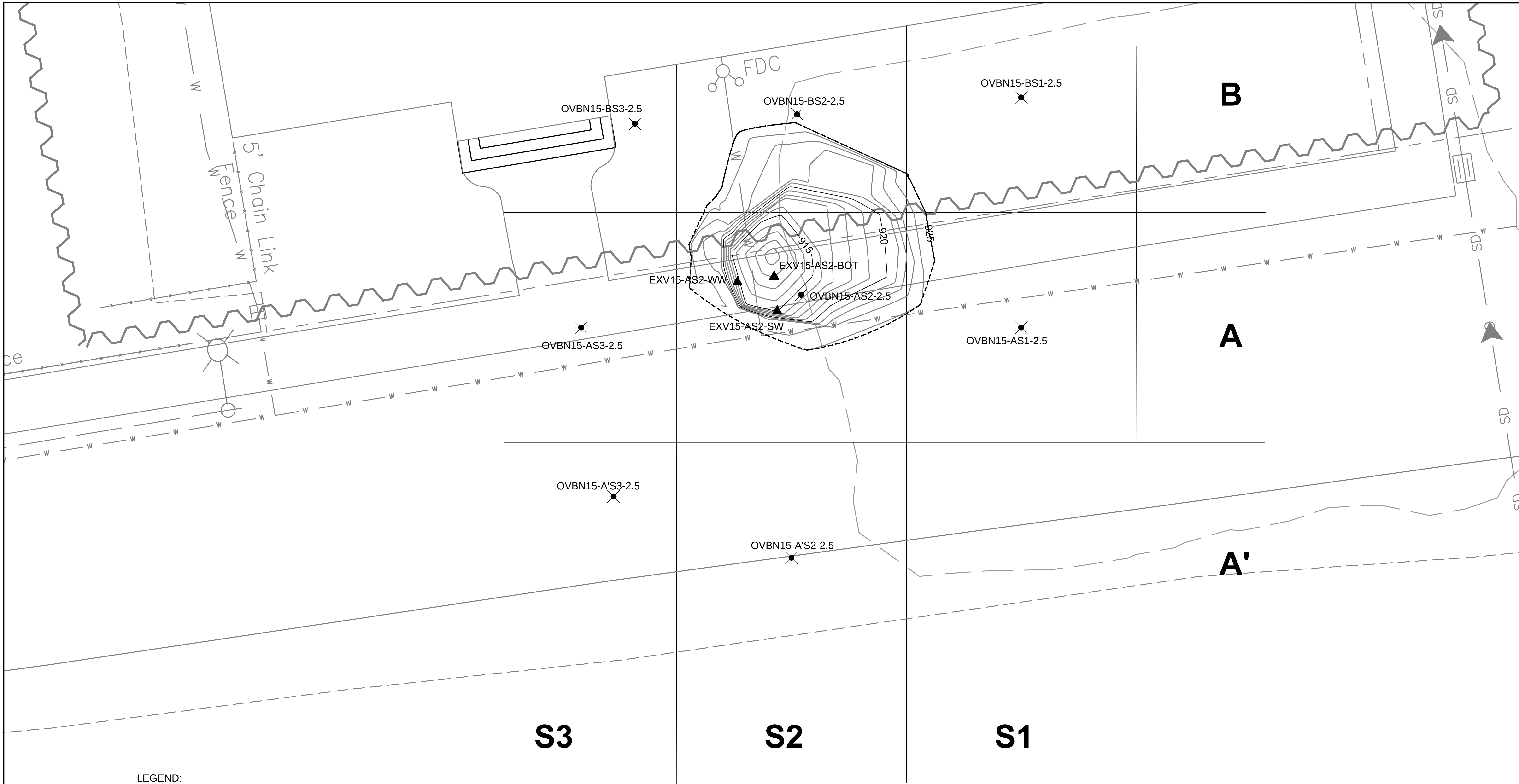
Washington: Issaquah | Bellingham | Seattle
Oregon: Portland | Bend | Baker City
California: Oakland | Sacramento | Irvine

FIGURE 2

SKYKOMISH SCHOOL PROPERTY OVERVIEW
2015 AS-BUILT COMPLETION REPORT
BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON

FARALLON PN: 683-057

Drawn By: ROL | Checked By: AEV | Date: 02/23/2016 | Disk Reference: 683057 AS



LEGEND:

EXV10-AS1-B ▲	2015 SUPPLEMENTAL BELOW VDL SOIL SAMPLE LOCATION
EXV15-A'S2-SW	2015 SUPPLEMENTAL EXCAVATION OVERBURDEN SOIL SAMPLE LOCATION
	SHEETPILE BARRIER WALL LOCATION
	LIMITS OF 2010 EXCAVATION BOTTOM
	LIMITS OF 2015 SUPPLEMENTAL EXCAVATION
915	2015 SUPPLEMENTAL SOIL EXCAVATION ELEVATION CONTOUR
A' S1	SOIL SAMPLE GRID (PER ADDENDUM #3 TO 2010 COMPLIANCE MONITORING PLAN UPDATE

0 10
Scale in feet

N

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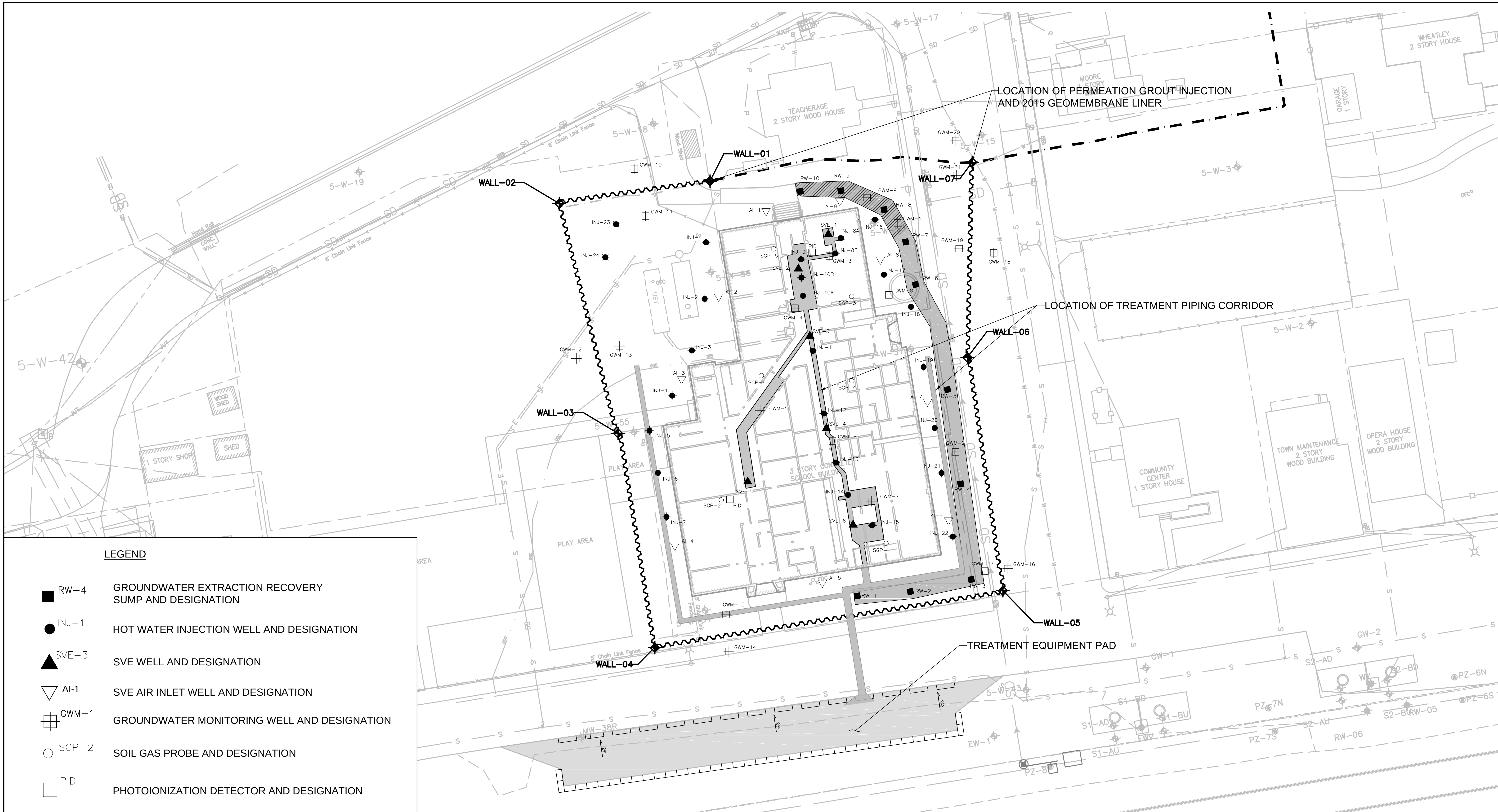
Washington
Issaquah | Bellingham | Seattle
Oregon
Portland | Bend | Baker City
California
Oakland | Sacramento | Irvine

FIGURE 3

SUPPLEMENTAL EXCAVATION CONTOURS AND SOIL SAMPLE LOCATIONS
2015 AS-BUILT COMPLETION REPORT
BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON

FARALLON PN: 683-057

Drawn By: ROL | Checked By: AEV | Date: 02/22/2016 | Disk Reference: SUPPLEMENTAL



LEGEND

RW-4	GROUNDWATER EXTRACTION RECOVERY SUMP AND DESIGNATION
INJ-1	HOT WATER INJECTION WELL AND DESIGNATION
SVE-3	SVE WELL AND DESIGNATION
AI-1	SVE AIR INLET WELL AND DESIGNATION
GWM-1	GROUNDWATER MONITORING WELL AND DESIGNATION
SGP-2	SOIL GAS PROBE AND DESIGNATION
PID	PHOTOIONIZATION DETECTOR AND DESIGNATION
	2006 MSE WALL
	SHEET PILE BARRIER WALL
	GROUNDWATER AND LNAPL RECOVERY TRENCH
	GROUNDWATER AND LNAPL RECOVERY TRENCH INSTALLED TO 10'-13' BELOW GROUND SURFACE

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FIGURE 4

HOT WATER FLUSHING SYSTEM LAYOUT PLAN
2015 AS-BUILT COMPLETION REPORT
BNSF FORMER MAINTENANCE AND FUELING FACILITY
SKYKOMISH, WASHINGTON

FARALLON PN: 683-057

Drawn By: MB | Checked By: AV | Date: 3/4/16 | Disk Reference: 683-038AS

TABLES

2015 AS-BUILT COMPLETION REPORT
BNSF Former Maintenance and Fueling Facility
Skykomish, Washington
Consent Decree No. 07-2-33672-9 SEA

Farallon PN: 683-057

Table 1
Overburden Soil Analytical Data
2015 As-Built Completion Report
Skykomish, Washington
Farallon PN: 683-057

Sample Location	Sample Identification	Sample Date	DRO (milligrams per kilogram)[1]			ORO (milligrams per kilogram)[1]			Calculated Total NWTPH-Dx[2] (milligrams per kilogram)
			Result	MDL	MRL	Result	MDL	MRL	
OVBN15-A3	OVBN15-AS3-2.5	6/18/2015	42	4.2	29	210	11	58	252
OVBN15-AS1	OVBN15-AS1-2.5	6/18/2015	< 3.6	3.6	25	< 9.1	9.1	50	< 6.35
OVBN15-AS2	OVBN15-AS2-2.5	6/18/2015	< 3.7	3.7	26	< 9.4	9.4	52	< 6.55
OVBN15-A'S2	OVBN15-A'S2-2.5	6/18/2015	< 4.2	4.2	29	64	11	58	66.1
OVBN15-A'S3	OVBN15-A'S3-2.5	6/18/2015	< 4.1	4.1	29	< 10	10	57	< 7.05
OVBN15-BS1	OVBN15-BS1-2.5	6/18/2015	< 3.7	3.7	26	< 9.4	9.4	52	< 6.55
OVBN15-BS2	OVBN15-BS2-2.5	6/18/2015	< 3.6	3.6	25	< 9.1	9.1	50	< 6.35
OVBN15-BS3	OVBN15-BS3-2.5	6/18/2015	30	4.1	28	120	10	56	150
Reuse Level for Soil[3]									**1,870**

NOTES:

< denotes analyte not detected at or exceeding the laboratory method detection limit listed.

Samples collected at 2.5 feet below ground surface.

[1]Analyzed by Northwest Method NWTPH-Dx.

[2]The total NWTPH-Dx calculation uses one-half the MDL for non-detectable concentrations to derive the sum of the DRO and ORO results obtained using the NWTPH-Dx analytical method. If either the DRO or the ORO concentration was reported as a detect, then the calculated total NWTPH-Dx concentration is indicated as a detect. If both DRO and ORO concentrations were reported as non-detects, then the calculated total NWTPH-Dx concentration is indicated as a non-detect. Note that in some instances, data validation resulted in additional data qualification and/or updates to laboratory data. If, for example, data validation caused an update to a non-detect result value because of laboratory blank contamination and the data validator concluded that the result should be non-detect instead of detect, the laboratory-given method detection limit and reporting limit were updated to match the validated non-detect result value.

[3]Reuse and Remediation Levels as defined in the *Cleanup Action Plan for BNSF Former Maintenance and Fueling Facility, Skykomish, Washington* dated October 2007, prepared by the Washington State Department of Ecology for BNSF Railway Company.

DRO = TPH as diesel-range organics
MDL = laboratory-specified method detection limit
MRL = laboratory-specified method reporting limit
ORO = TPH as oil-range organics
TPH = total petroleum hydrocarbons

Table 2
Supplemental Excavation Soil Analytical Data
2015 As-Built Completion Report
Skykomish, Washington
Farallon PN: 683-057

Excavation Area	Grid Sample Location	Sample Identification	Sample Date	Sample Depth (feet)[1]	DRO (milligrams per kilogram)[2]			ORO (milligrams per kilogram)[2]			Calculated Total NWTPH-Dx[3] (milligrams per kilogram)
					Result	MDL	MRL	Result	MDL	MRL	
Bottom	EXV15-AS2	EXV15-AS2-BOT	6/23/2015	12	< 3.6	3.6	25	< 9.0	9.0	50	< 6.3
Sidewall	EXV15-AS2	EXV15-AS2-SW	6/23/2015	8	< 4.0	4.0	28	< 10	10	56	< 7
	EXV15-AS2	EXV15-AS2-WW	6/23/2015	8	< 4.3	4.3	30	< 11	11	60	< 7.65
Remediation Level for Soil[4]											**3,400**

NOTES:

< denotes analyte not detected at or exceeding the laboratory method detection limit listed.

[1]Depth in feet below ground surface.

[2]Analyzed by Northwest Method NWTPH-Dx.

[3]The total NWTPH-Dx calculation uses one-half the MDL for non-detectable concentrations to derive the sum of the DRO and ORO results obtained using the NWTPH-Dx analytical method. If either the DRO or the ORO concentration was reported as a detect, then the calculated total NWTPH-Dx concentration is indicated as a detect. If both DRO and ORO concentrations were reported as non-detects, then the calculated total NWTPH-Dx concentration is indicated as a non-detect. Note that in some instances, data validation resulted in additional data qualification and/or updates to laboratory data. If, for example, data validation caused an update to a non-detect result value because of laboratory blank contamination and the data validator concluded that the result should be non-detect instead of detect, the laboratory-given method detection limit and reporting limit were updated to match the validated non-detect result value.

[4]Reuse and Remediation Levels as defined in the *Cleanup Action Plan for BNSF Former Maintenance and Fueling Facility, Skykomish, Washington* dated October 2007, prepared by the Washington State Department of Ecology for BNSF Railway Company.

DRO = total petroleum hydrocarbons (TPH) as diesel-range organics
MDL = laboratory-specified method detection limit
MRL = laboratory-specified method reporting limit
ORO = TPH as oil-range organics

Table 3
Soil Stockpile Analytical Data
2015 As-Built Completion Report
Skykomish, Washington
Farallon PN: 683-057

Sample Location	Sample Identification	Sample Date	DRO (milligrams per kilogram)[1] Result	MDL	MRL	ORO (milligrams per kilogram)[1] Result	MDL	MRL	Calculated Total NWTPH-Dx[2] (milligrams per kilogram)
OB-STOCK-1	OB-STOCK-1	7/13/2015	43	3.6	25	270	9.2	50	313
OB-STOCK-2	OB-STOCK-2	7/13/2015	640	3.6	25	< 9.1	9.1	50	644.55
OB-STOCK-3	OB-STOCK-3	7/13/2015	45	3.8	26	210	9.5	52	255
OB-STOCK-4	OB-STOCK-4	7/13/2015	33	3.6	25	170	9.1	50	203
OB-STOCK-5	OB-STOCK-5	7/13/2015	44	3.5	24	400	8.9	49	444
OB-STOCK-6	OB-STOCK-6	7/13/2015	27	3.6	25	91	9.1	50	118
OB-STOCK-7	OB-STOCK-7	7/13/2015	< 3.6	3.6	25	< 9.0	9.0	49	< 6.3
OB-STOCK-8	OB-STOCK-8	7/13/2015	31	3.5	25	150	8.9	49	181
OB-STOCK-9	OB-STOCK-9	7/23/2015	230	3.9	27	1,600	9.7	54	1,830
OB-STOCK-10	OB-STOCK-10	7/23/2015	< 3.7	3.7	26	140	9.4	52	141.85
OB-STOCK-11	OB-STOCK-11	7/23/2015	34	3.9	27	150	9.7	54	184
OB-STOCK-12	OB-STOCK-12	7/23/2015	< 3.8	3.8	26	94	9.6	53	95.9
OB-STOCK-13	OB-STOCK-13	7/23/2015	< 3.7	3.7	26	140	9.4	52	141.85
OB-STOCK-14	OB-STOCK-14	7/23/2015	34	3.6	25	170	9.1	50	204
OB-STOCK-15	OB-STOCK-15	7/23/2015	25	3.6	25	< 9.0	9.0	50	29.5
OB-STOCK-16	OB-STOCK-16	7/23/2015	36	3.6	25	220	9.0	50	256
OB-STOCK-17	OB-STOCK-17	9/29/2015	< 3.8	3.8	27	79	9.7	53	80.9
OB-STOCK-18	OB-STOCK-18	9/29/2015	29	4.1	28	120	10	57	149
OB-STOCK-19	OB-STOCK-19	9/29/2015	28	3.9	27	110	9.9	55	138
OB-STOCK-20	OB-STOCK-20	9/29/2015	< 3.8	3.8	26	81	9.6	53	82.9
Reuse Level for Soil[3]									**1,870**

NOTES:

< denotes analyte not detected at or exceeding the laboratory method detection limit listed.

Samples collected at 2.5 feet below ground surface.

[1]Analyzed by Northwest Method NWTPH-Dx.

[2]The total NWTPH-Dx calculation uses one-half the MDL for non-detectable concentrations to derive the sum of the DRO and ORO results obtained using the NWTPH-Dx analytical method. If either the DRO or the ORO concentration was reported as a detect, then the calculated total NWTPH-Dx concentration is indicated as a detect. If both DRO and ORO concentrations were reported as non-detects, then the calculated total NWTPH-Dx concentration is indicated as a non-detect. Note that in some instances, data validation resulted in additional data qualification and/or updates to laboratory data. If, for example, data validation caused an update to a non-detect result value because of laboratory blank contamination and the data validator concluded that the result should be non-detect instead of detect, the laboratory-given method detection limit and reporting limit were updated to match the validated non-detect result value.

[3]Reuse and Remediation Levels as defined in the *Cleanup Action Plan for BNSF Former Maintenance and Fueling Facility, Skykomish, Washington* dated October 2007, prepared by the Washington State Department of Ecology for BNSF Railway Company.

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ORO = TPH as oil-range organics