

CONSTRUCTION COMPLETION REPORT

Port of Seattle

Terminal 30 Site

February 27, 2020



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Draft

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PREPARED BY:



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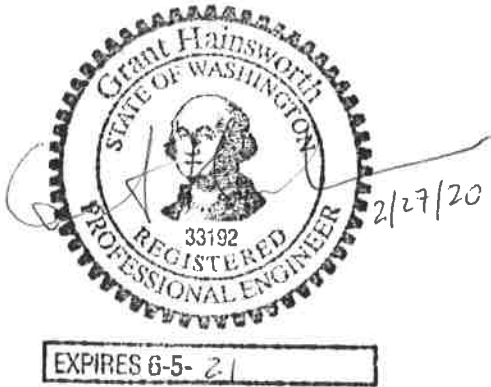
Professional Certification

Construction Completion Report
Port of Seattle Terminal 30 Property – 1901 East Marginal Way South, Seattle, Washington

Based on direct observation made by CRETE Consulting, Inc. (CRETE) personnel, materials testing, laboratory testing, and other construction documentation described in this report, it is the opinion of the undersigned that the Port of Seattle Terminal 30 cleanup action construction has been constructed in substantial compliance with the intended design document (Engineering Design Report dated December 20, 2018). The material and data in this report were prepared under supervision and direction of the undersigned.

CRETE Consulting, Inc.

CRETE Consulting, Inc.



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1 Introduction

This Construction Completion Report (Report) documents the construction conducted at the Port of Seattle (Port) Terminal 30 property (Property) located at 1901 East Marginal Way South, Seattle, Washington approximately one mile southwest of downtown Seattle, in King County, Washington (Figure 1). The construction was performed to satisfy requirements of the Consent Decree (CD) between the Department of Ecology and the Port of Seattle, filed July 19, 2017 (Ecology 2017), and was based on the design requirements presented in the CD and the Engineering Design Report (EDR) (CRETE 2018). This Report documents the construction activities and monitoring associated with the construction conducted from July 6, 2019 through November 9, 2019.

The construction was implemented under the Washington Department of Ecology (Ecology) Model Toxics Control Act (MTCA) specified in the Washington Administrative Code (WAC) Part 173-340. This Report was prepared on behalf of the Port for review by Ecology. The long-term effectiveness of the remedial system via the achievement of groundwater cleanup standards and system operational data is being documented through the groundwater monitoring program presented in the Groundwater Compliance Monitoring Plan and Quality Assurance Project Plan (CRETE 2018) and system monitoring program presented in the Operation, Monitoring, and Maintenance Plan (CRETE 2020).

The physical construction and system installation were performed by Clearcreek Contractors, Inc. (CC) under contract to the Port. Oversight of the Contractor was performed by the Port with assistance from CRETE Consulting, Inc (CRETE). The As-Built drawings are presented in Appendix A.

1.1 Property Description

The T30 Site is generally located at 1901 East Marginal Way South, Seattle, Washington, approximately 1 mile southwest of downtown Seattle, in King County, Washington on the shoreline of the East Waterway (Figure 1). The T30 Site encompasses about 7 acres of a 34-acre intermodal container terminal where petroleum contamination is present and includes light non-aqueous phase liquid (LNAPL), soil, and groundwater contamination.

Contamination at the T30 Site is due to a Chevron Bulk fuel terminal that operated between 1905 and 1984. The bulk fuel terminal consisted of above-ground fuel storage tanks and associated piping and equipment. The Port purchased the T30 Site from Chevron in 1985. The fuel terminal was demolished between December 1984 and about November 1985. The Port redeveloped the T30 Site and properties to the north and south into the 34-acre Terminal 30 intermodal container terminal. The Port converted Terminal 30 into a cruise ship terminal in 1999 and later converted it back to an intermodal container terminal in 2009.

The intermodal terminal is bordered on the north by an area of public shoreline access to the East Waterway, on the east by East Marginal Way South, on the south by Terminal 25, and on the west by the East Waterway.

1.2 Project Overview

The selected cleanup actions at the T30 site include air sparging (AS), soil vapor extraction (SVE), LNAPL recovery, long-term compliance monitoring, and institutional controls. The construction included the installation of three horizontal SVE wells, seven vertical SVE wells, 27 AS wells, 10 LNAPL recovery wells, an SVE/AS system, and a vapor treatment thermal oxidizer.

1.3 Construction Sequence

The T30 site is an active container shipping terminal that is a secure, TWIC controlled facility. The controlled terminal required the treatment system construction to be completed within restricted areas delineated with concrete barrier blocks for the protection of workers within the cleanup action and to restrict access to the construction area.

The construction work was sequenced and executed in five discrete work areas (Areas 1 through 5) shown on Figure 2 and detailed below.

- Area 1 – System equipment area
- Area 2 – MW-89 trench area
- Area 3 – East-West trench area
- Area 4 – Area between MW-39 and MW-42
- Area 5 – Area between MW-39 and MW-59

Construction had to be completed in a work area prior to moving to the next work area to reduce impacts on the site tenant and minimize accidents/etc.

1.4 Preconstruction Documents and Work Plans

The following preconstruction plans were submitted by the Contractor and subsequently approved or accepted by the Port.

- Site Specific Health and Safety Plan, May 8, 2019
- Quality Control Plan, June 7, 2019
- Contractor's Erosion and Sediment Control Plan, June 12, 2019
- Pollution Prevention Plan, June 7, 2019
- Waste Management Plan, June 7, 2019
- Decontamination Plan, June 20, 2019
- Demolition Plan, June 18, 2019

- Transportation and Disposal Plan, June 14, 2019
- Fugitive and Silica Dust Control Plan, June 7, 2019
- Earthwork Plan, June 20, 2019

2 Construction Activities

The following contractors and subcontractors were used during construction.

- **General Contractor or Prime: CC, address**
- **Fencing:** Fence Specialists
10708 Golden Given Road E.
Tacoma, WA 98445
- **Soil Disposal:** Allied Waste Disposal – Roosevelt Regional Landfill
500 Roosevelt Grade Road
Roosevelt, WA 99356
- **Asphalt Paving:** Puget Paving
10910 26th Avenue S.
Lakewood, WA 98499
- **Electrical:** SHJ Electrical
18920 13th Place S.
Seatac, WA 98148
- **Drilling:** Holt Services, Inc.
10621 Todd Road E.
Edgewood, WA 98372
- **Asphalt Recycling:** Kangley Rock & Recycling
510 Monster Road
Renton, WA 98055

System Installation activities occurred between July 6, 2019 and November 9, 2019. Work Area 1 and the Contractor laydown area were occupied by the Contractor for the entirety of the construction activities. The remaining Areas 2 through 5 were occupied one at a time in ascending order. The work areas for the project are shown on Figure 2. Field notes taken during construction oversight are presented in Appendix B and a photographic log is presented as Appendix C. A detailed summary of construction activities is described in the following subsections.

2.1 Site Preparation

The site is a paved, active intermodal container terminal used to off-load ships and transfer containers to trucks for transfers and deliveries. A survey was completed prior to beginning construction to determine extents of working areas, trench alignment, well locations, and the location of the equipment area. Due to the ongoing active industrial activities at the working terminal, a project schedule was developed to minimize impacts to the site

operations and allow the tenant (SSA) to adjust site operations to accommodate the construction. A pre-construction meeting was held on June 14, 2019 to review the schedule, construction sequencing, drilling, health and safety, and site working procedures.

2.2 Contractor Laydown Area

The Contractor laydown area setup occurred on July 6, 2019. The extents of the laydown area were determined by the Contractor's surveyor. Setup and delineation consisted of concrete barrier blocks installed at the limits of the area. Yellow flashing beacons were secured atop of alternating barrier blocks and red colored rope routed around the perimeter. Signs were placed around the perimeter indicating that the area was off limits to non-essential personnel. Once secured, the Contractor used this area for storage of equipment and materials during the entirety of the construction activities. The Contractor laydown area is shown on Figure 2.

2.3 TESC Measures

The Contractor submitted a Temporary Erosion and Sediment Control (TESC) Plan dated June 2019. The TESC Plan was written to comply with the Ecology 2014 Stormwater Management Manual for Western Washington (Ecology 2014) and project specifications. The Port provided conditional approval for the plan on June 12, 2109. This plan presented the following information.

- Site Description and Drawings
- Contractor Erosion and Sediment Control Personnel
- Scheduling and Sequencing of Construction Activities
- Best Management Practices (BMP) Installation, Maintenance, Inspection, and Removal
- Record Keeping
- Emergency Response
- Construction Dewatering
- Fugitive Dust Planning
- Utilities Planning

Prior to ground disturbing activities, each work area was surrounded by a continuous, perimeter berm fabricated from 4-inch diameter HDPE pipe filled with potable water and sealed using spray foam between the ground surface and the pipe with the exception of the driving berm to allow for truck and vehicular traffic which was fabricated using hot mix asphalt. The spray foam sealant was inspected daily and re-applied if necessary. The Contractor used sump pumps and vacuums to collect accumulated water from rainfall that fell within the bermed areas. The accumulated water was pumped to an on-site storage tank for disposal.

Storm drains located within and adjacent to the working areas were protected using catch basin filters in accordance with Ecology 2014 Stormwater Management Manual for Western Washington BMP C220 Storm Drain Inlet Protection (Ecology 2014).

2.4 Permitting

Table 2-1 lists the permits that were obtained for the construction work. Appendix D includes all permits received.

Table 2-1 List of Permits

Permitting Official	Type of Permit	Permit Number, Approval Date	Description
City of Seattle	Gas Piping Plumbing Permit	SR1430034, 9/6/2019	Approval of the gas piping from the propane tanks to the oxidizer.
City of Seattle – Fire Department	Propane Tank	118306, 9/6/2019	Approval to fill the propane tanks with propane.
Puget Sound Clean Air Agency	Air Discharge Permit	NOC # 11885 Registration # 30276	Approval to discharge treated air from the SVE system.
City of Seattle	Electrical Permit	6738514-EL, 9/5/2019	Approval of the electrical connection between the Terminal 30 electrical panel and the SVE/AS equipment electrical panel.

2.5 Decontamination

The site decontamination procedures were presented in the Contractor’s Site Specific Health and Safety Plan dated May 8, 2019. Decontamination involved equipment and personnel decontamination.

The equipment in the work area remained within the limits of the containment berm until excavation work was completed for each area. At the conclusion of work in each work area, equipment was decontaminated when each work area was completed. Haul trucks were never allowed to enter the work area. They were decontaminated using “dry methods” as the primary mechanism. Haul trucks used to export trench spoils were inspected by the Contractor and any soil material that accumulated on the truck rails, tires, or the tongue were brushed off within the containment berm.

Dry and wet boot basins with brushes were located at entrance and egress points around the perimeter of the containment berm to address personnel decontamination. Personnel leaving the exclusion zone (within the perimeter of the containment berm) were required to decontaminate at these stations.

The drill rig and augers remained within the limits of the containment berm until drilling activities were completed for that work area. The drill rig was decontaminated once drilling was completed for a work area using the same procedures for the haul trucks. Augers were decontaminated using an on-site pressure washing station. Water from the auger decontamination pressure washing station was collected and stored in the on-site storage tank for off-site disposal.

2.6 Health and Safety

The site health and safety requirements were presented in the Contractor's Site Specific Health and Safety Plan dated May 8, 2019.

Weekly safety inspections were performed by the Port's Construction Safety Inspector. Overall health and safety procedures were followed during the construction with no injuries reported. A brief safety stand-down was performed by the Port on August 7, 2019 to present the observations made during the week of July 29, 2019 and develop actions that would correct the health and safety deficiencies. The issues rose, and subsequently addressed by the Contractor, included inappropriate driving lanes used by the Contractor on the terminal and general inadequate housekeeping. No other safety concerns were noted during construction.

2.7 Construction

Construction was completed in a phase approached with five work areas. When work was completed in one work area construction moved to the next work area. Work was sequenced in this way to maintain a smaller construction footprint and allow more access for SSA. Many activities, such as the fencing, saw cutting, and TESC were similar between each work area. The construction work is detailed below.

2.7.1 Area 1 Construction

Area 1 setup occurred on July 6, 2019. The extents of the laydown area were determined by the Contractor's surveyor. Setup and delineation consisted of concrete barrier blocks installed at the limits of the area. Yellow flashing beacons were secured atop of alternating barrier blocks and red colored rope routed around the perimeter. Signs were placed around the perimeter indicating that the area was off limits to non-essential personnel. The Area 1 work area is shown on Figure 2.

The Contractor used this secured area temporarily for placement of their office trailer, placement of a 2,000 gallon water storage tank used for pressure testing of the subsurface piping, placement of a 20,000 gallon water storage tank for storage of runoff water, and

placement of the diesel powered generator used during the project. The Contractor equipment was demobilized from Area 1 on August 22, 2019 in preparation for the placement of the SVE/AS equipment and oxidizer which was delivered on August 23, 2019.

TESC measures were placed around the perimeter of the work area and included a 15-foot length of temporary asphalt berm placed at the perimeter to eliminate runoff. Boot wash stations were placed at the entry and egress locations of the berm for decontamination of personnel.

Area 1 Equipment Area

The equipment area is located at the Northwest area of the site as shown on Figure 2. The extents of the equipment area were determined by the Contractor's surveyor. A permanent chain link fence was constructed around the perimeter between September 4 and 6, 2019. The fence is 6 feet high and contains brown privacy slats, equip access and personnel gates. Upon completion of the fence, concrete barrier blocks were placed around the outside perimeter of the fence during the week of September 9, 2019 for protection of fence and equipment. This is the only work area in which the fence remained in place post construction, the fence restricts access to the equipment area to authorized personnel only and the concrete barrier blocks provides additional protection for the equipment inside the fence.

Area 1 Electrical Installation

A 480-volt, 3-phase, 60-ampere service was installed from an existing Port disconnect (HH32) to supply the power necessary to operate the SVE/AS systems. A trench was excavated between the equipment area and an electrical service manhole to facilitate the installation of the subsurface conduit. The trench was excavated, and conduit installed on July 18 and July 19, 2019. Concrete was placed surrounding the below grade conduit and electrical marking tape was placed above. The specifications of the concrete placed around the electrical conduit are presented in Appendix E. The trench was backfilled and re-paved using 14 inches of hot mix asphalt on July 22 and 23, 2019.

The electrical connections between the existing Port disconnect and the SVE/AS equipment, oxidizer, and controls were made between August 26 and 30, 2019. The electrical work was inspected and approved by the City of Seattle on September 5, 2019 (Appendix D).

Area 1 Equipment Installation

The SVE/AS system is comprised of the following 3 components:

- 1 SVE/AS Skid Containing:
 - A SVE Blower within a sound enclosure with inlet filter, inlet silencer, and discharge silencer.
 - A moisture separator with level switches and transfer pump.

- An AS blower within a sound enclosure with inlet filter, inlet silencer, discharge silencer, and air-to-air heat exchanger.
- A SVE and AS manifold containing the necessary measuring and control equipment.
- 1 Oxidizer skid for off gas treatment.
- 1, 2,000-gallon black HDPE tank with level switches for extracted water storage.

The SVE/AS skid was manufactured by H2K Technologies, Inc. located in Corcoran, Minnesota. The oxidizer was manufactured by Intellishare Environmental located in Menomonie, Wisconsin. The water storage tank was supplied by H2K Technologies, Inc. and manufactured by Snyder industries.

The SVE/AS system equipment was delivered to the site on August 23, 2019 via a flatbed truck. The Contractor unloaded the equipment from the truck and placed the equipment in the equipment area the same day. Photographs of the equipment unloading and placement are presented in Appendix C, photographs 88 through 92.

Area 1 Propane Storage Tanks Installation

The oxidizer fuel is supplied by two, 1,000-gallon propane tanks located in the equipment area and shown on Figure 2, installed on September 5, 2019. The tanks are placed on concrete blocks installed above the existing asphalt and secured to the blocks. The piping between the tanks and the oxidizer was installed by the Port on September 5, 2019. The piping between the tanks and the oxidizer unit is secured to the existing asphalt using Unistrut and asphalt anchors and painted yellow indicating it is a gas line (Photograph 102 of Appendix C)

The propane tanks and gas piping were inspected and approved on September 6, 2019 by the City of Seattle Fire Department and the City of Seattle Plumbing Department (Appendix D).

2.7.2 Area 2 Construction

Area 2 construction was performed between July 6 and 23, 2019. The Area 2 work area is shown on Figure 2. Setup and delineation were consistent with Area 1.

Area 2 Saw Cutting

The limits of the trench were saw cut using a walk behind water cooled asphalt saw. Process water was removed from the pavement during saw cutting using a shop vacuum and placed in drums for disposal.

Saw cutting of Area 2 was performed on July 10, 2019 by Cascade Concrete Sawing & Drilling (photograph 9 of Appendix C). Due to the thickness of the existing asphalt, approximately 14 to 16 inches, the saw cut was performed in 3 passes using a deeper blade during each pass.

Area 2 Trench Excavation and Horizontal Well Installation

The Area 2 trench excavation began on July 11, 2019 and was completed on July 14, 2019. The trench excavation utilized a Hitachi Zaxis 75 track hoe equipped with a bucket to remove asphalt and soil and a Deere backhoe equipped with a pneumatic concrete breaker to break up the asphalt.

The asphalt was loaded on to a dump truck staged within the bermed area. Once the truck was filled, it was decontaminated using dry methods and transported to Kangley Rock and Recycling. A total of 20 truckloads of asphalt were transported from Area 2. A material summary and truck tickets are presented in Appendix F.

Excavation of soil was performed between July 11 and 17, 2019. The excavation was completed to an approximate depth of three feet below the existing ground surface. The soil was loaded on to a dump truck staged within the bermed area. Once the truck was filled, it was decontaminated using dry methods and transported to the Seattle Regional Disposal Intermodal facility located at 3rd and Lander streets in Seattle, WA. A total of 18 truckloads carrying a total of 318 tons of soil were transported from Area 2 for disposal. A material summary and weigh tickets are presented in Appendix F.

The Area 2 trench contains the first horizontal SVE well (SVE-1). SVE-1 was installed by excavating a 2-foot wide by 2-foot deep trench within the Area 2 trench on the western edge of the trench. Approximately 6 inches of sand bedding was placed prior to installing SVE-1. The specifications and laboratory results of the bedding sand are presented in Appendix G. SVE-1 is constructed using 154 feet of 4-inch corrugated, perforated, double-walled (smooth interior) pipe material. The SVE-1 pipe was wrapped using a fabric wrap consisting of circular knitted polyester geotextile fabric. Once placed the remaining portion of the SVE-1 trench was backfilled with sand and compacted to a minimum compaction of 93% ASTM D-1557 proctor density. The sand compaction test results are presented in Appendix H. A material summary and weigh tickets are presented in Appendix F. Photographs of horizontal SVE-1 are shown in Appendix C, photographs 17 through 20.

Approximately 2 inches of controlled density fill (CDF) was placed after completion of the horizontal SVE well installation at the floor of the Area 2 trench as bedding for the air sparging conveyance piping. A minimum time of 6 hours was allowed for the CDF to set. Specifications of the CDF are presented in Appendix I.

Thirty-one air sparge conveyance pipes were placed in the Area 2 trench. The air sparge conveyance pipes were pressure tested and approved, and an additional 5.5 inches of CDF was placed over the air sparge pipes. See Section 2.8.3 of this document for additional details of the air sparge conveyance piping installation.

Twelve SVE conveyance pipes were placed in the Area 2 trench. The SVE pipes were pressure tested and approved, and an additional 7 inches of CDF was placed over the SVE pipes. See Section 2.8.4 of this document for additional details of the SVE conveyance piping installation. A material summary and weigh tickets are presented in Appendix F.

Crushed rock base was placed to fill the trench to eight inches below the existing asphalt surface and compacted to a minimum of 95% ASTM D-1557 proctor density. Specifications of the crushed rock base are presented in Appendix J and compaction results are presented in Appendix H. A material summary and weigh tickets are presented in Appendix F.

Paving was performed by Puget Paving and Construction, Inc. on July 23, 2019. Four inches of class 1-inch hot mix asphalt (HMA) was placed above the crushed rock base using a CAT AP555F spreader and compacted using a hydrostatic vibratory roller. Four inches of class ½ inch HMA was placed above the class 1-inch HMA using a CAT AP555F spreader and compacted using a hydrostatic vibratory roller. This second lift of HMA brought the Area 2 trench elevation up to match the existing grade. Specifications for the HMA are presented in Appendix K and testing is presented in Appendix H.

Area 2 Well Installation

The following wells and well types were installed within Area, shown on Figure 2.

- AS-1 through AS-6
- Vapor Monitoring Well (VMP) VMP-1
- Horizontal SVE-1

The construction well details are shown on Sheets C8.1 and C8.2 of the As-Built drawings (Appendix A), copies of well logs are included in Appendix N.

Area 2 Fiber Optic Communication Line

An existing fiber optic communication line was located in the Area 2 work area and operated by Tideworks Technology. The existing fiber optic line needed to be removed during trenching activities. The fiber optic line was removed during the week of July 8, 2019 and replaced as shown on Drawing C1.1 of the As-Built drawings during the week of July 15, 2019.

2.7.3 Area 3 Construction

Area 3 construction was performed between July 23, 2019 and August 2, 2019. The Area 3 work area is shown on Figure 2. Construction was very similar to Area 2, with saw cutting, trench excavation, AS and SVE header/well install following the methods detailed above for Area 2. The following specifics were completed for Area 3:

- The Area 3 trench excavation began on July 25, 2019 and was completed on August 2, 2019. A total of 8 truckloads of asphalt were transported from Area 3. A material summary and truck tickets are presented in Appendix F. Excavation of soil was performed between July 26 and 30, 2019. The excavation was completed to an approximate depth of 3 feet below the existing ground surface. A total of 5

truckloads carrying a total of 104 tons of soil were transported from Area 3 for disposal.

- Twenty-five air sparge conveyance pipes were placed in the Area 3 trench once the CDF was set. The air sparge pipes were pressure tested and approved, and an additional 5.5 inches of CDF was placed over the air sparge pipes.
- Eleven SVE conveyance pipes were placed in the Area 3 trench. The SVE pipes were pressure tested and approved, and an additional 7 inches of CDF was placed over the SVE pipes.
- Crushed rock base and paving was completed consistent with the methods detailed for Area 2.
- There are no AS wells located within the Area 3 trench limits. Therefore, 25 air sparge conveyance pipes are installed at the start (Western end) of the Area 3 trench and 25 are installed at the end (Eastern end) of the Area 3 trench going to the Area 4 trench.
- There are no SVE wells located within the Area 3 trench limits. Therefore, 11 SVE conveyance pipes are installed at the start (Western end) of the Area 3 trench and 11 are installed at the end (Eastern end) of the Area 3 trench going to the Area 4 trench.
- There are no SVE, AS, or VMP wells installed within the limits of the Area 3 trench.

2.7.4 Area 4 Construction

Area 4 construction was performed between on August 5 and 16, 2019. The Area 4 work area is shown on Figure 2. Construction was very similar to Areas 2 and 3, with saw cutting, trench excavation, AS and SVE header/well install following the methods detailed above for Area 2. The following specifics were completed for Area 4:

- The Area 4 trench excavation began on August 8, 2019 and was completed on August 16, 2019. A total of 16 truckloads of asphalt were transported from Area 4. A material summary and truck tickets are presented in Appendix F.
- Excavation of soil was performed between August 8 and 9, 2019. The excavation was completed to an approximate depth of 3 feet below the existing ground surface. A total of 10 truckloads carrying a total of 186 tons of soil were transported from Area 4 for disposal.
- The Area 4 trench contains the second and third horizontal SVE wells (SVE-2 and SVE-3). SVE-2 is located in the Northern section of the Area 4 trench and SVE-3 is located in the Southern section of the Area 4 trench (Figure 2). Approximately 6 inches of sand bedding was placed prior to installing SVE-2 and SVE-3. SVE-2 is

constructed using 110 feet of 4-inch corrugated, perforated, double-walled (smooth interior) pipe material. SVE-3 is constructed using 90 feet of 4-inch corrugated, perforated, double-walled (smooth interior) pipe material. Both SVE-2 and SVE-3 pipe was wrapped using a fabric wrap consisting of circular knitted polyester geotextile fabric.

- Approximately 2 inches of CDF was placed after completion of the horizontal SVE well installation at the floor of the Area 4 trench as bedding for the air sparging conveyance piping. Specifications of the CDF are presented in Appendix I.
- Four air sparge conveyance pipes were placed in the Northern Section of the Area 4 trench and 21 air sparge conveyance pipes were placed in the Southern Section of the Area 4 trench. The air sparge conveyance pipes were pressure tested and accepted.
- One SVE conveyance pipe was placed in the Northern section of the Area 4 trench and 9 SVE conveyance pipes were placed in the Southern section of the Area 4 trench. The SVE pipes were pressure tested and accepted.
- The following wells and well types were installed within Area locations are shown on Figure 2:
 - AS-7 through AS-15
 - VMP-2 and -3
 - Horizontal SVE-2 (HSVE-2) and Horizontal SVE-3 (HSVE-3)

2.7.5 Area 5 Construction

Area 4 construction was performed between on August 17 a September 5, 2019. The Area 5 work area is shown on Figure 2. Construction was very similar to Areas 2 through 5, with saw cutting, trench excavation, AS and SVE header/well install following the methods detailed above for Area 2. The following specifics were completed for Area 5:

- The Area 5 trench excavation began on August 23, 2019 and was completed on September 4, 2019. A total of 4 truckloads carrying a total of 75 tons of soil were transported from Area 5 for disposal.
- Sixteen air sparge conveyance pipes were placed in the Area 5 trench. The air sparge pipes were pressure tested and accepted.
- Nine SVE conveyance pipes were placed in the Area 5 trench. The SVE pipes were pressure tested and accepted.
- The following wells were installed within Area 5, locations are shown on Figure 2:

- AS-16 through AS-27
- VMP-4 and VMP-5
- Vertical SVE-4 through SVE-10

2.7.6 Existing Well Refurbishment

Several existing monitoring wells located throughout the terminal were in need of monument replacement due to the heavy loads carried during terminal operations over many years. The following well monuments were removed and replaced with an aircraft rated monument encased in a 2-foot by 2-foot rebar reinforced concrete apron as shown on As-Built drawing C8.1.

- MW-36A
- MW-38
- MW-39A
- MW-42
- MW-45A
- MW-46B
- MW-58A
- MW-59
- MW-84A
- MW-89
- MW-92
- RW-1
- RW-9

These wells were refurbished during the weeks of October 21, 2019 and November 4, 2019.

2.7.7 LNAPL Recovery Wells

Ten light non-aqueous phase liquid (LNAPL) recovery wells were installed within Work Area 5. Recovery wells RW-101 through RW-107 were installed between July 30 and August 1, 2019. Recovery wells RW-108 through RW-110 were installed on August 21, 2019. The 10 recovery well locations are shown on Figure 2 and Figure 3.

The 10 recovery wells were installed using a hollow stem auger equipped drill rig by Holt Services, Inc. Each recovery well is drilled to a depth of 15 feet bgs. The recovery wells are constructed of 4-inch Schedule 40 PVC with a 10-foot, 0.010-inch well screen placed from 5 to 15 feet bgs. The recovery well annulus sand pack (10/20 Colorado silica sand) extends to 12 inches above the top of well screen, followed by a 3-foot bentonite seal, and the remainder of the annulus is filled with cement-bentonite grout to 3 feet bgs. An airport

rated well monument was installed at each recovery well location to allow access to the recovery wellhead. The recovery well monuments were installed the week of November 4, 2019. The construction details of the recovery wells are shown on Sheets C8.1 and C8.2 of the As-Built drawings.

Each recovery wellhead is constructed to facilitate LNAPL recovery. A well seal was installed at the top of each recovery well and fitted with a dedicated 1-inch LNAPL recovery pipe that extends below the water table and is fitted with a 1.5-inch quick connect fitting above the well seal. In addition, a bleed valve is installed at the wellhead and a threaded plug is installed to facilitate groundwater measurements.

2.8 Deviations from Design

There were no major deviations to the design during construction, however the following deviations were made to the locations of wells due to conflicts with existing underground utilities and minor modifications were made during saw cutting:

- The location of VMP-1 was moved 1.5 feet west of the design location.
- The location of VMP-5 was moved 2.5 feet west of the design location.
- The location of RW-104 was moved 3 feet east of the design location.
- The location of RW-105 was moved 3 feet east of the design location.
- The location of RW-106 was moved 3 feet east of the design location.
- The location of RW-107 was moved 3 feet east of the design location.
- The location of AS-26 was moved 4 feet north of the design location.

- In areas that saw cutting resulted in very narrow strip of existing asphalt to remain, the saw cut area was increased to ensure that the restored asphalt surface tied into existing asphalt.

3 Transportation, Recycling, and Disposal of Material

Asphalt removed during excavation from the work areas was loaded on to the Contractor dump trucks and transported to Kangley Rock and Recycling for recycling. A total of 50 truckloads or approximately 750 tons of asphalt was removed during the construction project. Transportation tickets are presented in Appendix F.

Soil removed during excavation from the work areas was loaded on to the Contractor dump trucks and transported to Seattle Regional Disposal Intermodal facility located at 3rd and Lander streets in Seattle, WA for disposal. A total of 683 tons of soil was removed during the construction project, disposed of as nonhazardous subtitle D soil. Transportation tickets are presented in Appendix F soil proofing data and the soil disposal profile is included in Appendix M.

4 Site Restoration

The property was returned to existing grade, paved, and the pre-construction use of the terminal has been restored in all areas upon completion of construction with the exception of Area 1. All TESC measures were removed. Area 1 was converted to the equipment area which consists of the fenced equipment area containing the long term SVE/AS equipment.

5 Installation, Testing, and Setup of the SVE/AS System Equipment

The components of the SVE/AS system were placed into their permanent locations on August 23, 2019. The electrical installation and inspection for the SVE/AS system was completed on September 5, 2019. The propane fuel system installation and inspection for the oxidizer was completed on September 6, 2019. The equipment piping and physical connections were completed by the Contractor on September 9, 2019. All equipment was placed on level pavement, secured to the existing pavement, and installed per the project plans and specifications.

Once installation of the SVE/AS system equipment and support equipment were completed, the equipment manufacturer representatives were on-site to test the equipment to ensure it operated in conformance with the project specifications.

The SVE/AS equipment testing and setup was performed by the manufacturer H2K Technologies, Inc. The oxidizer testing and setup was performed by the manufacturer Intellishare Environmental. Supervision of the manufacturer's testing and setup were provided by CRETE Consulting and the Contractor. Testing and setup of the SVE/AS equipment was performed between September 10 and 11, 2019. Testing and setup of the oxidizer was performed between September 10 and 12, 2019.

The following testing and set-up were performed on the SVE/AS equipment to confirm compliance with the project specifications.

- The SVE blower motor was tested to ensure the correct operation and spinning direction.
- The AS blower motor was tested to ensure the correct operation and spinning direction.
- The moisture separator transfer pump motor was tested to ensure the correct operation and spinning direction.
- The level switches associated with the moisture separator pump operation were tested to ensure proper operation.
- The variable frequency drives were tested to ensure proper operation and control of the SVE and AS blower speeds.
- The high-high level switch associated with the moisture separator tank shutdown was tested for proper operation.
- The emergency stop switch was tested for proper operation.
- The programmable logic controller (PLC), man-machine interface (MMI), and software programming of the SVE/AS system skid were tested for proper operation.

- The electrical interlocks and communications between the SVE/AS system equipment and the oxidizer were tested to ensure communication and proper operation.
- The SVE/AS system auto-dialer was set up and tested to ensure proper operation and notification. The auto-dialer call out information and phone numbers were input during the set-up activities.
- The SVE blower was operated for approximately 12 hours to ensure air flow and vacuum were in conformance with the project specifications.
- The AS blower was operated for approximately 2 hours to ensure air flow and pressure were in conformance with the project specifications.
- The system valving was tested to ensure proper operation.
- The SVE/AS system gauges and measurement devices were tested to ensure proper operation.

The following testing and setup were performed on the oxidizer to confirm compliance with the project specifications.

- The combustion blower motor was tested to ensure the correct operation and spinning direction.
- The process blower motor was tested to ensure the correct operation and spinning direction.
- The inlet gas train was adjusted and tested to ensure the correct quantity of propane would be supplied to the burner chamber for proper operation.
- The inlet and outlet temperature controllers were tested to ensure proper operation and shutdown capability.
- The flame sensor was tested to ensure proper operation and measurement.
- The emergency stop switch was tested for proper operation.
- The programmable logic controller (PLC), man-machine interface (MMI), and software programming of the oxidizer were tested for proper operation and control.
- The electrical interlocks and communications between the SVE/AS system equipment and the oxidizer were tested to ensure communication and proper operation.
- The oxidizer was operated for approximately 20 hours to ensure temperature requirements were in conformance with the project specifications and air permit requirements.
- The electrically actuated combustion valve was tested to ensure proper operation.
- The electrically actuated dilution valve was tested to ensure proper operation.
- The SVE/AS system gauges and measurement devices were tested to ensure proper operation.

The SVE/AS system and oxidizer setup and testing was completed on September 12, 2019. Based on this testing it was determined that the system performed in conformance with the project specifications. Once the setup and testing were completed the SVE system and oxidizer startup period began on September 13, 2019. Information on the operation, monitoring, and maintenance of the SVE/AS system and oxidizer are provided in the Operation, Monitoring, and Maintenance Plan (CRETE 2020).

6 Conclusions

Project construction and SVE/AS system installation was conducted between July 6, 2019 and November 9, 2019. The SVE/AS system was installed in conformance with the project specifications and as described herein.

Testing and setup of the SVE/AS equipment was performed between September 10 and 11, 2019. Testing and setup of the oxidizer was performed between September 10 and 12, 2019. Operations, performance sampling, and LNAPL recovery events are detailed in the OMMP (CRETE 2020) and the CMP (CRETE 2018).

7 References

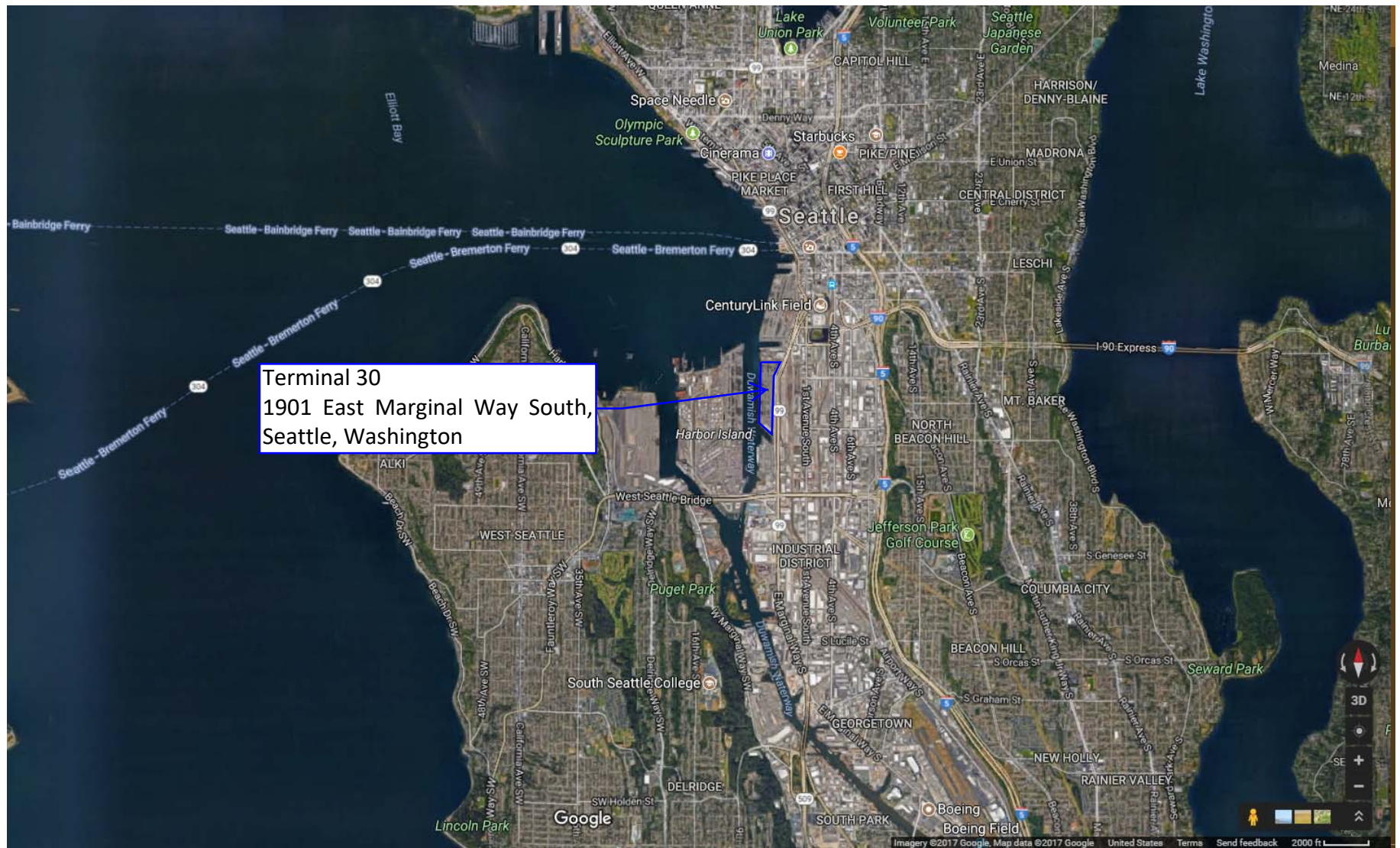
Ecology 2014. 2014 Stormwater Management Manual for Western Washington. Washington. December, 2014

Ecology 2017. Consent Decree, Terminal 30 Site. July 19, 2017

CRETE 2018. Engineering Design Report, Terminal 30 Cleanup Project. Seattle, Washington. December 20, 2018.

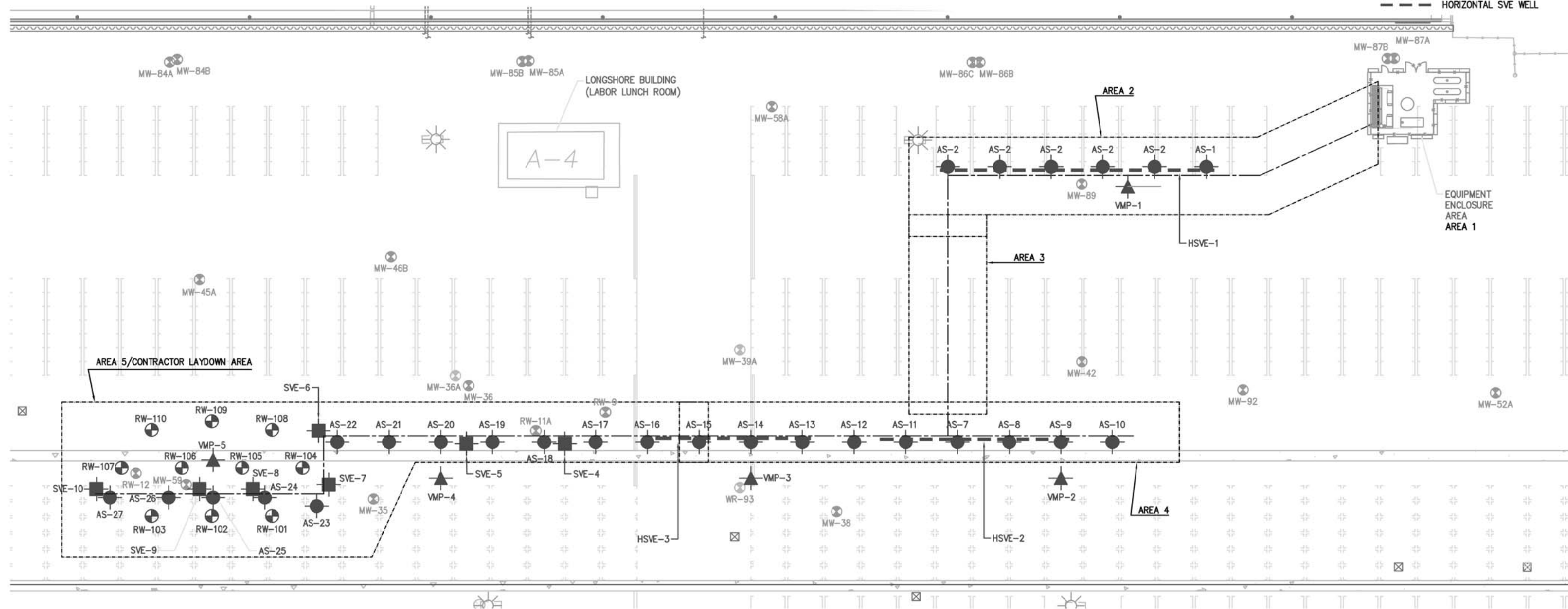
CRETE 2020. Operation, Monitoring and Maintenance Plan, Terminal 30 Cleanup Project. Seattle, Washington. March 2020.

Figures



LEGEND

- AS WELL
- SVE WELL (VERTICAL)
- ⊕ PRODUCT RECOVERY WELL (RW)
- ▲ VAPOR MONITORING WELL (VMP)
- ⊙ EXISTING MONITORING WELLS
- TRENCH ALIGNMENT
- ⊠ EXISTING STORM WATER CATCH BASINS
- HORIZONTAL SVE WELL



PLAN
SCALE: 1" = 30'

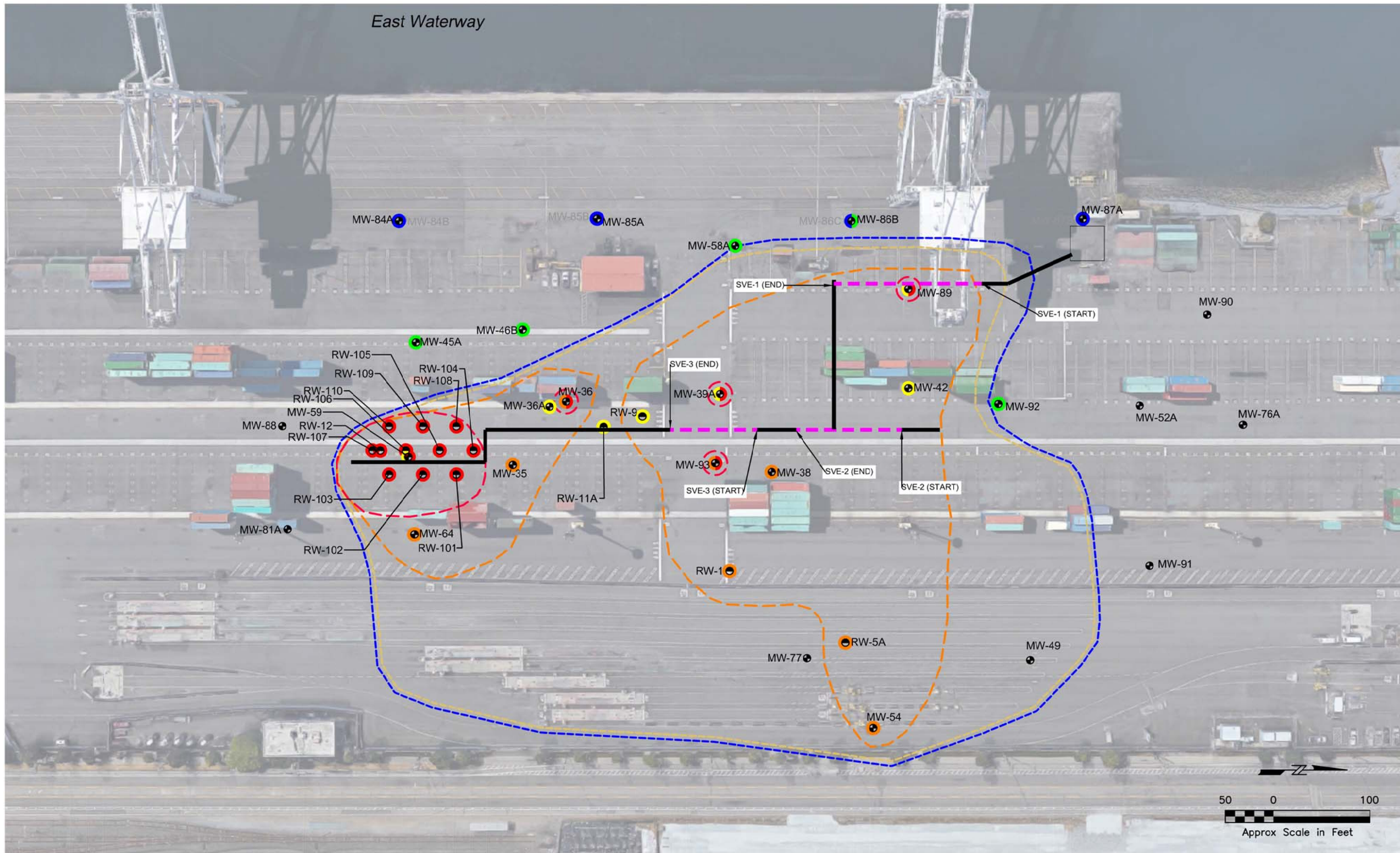


LEGEND

- MONITORING WELL
- ⊕ PRODUCT RECOVERY WELL
- INTERIOR MONITORING WELL
- CPOC MONITORING WELL
- SHORELINE MONITORING WELL
- FREE PRODUCT GAUGING WELL



Compliance Monitoring Plan Terminal 30 Cleanup Action		CLEANUP ACTION OVERVIEW
DATE: 1/6/2020	DRWN: BTS	Figure 2



LEGEND

- MONITORING WELL
- CPOC MONITORING WELL
- PRODUCT RECOVERY WELL
- SHORELINE MONITORING WELL
- INTERIOR MONITORING WELL
- FREE PRODUCT GAUGING WELL



Compliance Monitoring Plan Terminal 30 Cleanup Action		Groundwater Confirmation Sampling Wells
DATE: 1/6/2020	DRWN: BTS	Figure 3

Appendix A

As-Built Drawings

Appendix B
Field Notes
(see attached DVD)

Appendix C
Photographic Log
(see attached DVD)

Appendix D
Copies of Permits
(see attached DVD)

Appendix E
Electrical Conduit Concrete Specifications
(see attached DVD)

Appendix F
Material Summary and Transportation Tickets
(see attached DVD)

Appendix G
Bedding Sand Specifications and Laboratory
Report
(see attached DVD)

Appendix H
Compaction Test Results
(see attached DVD)

Appendix I
CDF Specifications
(see attached DVD)

Appendix J
Crushed Rock Base Specifications
(see attached DVD)

Appendix K
Hot Mix Asphalt Specifications
(see attached DVD)

Appendix L
Hydrostatic Pipe Pressure Testing Results
(see attached DVD)

Appendix M
Laboratory Reports and Soil Waste Profile
(see attached DVD)

Appendix N
Well Logs
(see attached DVD)