Engineering Design Report (Lot 11)

East Bay Redevelopment Site (Lot 11)
Olympia, Washington

Agreed Order No. DE 14072
Facility/Site No. 5785176
Cleanup Site ID: 407

Prepared for:

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Executive Summary

The purpose of this Engineering Design Report (EDR) is to present the design for the additional cleanup activities that will be performed at Lot 11 of the Port of Olympia's (Port's) Model Toxics Control Act (MTCA) East Bay Redevelopment Site (Site) during building construction and development activities (hereafter referred to as development activities). The additional cleanup activities were documented in the Cleanup Action Plan (CAP) Amendment (CAPA) and will be performed per the Agreed Order Amendment No. DE 14072 (PIONEER Technologies Corporation [PIONEER] 2018a; Washington State Department of Ecology [Ecology] 2017). This EDR was prepared in accordance with Washington Administrative Code (WAC) 173-340-400(4)(a) and will be incorporated, by reference, into the developer's plans and specifications, which Ecology will have the opportunity to review.[1]

Potentially-contaminated soil remains under the clean soil cover that was installed during the cleanup activities conducted at the Site in 2017 (hereafter referred to as 2017 cleanup activities) per Agreed Order No. DE 14072 (PIONEER 2018b). Soil with constituent of concern (COC) concentrations greater than remediation levels (RLs) was removed during the 2017 cleanup activities. However, some soil with COC concentrations less than RLs but greater than cleanup levels (CLs) remains at the Site beneath the clean soil cover.[2] The clean soil cover is comprised of a geotextile membrane covered by 12 inches of crushed rock.

The development activities proposed for Lot 11 include constructing mixed-use-commercial and urban-residential buildings (e.g., townhomes). These buildings will be pile-supported, slab-on grade construction and will not have basements or crawl-spaces, thus minimizing the volume of potentially-contaminated soil that will require excavation. However, removal of the clean soil cover and excavation of the potentially-contaminated soil beneath the cover will be required to support development activities (e.g., the installation of piles, grade beams, light poles, elevator shafts, utilities, and other subsurface features).

The additional cleanup activities will include excavating, stockpiling, and sampling the potentially-contaminated soil beneath the clean soil cover to determine the final disposition of the soil. If COC concentrations are less than or equal to remediation levels (RLs), the stockpiled material may be used on-Site, beneath hardscape and softscape surfaces. If COC concentrations are greater than RLs, the stockpiled material will disposed of at an off-site facility permitted to receive such waste. The clean soil cover may be reused at Lot 11 or transported off-Site for reuse.

[1] The developer for Lot 11 is Walker John of Olympia, Washington.

[2] Site COCs include arsenic, lead, total carcinogenic polycyclic aromatic hydrocarbons [cPAHs], total chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans (dioxins/furans), total petroleum hydrocarbons [TPH] in the diesel and heavy oil range (TPH-D and TPH-HO), TPH in the gasoline range [TPH-G], and total naphthalenes.

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Certification

This document was prepared under my direction. The information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

Levi Fernandes, P.E.
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List of Acronyms

Acronym	Explanation
bgs	Below Ground Surface
BMPs	Best Management Practices
CAP	Cleanup Action Plan
CAPA	Cleanup Action Plan Amendment
City	City of Olympia
CL	Cleanup Level
COC	Constituent of Concern
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
cy	Cubic Yards
Dioxins/Furans	Chlorinated Dibenzo-p-dioxins and Chlorinated Dibenzofurans
ECs	Engineering Controls
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
FS	Feasibility Study
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
IA	Interim Action
ICs	Institutional Controls
LOTT	Lacey, Olympia, Tumwater, and Thurston County Clean Water Alliance
MTCA	Model Toxics Control Act
MW	Monitoring Well
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Act
PIONEER	PIONEER Technologies Corporation
QAPP	Quality Assurance Project Plan
Port	Port of Olympia
RCW	Revised Code of Washington
RI	Remedial Investigation
RL	Remediation Level
SAP	Sampling and Analysis Plan
SEPA	State Environmental Policy Act
Site	East Bay Redevelopment Site
SPCC	Spill Prevention Control and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control

Acronym	Explanation
TCP	Toxics Cleanup Program
TPH	Total Petroleum Hydrocarbons
TPH-D	Total Petroleum Hydrocarbons in the Diesel Range
TPH-G	Total Petroleum Hydrocarbons in the Gasoline Range
TPH-HO	Total Petroleum Hydrocarbons in the Heavy Oil Range
UECA	Uniform Environmental Covenants Act
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act

SECTION 1: INTRODUCTION

The purpose of this Engineering Design Report (EDR) is to present the design for the additional cleanup activities that will be performed at Lot 11 of the Port of Olympia's (Port's) Model Toxics Control Act (MTCA) East Bay Redevelopment Site (Site) during building construction and development activities (hereafter referred to as development activities). The additional cleanup activities were documented in the Cleanup Action Plan (CAP) Amendment (CAPA) and will be performed per the Agreed Order Amendment No. DE 14072 (PIONEER Technologies Corporation [PIONEER] 2018a; Washington State Department of Ecology [Ecology] 2017).[3,4] This EDR was prepared in accordance with Washington Administrative Code (WAC) 173-340-400(4)(a) and will be incorporated, by reference, into the developer's plans and specifications, which Ecology will have the opportunity to review.

The Site is located in Olympia, Washington, on the southwest corner of the East Bay of Budd Inlet (see Figure 1). For development purposes, the Site was conceptually divided into 10 lots (Lots 4 through Lot 13; see Figure 2). Lot 11 comprises 1.53 acres of the Site and is the subject of this EDR.

The proposed development activities for Lot 11 include the construction of mixed use commercial and urban residential buildings (e.g., townhomes). The development will be comprised of a multistory main building oriented east/west along State Avenue NE and two townhome buildings oriented north and south of the main building (see Figure 2). The U-shaped of the buildings will be anchored in the center by a parking area which will serve all of the buildings. The proposed buildings are presented in the following graphics.

Graphic 1: View of Proposed Westman Mill from Northwest (Jefferson Street NE)

[3] The Remedial Investigation (RI)/Feasibility Study (FS) Report and the original Cleanup Action Plan (CAP) for the Site were prepared pursuant to Agreed Order DE7830 and the cleanup implementation was conducted pursuant to Agreed Order DE 14072 (Washington State Department of Ecology [Ecology] 2017).

[4] The Port, City of Olympia (City), and Lacey, Olympia, Tumwater, and Thurston County Clean Water Alliance (LOTT) are potentially liable parties in Agreed Order DE7830 and Agreed Order DE 14072.

View of Proposed Westman Mill from Southeast (State Ave NE)

The buildings will be pile-supported, slab-on-grade construction and will not have basements or crawl-spaces, thus minimizing the volume of potentially-contaminated soil that will require excavation due to development activities. However, removal of the existing clean soil cover and excavation of the potentially-contaminated soil beneath the clean soil cover will be required to support development activities (e.g., installation of piles, grade beams, light poles, elevator shafts, utilities, and other subsurface features). The development activities proposed in the CAPA and presented in this EDR are consistent with the completed interim actions and 2017 cleanup activities (i.e., targeted soil removal, cover, and controls) which was implemented at the Site per Agreed Order DE 14072 (PIONEER 2018b).

The additional cleanup activities presented in this EDR were designed to manage soil disturbances and infrastructure construction/excavation activities in a manner that will be protective of human health and the environment as required by MTCA. This EDR will be incorporated by reference into the developer's architectural, civil, and landscaping plans and specifications, which Ecology will have an opportunity to review.

This report is organized as follows:

- Section 2: Selected Remedy Overview
- Section 3: Additional Cleanup Activities Summary
- Section 4: References

SECTION 2: SELECTED REMEDY OVERVIEW

The purpose of this section is to (1) briefly describe the Site background, (2) summarize the Remedial Investigation (RI)/Feasibility Study (FS) and 2017 cleanup action, (3) present the cleanup standards, and (4) summarize the additional cleanup activities for Lot 11.

2.1 Site Background

The approximately 14.8-acre Site is located in Olympia, Washington adjacent to the southwest corner of the East Bay of Budd Inlet (see Figure 1). As shown on Figure 1, the original (predevelopment) shoreline near the Site was significantly different than the current shoreline. Most of the Site is situated on land that was reclaimed using fill material which consists of sediment that was dredged from Budd Inlet as part of civic improvement projects beginning in the late 1800s. The last fill event, which created the current shoreline, occurred along the eastern boundary of the Site in 1982. The 1982 fill was imported from an upland rock quarry and was placed subsequent to historical operations.[5] Site contamination is not present in 1982 fill, but is present in pre-1982 fill material as a result of historical Site operations. The primary historical operations of interest for this MTCA Site are the former lumber milling activities and related operations which occurred from the late 1800s to 1972, including lumber sawing, lumber milling, veneer manufacturing, and plywood manufacturing.

2.2 Remedial Investigation

In order to characterize the nature and extent of impacts associated with the historical Site operations, soil and groundwater RI activities were conducted at the Site from 2006 to 2015. During the RI, 292 soil samples were collected from multiple depths at 130 locations. Based on the sample results, arsenic, lead, total petroleum hydrocarbons (TPH) in the gasoline range (TPH-G), total naphthalenes, TPH in the diesel range (TPH-D) and TPH in the heavy oil range (TPH-HO) combined, total carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and total chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans (dioxins/furans) were identified as soil constituents of concern (COCs). The primary COC release mechanisms appeared to be spills, buried refuse, and treated wood pilings. Further action was determined to be necessary for Site soil. Twenty-eight monitoring wells (MWs) were installed and groundwater samples were collected during 12 groundwater monitoring events. Based on the lack of groundwater impacts in these RI groundwater samples, no further action was necessary for Site groundwater. While the RI phase was being conducted, two Interim Actions (IAs) were completed. The principal components of the IAs were (1) excavation and off-site disposal of soil with concentrations that exceeded soil Remediation Levels (RLs), (2) installation of a soil cap/cover, and (3) implementation of engineering controls (ECs) during construction activities.

[5] The pre-1982 shoreline and fill event locations were determined by evaluating historical records (e.g., aerial photographs, Sanborn maps) presented in previous site reports (GeoEngineers 2007a, GeoEngineers and PIONEER 2008). The 1982 shoreline and fill event locations were determined by evaluating a 1979 aerial photograph (GeoEngineers 2007a), 1979 ground surface elevation contours (Eric Egge, personal communication), and boring logs (GeoEngineers 2007b, PIONEER 2009).

Current land use at the Site consists of urban land that was developed at the same time as the IAs and vacant land awaiting urban development. The current zoning for the Site is urban waterfront. Consistent with that zoning, future land use will be mixed-use urban buildings, which could include commercial office space, retail/restaurants, multi-family apartments aboveground-level retail space, et cetera. However, consistent with MTCA requirements, land use was assumed to be unrestricted (i.e., single-family residential) for the purposes of developing more protective soil cleanup levels (CLs), even though there is no current residential land use, and future single-family residential land use is not allowed due to zoning restrictions. Likewise, soil RLs were based on default exposure assumptions for commercial workers in order to develop protective RLs for the complete exposure pathways associated with construction/utility workers and utility maintenance workers.

Based on the RI results, the primary cleanup action objective the Site was to protect human health and the environment by eliminating unacceptable soil exposures for hypothetical single-family residents and commercial workers (which were used as surrogate pathways for the complete exposure pathways). Other key cleanup action objectives included:

- Complying with cleanup standards
- Complying with applicable state and federal laws and regulations
- Providing for compliance monitoring
- Completing the cleanup action prior to Site development, consistent with anticipated future land use
- Considering public concerns
- Considering cost-effectiveness and sustainability criteria

2.3 Feasibility Study

A Feasibility Study (FS) was conducted to develop and evaluate cleanup action alternatives for addressing Site soil impacts. As a first step, potentially applicable soil remedial technologies were screened to identify the feasible technologies. Three cleanup action alternatives were assembled from the feasible remedial technologies. These three alternatives represented a range of potential remedial approaches for addressing Site contamination, including one permanent alternative in accordance with WAC 173-340-350(8). The three alternatives were evaluated using the four MTCA threshold criteria in WAC 173-340-360(2)(a), the three MTCA balancing criteria in WAC 173-340-360(2)(b), and a sustainability criterion. All seven of the MTCA criteria were evaluated qualitatively by considering Site characteristics, COC characteristics, technology capabilities, and professional judgment. The sustainability criterion was evaluated qualitatively by considering air emissions, solid waste production, traffic, and resource usage.

2.4 2017 Cleanup Action

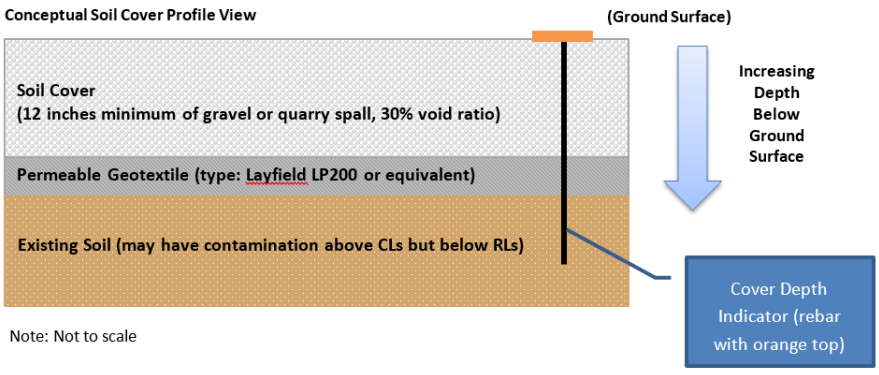
The selected cleanup action alternative for the Site was targeted soil removal, cover, and controls, as presented in the CAP included in Agreed Order DE 14072. The 2017 cleanup action included the following remedial components (PIONEER 2018b):

- Soil was excavated from four sample locations (i.e., DP04, DP06, SVP-2SO, and MW24S) where concentrations exceeded RLs (see Figure 2). These were the only RL exceedances that remained on Site prior to the implementation of the 2017 cleanup activities (i.e., all other RL exceedances had been removed during IAs). The soil was disposed of at Wasco Country Landfill in The Dalles, OR. The RL excavations were backfilled using clean soil from an off-site, documented, upland borrow source approved by Ecology.

Sample ID	COC	Sample Depth	COC Concentration
DP04	Arsenic	4-6 feet below ground surface (bgs)	52 mg/kg
DP06	TPH-G Total Naphthalenes	3-5 feet bgs	290 mg/kg 142 mg/kg
SVP-2SO	TPH-G Total Naphthalenes	4-6 feet bgs	1,100 mg/kg 150 mg/kg
MW24S	Dioxins/furans	6.5-8 feet bgs	979 ng/kg

- A clean soil cover was installed in the portions of the Site not covered by 1982 fill. The clean soil cover consisted of a permeable geotextile and at least 12 inches of crushed rock from an off-site upland borrow source. The clean soil cover areas are shown on Figure 3 and a conceptual cross section is presented below.

  A suitable cap or soil cover already existed in Lot 4, Lot 5, the infrastructure corridor, and the existing landscaped area located between Marine Drive and the Marine Drive sidewalk (see Figure 2).



The Port, City, and LOTT implemented and maintain the following institutional controls (ICs) on the Site. The ICs will:

- Prohibit any activity at the property which may result in the release of residual contamination contained as part of the remedial action, exacerbate or create a new exposure to residual contamination remaining on the Property, or disturb the soil cap/cover without prior written approval by Ecology.
- Prohibit installation of a well for water supply purposes within the Site boundary
- Restrict extraction of groundwater within the Site boundary for any purpose other than temporary construction dewatering, investigation, monitoring or remediation.

- Require that any groundwater extracted for any purpose within the Site boundary be considered potentially contaminated and any discharge of this water be done in accordance with local, state and federal law.
- Restrict construction of stormwater infiltration facilities or ponds within the contaminant delineation areas where the depth of these exceedances are shallower than the historical lowest measured groundwater depths for that location.
- Require that all stormwater catch basins, conveyance systems, and other appurtenances be of water-tight (i.e., subsurface piping will be pressure tested) construction within the contaminant delineation areas where the depth of these exceedances are shallower than the historical lowest measured groundwater depths for that location.

2.5 Cleanup Standards

In accordance with WAC 173-340-700(3), "Cleanup standards consist of the following: (a) cleanup levels for hazardous substances present at the site; (b) the location where these cleanup levels must be met (point of compliance); and (c) other regulatory requirements that apply to the site because of the type of action and/or location of the site ('applicable state and federal laws')." Soil RLs were also established in accordance with WAC 173-340-355. The soil CLs and RLs were based on unrestricted land use (i.e., single-family residential) and commercial/industrial land use, respectively. The following table presents the CLs and RLs for the COCs:

Soil COC	Soil CL	Soil RL
Arsenic	20 mg/kg	20 mg/kg
Lead	250 mg/kg	1,000 mg/kg
TPH-G	100 mg/kg	100 mg/kg
Total Naphthalenes	5.0 mg/kg	5.0 mg/kg
TPH-D and TPH-HO Combined	4,700 mg/kg	24,000 mg/kg
Total cPAHs	0.095 mg/kg	3.4 mg/kg
Total Dioxins/Furans	11 ng/kg	590 ng/kg

2.6 Additional Cleanup Activities for Lot 11

The development activities proposed in the CAPA and presented in this EDR are consistent with the interim actions and the 2017 cleanup activities (i.e., targeted soil removal, cover, and controls) that were completed per Agreed Order DE 14072 and summarized in Section 2.4. The additional cleanup activities for Lot 11 will include the following remedial components:

- The clean soil cover will be excavated and stockpiled for on-site or off-site reuse.
- The potentially-contaminated soil that is excavated to support development activities will be stockpiled on-site on an impervious surface (e.g., concrete, asphalt, or polyethylene liner with a thickness of at least 10 mil). When a stockpile is left overnight or not in use, it will be covered with a polyethylene liner (at least 10 mil thick), which will be secured with ropes and sandbags. Potentially-contaminated soil considered geotechnically suitable for reuse will be stockpiled separately from soil that is not geotechnically suitable for reuse.

- The potentially-contaminated soil will be stockpiled and sampled to determine the final disposition of the soil. If all COC concentrations in the stockpile characterization samples are less than or equal to RLs and the soil is geotechnically-suitable for reuse, that stockpile can be reused on-Site beneath hardscape and softscape surfaces. If any COC concentrations in the stockpile characterization samples are greater than RLs, that stockpile will be disposed of at an off-site facility permitted to receive such waste. Stockpiles that are not geotechnically-suitable for reuse (e.g., likely containing wood debris or metal debris) will also be disposed of in the same manner as stockpiles with COC concentrations that exceed the RLs.
- Surface and subsurface concrete encountered during additional cleanup activities will be transported off-site for disposal as general construction debris.
- Hardscape (i.e., impervious cap) surfaces such as buildings, parking areas, roads, sidewalks, or other paved outdoor areas) and softscape (i.e., pervious cover) surfaces will be constructed as part of development activities and serve as a protective cap/cover (with the existing clean soil cover).
- ICs and ECs will be implemented to minimize exposures for potential receptors (i.e., on-site workers and trespassers). During development activities, the Port will require the developer and contractors to implement ECs (see Section 3.7 for a description of the ECs). In order to minimize exposures following construction activities, the Port will also maintain ICs for perpetuity using an environmental covenant prepared in accordance with WAC 173-340-440 and Ecology's Toxics Cleanup Program (TCP) Procedure 440A. The ICs are presented in Section 3.14.

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SECTION 3: ADDITIONAL CLEANUP ACTIVITIES SUMMARY

The purpose of this section is to provide a detailed description of the engineering design for the additional cleanup activities at Lot 11. The developer will produce the design plans and specifications, including architectural, civil, and landscaping disciplines, for the additional cleanup activities.

3.1 Roles and Responsibilities

Representatives from the Port, Ecology, PIONEER, the developer, and other to-be-determined organizations, contractors, and service providers will perform the additional cleanup activities at Lot 11. Table 1 presents anticipated roles and responsibilities for the additional cleanup activities. This information will be updated as the project progresses.

3.2 Preparation Activities

To prepare for the additional cleanup activities at Lot 11, several tasks will need to be completed prior initiation of development activities, including:

- Marking the boundaries of the clean soil cover and 1982 fill
- Establishing contractor laydown area(s)
- Designating clean and potentially-contaminated stockpile areas
- Locating utilities, including marking the 10-foot utility corridor setback at the western and southern Site/Lot 11 boundary along Jefferson Street and State Avenue, respectively

3.3 Potential Soil CL Exceedance Excavations

Development activities will include soil excavations to support the construction of hardscapes (impervious) surfaces such as buildings, parking areas, roads, sidewalks and softscape (pervious) surfaces such as landscaped areas (see Figure 5). During the excavation activities, potentially-contaminated soil (i.e., soil with COC concentrations greater than CLs) may be encountered beneath the clean soil cover.[6] The processes that will be used to safely handle potentially-contaminated soil are presented in this section.

3.3.1 Excavations

The clean soil cover and the potentially-contaminated soil will be excavated to support development activities, particularly the installation of the building foundation (i.e., grade beams), subsurface utilities (e.g., storm sewer including Bayfilter™ vault, sanitary sewer including manholes, water), light poles, two elevator shafts, and other subsurface features. The proposed building foundation plan, excavation plan, and associated details are provided in Appendix A. Steel pile/grade beam, utilities, and elevator shaft excavation illustrations are shown on Figures 6, 7, and 8, respectively.

[6] COCs include arsenic, lead, total cPAHs, and total dioxins/furans TPH-D and TPH-HO combined, TPH-G, and total naphthalenes.

The anticipated maximum depths of excavation, referenced to feet below the permeable geotextile membrane (i.e., the pre-cover grade), are summarized in the table below:

Subsurface Feature Type	Maximum Depth of Excavation Below Clean Soil Cover (feet below geotextile membrane)
Building Foundation Grade Beams	4.5
Townhome Grade Beams	1.0
Utilities	8.0
Light Poles	5.0
Elevator Shafts	8.0
Pavement	0.67
Landscaping	2.0

The volume of clean soil cover at Lot 11 is estimated at approximately 2,500 cubic yards (cy). The volume of potentially-contaminated soil that will be excavated to support development activities is estimated at approximately 5,200 cy (see Table 2). The volume of potentially-contaminated soil designated for off-site disposal will be based on the results of stockpile sampling (see Sections 3.3.2 and 3.3.4).

In the event that cultural/archaeological resources or human remains are inadvertently found, the work will be stopped immediately, the site secured, and the appropriate authorities notified in accordance with the Unanticipated Discoveries Plan (see Appendix B).

3.3.2 Soil Segregation and Temporary Stockpiles

The clean soil cover (which consists of crushed rock placed on top of a geotextile membrane), will be segregated, temporarily stockpiled, and reused on-site or transported off-site for reuse. The potentially-contaminated soil below the geotextile membrane will be segregated, temporarily stockpiled, and sampled to determine the final disposition of the soil in accordance with the Sampling and Analysis Plan and Quality Assurance Project Plan (SAP/QAPP; see Appendix C). The potentially-contaminated soil will be managed using the procedures presented in the Stockpile Management and Procedures Plan, which is presented in Appendix D.

The potentially-contaminated excavated soil will be segregated into two temporary stockpiles depending on whether the soil is geotechnically-suitable for reuse or not geotechnically-suitable for reuse. The temporary stockpiles will be placed on impervious surfaces (e.g., concrete, asphalt, or polyethylene liner with a thickness of at least 10 mil), and if left overnight, it will be covered with a polyethylene liner (at least 10 mil thick), which will be secured with ropes and sandbags. Water drained from excavated and stockpiled soil will be collected and disposed of with other dewatering effluent (see Section 3.3.3) in accordance with local, state, and federal regulations.

3.3.3 Groundwater Dewatering

Given the maximum depths of excavation (see the table in Section 3.3.1 and Table 2) and the typical depths of groundwater at the Site, it is expected that some groundwater will need to be removed from the excavation(s) to complete excavation activities and install subsurface structures. Groundwater that is removed from these excavations will be temporarily stored in portable tanks(s), treated (if required), and discharged in accordance with local, state and federal regulations.

3.3.4 Reuse/Disposal

Stockpiled soil will be evaluated to determine if it should be reused on-site or disposed of off-site. If the excavated and temporarily-stockpiled soil COC concentrations are less than or equal to RLS and the soil is geotechnically-suitable, the soil will be reused on-site if needed. If the excavated and temporarily-stockpiled COC concentrations are greater than RLs, the soil will be disposed of at an off-site facility permitted to receive such waste (e.g., Wasco Country Landfill in The Dalles, OR). Stockpiled soil that is not geotechnically-suitable for reuse (e.g., it contains wood or metal debris) will also be disposed of at an off-site facility permitted to receive such waste. Surface and subsurface concrete encountered during excavation activities will be transported off-site for disposal as general construction debris.

3.4 Hardscape Surfaces

Hardscape surfaces are defined as areas covered by buildings, parking lots, roads, sidewalks, or other paved outdoor areas. Hardscape surfaces (e.g., asphalt or concrete) will be installed in Lot 11 as part of development activities in areas not covered by 1982 fill (see Figure 5 and Appendix A). In the event that development activities disturb the clean soil cover in the hardscape areas, the clean soil cover and/or potentially-contaminated soil located beneath the cover will be (1) left in place or (2) temporarily stockpiled in separate locations on site (i.e., the clean soil cover will be stockpiled separately from the potentially-contaminated soil) to determine the final disposition of the soil (see Section 3.3.2). The 12 inches of crushed rock is not required beneath hardscape surfaces; however, the permeable geotextile membrane is required to demarcate the location of the potentially-contaminated soil (see Section 3.6 for details regarding the geotextile membrane). The sub-base beneath the hardscape surfaces will be graded and compacted (as necessary) to support the final hardscape surface.

3.5 Softscape Surfaces

Softscape areas are defined as areas not covered by an impervious hardscape surface as described in Section 3.4. The existing clean soil cover installed in the softscape areas per the 2017 cleanup activities will be maintained. In the event that construction activities disturb the soil cover in these areas, the soil cover (and permeable geotextile membrane [see Section 3.6 for details] if necessary) will be repaired/replaced/restored to ensure that the clean soil cover in these areas is comprised of a permeable geotextile membrane and at least 12 inches of clean soil from off-site upland borrow source (e.g., bedding soil for landscaping).

3.6 Permeable Geotextile Membrane

A permeable geotextile membrane will be used under hardscape and softscape surfaces to demarcate areas where potentially-contaminated soil could be encountered. The permeable geotextile membrane shall be Layfield LP200 or equivalent (see Appendix E). The seams of the geotextile will overlap by at least one foot, and pins, staples, anchors or other methods will be used to secure the geotextile to the ground surface.

3.7 Engineering Controls during Construction

The general/remediation contractor will be required to implement ECs during cleanup activities (i.e., Lot 11 control measures, dust control measures, stormwater control measures, and spill control measures) and discussed below.

3.7.1 Site Control

To limit public access to Lot 11, the temporary perimeter fencing (i.e., chain-link panels) placed around the lot during the 2017 cleanup activities will be maintained until development activities are completed. The Port and/or developer's contractor(s) will control fencing access points during construction. In addition, traffic and pedestrian control measures will be implemented as necessary during construction.

3.7.2 Dust Control

Dust control best management practices (BMPs) will be implemented during development activities (e.g., misting/watering dry soil) to suppress dust, as necessary. Dust control measures will be conducted in accordance with Ecology's BMPs Standards and Specifications for Dust Control (Ecology 2012). However, to minimize contaminant transport to stormwater, misting/watering will not be conducted for stockpiles of potentially-contaminated soil (see the stockpile cover requirements in Appendix D). To prevent soil from being tracked off of the Site, crushed rock construction entrances and wheel washes will be required.

All respirable dust measurements collected during the 2017 cleanup activities were less than the Airborne Dust Action Level of 1 mg/m^3 by more than an order of magnitude (PIONEER 2018b).[7] To verify that the contractor's means and methods for excavating potentially-contaminated soil does not create an airborne dust issue, dust monitoring will be conducted during the first week of soil excavation activities associated with the installation of deep subsurface utilities (north of the main building and at the southeast corner of Lot 11 for the sanitary sewer connection to main in State Avenue NE) and grade beams (for both the main building and townhomes)(see Appendix C). Discontinuation of dust monitoring will be determined in consultation with Ecology.

[7] Dust measurements were collected daily during the 2017 cleanup activities, which lasted approximately two months (PIONEER 2018b).

3.7.3 Stormwater Control

BMPs for construction stormwater will be implemented, as necessary, to ensure that stormwater stays on Lot 11 until excavation and development activities are complete. Stormwater BMPs include but are not limited to a crushed rock construction access, wheel washes, a silt fence, and a storm-drain inlet protection.

3.7.4 Spill Control

To prevent equipment oil/fuel spills, all contractors using heavy equipment will have a spill kit available on-site and will take necessary measures to prevent equipment oil/fuel spills during construction activities. Any release to the environment will be completely remedied to the Port's and Ecology's satisfaction by the contractor responsible for the spill.

3.7.5 Groundwater Control During Piling

As part of development, open-end piles will be driven to the depths of 95 to 115 feet bgs and penetrate the regional aquitard and into the artesian aquifer. In an email from Ecology Project Manager (Steve Teel, LHG) dated June 12, 2018, Ecology expressed concerns of the aquifer interconnection between the confined artesian aquifer and the overlying unconfined aquifer as a result of installation of piles. The potential consequences associated with pile penetration of the regional aquitard as stated by Ecology include the following:

- Potential upward artesian flow through the center and/or outside of the pile.
- Potential increase in ponded water at the surface.
- Potential rising groundwater table and influence of the groundwater flow direction in the unconfined aquifer wells as the potential for increase in contaminant partitioning from soil to groundwater.
- Potential for cross-contamination due to "carry-down" of contaminated soil.
- Potential for depressurization of the artesian aquifer.
- Potential for artesian flow to "float" the piles.

Based on the anticipated Site conditions, experience driving piles in downtown Olympia, and professional expertise, it is unlikely that there will be significant artesian flow around the piles and/or floating of the piles. Consequently, it is not anticipated groundwater levels in the upper saturated zone will be significantly impacted. Furthermore, given the low solubility and high sorption capacity associated with COCs at the Site (i.e., TPH-D and TPH-HO combined, total cPAHs, and total dioxins/furans), the soil-to-groundwater pathway as deemed incomplete during the RI/FS/CAP still remains unchanged even in the event of a temporal change in groundwater level.

Correspondence between Ecology and the Port's project team regarding pile installation at East Bay Lot 11 is provided in Appendix F. A contingency plan will be developed describing pile installation mean and methods and measures to manage and dispose of water potentially generated due to artesian conditions. The contingency plan will be submitted for Ecology review, comment, and approval prior to driving piles.

3.8 Required Permits

The following environmental laws and regulations should be considered during the additional cleanup activities:[8]

- Occupational Safety and Health Act and Washington Industrial Safety and Health Act regulations (29 Code of Federal Regulations 1910.120; WAC 296-843).
- Washington Industrial Safety and Health Act, Chapter 49.17 Revised Code of Washington (RCW), Safety Standards for Construction Work (WAC 296-155).
- Underground Utilities, RCW 19.122.010, General Protection Requirements (WAC 296-155-655).
- Coverage under the general construction stormwater National Pollution Discharge Elimination System (NPDES) permit. The remediation contractor will prepare a Temporary Erosion and Sediment Control (TESC) plan, Stormwater Pollution Prevention Plan (SWPPP), and Spill Prevention Control and Countermeasures (SPCC) plan, as necessary, in accordance with the NPDES permit.
- City permit requirements (e.g., grading and building permit).[9]
- Solid Waste Management Chapter 43.21 RCW, Minimum Functional Standards for Solid Waste Handling (WAC 173-304).

The City issued a State Environmental Policy Act (SEPA) environmental determination regarding the development project. Ecology prepared a SEPA document that adopted the City's SEPA determination of nonsignificance.

3.9 Pre-Mobilization Coordination

Pre-mobilization coordination activities will include, but are not limited to, the following:

- Addressing any overlapping health and safety issues with the project team.
- Communicating the project schedule with the project team.
- Notifying Ecology about the anticipated field schedule at least five working days prior to the scheduled start of the cleanup activities.
- Performing a utility locate prior to each excavation activity.
- Communicating with the laboratory about the laboratory requirements included in the SAP/QAPP (see Appendix C).
- Communicating with the off-Site waste disposal facility regarding the acceptance of solid waste from Lot 11.
- Coordinating with the appropriate wastewater facility regarding the acceptance of any groundwater discharged to that facility.

3.10 Schedule

The schedule is presented in the Agreed Order DE 14072. The preliminary construction schedule is shown on Figure 9. The development is anticipated to be completed in the following sequence:

[8] These potentially applicable or potentially relevant and appropriate requirements are associated with non-MTCA environmental laws and regulations.

[9] City permits will be required to construct permanent structures on Lot 11. It is beyond the scope of this EDR to discuss the City permitting requirements associated with construction of those structures.

- Excavate and stockpile the clean soil cover to the extent practicable.
- Install deep utilities north of the main building and at the southeast corner of Lot 11 (i.e., sanitary sewer connection to the main in State Avenue NE).
- Drive steel piles for the main building and two townhomes.
- Excavate at the main building for construction of the elevator shaft, grade beams, and footings.
- Pour concrete grade beams and footings at the main building.
- Construct the main building.
- Excavate at the townhomes for construction of grade beams and footings.
- Pour concrete grade beams and footings at the townhomes.
- Construct townhomes.
- Final site work including landscaping.

It is anticipated that the main building will not be occupied until the concrete foundation (slab on grade) has been completed for the townhomes (i.e., potentially-contaminated soil capped/covered by hardscapes and softscapes).

3.11 Compliance Monitoring

The compliance monitoring plan for the Site was developed in accordance with the requirements of WAC 173-340-410. Three types of compliance monitoring are defined in WAC 173-340-410: (1) protection monitoring, (2) performance monitoring, and (3) confirmational monitoring. The application of each type of compliance monitoring during additional cleanup activities is described below. Compliance monitoring includes qualitative EC assessments during development activities, dust monitoring, stockpile sampling, and long-term inspections of the protective cap/cover (hardscape and softscape) and ICs. The Port, developer, and PIONEER will implement the compliance monitoring plan. The applicable sampling, analyses, and quality assurance/quality control details associated with the compliance monitoring plan are presented in the SAP/QAPP (see Appendix C).

3.11.1 Protection Monitoring

The purpose of protection monitoring per WAC 173-340-410(1)(a) is to "Confirm that human health and the environment are adequately protected during construction and the operation and maintenance period of an interim action or cleanup action as described in the safety and health plan." Even though dust monitoring data collected at the Site during the 2017 cleanup activities indicated it was likely that the dust levels that may be produced during future construction activities would be acceptable, airborne dust monitoring with a particulate-matter field monitor will be conducted during the additional cleanup activities as described in the SAP/QAPP (see Appendix C; PIONEER 2018b).

3.11.2 Performance Monitoring

The purpose of performance monitoring per WAC 173-340-410(1)(b) is to "confirm that the interim action or cleanup action has attained cleanup standards and, if appropriate, remediation levels or other performance standards..." Soil samples will be collected from soil stockpiles generated during the

excavation of potentially-contaminated soil and designated for possible on-site reuse or off-site disposal (see Appendix C).

3.11.3 Confirmational Monitoring

The purpose of confirmational monitoring per WAC 173-340-410(1)(c) is to "Confirm the long-term effectiveness of the interim action or cleanup action once cleanup standards and, if appropriate, remediation levels or other performance standards have been attained." Long-term monitoring will be conducted to confirm that the hardscape and softscape surfaces are continuing to provide a suitable exposure barrier. The details of the monitoring will be included in the Long-term Operations and Maintenance Plan for the Site which will be revised to incorporate monitoring for the Lot 11 additional cleanup and development activities (PIONEER 2017). The Port will document each annual monitoring event and provide a copy of the document to Ecology. Qualitative EC assessments during construction activities and long-term inspections of the protective cap/cover (hardscape and softscape) and ICs are considered part of long-term monitoring and will be included in the updated Long-Term Operations and Maintenance Plan for the Site (see Section 3.14).

3.12 Health and Safety Plan

PIONEER's HASP is presented in Appendix G. PIONEER will support the Port with oversight of the additional cleanup activities, including dust monitoring and collection of soil samples from potentially-contaminated stockpiles.

The companies performing the additional cleanup and development activities (a remediation contractor to be determined) are responsible for their own HASPs. The remediation contractor excavating the potentially-contaminated soil and installing the subsurface features below the existing clean soil cover will need to prepare and implement a HASP specific to the activities the contactor will be conducting. Because the Site is regulated under MTCA and construction activities related to soil excavation, soil cover installation, and development are being conducted, hazardous waste operation regulations promulgated under the Occupational Safety and Health Act (OSHA) and Washington Industrial Safety and Health Act (WISHA) are applicable (see WAC 173-340-810 and WAC 246-843-100).

In addition, Hazardous Waste Operations and Emergency Response (HAZWOPER) trained construction workers will perform potentially-contaminated soil-related work in accordance with WAC 296-843-200. Once a hardscape or softscape surface is installed, Lot 11 will be protective of human health and the environment and HAZWOPER training will not be required for workers on Lot 11 who will not come into contact with the soil beneath the permeable geotextile. HAZWOPER training will be required for any workers who are performing subsurface work (e.g., utility workers).

3.13 Cleanup Action Completion Report

Once the additional cleanup activities are complete, a Cleanup Action Completion Report will be prepared to document the additional cleanup activities and the installation of the hardscape and softscape surfaces.

3.14 Institutional Controls

ICs are a component of the proposed cleanup action. The Port, City, and LOTT will implement and maintain the ICs for Lot 11 using an environmental covenant developed in accordance with WAC 173-340-440 and Ecology's TCP Procedure 440A. Specifically, the environmental covenant will:

- Prohibit any activity at the property which may result in the release of residual contamination contained as part of the remedial action, exacerbate or create a new exposure to residual contamination remaining on the Property, or disturb the soil cap/cover without prior written approval by Ecology
- Prohibit installation of a well for water supply purposes within the Site boundary
- Restrict extraction of groundwater within the Site boundary for any purpose other than temporary construction dewatering, investigation, monitoring or remediation
- Require that any groundwater extracted for any purpose within the Site boundary be considered potentially contaminated and any discharge of this water be done in accordance with local, state, and federal law
- Restrict construction of stormwater infiltration facilities or ponds within the contaminant delineation areas where the depth of these exceedances are shallower than the historical lowest measured groundwater depths for that location
- Require that all stormwater catch basins, conveyance systems, and other appurtenances be of water-tight construction (i.e., subsurface piping will be pressure tested) within the contaminant delineation areas where the depth of these exceedances are shallower than the historical lowest measured groundwater depths for that location

Once signed, the environmental covenant will be recorded in Thurston County in accordance with Uniform Environmental Covenants Act (UECA) requirements in the RCW Chapter 64.70.080(1). A copy of the recorded environmental covenant will also be distributed to each person who signed the covenant, each person holding a recorded interest in the real property subject to the covenant, each person in possession of the real property subject to the covenant at the time the covenant is executed, the City, and Ecology per UECA requirements in RCW Chapter 64.70.070(1).

The Port's Long-term Operations & Maintenance Plan will be updated to reflect Lot 11 development activities (i.e., the hardscape and softscape surfaces) after construction is complete. The existing Long-term Operations & Maintenance Plan includes information about roles and responsibilities and a land use inspection form (including instructions for using the form) for the Site (PIONEER 2017).

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SECTION 4: REFERENCES

Ecology. 2017. Agreed Order Amendment. No. DE 14072. May 30.

Ecology 2012. "BMP C140: Dust Control" in Stormwater Management Manual for Western Washington Volume II Construction Stormwater Pollution Prevention, August.

GeoEngineers 2007a. Phase I Environmental Site Assessment, East Bay Redevelopment Project, March 14.

——— 2007b. Supplemental Site Use History and Soil and Groundwater Sampling Clarifications, East Bay Redevelopment Site, August 3.

GeoEngineers and PIONEER 2008. Remedial Investigation Work Plan, East Bay Redevelopment Site, October 22. As amended with January 30, 2009 replacement pages.

PIONEER 2009. Port of Olympia East Bay Site: Interim Action Work Plan, May.

——— 2016. Remedial Investigation/Feasibility Study Report, East Bay Redevelopment Site, October.

——— 2017. Long-term Operations & Maintenance Plan, East Bay Redevelopment Site, December.

——— 2018a. Cleanup Action Plan Amendment, East Bay Redevelopment Site (Lot 11), January.

——— 2018b. Cleanup Action Completion Report, East Bay Redevelopment Site, February.

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Figures

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Legend

- Site Boundary
- Lot 11 Boundary
- Original Predevelopment Shoreline (Pre-1888)

0 500 1,000 1,500 Feet

PIONEER TECHNOLOGIES CORPORATION

Vicinity Map
Engineering Design Report (Lot 11)
East Bay Redevelopment Site

Figure 1

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Legend

- Site Boundary
- Lot Boundary (2018)
- Soil Cover
- 1982 Fill

Lot 11 Layout

- Building
- Asphalt
- Hardscape
- Softscape

0 100 200 300 Feet

PIONEER TECHNOLOGIES CORPORATION

Proposed Cap/Cover for Lot 11
Engineering Design Report (Lot 11)
East Bay Redevelopment Site

Figure 2

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Legend

- Site Boundary
- Lot 11 Boundary
- 1982 Fill

Completed During Previous Interim Actions

- Soil Cap
- Soil Cover
- Soil Removal

2017 CAP Remediation Activities

- Soil Removal
- Soil Cover

0 100 200 300 Feet

PIONEER TECHNOLOGIES CORPORATION

2017 Soil Removal and Cover Locations
Engineering Design Report (Lot 11)
East Bay Redevelopment Site

Figure 3

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Legend

- Site Boundary
- Lot 11 Boundary
- Soil Cover
- 1982 Fill

0 100 200 300 Feet

PIONEER TECHNOLOGIES CORPORATION

Soil Cover Areas per Original Agreed Order DE 14072
Engineering Design Report (Lot 11)
East Bay Redevelopment Site

Figure 4

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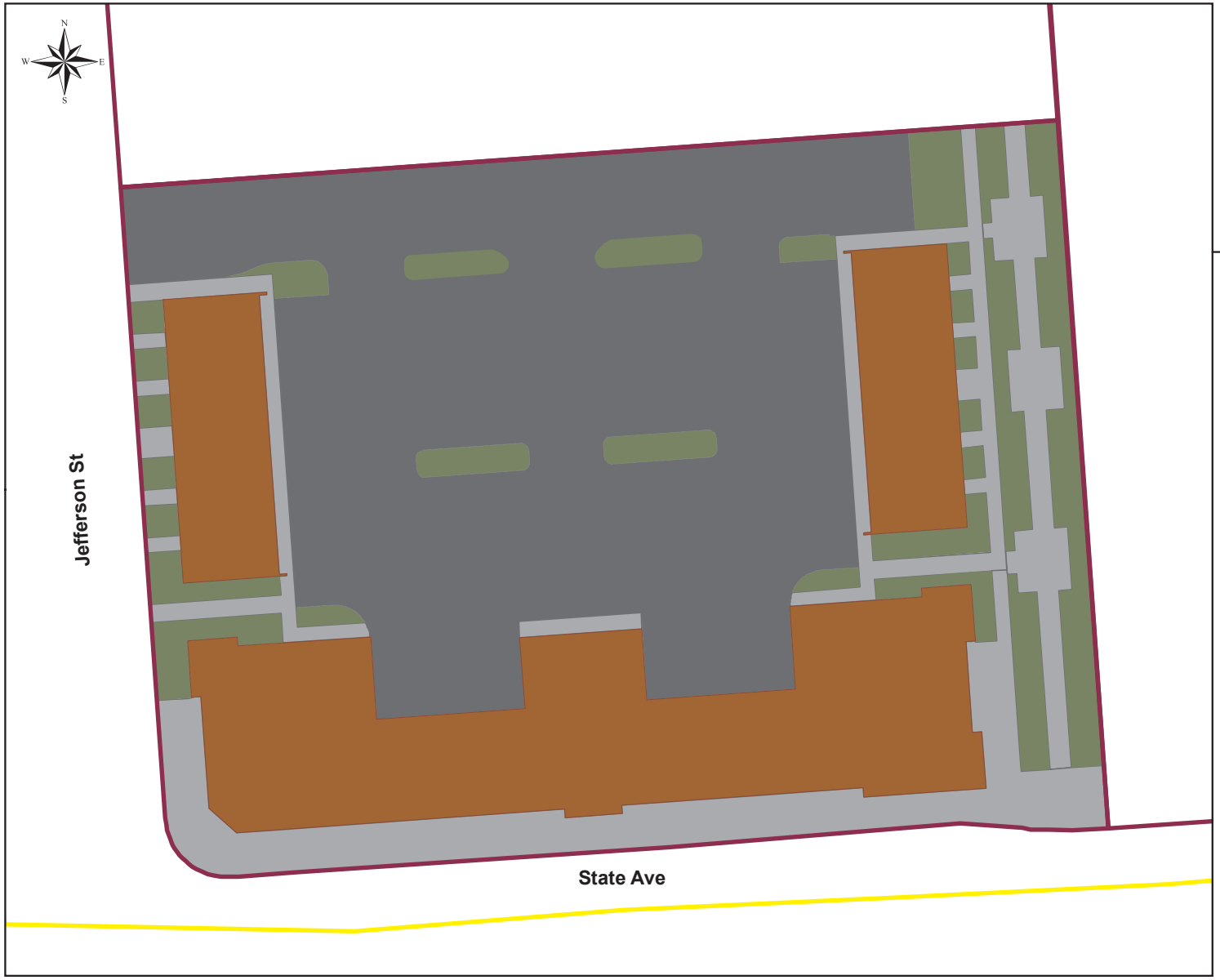

PIONEER TECHNOLOGIES CORPORATION

Lot 11 Layout
Engineering Design Report (Lot 11)
East Bay Redevelopment Site

Figure 5

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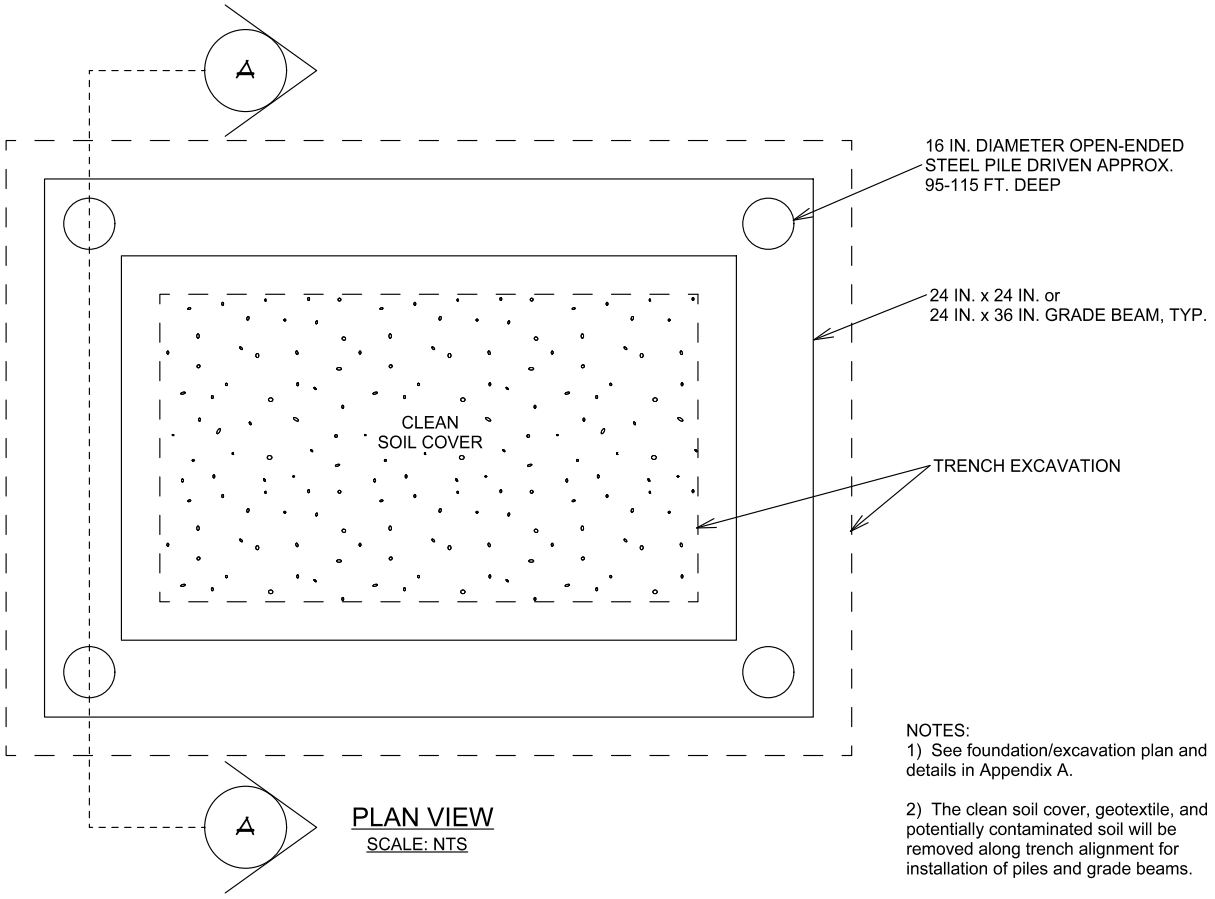
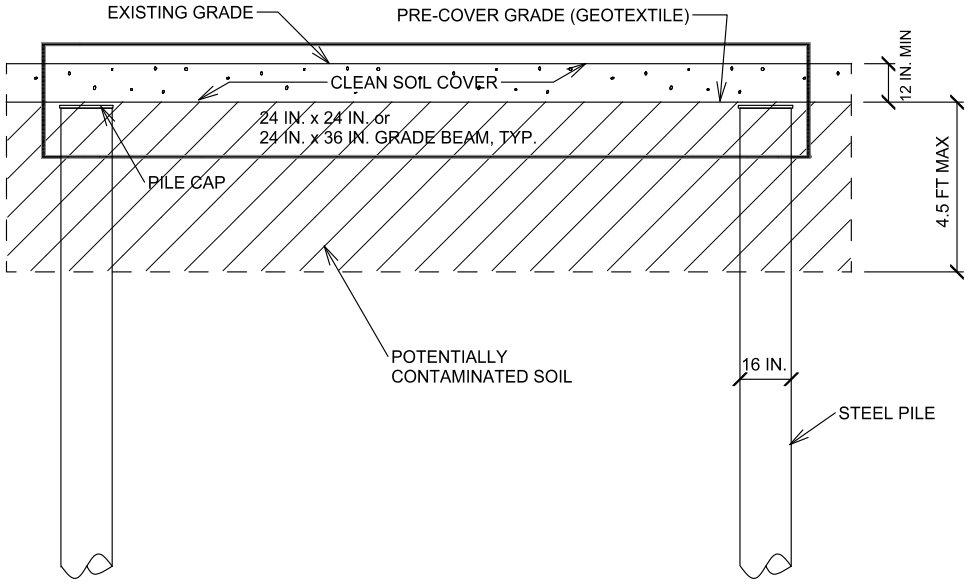


PLAN VIEW
SCALE: NTS

NOTES:
1) See foundation/excavation plan and details in Appendix A.

2) The clean soil cover, geotextile, and potentially contaminated soil will be removed along trench alignment for installation of piles and grade beams.

FT. - Feet
IN. - Inches



ELEVATION PLAN
SCALE: NTS

PIONEER TECHNOLOGIES CORPORATION

Steel Pile and Grade Beam Excavation Illustration
Engineering Design Report (Lot 11)
East Bay Redevelopment Site

Figure 6

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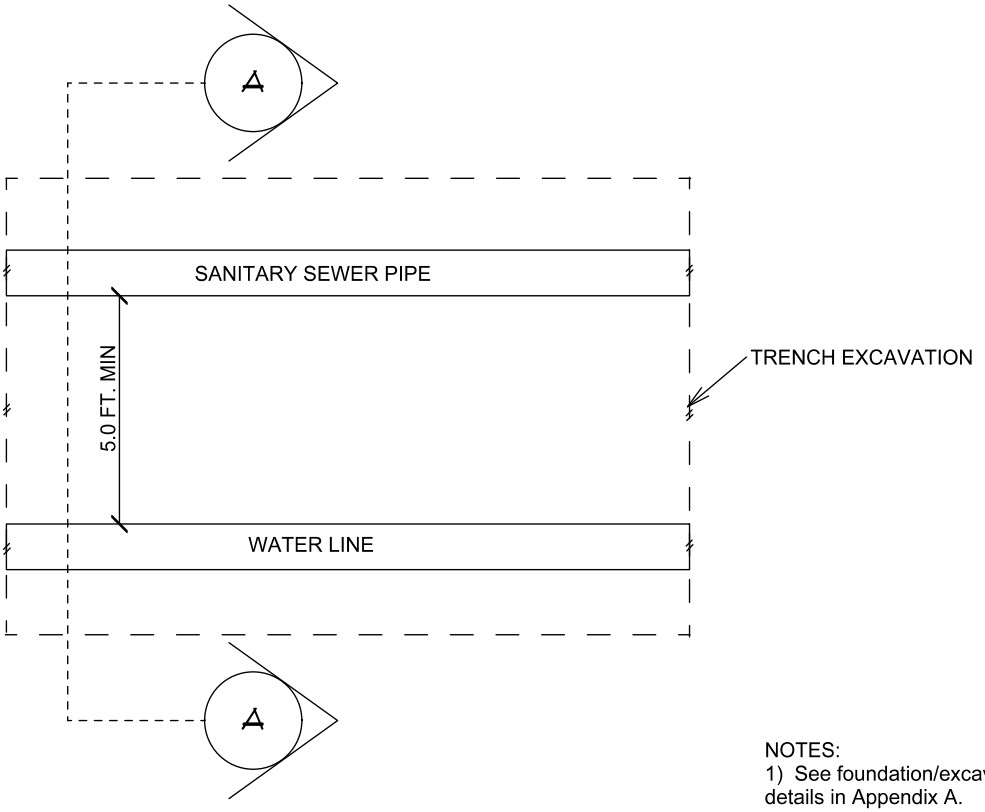
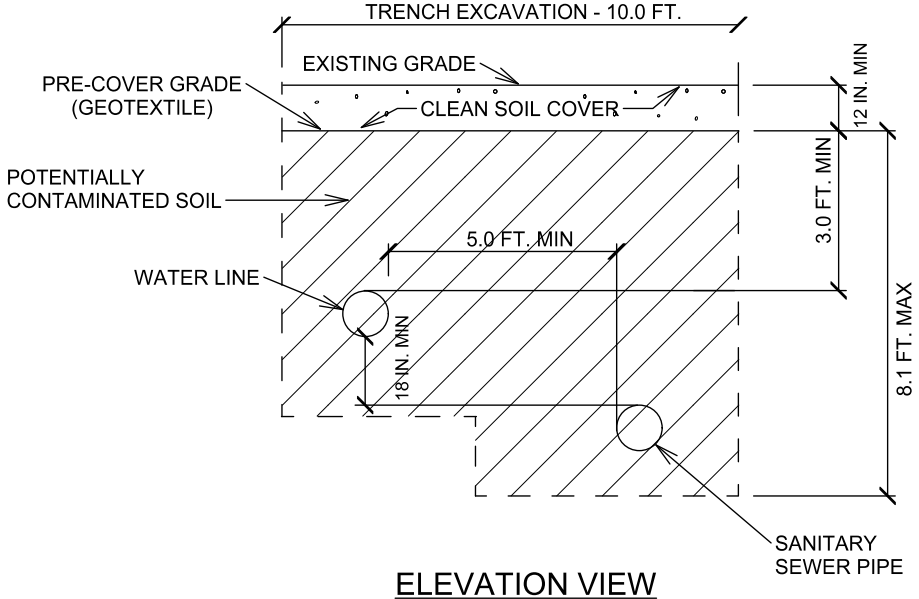


PLAN VIEW
SCALE: NTS

NOTES:
1) See foundation/excavation plan and details in Appendix A.

2) The clean soil cover, geotextile, and potentially contaminated soil will be removed for installation of utilities.

FT. - Feet
IN. - Inches



ELEVATION VIEW
SCALE: NTS

PIONEER TECHNOLOGIES CORPORATION

Utilities Excavation Illustration
Engineering Design Report (Lot 11)
East Bay Redevelopment Site

Figure 7

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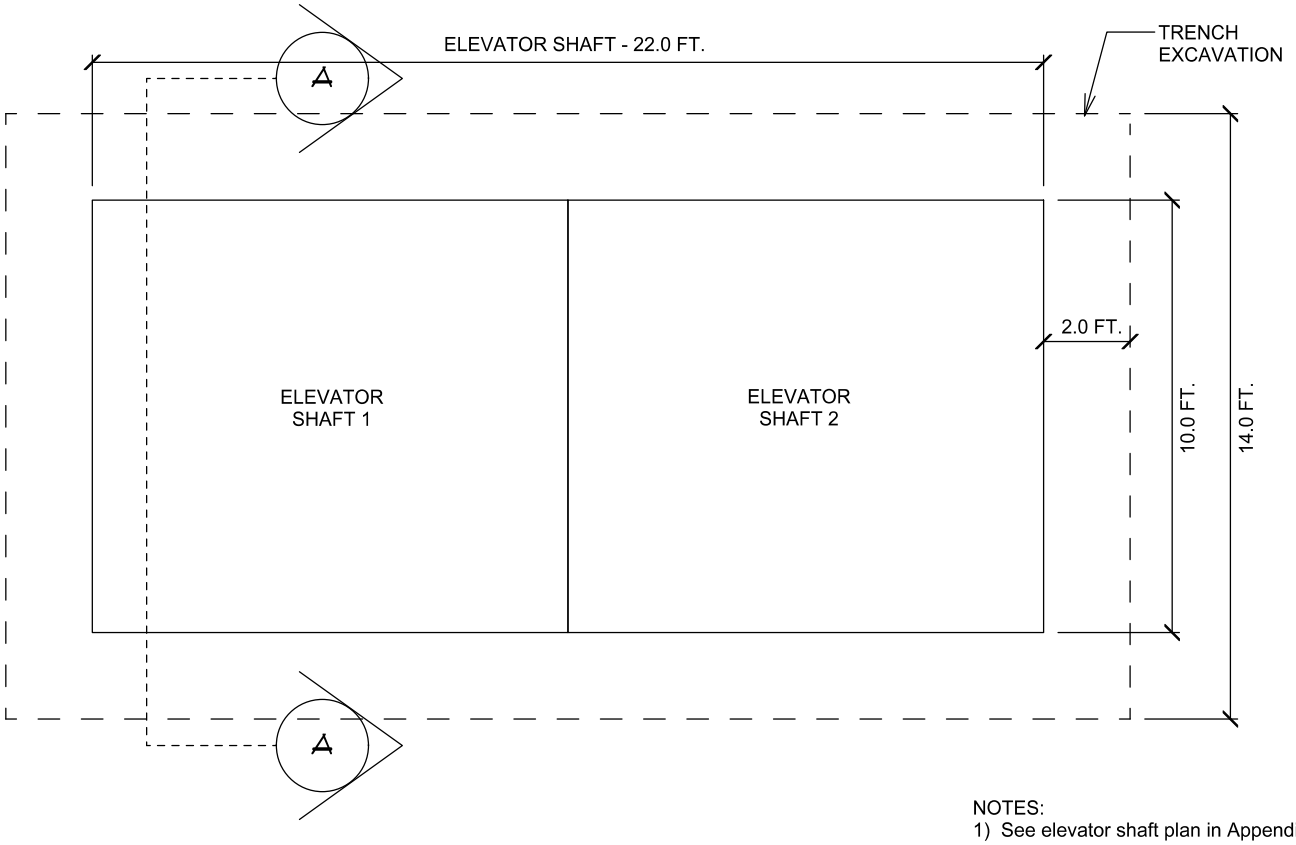
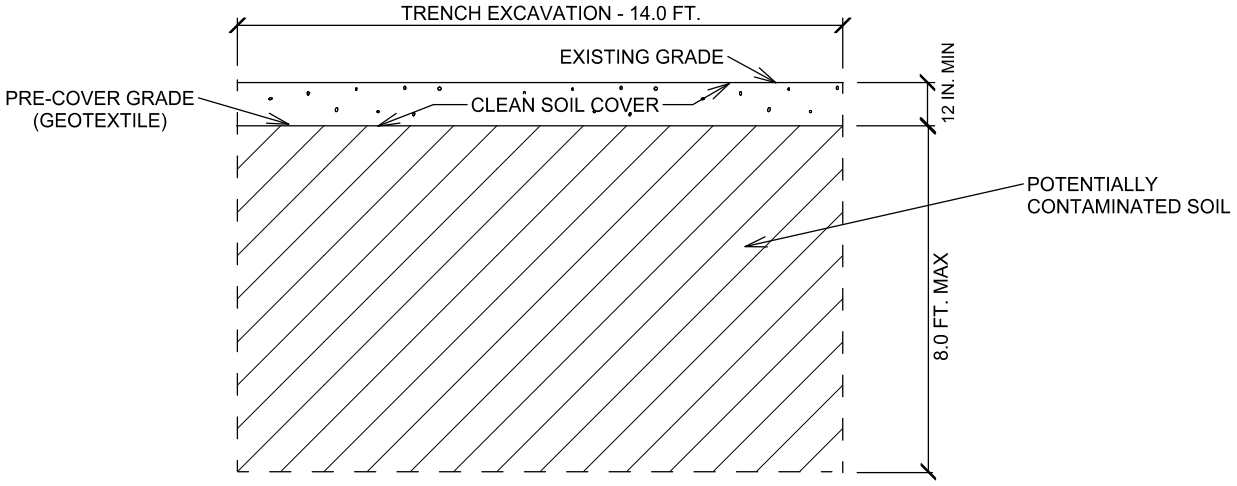


PLAN VIEW
SCALE: NTS

NOTES:
1) See elevator shaft plan in Appendix A.

2) The clean soil cover, geotextile, and potentially contaminated soil will be removed for installation of elevator shafts.

FT. - Feet
IN. - Inches



ELEVATION VIEW
SCALE: NTS

PIONEER TECHNOLOGIES CORPORATION

Elevator Shaft Excavation Illustration
Engineering Design Report (Lot 11)
East Bay Redevelopment Site

Figure 8

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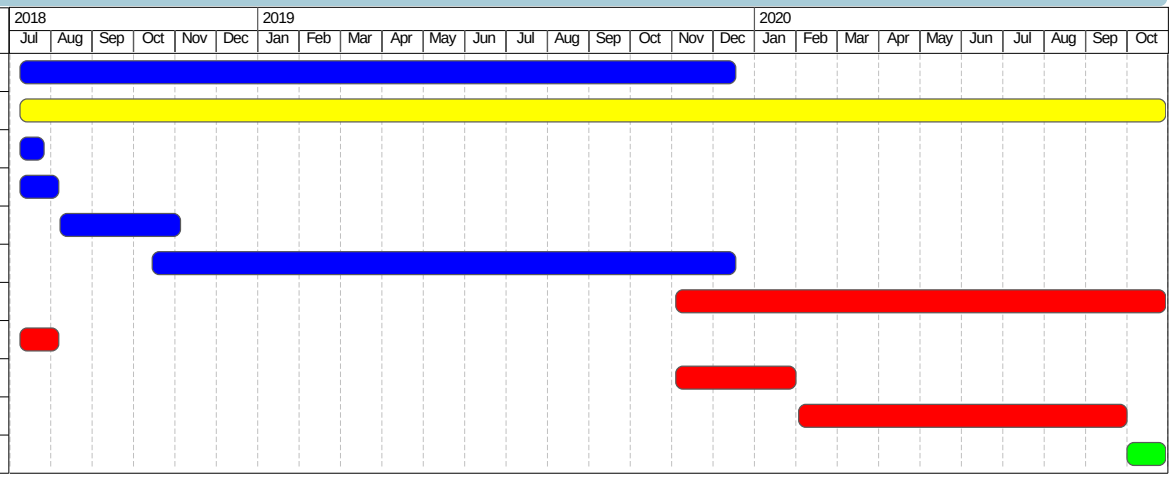
Figure 9 - Preliminary Construction Schedule

ID	Event Name	Start	End
1	Main Building	Jul 09 2018	Dec 18 2019
1A	Excavate and Stockpile Clean Soil Cover (as needed)	Jul 09 2018	Oct 30 2020
1B	Install Deep Utilities	Jul 09 2018	Jul 27 2018
1C	Drive Steel Piles at Main Building	Jul 09 2018	Aug 07 2018
1D	Excavate and Pour Concrete at Main Building	Aug 08 2018	Nov 05 2018
1E	Construct Main Building	Oct 15 2018	Dec 18 2019
2	Townhomes	Nov 04 2019	Oct 30 2020
2A	Drive Steel Piles at Townhomes	Jul 09 2018	Aug 07 2018
2B	Excavate and Pour Concrete at Townhomes	Nov 04 2019	Feb 01 2020
2C	Construct Townhomes	Feb 03 2020	Oct 01 2020
3	Final Site Work	Oct 01 2020	Oct 30 2020



Created with Timeline Maker Pro. Produced on May 09 2018.

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Tables

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Table 1: Project Roles and Responsibilities

Project Role	Contact Name, Phone Number, and Email	Project Responsibilities
Port Planning, Public Works, and Environmental Director	Rachael Jamison (360) 528-8020 Rachaelj@portolympia.com	Overall environmental project management. Communication and coordination with Ecology, Port staff, and PIONEER.
Port Senior Engineer	Tyson Carpenter, P.E. (360) 528-8006 TysonC@portolympia.com	Communication and coordination with the Port Planning, Public Works, and Environmental Director, Port staff, and PIONEER.
Ecology Site Manager	Steve Teel, L.H.G. (360) 407-6247 stee461@ecy.wa.gov	Regulatory review and approval of EDR (Lot 11). Complete public notification requirements.
PIONEER Project Manager	Chris Waldron, P.E. (360) 570-1700 waldronc@uspioneer.com	Prepare EDR (Lot 11). Oversee cleanup implementation in accordance with existing contract. Support primary organization(s) conducting oversight for environmental soil issues related to implementation of this EDR. Implementation of the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP).
Developer	Walker C. John walker@oliviabeach.com	Developer for Lot 11 Redevelopment.
Thomas Architecture Studios Project Manager	Amos Callender (360) 915-8775 amos@tasolympia.com	Architect for development activities.
SCJ Alliance Landscape Architect	Jeff Glander (360) 352-1465 jeff.glander@scjalliance.com	Softscapes
Parametrix Project Manager	Sam Nielson, P.E. (253) 604-6600 SNielson@parametrix.com	Design civil engineer for utilities and hardscapes.
General/Remediation Contractor	To be determined	
Analytical Laboratory	Friedman & Bruya, Inc. and Frontier Analytical Laboratory	Analyze soil samples and conduct laboratory quality control.
Solid Waste Disposal Facility	Off-Site Facility Permitted to Receive Solid Waste (e.g., Wasco Country Landfill in The Dalles, OR)	Permitted facility for disposal of off-site solid waste.
Material Supplier	To be determined	
Wastewater Disposal Facility	Off-Site Facility Permitted to Receive Wastewater	Permitted facility for disposal of off-site wastewater.

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Table 2: Potentially-Contaminated Soil Volume Estimate

Cover Feature	Length of Excavation (feet)	Width of Excavation (feet)	Excavation Area (square feet)[1]	Maximum Depth of Excavation (feet)[2]	Contaminated Soil Volume (cubic yard)[3]
Hardscape Area (pavement)	--	--	11,049	0.75	307
Hardscape Area for Trash Enclosure (pavement)	--	--	891	0.75	25
Landscaped Area	--	--	7,919	2	587
Parking Lot	--	--	28,928	0.75	804
Westman Mill Main Building (slab on grade)	--	--	11,062	0.75	307
Townhomes (slab on grade)	--	--	5,557	0.00	0
Elevator Shaft[4]	20	11	220	8	65
Main Building - Grade Beams[5]	1,929	3	5,787	4.5	965
Townhomes - Grade Beams[5]	635	3	1,905	1.0	71
Exterior Utilities[6]	1,170	5	5,850	8	1,733
Interior Utilities[6]	235	5	1,175	8	348
Totals					5,211

Notes:

Volume of clean soil cover (crushed rock) = 66,581 square feet x 1 feet (minimum thickness) / 27 cubic yard per cubic feet = 2,500 cy

1. Provided by Thomas Architecture Studios (Foundation Plan).
2. Provided by Thomas Architecture Studios (Excavation Plan). Maximum depth of excavation referenced to interface between clean soil cover and contaminated soil (demarcated by geotextile).
3. Calculated value: Length (feet) x Width (feet) (or Area in square feet) x Maximum Depth of Excavation (feet) / 27 cubic yards per cubic feet.
4. Elevator shaft length and width of excavation estimated from Parametrix civil design Utility Plan (Sheet UT-01).
5. Grade beam total length estimated from Thomas Architecture Studios (Excavation Plan).
6. Utility alignment length and width of excavation estimated from Parametrix civil design Utility Plan (Sheet UT-01). Assume average excavation depth of 4 feet; maximum depth of 8.1 feet.

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Appendix A

Foundation/Excavation Plan and Details

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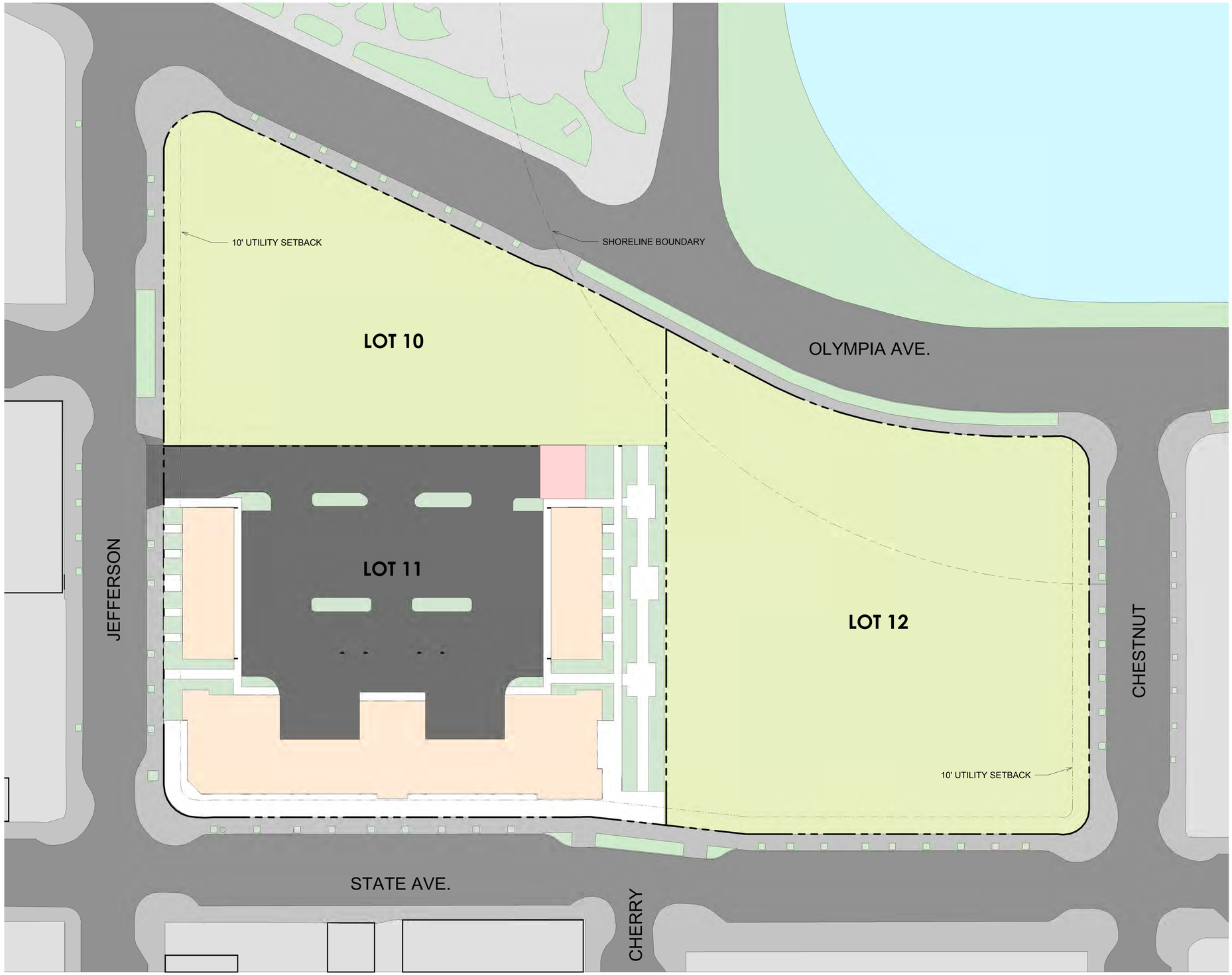


HARDSCAPED AREA
11,049 SF

HARDSCAPED AREA FOR TRASH ENCLOSURE
891 SF

LANDSCAPED AREA
7,919 SF

PARKING LOT
28,928 SF

ADJACENT PARCEL

SIDE WALK

WESTMAND MILL AND TOWNHOMES
17,794 SF

TOTAL LOT 11: 66,581 SF

1 FOUNDATION PLAN
1" = 30'-0"

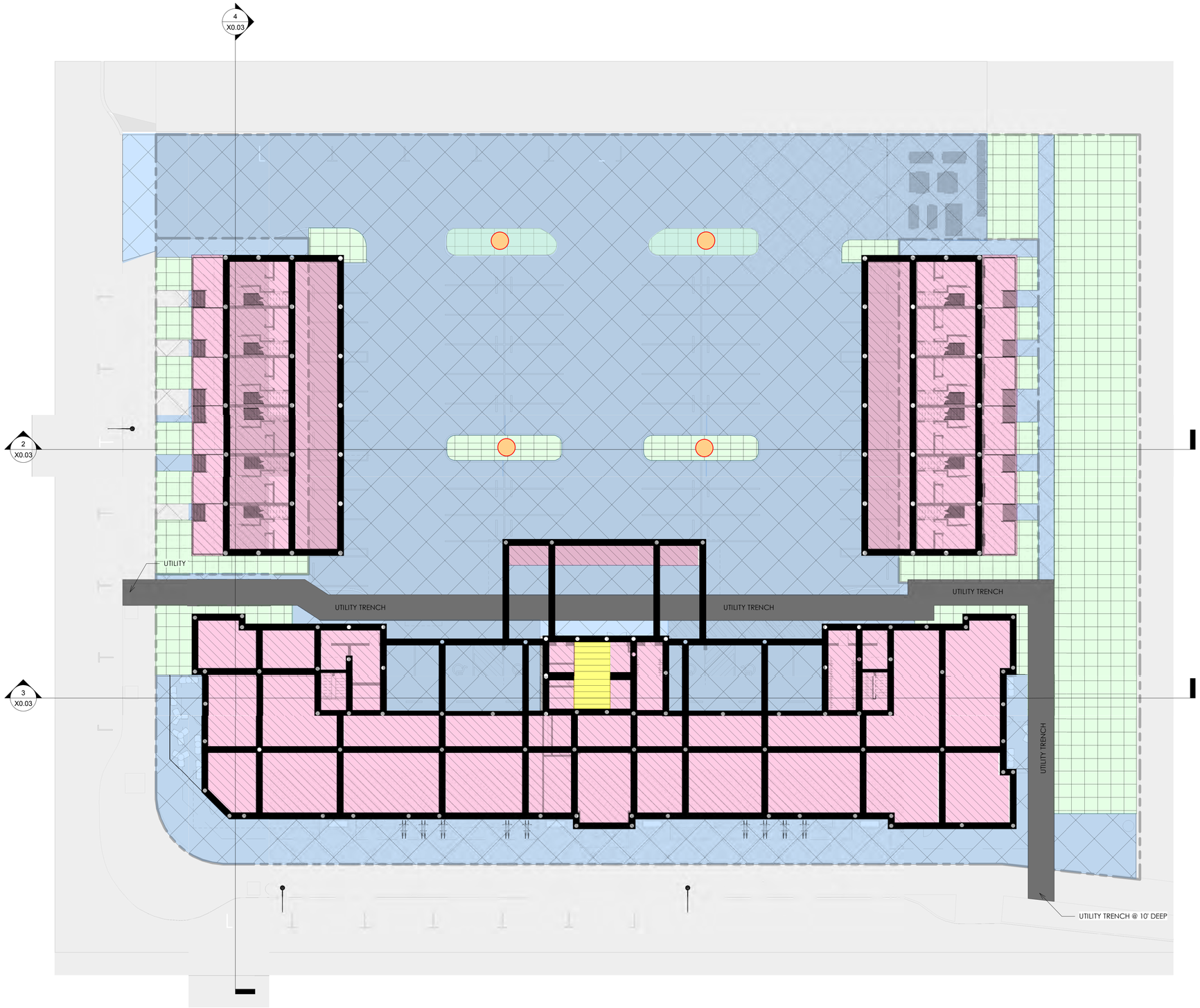
THOMAS
architecture studios
525 COLUMBIA ST SW | OLYMPIA, WA 98501
360.915.8775 | TASOLYMPIA.COM

EAST BAY LOT A
WESTMAN MILL
510 STATE AVE OLYMPIA, WA. 98501

Project No: 1514
CD SET
01/08/2018

FOUNDATION PLAN

X0.04



1 EXCAVATION SITE PLAN
1/16" = 1'-0"

DEPTH OF EXCAVATION LEGEND

- PAVEMENT : 0'-8" BELOW PRE-COVER GRADE
- LANDSCAPE : 2'-0" BELOW PRE-COVER GRADE
- SLAB ON GRADE BEAM : 1'-0" BELOW PRE-COVER GRADE
- ELEVATOR PIT : 8'-0" BELOW PRE-COVER GRADE
- 3'-6" GRADE BEAM : BOTTOM OF GRADE BEAM 4'-6" BELOW PRE-COVER GRADE
- LIGHTPOST BASE: 5'-0" BELOW PRE-COVER GRADE
- 8' WIDE 8'DEEP AVERAGE UTILITY TRENCH

NOTE:
PRE-COVER GRADE = SITE GRADE PRIOR TO INSTALLATION OF CLEAN SOIL COVER. THIS IS THE INTERFACE BETWEEN THE EXISTING CLEAN SOIL COVER (CRUSHED ROCK) AND THE POTENTIALLY CONTAMINATED SOIL, DEMARCATED WITH A PERMEABLE GEOTEXTILE MEMBRANE

THOMAS
architecture studios
525 COLUMBIA ST. | OLYMPIA, WA 98501
360.915.8775 | tasolympia.com

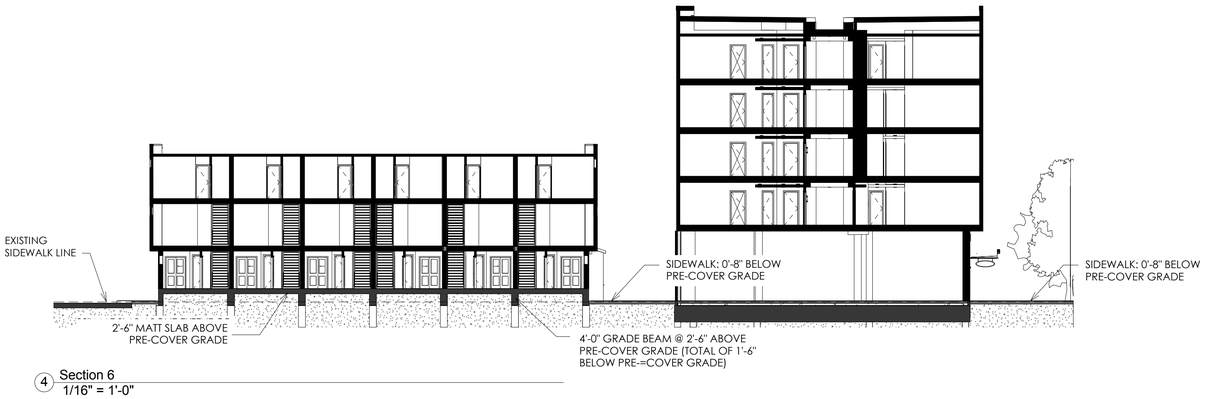
EAST BAY LOT A
WESTMAN MILL

510 STATE AVE OLYMPIA, WA. 98501

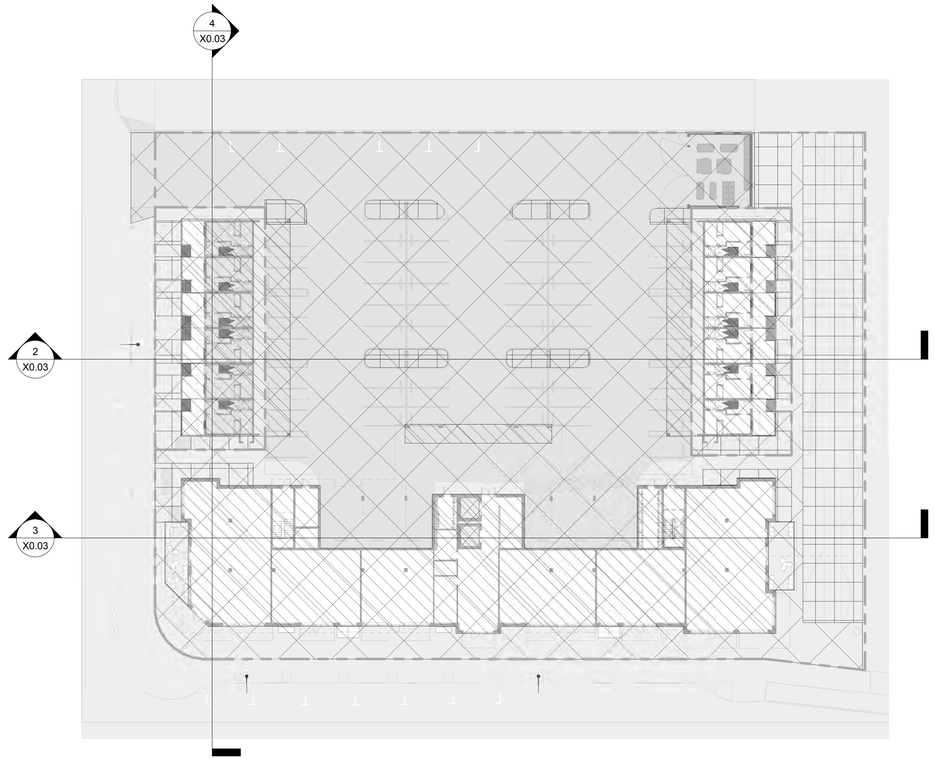
Project No: 1514
PERMIT SET
05/11/2018

EXCAVATION PLAN

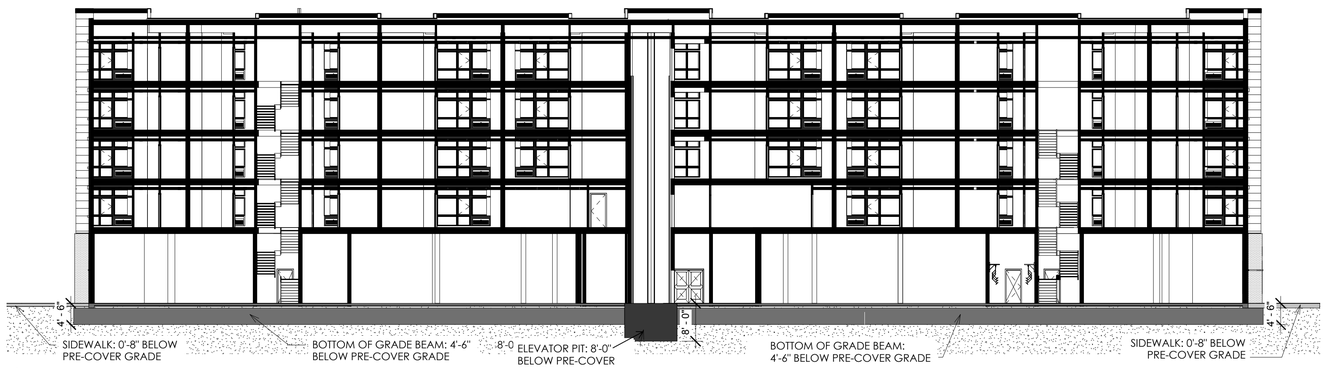
X0.02



4 Section 6
1/16" = 1'-0"

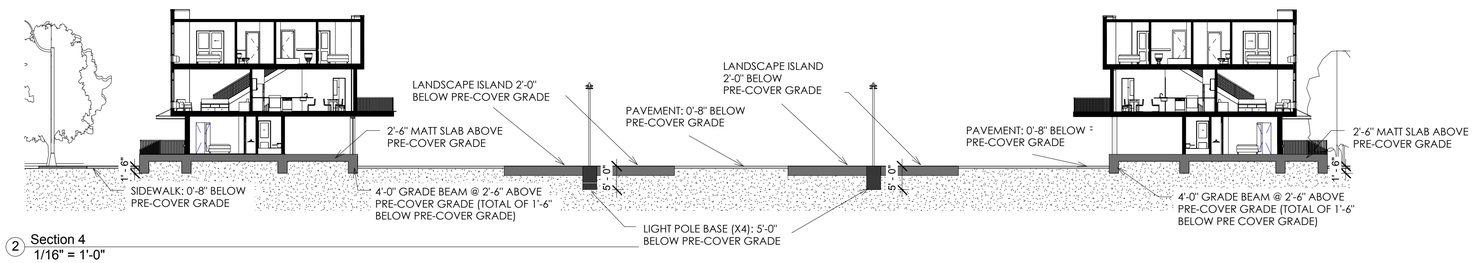


1 EXCAVATION SITE PLAN KEY
1/32" = 1'-0"



3 Section 5
1/16" = 1'-0"

NOTE:
PRE-COVER GRADE = SITE GRADE PRIOR TO INSTALLATION OF CLEAN SOIL COVER. THIS IS THE INTERFACE BETWEEN THE EXISTING CLEAN SOIL COVER (CRUSHED ROCK) AND THE POTENTIALLY CONTAMINATED SOIL, DEMARCATED WITH A PERMEABLE GEOTEXTILE MEMBRANE



2 Section 4
1/16" = 1'-0"

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EAST BAY LOT A
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510 STATE AVE OLYMPIA, WA. 98501

Project No: 1514
FOUNDATION
02/01/18

EXCAVATION PLAN

X0.03

Appendix B

Unanticipated Discoveries Plan

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Memo

PIONEER TECHNOLOGIES CORPORATION
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Olympia, WA 98503-5901
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www.uspioneer.com

To: Steve Teel, LHG

From: Levi Fernandes, P.E.

Cc: Tyson Carpenter, PE (Port of Olympia [Port]), Rachael Jamison (Port), Chris Waldron, PE (PIONEER Technologies Corporation [PIONEER])

Date: February 22, 2018

Subject: Unanticipated Discoveries Plan
Engineering Design Report for Lot 11 at the East Bay Redevelopment Site

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The purpose of this memorandum is to present the Unanticipated Discoveries Plan (Plan) for Lot 11 at the East Bay Redevelopment Site (Site; Agreed Order No. DE14072, Facility/Site No. 5785176). This memorandum was presented an addendum to the June 2017 Engineering Design Report for Cleanup Implementation (EDR; PIONEER 2017) and has been updated to incorporate findings and recommendations from a cultural resource assessment performed at the Site (Cultural Resource Consultants, LLC [CRC] 2017) and to reflect Lot 11 development activities.

Introduction

In December 2017, CRC performed an assessment of the Site to identify any previously recorded archaeological or historic sites in the project location and to evaluate the potential for the project to affect cultural resources. Based on background research, CRC did not identify pre-contact or historic era cultural resources. CRC concluded that native sediments, particularly at the historical upland and shoreline locations, retain the potential to contain buried intact archaeological site, which were liked capped by historic fill material or buried during seismic subsidence. CRC recommended archaeological monitoring be performed for any excavation anticipated to intersect native sediments below the overlying fill material; monitoring is not required for disturbances within the fill material as it is not anticipated that the fill will contain significant archaeological deposits.

Based on the extent of fill material across the majority of the Site, it is unlikely that development activities will disturb soil containing items of cultural/archaeologic significance (cultural/archaeological resources) or human remains. However, in the event that any cultural/archaeological resources or human remains are inadvertently found, this Plan outlines the procedures to be followed at the Site. All Site personnel will be notified of the procedures during a pre-construction meeting and with reminders during tailgate meetings prior to excavation work. This Plan was developed in accordance with: Chapters 27.44 (Indian Graves and Records), 27.53 (Archaeological Sites and Resources), 68.50 (Human Remains), and 68.60.050 (Protection of Historic Graves) of the Revised Code of Washington (RCW), and Chapter 25-48 (Archaeological Excavation and Removal Permit) of the Washington Administrative Code (WAC).

Discovery of Cultural/Archaeological Resources

Description of Cultural/Archaeological Resources

A cultural/archaeological resource discovery could be prehistoric or historic (e.g., older than 50 years) in age. Some examples of cultural/archaeological resources include:

- Groups of shells, charred rocks, or other materials related to food preparation

- Soil with burned material (charcoal or very dark staining) that could contain artifacts
- Stone tools, points, or stone flakes
- Historic tin cans or glass bottles
- Buried logging or agricultural equipment (e.g., hand saw)

If in doubt, assume the material found could be a cultural/archaeological resource.

Procedure

1. Stop work in the vicinity of the discovery, ensuring no change or damage to the discovery, and immediately contact the Port Primary Contact (see Table 1).
2. Secure the location and prevent foot and vehicle access. The Port Primary Contact will arrange for security at the Site, as necessary.
3. The Port Primary Contact will contact a professional archaeologist to examine the finding and determine whether or not the discovery is a cultural/archaeological resource.
    a. If the discovery is determined to be non-cultural/non-archaeological, work may resume at that location.
    b. If the discovery is a cultural/archaeological resource, the Port Primary Contact must notify the Washington State Department of Ecology (Ecology), Washington State Department of Archaeology and Historic Preservation (DAHP) and the Squaxin Island Tribe (see Table 1 for contact information). All parties will be invited to attend an on-site inspection with a professional archaeologist. The discovery will be investigated and documented appropriately as mandated by state and federal law. Field personnel will not resume work in the vicinity of the discovery until official written notice has been received from applicable authorities stating that the appropriate protection and mitigation measures have been fulfilled.
    c. If the discovery is determined to be human remains, follow the procedures in the Discovery of Human Remains section below.

Within six months after completion of the above steps, the Port and professional archaeologist subcontractor will prepare a final report of the discovery. The report will include a description of the contents of the discovery, a summary of the consultation, and a description of the treatment or mitigation measures.

Discovery of Human Remains

Procedure

1. Stop work in the vicinity of the apparent remains, ensuring no change or damage to the remains, and immediately contact the Port Primary Contact (see Table 1).
2. Site personnel will be respectful. A cover (such as a tarp) will be put over the remains to prevent disturbance or photographs.
3. The Port Primary Contact will immediately contact Ecology, the City of Olympia Police Department and the Thurston County Coroner's Office (see Table 1).
4. The Port Primary Contact will arrange for security at the Site to prevent foot and vehicle access.
5. The City of Olympia Police Department and Thurston County Coroner will assumed jurisdiction over the human remains and determine whether the remains are forensic or non-forensic.

6. If the City of Olympia Police Department and Thurston County Coroner determined that the remains are non-forensic, then they will report the finding to DAHP, which will then take jurisdiction over the remains. DAHP will notify any appropriate cemeteries and all affected tribes of the find (see Table 1). The State Physical Anthropologist will make a determination of whether the remains are Indian or Non-Indian and report the finding to any appropriate cemeteries and the affected tribes. DAHP will then handle all consultation with the affected parties as to the future preservation, excavation, and disposition of the remains.
7. Field personnel will not resume work in the vicinity of the discovery until the consultation and documentation process is complete and official notice to resume work has been given by the applicable authorities.

Contact Information

Table 1: Contact Information

Role/Organization	Name/Title	Contact Information
Port Primary Contact	Tyson Carpenter, Project Engineer	(360) 528-8006 tysonc@portolympia.com
Port Alternate Contact	Rachael Jamison, Planning, Public Works, and Environmental Director	(360) 528-8020 rachaelj@portolympia.com
Washington State Department of Ecology Contact	Steve Teel, Cleanup Project Manager	(360) 407-6247 steve.teel@ecy.wa.gov
City of Olympia Police Department	(General Non-Emergency Number)	(360) 704-2740
Thurston County Coroner's Office	Gary Warnock, Coroner	(360) 867-2140
DAHP	Allyson Brooks, State Historic Preservation Officer/Director	(360) 586-3066 allyson.brooks@dahp.wa.gov
Squaxin Island Tribe	Rhonda Foster, Tribal Historic Preservation Officer	(360) 432-3850 rfoster@squaxin.us

References

Cultural Resource Consultants, LLC 2017. Cultural Resource Overview for the East Bay Redevelopment Site Project, December.

PIONEER 2017. Engineering Design Report for Cleanup Implementation, East Bay Redevelopment Site, June.

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Appendix C

Sampling and Analysis Plan/Quality Assurance Project Control Plan

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Appendix C: Sampling and Analysis Plan/Quality Assurance Project Plan

East Bay Redevelopment Site (Lot 11)
Olympia, Washington

Facility/Site No. 5785176

Prepared for:

Port of Olympia
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Olympia, WA 98501

City of Olympia
P.O. Box 1967
Olympia, WA 98507-1967

LOTT Clean Water Alliance
500 Adams Street NE
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Prepared by:

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May 2018

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Table of Contents

Figures

Tables

Attachments

List of Acronyms

Acronym	Explanation
bgs	Below Ground Surface
CFR	Code of Federal Regulations
CL	Cleanup Level
COC	Constituent of Concern
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons
Dioxins/Furans	Total Chlorinated Dibenzo-p-dioxins and Chlorinated Dibenzofurans
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
PIONEER	PIONEER Technologies Corporation
POC	Point of Compliance
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
QAPP	Quality Assurance Project Plan
QC	Quality Control
RL	Remediation Level
SAP	Sampling and Analysis Plan
Site	East Bay Redevelopment Site
TPH-D	Total Petroleum Hydrocarbons in the Diesel Range
TPH-G	Total Petroleum Hydrocarbons in the Gasoline Range
TPH-HO	Total Petroleum Hydrocarbons in the Heavy Oil Range
WAC	Washington Administrative Code
USEPA	United States Environmental Protection Agency

SECTION 1: SAMPLING AND ANALYSIS PLAN

1.1 Purpose

The purpose of this Sampling and Analysis Plan (SAP) is to present the methodology for collecting and analyzing samples associated with soil excavation and development activities for Lot 11 at the East Bay Redevelopment Site (Site) pursuant to this Engineering Design Report (EDR). The work addressed in this SAP is being conducted in accordance with Washington Administrative Code (WAC) 173-340-820 and the Washington State Department of Ecology (Ecology) guidance (Ecology 1995).

PIONEER Technologies Corporation (PIONEER) has developed and will implement this SAP on behalf of the Port of Olympia (Port). A soil SAP summary is presented in Table C-1 and the excavation/foundation plan and details are shown on Figures in Appendix A.

1.2 Roles and Responsibilities

The cleanup action implementation team includes representatives from the Port, Ecology, PIONEER, the developer and design team, and other to-be-determined organizations, contractors, and service providers. Table C-2 shows anticipated EDR implementation roles and responsibilities. This information will be updated as the project progresses.

1.3 Soil Sampling for Stockpiles Generated During Excavation

Soil samples will be collected from the soil stockpiles generated during excavation of potentially contaminated soil from beneath the existing soil cover to support development activities. These samples will be collected at the sampling frequencies shown in Table C-3 to determine if this soil can be reused on-Site. Each stockpile sample will be collected using stainless steel hand tools (e.g., hand trowel) and will be analyzed for:

- Arsenic by USEPA Method SW846-6010 or 6020
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by USEPA Method SW846-8270D
- Dioxins/furans by USEPA Method SW846-8290
- Lead by USEPA Method SW846-6010 or 6020
- Total petroleum hydrocarbons (TPH) in the diesel range (TPH-D) and the heavy oil range (TPH-HO) by Ecology Method NWTPH-Dx
- TPH-G by Ecology Method NWTPH-Gx
- Total naphthalenes by USEPA Method SW846-8270D

1.4 Sample Containers, Preservation, and Holding Times

New, clean sample containers will be provided by the analytical laboratory for all analyses. Table C-4 presents the appropriate sample containers, preservation, and holding times for the analyses included in this SAP. Sample containers will be filled until almost full in order to provide the laboratory with a sufficient sample volume for analysis.

1.5 Sample Labeling, Handling, and Shipment

All samples will be identified by a unique sample designation that includes the sample media, sample location name, sample date, and sample depth. The sample designation nomenclature will be in the form of: {sample media}-{sample location name}-{sample date}-{sample depth top}-{sample depth bottom}-{type code, if necessary}.

The sample media is a two character code that uniquely identifies each medium (e.g., SO for soil, EB for equipment rinsate blank). The sample location name uniquely identifies each sampling location (grade beam [GB] and utility [UT] soil excavations) and has two parts separated by a dash: the first part contains both the Site ID and a two-letter location type (e.g., SP for stockpile sample) followed by a unique, sequential two-digit number. Sample date is in the format of month, day, and year (i.e., MMDDYY). Sample depth top is the top of the sample interval in feet below stockpile (e.g., 0.5). Sample depth bottom is the bottom of the sample interval in feet below stockpile or ground surface (e.g., 1). A type code of (01) is used for field duplicates. The following table presents examples of complete sample designations:

Sample Number	Explanation of Sample Schema
SO-GBSP-01-050118-0.5-1	Soil stockpile sample #1 collected from a stockpile associated with grade beam (GB) soil excavation on May 1, 2018 from a depth of 0.5 to 1 foot below the stockpile surface.
SO-GBSP-05-050118-0.5-1-(01)	Duplicate of above soil sample from the stockpile associated with the grade beam (GB) soil excavation.

Sample packaging and shipping procedures are based on USEPA specifications and United States Department of Transportation regulations as specified in 49 Code of Federal Regulations (CFR) 173.6 and 49 CFR 173.24. All samples will be shipped as environmental samples, not as hazardous materials. Samples will be shipped via express delivery to the laboratory as soon as reasonably possible after samples have been collected using PIONEER standard operating procedures for packing and shipping.

1.6 Chain-of-Custody Documentation

Chain-of-custody procedures will be employed to document sample possession. A sample is considered under a person's custody if it is in that person's physical possession, within visual sight of that person after taking physical possession, secured by that person so that the sample cannot be tampered with, or secured by that person in an area that is restricted to unauthorized personnel.

The originator (the sampler) will fill in all requested information on the custody record and will sign and date the record in the first “relinquished by” box. Original signed custody records listing the samples in the cooler will accompany all shipments of samples (note: it is possible that more than one custody form will be needed per cooler to list all the samples contained in the cooler). The originator of the custody record will keep the bottom copy.

1.7 Equipment Decontamination Procedures

Non-dedicated sampling equipment (e.g., hand trowel) to be reused at multiple sample locations will be decontaminated in accordance with the following procedures:

- All non-dedicated equipment will be cleaned before use.
- A hand brush and a hand sprayer containing potable water with diluted detergent (e.g., Liquinox) will be used to clean the affected portions of non-dedicated equipment following use at each monitoring location.
- The affected portions of non-dedicated equipment will be sufficiently rinsed with potable water after cleaning.
- Gloves will be changed before working at each sampling location.

1.8 Investigation-Derived Waste

All decontamination water generated during sampling will be contained for off-site disposal, pre-treated for suspended solids, and discharged to LOTT wastewater treatment plant, pending approval. Disposable PPE (e.g., nitrile gloves) and other general garbage will be disposed of as part of the normal solid waste stream.

1.9 Airborne Dust Monitoring

Airborne dust monitoring will be conducted during excavation of potentially contaminated soil beneath the existing soil cover to support installation of the building foundation (i.e., grade beams), subsurface utilities (e.g., storm, sanitary sewer, water), and the elevator shafts. Real-time monitoring will be conducted each work day for the duration of the work day at one reasonable maximum exposure sample location (e.g., next to heavy equipment operators). Each work day may have a different monitoring location depending on the nature of work being conducted that day.

A calibrated MIE personal DataRAM model pDR-1000 dust monitor or equivalent field meter will be used to measure the amount of respirable dust (i.e., particles less than 10 microns in diameter) in the air. The respirable dust measurements will be logged throughout the day. The field meter will be configured to collect measurements approximately every minute and to emit an alarm if a concentration exceeds the Site's Airborne Dust Action Level of 1 mg/m^3 (PIONEER 2009; PIONEER 2010). The Airborne Dust Action Level is the more stringent of (1) the permissible exposure limit for the respirable fraction of nuisance dust of 5 mg/m^3 per WAC 296-841-20025 (PIONEER 2010) and (2) the dust concentration (1 mg/m^3) that is protective of human health based on Site soil concentrations (PIONEER 2009).

Airborne dust monitoring will be conducted during the excavation of potential contaminated soil associated with the installation of the deep subsurface utilities and grade beams. Airborne dust monitoring will be initially be performed for the first week of an installation activity (i.e., one week each for deep subsurface utilities (i.e., north of the main building and at the southeast corner of Lot 11 for sanitary sewer connection to main in State Avenue NE) and grade beams (for both the main building and townhomes); total of three weeks). If the time-weighted averages of all daily dust measurements do not exceed the Airborne Dust Action Level during the first week of excavation of potentially contaminated soil, then airborne dust monitoring will be discontinued for the remainder of a given installation activity. If the time-weighted average of the daily dust measurements for any day exceeds the Airborne Dust Action Level, corrective measures (e.g., misting) will be implemented by the contractor and airborne dust monitoring will be continued for additional week. Airborne dust

monitoring will be discontinued, in consultation with Ecology, when it has been demonstrated that the contractor's means and methods for excavating potential contaminated soil for a given installation activity does not create an airborne dust issue.

1.10 Field Recordkeeping

PIONEER will utilize the following forms to document this investigation: Field Checklist and Daily Field Report. The Field Checklist is designed to assist with planning and coordinating field activities prior to a field event. The Daily Field Report is used to document field activities on a daily basis. A copy of each form is included in Attachment A-1.

SECTION 2: QUALITY ASSURANCE PROJECT PLAN

2.1 Purpose

The purpose of this Quality Assurance Project Plan (QAPP) is to provide methodology for evaluating whether or not sampling and analysis procedures will produce data of acceptable quality. This QAPP was prepared in accordance with WAC 173-340-820 and Ecology guidance (Ecology 2004). Some contents of a typical standalone QAPP are not included in this QAPP if they were included in the SAP or EDR.

2.2 Field Quality Control Samples

Field quality control (QC) samples will include field duplicates and an equipment rinsate blank (see Table A-1). Field duplicate samples will be collected at a frequency of approximately one duplicate per 20 primary soil samples. Field duplicate samples will be collected at random locations selected by the field sampling team. One equipment rinsate blank will be collected for the project. The equipment rinsate blank will be collected by pouring deionized water on non-dedicated soil sampling equipment following its decontamination.

2.3 Laboratory Quality Control

The analytical laboratory for this project will be responsible for conducting laboratory QC procedures and reporting laboratory QC results in accordance with laboratory standard operating procedures. It is expected that, at a minimum, the laboratory will perform and report a method blank, blank spike, matrix spike, and matrix spike duplicate once per batch of analyses. Laboratory control limits for acceptable spike recoveries and the relative percent differences on spike duplicates are shown in Table C-5. Also, it is expected that the laboratory will perform and report surrogate recovery results for all analytes except metals. Control limits for acceptable surrogate percent recoveries are also shown in Table C-5.

2.4 Practical Quantitation Limit

Table C-6 presents a comparison of Cleanup Levels (CLs) and RLs with target practical quantitation limits (PQLs) for each COC. The target PQLs are less than CLs and RLs. Thus, it is expected that the project will be able to achieve soil PQLs of appropriate sensitivity.

2.5 Data Quality Review

The overall data quality will be reviewed by PIONEER to determine the appropriateness of the project-related data. Project data and quality assurance/QC data (i.e., field QC results, lab QC results, actual PQLs, and holding times) will be evaluated in terms of precision, accuracy, representativeness, comparability, completeness, and sensitivity. Results of this evaluation will be summarized in the Cleanup Action Completion Report. Corrective action for field or laboratory procedures will be conducted as necessary in consultation with Ecology.

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SECTION 3: REFERENCES

Ecology. 1995. Guidance on Sampling and Data Analysis Methods, January.

Ecology. 2004. Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies, July.

PIONEER 2009. Port of Olympia East Bay Site: Interim Action Work Plan, May.

PIONEER 2010. Infrastructure Interim Action Report for East Bay Redevelopment Site, June.

PIONEER 2018. Cleanup Action Completion Report, East Bay Redevelopment Site, January.

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Tables

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Table C-1: Confirmation Soil Sampling and Analysis Plan Summary

Category	Sample Type	Arsenic by USEPA Method SW846-6010 or 6020	Lead by USEPA Method SW846-6010 or 6020	cPAHs by USEPA Method SW846-8270D	Dioxins/Furans by USEPA Method SW846-8290	TPH-D and TPH-HO by Ecology Method NWTPH-Dx	TPH-G by Ecology Method NWTPH-Gx	Total Naphthalenes by USEPA Method SW846-8270D
Existing Soil Cover	None	The clean crushed rock placed over the geotextile does not require sampling and chemical analyses. Suitable for reuse at Site where deemed suitable or transported off-site for recycling.						
Potentially Contaminated Stockpiles	Soil stockpiles generated during excavation activities and designated for possible reuse	Sample quantity per Table C-3	Sample quantity per Table C-3	Sample quantity per Table C-3	Sample quantity per Table C-3	Sample quantity per Table C-3	Sample quantity per Table C-3	Sample quantity per Table C-3
Field QC Samples	Field duplicates	1 Field duplicate sample per 20 primary soil samples (same analyses as the primary sample)						
	Equipment rinsate blank	1 Equipment rinsate blank for the project (same analyses as the associated primary samples)						

Notes:

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Table C-2: Project Roles and Responsibilities

Project Role	Contact Name, Phone Number, and Email	Project Responsibilities
Port Planning, Public Works, and Environmental Director	Rachael Jamison (360) 528-8020 Rachaelj@portolympia.com	Overall environmental project management. Communication and coordination with Ecology, Port staff, and PIONEER.
Port Senior Engineer	Tyson Carpenter, P.E. (360) 528-8006 TysonC@portolympia.com	Communication and coordination with the Port Planning, Public Works, and Environmental Director, Port staff, and PIONEER.
Ecology Site Manager	Steve Teel, L.H.G. (360) 407-6247 stee461@ecy.wa.gov	Regulatory review and approval of EDR (Lot 11). Complete public notification requirements.
PIONEER Project Manager	Chris Waldron, P.E. (360) 570-1700 waldronc@uspioneer.com	Prepare EDR (Lot 11). Oversee cleanup implementation in accordance with existing contract. Support primary organization(s) conducting oversight for environmental soil issues related to implementation of this EDR. Implementation of the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP).
Developer	Walker C. John walker@oliviabeach.com	Developer for Lot 11 Redevelopment.
Thomas Architecture Studios Project Manager	Amos Callender (360) 915-8775 amos@tasolympia.com	Architect for development activities.
SCJ Alliance Landscape Architect	Jeff Glander (360) 352-1465 jeff.glander@scjalliance.com	Softscapes
Parametrix Project Manager	Sam Nielson, P.E. (253) 604-6600 SNielson@parametrix.com	Design civil engineer for utilities, hardscapes, and softscapes.
General/Remediation Contractor	To be determined	
Analytical Laboratory	Friedman & Bruya, Inc. and Frontier Analytical Laboratory	Analyze soil samples and conduct laboratory quality control.
Solid Waste Disposal Facility	Off-Site Facility Permitted to Receive Solid Waste (e.g., Wasco Country Landfill in The Dalles, OR)	Permitted facility for disposal of off-site solid waste.
Material Supplier	To be determined	
Wastewater Disposal Facility	Off-Site Facility Permitted to Receive Wastewater	Permitted facility for disposal of off-site wastewater.

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Table C-3: Sampling Quantity by Stockpile Size

Stockpile Size (CY)	Sample Quantity
0 - 100	3
101 - 500	5
501 - 1000	7
1001 - 2000	10
2000	10 + 1 for each additional 500 CY of soil

Notes:
cy: cubic yards

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Table C-4: Soil Sample Containers, Preservation, and Holding Times

Analytical Method	Container Type	Preservation	Extraction Holding Time (days)	Analyses Holding Time (days)
USEPA Method SW846-6010/6020	One 4-oz glass jar	Cool to 4°C +/- 2°C	Not applicable	180
USEPA Method SW846-8270D	One 4-oz glass jar	Cool to 4°C +/- 2°C	7	40
USEPA Method SW846-8290	One 4-oz glass jar	Cool to 4°C +/- 2°C	30	40
Ecology Method NWTPH-Dx	One 4-oz glass jar	Cool to 4°C +/- 2°C	14	40
Ecology Method NWTPH-Gx	Pre-tared VOA vials	Cool to 4°C +/- 2°C; Methanol preservative.	Not applicable	14

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Table C-5: Laboratory Control Limits

Analytical Method	Range of Acceptable Blank Spike Recoveries (%)	Range of Acceptable Matrix Spike/Matrix Spike Duplicate Recoveries (%)	Acceptable Spike Duplicate Relative Percent Difference (%)	Acceptable Range of Surrogate Percent Recovery (%)
USEPA Method SW846-6010/6020	80 - 120	75 - 125	< 20	Not applicable
USEPA Method SW846-8270D	30 - 140	30 - 140	< 50	18 - 137
USEPA Method SW846-8290	63 - 170	30 - 150	< 30	25 - 175
Ecology Method NWTPH-Dx	50 - 150	50 - 150	< 50	50 - 150
Ecology Method NWTPH-Gx	70 - 130	70 - 130	< 25	70 - 130

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Table C-6: Comparison of Cleanup Levels and Remediation Levels with Target Practical Quantitation Limits

Analytical Method	Constituent of Concern	Cleanup Level (mg/kg)	Remediation Level (mg/kg)	Target PQL[1] (mg/kg)
USEPA Method SW846-6010/6020	Arsenic	20	20	0.5
	Lead	250	1,000	0.5
USEPA Method SW846-8270D	Total cPAHs	0.095	3.4	0.015[2]
	Total naphthalenes	5.0	5.0	0.015
USEPA Method SW846-8290	Total dioxins/furans	0.000011	0.00059	0.000005[2]
Ecology Method NWTPH-Dx	TPH-D and TPH-HO	4,700	24,000	25,100[3]
Ecology Method NWTPH-Gx	TPH-G	100	100	2.5

Notes:

[1] It may not be possible to achieve these quantitation limits for some samples (e.g., samples that require dilution before analysis).

[2] The total PQL was calculated using toxicity equivalency factors in WAC 173-340-708(8).

[3] PIONEER will be combining the TPH-D and TPH-HO results once the laboratory has tested for both of these COCs separately, therefore, the Target PQL values are listed individually.

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Attachment C-1

PIONEER Field Forms

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PIONEER TECHNOLOGIES CORPORATION (PIONEER)
FIELD CHECKLIST

Project/Task Name: _____ Site Location: _____

Requested By / Date: _____ Work Deadline: _____

SERVICES REQUESTED	COMPLETED
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO
_____	☐ YES ☐ NO

ADDITIONAL STANDARD INSTRUCTIONS	COMPLETED		COMPLETED
☐ Review Docs: _____	☐ YES ☐ NO	☐ Health & Safety Meeting	☐ YES ☐ NO
☐ Agency NOI / Utility Locate / Concrete Coring	☐ YES ☐ NO	☐ Call PM from Site	☐ YES ☐ NO
☐ Coordinate Access: _____	☐ YES ☐ NO	☐ Draw Site Map _____	☐ YES ☐ NO
☐ Coordinate Sub / Equip: _____	☐ YES ☐ NO	☐ Cuttings / Purge Water Characterization & Disposal	
☐ Purchase / Rent Equip: _____	☐ YES ☐ NO	☐ Potential HW _____	☐ YES ☐ NO
☐ Client/Agency Coordination: _____	☐ YES ☐ NO	☐ Non-Haz _____	☐ YES ☐ NO
☐ Calibrate Equipment: _____	☐ YES ☐ NO	☐ Background _____	☐ YES ☐ NO

_____

_____

SAMPLING REQUIREMENTS

☐ Field Testing: _____

☐ Lab Testing: _____ Laboratory: _____

☐ Lab Testing: _____ Laboratory: _____

☐ Lab Testing: _____ Laboratory: _____

FIELD SUPPLIES NEEDED

☐ Site Map ☐ Camera ☐ Survey Equip / GPS ☐ Vehicle

☐ Std Field Equip (keys, forms, SAP, HASP, PPE, decon, tools)

☐ Drilling Equip (PID, references, knife, baggies, tape)

☐ Soil Equip (SS bowls, spoon/shovel, hand auger, pick, sieves)

☐ GWM (pump, tubing, gen., compres., bailers, rope/string, PDB)

☐ Pump / Slug Test Equip (GWM Equip, slug, stopwatch)

☐ Water Level Indicator / Interface Probe

☐ Water Quality Meter _____ ☐ Field Test Kits _____

☐ Sample Kit / Cooler / COC / Ice _____

☐ IDW: ☐ Drums _____ ☐ 5-gal buckets _____

☐ Other: _____

☐ Other: _____

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PIONEER
DAILY FIELD REPORT

Date:_____ Site Location: _____ Site Arrival Time: _____ Site Departure Time :_____

WEATHER
TEMPERATURE
WIND

Clear Sun	Overcast	Drizzle	Rain	Snow
To 32	32-50	50-70	70-85	85 Up
Calm	Med.	Strong	Severe	

PEOPLE PRESENT ON-SITE

NAME	ASSOCIATION	TIME ON-SITE AND OFF-SITE

NOTES ON WORK COMPLETED

SIGNATURE:_____ DATE:_____

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Appendix D

Stockpile Management and Procedures

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Memo

PIONEER TECHNOLOGIES CORPORATION
5205 Corporate Ctr. Ct. SE, Ste. A
Olympia, WA 98503-5901
Phone: 360.570.1700
Fax: 360.570.1777
www.uspioneer.com

To: Chris Waldron, P.E.

From: Levi Fernandes, P.E.

Cc: Rachael Jamison, Director of Environmental Programs, Port of Olympia

Date: February 22, 2018

Subject: Engineering Design Report for Lot 11 at the East Bay Redevelopment Site
Appendix D: Stockpile Management and Procedures

The purpose of this appendix is to explain how soil stockpiles generated during excavation of the existing soil cover (crushed gravel) and potentially contaminated soil beneath the existing soil cover will be managed by the Port of Olympia (Port) and PIONEER Technologies Corporation (PIONEER) for Lot 11 at the East Bay Redevelopment Site (Site).

Soil Stockpile Management and Procedures

- Existing Soil Cover. The Contractor may reuse the existing soil cover (crushed gravel) at Lot 11 or transport off-site for reuse.
- Soil Reuse: During development activities, potentially contaminated soil excavated from beneath the existing soil cover will be stockpiled and sampled to determine the final disposition of the soil (see Sampling and Analysis Plan and Quality Assurance Project Plan [SAP/QAPP] in Appendix C). If all COC concentrations in the stockpile characterization samples are less than or equal to RLs and the soil is geotechnically-suitable for reuse, that stockpile can be reused on-Site beneath hardscape and softscape surfaces. If all COC concentrations in the stockpile characterization samples are greater than RLs, that stockpile will be disposed of at an off-site facility permitted to receive such waste. Stockpiles that are not geotechnically-suitable for reuse (e.g., likely containing wood debris or metal debris) will also be disposed of in the same manner as stockpiles with COC concentrations that exceed the RLs.
- Stockpile Placement Locations: The Contractor will consolidate potentially contaminated soil into stockpiles rather than windrowing soil adjacent to an excavation. The Contractor will place all stockpiles on an impervious surface such as concrete, asphalt, or polyethylene liner with a thickness of at least 10-mils.
- Covering Stockpiles: The Contractor will cover stockpiles with a polyethylene liner with a thickness of at least 10-mils and secure the cover with ropes and sandbags. All stockpiles will be covered and secured when not in use. The Remediation Contractor will only uncover the working face of a stockpile when adding soil to, removing soil from, or sampling a stockpile. Active stockpiles will be recovered and secured at the end of each work day.
- Stockpile Throughput: To the extent practicable, it is expected that the Contractor will maximize the generation of stockpiled soil at the beginning of the project in order to ensure that soil is available for reuse when needed later in the project. Due to the need to collect soil samples and perform chemical analyses for each stockpile (see Appendix C), there will be a delay between when the Remediation Contractor is done generating a stockpile and when a determination is made as to whether the stockpile can be reused on-Site or needs to be disposed of off-Site.

- Stockpile Sign Management System: PIONEER will establish and maintain a stockpile sign management system to designate and track each stockpile generated by the Contractor. PIONEER will place color-coded stockpile signs (approximately 18 inches by 24 inches) on each stockpile to communicate the current status of each stockpile. Attachment D-1 presents the text and color for the three types of signs that will be used to communicate stockpile status. The attached signs are defined as follows:
  - Class A Soil is designated with a green sign that means the soil can only be reused under the soil cover
  - Class B Soil is designated with an red sign that means the soil cannot be reused and must be disposed of
  - Unclassified Soil is designated with a white sign that means the soil has not been tested yet
- Once notified by the Contractor that new stockpile(s) are ready for chemical testing, PIONEER will (1) estimate the size of each stockpile, (2) collect representative soil sample(s) from each stockpile (the number of which will depend on the stockpile size), and (3) place a white sign on the stockpile. The Contractor will not move a stockpile while it is designated with a white sign. Once analytical results are received and evaluated, PIONEER will replace the white sign with a green or red sign, depending on the analytical results. The Contractor may then move soil to the final location in accordance with the stockpile classification color.
- Sign Protection: The Contractor is responsible for ensuring the signs are not damaged or removed once placed on a stockpile.

Enclosures

Attachment D-1 Soil Stockpile Sign Designs

Attachment D-1

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Class A Soil

Reuse Under Soil Cover ONLY

For more information, contact:

Port of Olympia
360-528-8020

PIONEER Technologies
360-570-1700

Sample No:

Stockpile ID:

Date Sampled:

Date Released for Use:

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Class B Soil

NO USE

Disposal ONLY

For more information, contact:

Port of Olympia
360-528-8020

PIONEER Technologies
360-570-1700

Sample No:

Stockpile ID:

Date Sampled:

Date Released for Use:

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Appendix E

Layfield LP200 Specifications Sheet

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1. Product Description
Standard woven slit-film polypropylene geotextiles, usually called "wovens" are an economical range of geotextiles that combine high strength with low cost. These materials are made by weaving pre-stressed polypropylene tapes in a simple weave pattern. The resulting fabric has a high strength to weight ratio. Slit-film wovens are primarily used in roadbuilding and embankment construction but can be used in most applications requiring the separation of one type of soil from another. Slit-film wovens help to speed construction with short term reinforcement of the base. Slit film wovens can also be used in sediment control products such as floating silt curtains and silt fence.

2. Technical Data
Materials information is on page 2.

3. Installation
General Installation: Place the roll of woven geotextile at the top of the slope/grade and roll down grade, over lap successive and adjacent rolls by 450mm minimum. Do not allow vehicles to drive directly on the geotextile. Geotextile should be stored such that it is protected from rain and direct sunlight. Geotexile Separation: Ensure subgrade is rolled flat and compacted to engineer's specifications with no sharp objects or protrusions. Install geotextile as per General Installation above.

4. Availability and Cost
Available from Layfield or distributors. Call
425-254-1075 Pacific time
780-453-6731 Mountain time, or
905-761-9123 Eastern time

5. Manufactured For
Layfield USA Corp.
Layfield Canada Ltd.

6. Warranty
Products sold will meet Layfield's published specifications at time of sale. Full warranty details are available from Layfield.

7. Maintenance
Once geotextiles and geogrids are installed and carefully backfilled they do not require ongoing maintenance.

8. Filing Systems
https://www.layfieldgroup.com/Geosynthetics/Geotextile-Products/Woven-Geotextiles.aspx

9.

26 May 2015	Woven Geotextiles - US Values[1]			
	ASTM	**LP 200**	**LP 250**	**LP 315**
Grab Tensile (lbs)	D4632	200	250	315
Elongation (%)	D4632	15	15	15
Trapezoid Tear (lbs)	D4533	75	90	120
CBR Puncture Strength (lbs)	D6241	700	900	1000
AOS (sieve size)	D4751	50	40	40
Permittivity (sec^{-1})	D4491	0.05	0.05	0.05
Weight (oz/yd^2) (Typical)	D5261	4.0	5.0	6.3
UV Resistance (500 hrs)	D4355	70	70	70
Wide Width Seam Strength (lbs/in)	D4884	66	77	91
Roll Size (ft) Typical)		17.5 x 309	17.5 x 309	17.5 x 258
Roll Weight (lbs) (Typical)		205	215	220
Note[1] - The physical properties presented in the table above are Minimum Average Roll Values or otherwise indicated.				

10.

26 May 2015	Woven Geotextiles - Metric Values[1]			
	ASTM	**LP 200**	**LP 250**	**LP 315**
Grab Tensile (N)	D4632	889	1110	1400
Elongation (%)	D4632	15	15	15
Trapezoid Tear (N)	D4533	333	400	533
CBR Puncture Strength (N)	D6241	3115	4005	4450
AOS (Microns)	D4751	300	425	425
Permittivity (sec^{-1})	D4491	0.05	0.05	0.05
Weight (g/m^2) (Typical)	D5261	136	170	214
UV Resistance (500 hrs)	D4355	70	70	70
Wide Width Seam Strength (kN/m)	D4884	11.5	13.5	16.0
Roll Size (m) (Typical)		5.3 x 94	5.3 x 94	5.3 x 79
Roll Weight (kg) (Typical)		92	97.5	100
Note[1] - The physical properties provided in the table above are Minimum Average Roll Values or otherwise indicated.				

Appendix F

Response to Ecology's Comments

Regarding Pile Installation at East Bay

Lot 11

This page has been left blank intentionally to allow for double-sided printing.

From: Teel, Steve (ECY) [mailto:STEE461@ECY.WA.GOV]
Sent: Tuesday, June 19, 2018 10:17 AM
To: Chris Waldron <waldronc@uspioneer.com>; Rachael Jamison <RachaelJ@portolympia.com>
Cc: Tyson Carpenter (TysonC@portolympia.com) <TysonC@portolympia.com>; Rudy Rudolph (RudyR@portolympia.com) <RudyR@portolympia.com>; jburney@ci.olympia.wa.us; Wendy Steffensen <WendySteffensen@lottcleanwater.org>; Lawson, Rebecca (ECY) <rlaw461@ECY.WA.GOV>; Acklam, Nicholas (ECY) <nack461@ECY.WA.GOV>; Abbett, Marian L. (ECY) <MABB461@ECY.WA.GOV>
Subject: RE: Ecology concerns regarding pile installation at East Bay Lot 11

Chris –

Thank you for your prompt response to our concerns regarding pile installation at Lot 11. After reviewing and discussing them internally, Ecology is requesting the following revisions be made to the Engineering Design Report (EDR):

1. Please add a summary of our concerns and your responses to the text of the EDR.
2. Please provide a signed, stamped letter from the geotechnical expert that lists and discusses the rationale and conclusions that you referenced in your responses to comments #1, 4, 5, and 6. This letter should be included as an appendix to the EDR.

Please also ensure that there is a contingency plan in place in the event that there is ponding of water from piling installation. This plan shall ensure that there is sufficient equipment, materials, and procedures in place in order to contain and handle this water according to the stormwater pollution prevention plan and the Construction Stormwater General National Pollutant Discharge Elimination System Permit.

Please let me know if you have any questions.

Thanks,

Steve

Steve Teel, LHG
Cleanup Project Manager/Hydrogeologist
Washington State Department of Ecology
Toxics Cleanup Program, Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504-7775

Phone (360) 407-6247

steve.teel@ecy.wa.gov

From: Chris Waldron [mailto:waldronc@uspioneer.com]
Sent: Thursday, June 14, 2018 11:19 PM
To: Teel, Steve (ECY) <STEE461@ECY.WA.GOV>; Rachael Jamison <RachaelJ@portolympia.com>
Cc: Tyson Carpenter (TysonC@portolympia.com) <TysonC@portolympia.com>; Rudy Rudolph (RudyR@portolympia.com) <RudyR@portolympia.com>; jburney@ci.olympia.wa.us; Wendy Steffensen <WendySteffensen@lottcleanwater.org>; Lawson, Rebecca (ECY) <rlaw461@ECY.WA.GOV>; Acklam, Nicholas (ECY) <nack461@ECY.WA.GOV>
Subject: RE: Ecology concerns regarding pile installation at East Bay Lot 11

Hi Steve,

We appreciate Ecology's concerns and would like to address them as quickly and efficiently as possible since Walker John's Team is ready to begin construction. We have addressed each of your questions in the email below. In short, based on the Walker John's Geotechnical expert's assessment of the conditions at the Site and experience driving piles in downtown Olympia it is highly unlikely that there will be significant upward artesian flow around the piles and/or floating of the piles. It is possible that there could be minor upwelling of water around the piles but this should not significantly impact the water levels in the upper saturated zone at the site. Further, given the low solubilities and high Kds of the COCs (i.e., TPH-D and TPH-HO combined, total cPAHs, and total dioxins/furans) our conclusion in the RI/FS/CAP that the soil-to-groundwater pathway is not complete would not change even with a slight change in the water level at the site.

If you have any questions, please don't hesitate to contact me. I am currently travelling to Lake Tahoe with my family but am available on my cell: 360.359.6026. If we can expedite resolution of this issue over the phone that would be appreciated.

1. **Ecology Comment:** Raising of the water-table at the site from the added influx of artesian flow through and around the piles. This could affect the groundwater flow direction in the unconfined aquifer.

Response: Based, on our analysis and discussions with the Developer's geotechnical expert (see Geotech-related responses below) it is: (1) unlikely that there will be a significant change in the groundwater elevation in the unconfined aquifer at the site and (2) it is unlikely that there will be a significant change in the groundwater flow direction (which is to the Northeast) where the unconfined groundwater discharges to East Bay. Even if additional groundwater mounding occurs near the proposed Westman Mill building (associated with potential influx of artesian flow via the piles) this would not change the groundwater flow direction since the building is in the southwest corner of the Site and the groundwater flow direction is to the northeast (i.e., the unconfined groundwater will still flow northeast and discharge into East Bay).

2. **Ecology Comment:** This increase in the saturated zone could also potentially increase the potential for contaminants to dissolve into groundwater.

Response: The saturated zone within the project area is typically only a few feet below ground

surface (see Figure 4 – attached) so an increase in the groundwater elevation would not result in significantly different conditions (with respect to the soil-to-groundwater pathway) than were observed during the RI/FS/CAP. For example, groundwater is already present near the ground surface proximate to the proposed Westman Mill building during the majority of the year. Even during the dry season, groundwater in MWs co-located with the building (i.e., MW22S and MW25S) is less than 1 foot below ground surface (see attached Figure 4, which overlays the building footprint with the depth to groundwater during the September 2009 monitoring event [from the RI/FS Report]). In other words, we typically have saturated conditions close to the ground surface at the site so it is unlikely that additional groundwater from the artesian aquifer will significantly change the conditions with respect to increasing the potential for contaminants to dissolve into groundwater. Furthermore, we demonstrated in the RI/FS/CAP that the soil-to-groundwater pathway is not a concern at this site based on the empirical data (i.e., detailed evaluation of soil/groundwater data over time). This coupled with the very low solubilities and high Kds of the COCs remaining at the site (i.e., TPH-D and TPH-HO combined, total cPAHs, and total dioxins/furans are not very soluble in water and bind strongly to soil) makes it highly unlikely that groundwater will be impacted by site-related COCs even if there is additional contribution in groundwater in the unconfined zone from the artesian aquifer.

3. Ecology Comment: Carry-down of contaminated soil from the Site during pile installation causing contamination of the underlying aquifer.

Response: It is possible that some contaminated soil may be carried "down hole" as the piles are driven; however, this should be minimal from a "mass" perspective because the piles are designed to be driven through the soil. The piles are hollow, so soil will pass through the annular space and around the outside diameter of the pile. It is possible that a small amount of

contaminated soil could be transported downhole (by adhering to the pile surface [sidewall or leading edge]) but this is negligible from a mass perspective when considered in the context of the overall mass/volume of the artesian aquifer. In addition, the COCs at the Site have very low solubilities and high Kds (i.e., TPH-D and TPH-HO combined, total cPAHs, and total dioxins/furans are not very soluble in water and bind strongly to soil), which makes it highly unlikely that groundwater in the artesian aquifer will be impacted by site-related COCs even if small amounts of contaminated soil are carried "down hole" by the piles. There is empirical evidence from the RI/FS/CAP which shows that the COCs in soil at the site do not impact groundwater even when they are present in saturated conditions.

4. Ecology Comment: Upward artesian flow through the center and/or around the outside of the pipe.

Response: The piles are open ended, driven pipe. This is a displacement pile. No soil is removed, or void created, as would occur during installation of a drilled well or drilled piling. Being a driven displacement pile, considerable lateral ground stress is introduced at the soil-to-pile interface, reducing the likelihood for preferential pathways to develop around or within the pile. In LAI's opinion, it is unlikely that any appreciable amount of water would be observed near the pile top. Upwelling of water has not been observed at ground surface in LAI's other projects founded in the same geologic unit.

Note: Landau Associates (LAI) has experience on several projects downtown Olympia that used driven steel pipe piles (HOCM, City Hall, 321 Lofts) that extend into the lower recessional outwash sand unit, situated below the silt "aquitard." LAI has also reviewed several documents pertaining to the scientific community's understanding of artesian conditions downtown, and discussed other recent projects that used deep piles with the engineering community.

5. Ecology Comment: Depressurization of the artesian aquifer.

Response: This seems very unlikely. The open ended pipe piles self-seal aquifer penetrations and do not remove soil. LAI's review indicates there are countless penetrations into the aquifer with existing wells, that are largely unused, and free flow into municipal collection systems. It is very unlikely that displacement piling would generate a preferential pathway relative to existing free flowing wells that tap the same aquifer(s).

6. Ecology Comment: Upward artesian flow around the outside of the pipe causing "floating" of the piles.

Response: The combination of skin friction and soil remaining inside the pipe are sufficient for pipe buoyancy design considerations.

-Thanks,

-Chris

Chris Waldron, P.E.

PIONEER Technologies Corporation
5205 Corporate Ctr. Ct. SE, Ste. A
Olympia, WA 98503-5901
Phone: 360.570.1700
https://uspioneer.com/

From: Teel, Steve (ECY) [mailto:STEE461@ECY.WA.GOV]
Sent: Tuesday, June 12, 2018 3:47 PM
To: Rachael Jamison <RachaelJ@portolympia.com>; Chris Waldron <waldronc@uspioneer.com>
Cc: Tyson Carpenter (TysonC@portolympia.com) <TysonC@portolympia.com>; Rudy Rudolph (RudyR@portolympia.com) <RudyR@portolympia.com>; jburney@ci.olympia.wa.us; Wendy Steffensen <WendySteffensen@lottcleanwater.org>; Lawson, Rebecca (ECY) <rlaw461@ECY.WA.GOV>; Acklam, Nicholas (ECY) <nack461@ECY.WA.GOV>
Subject: Ecology concerns regarding pile installation at East Bay Lot 11
Importance: High

Rachael, Chris, and all –

After further review of the Engineering Design Report (EDR) and particularly the construction plans, we have identified some concerns about the proposed depth of driven piles consisting of open-ended pipes to depths of 95 to 115 feet below ground surface. This means that the piles will penetrate below the regional aquitard and into the artesian aquifer. Neither the EDR, construction plans, or geotechnical report mention this fact or discuss any precautions that will be taken during pile installation. Ecology is concerned that aquifer intercommunication between the confined artesian aquifer and the overlying unconfined aquifer will occur as a result of pile installation. Consequences of this could include:

- Upward artesian flow through the center and/or around the outside of the pipe.
- An increase in ponded water at the surface of the Site. Section 2.2.2 of the East Bay Redevelopment Remedial Investigation Report speculates that the ponded water that currently is present at the surface may represent artesian flow from previous breaches of the regional confining layer.
- Raising of the water-table at the site from the added influx of artesian flow through and around the piles. This could affect the groundwater flow direction in the unconfined aquifer. This increase in the saturated zone could also potentially increase the potential for contaminants to dissolve into groundwater.
- Carry-down of contaminated soil from the Site during pile installation causing contamination of the underlying aquifer.
- Depressurization of the artesian aquifer.
- Upward artesian flow around the outside of the pipe causing "floating" of the piles.

Please respond to Ecology with a proposal on how the EDR and the construction plans would be modified to address these concerns.

We also have a comment on Sheet LG-02, General Notes: Please delete the last bullet under "City of Olympia Standard Erosion Control Notes." This bullet states that non-turbid water may be discharged to State waters. This is incorrect. It is our understanding that there will be zero discharge to State waters.

Please let me know if you have any questions.

Thanks,

Steve

Steve Teel, LHG
Cleanup Project Manager/Hydrogeologist
Washington State Department of Ecology
Toxics Cleanup Program, Southwest Regional Office
P.O. Box 47775
Olympia, WA 98504-7775

Phone (360) 407-6247

steve.teel@ecy.wa.gov

LANDAU ASSOCIATES

June 22, 2018

Walker John
c/o Thomas Architecture Studio
525 Columbia Street SW
Olympia, WA 98401

Attn: Mr. Amos Callendar

Transmitted via email to: *amos@tasolympia.com*

Re: Geotechnical Response to Review Comments
Westman Mill Development
Olympia, Washington
Project No. 1470005.010.011

Dear Mr. Callendar:

The Washington State Department of Ecology (Ecology) recently completed its review of the engineering design report (EDR) prepared by Landau Associates, Inc. (LAI) for the proposed Westman Mill Development in Olympia, Washington. Review comments were provided by Ecology Site Manager Steve Teel in an email, dated June 12, 2018. LAI's responses to Ecology comments 1, 4, 5, and 6 are provided below.

> **Ecology Comment No. 1:** Raising of the water-table at the site from the added influx of artesian flow through and around the piles. This could affect the groundwater flow direction in the unconfined aquifer.
>
> **LAI Response:** LAI has completed many pile-driving projects in downtown Olympia. Some of the projects included piling that extended into geologic units similar to those observed during geotechnical explorations at the Westman Mill site. LAI acknowledges that confined aquifers under pressure and artesian conditions are sometimes present in these units.
>
> However, on the basis of this pile-driving experience and the results of the explorations advanced at the Westman Mill site, LAI concludes that an appreciable amount of groundwater is unlikely to return to ground surface, either around or within the piling. This could contribute to groundwater quantities within the shallow, unconfined aquifer. Open-ended steel pipe piles, or displacement piles, will be used to form a plug during driving. With displacement piles, no soil is removed, and no void is created, as would occur during installation of a drilled well or drilled piling. Driven displacement piles introduce considerable lateral ground stress at the soil-to-pile interface, reducing the likelihood for preferential pathways to develop around or within the pile.
>
> Pioneer Technologies Corporation (Pioneer), the environmental consultant for the project, has developed studies and opinions related to groundwater characteristics within the shallow, unconfined aquifer. Pioneer has provided the following response to Ecology comment 1: *Based, on our analysis and discussions with the Developer's geotechnical expert it is: (1)*

unlikely that there will be a significant change in the groundwater elevation in the unconfined aquifer at the site and (2) it is unlikely that there will be a significant change in the groundwater flow direction (which is to the Northeast) where the unconfined groundwater discharges to East Bay. Even if additional groundwater mounding occurs near the proposed Westman Mill building (associated with potential influx of artesian flow via the piles) this would not change the groundwater flow direction since the building is in the southwest corner of the Site and the groundwater flow direction is to the northeast (i.e., the unconfined groundwater will still flow northeast and discharge into East Bay).

Ecology Comment No. 4: Upward artesian flow through the center and/or around the outside of the pipe.

LAI Response: Upward artesian flow through the center and/or around the outside of the pipe is unlikely, as addressed in LAI's response to Ecology comment 1.

Ecology Comment No. 5: Depressurization of the artesian aquifer.

LAI Response: LAI concludes that depressurization of the artesian aquifer is unlikely. The open-ended pipe piles self-seal aquifer penetrations, and do not remove soil. LAI's review indicates there are countless penetrations into aquifer(s) with existing wells, including wells that are largely unused and free flow into municipal collection systems. Displacement piling is unlikely to generate a preferential pathway relative to existing free-flowing wells that tap the same aquifer(s).

Ecology Comment No. 6: Upward artesian flow around the outside of the pipe causing "floating" of the piles.

LAI Response: Skin friction capacity of the pipe piles is sufficient to resist pipe buoyancy.

We trust that this letter serves to meet your needs at this time. Prior to construction, LAI will contribute to the contingency plan being developed by the project team. The plan can be used in the event of water ponding during piling installation. If you have any questions or require clarification on any of the project's geotechnical aspects, please call me at (360) 791-3178.

LANDAU ASSOCIATES, INC.

Calvin McCaughan, PE
Principal

CAM/mcs
[\\OLYMPIA1\PROJECTS\1470\005\R\GEOTECHNICAL RESPONSE TO ECOLOGY REVIEW COMMENTS.DOCX]

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Appendix G

PIONEER Health and Safety Plan

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Appendix G: PIONEER Health and Safety Plan

East Bay Redevelopment Site (Lot 11)
Olympia, Washington

Prepared for:

Port of Olympia
606 Columbia St NW, Suite 300
Olympia, WA 98501

City of Olympia
P.O. Box 1967
Olympia, WA 98507-1967

LOTT Clean Water Alliance
500 Adams Street NE
Olympia, WA 98501

Prepared by:

PIONEER TECHNOLOGIES CORPORATION

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Olympia, Washington 98503
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January 2018

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Attachments

Attachment G-1: HASP Compliance Agreement Form
Attachment G-2: IIPP/APP Form 5 - Safety Audit Form
Attachment G-3: Tailgate Meeting Form
Attachment G-4: IIPP/APP Forms for Injury/Illness, Accident and Unexpected Occurrence Reporting
Attachment G-5: Heat and Cold Exposure Information

List of Acronyms

Acronym	Explanation
ACGIH	American Conference of Governmental Industrial Hygienists
COC	Constituent of Concern
CPR	Cardiopulmonary Resuscitation
EDR	Engineering Design Report
H&S	Health and Safety
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
LOTT	Lacey, Olympia, Tumwater, and Thurston County Clean Water Alliance
NIOSH	National Institute of Occupational Safety and Health
PIONEER	PIONEER Technologies Corporation
Port	Port of Olympia
PPE	Personal Protective Equipment
RL	Remediation Level
Site	East Bay Redevelopment Site
SSO	Site Safety Officer
TLV	Threshold Limit Value
WAC	Washington Administrative Code

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SECTION 1: PIONEER HEALTH AND SAFETY PLAN

1.1 Purpose

The purpose of this health and safety plan (HASP) is to establish personnel protection standards, specify safe operating procedures, and provide for contingencies that may arise during on-site cleanup action activities conducted by PIONEER Technologies Corporation (PIONEER) for Lott 11 of the East Bay Redevelopment Site (Site) pursuant to the Engineering Design Report (EDR) (PIONEER 2018b). This HASP covers PIONEER personnel and any of its subcontractors. Any other on-site contractors or organizations are not covered by this HASP. This HASP was developed in accordance with 29 Code of Federal Regulations 1910.120, Chapter 296-843 of the Washington Administrative Code (WAC) and WAC 173-340-810. This HASP will be updated as necessary when conditions change. PIONEER employees will keep a copy of this HASP with them when they are conducting work on Site.

1.2 Compliance Agreement

Each field worker must complete and sign the HASP Compliance Agreement form in Attachment G-1 prior to conducting any fieldwork in order to:

1. Document that they have reviewed the HASP;
2. Ensure that they have the required training;
3. Communicate any physical conditions (e.g., allergies) they may have; and
4. Provide emergency contact information in case of an emergency.

1.3 Scope of Work

PIONEER employees' fieldwork for this EDR includes:

- Overseeing cleanup level (CL) and/or remediation level (RL) soil exceedance removal activities, including excavation, dewatering, and material hauling tasks
- Overseeing installation of the soil cover
- Collecting soil samples
- Performing airborne dust monitoring
- Using a global positioning system unit

PIONEER subcontractors' fieldwork for this EDR may include:

- Completing CL and/or RL soil exceedance removal activities, including excavation, dewatering, and material-hauling tasks

1.4 HASP Roles and Responsibilities

Key PIONEER health and safety (H&S) roles and responsibilities are as follows:

- The Project Manager is responsible for ensuring the HASP is implemented throughout the duration of the project. The Project Manager is also responsible for ensuring that the project is audited as necessary to verify compliance with the HASP (see Attachment G-2).

- The Site Safety Office (SSO), under the direction of the Project Manager, is responsible for (1) implementing and enforcing this HASP daily, (2) overseeing the safety of daily operations and coordination of H&S issues with PIONEER subcontractors, (3) conducting daily tailgate H&S meetings (see Attachment G-3), and (4) documenting the completion of H&S tasks (e.g., ensuring completion of all applicable forms in Attachments G-1 through G-5).
- All field personnel (e.g., PIONEER employees and PIONEER subcontractors), under the direction of the SSO, are responsible for (1) reviewing this HASP, (2) taking all reasonable precautions to prevent injury to themselves and other workers, (3) conducting only those tasks that they believe they can do safely, (4) reporting all injuries, accidents, and unexpected occurrences to the SSO (forms are included in Attachment G-4), and (5) exercising stop-work authority in the event of an unsafe condition or imminent danger to any personnel.

If PIONEER employees and subcontractors are going to work in an area where other Site construction activities will be occurring, they will check in with the Construction Superintendent or other responsible person to communicate that they are going to work in the area and to obtain any needed safety instructions. PIONEER employees involved in field activities will attend the Construction Contractor's safety tailgate meetings, as appropriate, in order to facilitate clear communication between all individuals working at the Site.

1.5 Hazard Analysis

In addition to possible chemical, physical, and biological hazards, other hazards may be identified as field work progresses. The unexpected occurrence reporting forms in Attachment G-4 will be completed by the SSO in the event of a near miss, incident or accident, spill or environmental release, as well as any unplanned event which could be indicative of a trend or potential hazard.

1.5.1 Chemical Hazards

Overexposure from site chemicals is not anticipated based on the concentrations in Site soil and the limited nature of PIONEER's cleanup action activities. Nonetheless, the following procedures will be used to minimize potential chemical hazards:

- Safe work practices will be employed (e.g., allowing only essential personnel in the area and standing in upwind locations to the extent practicable).
- Personal protective equipment (PPE) will be worn (see Section 1.7).
- Personnel and equipment decontamination procedures will be followed (see Section 1.9).
- Good hygiene practices will be enforced (e.g., all field personnel will be required to wash hands and face prior to any hand-to-face activities).

The maximum detected constituent of concern (COC) concentration in Site soil and the associated permissible exposure limits and symptoms of overexposure are presented on Table G-2. The Site's Airborne Dust Action Level of 1 mg/m^3 is conservatively protective of potential inhalation exposures associated with COCs in airborne dust (PIONEER 2018a).

1.5.2 Physical Hazards

Potential physical hazards and the procedures to monitor/reduce these hazards will include the following:

- Concrete/Pavement Cutting: Implement effective dust control during concrete/pavement cutting. Eye protection and hearing protection are required for concrete/pavement cutting. Operators need to designate cutting paths with effective means of delineating work areas and use barrier tape or barricades as necessary.
- Cutting Hazards: Fixed, open-blade hand-tools are never permitted for use. Identify all hand safety hazards as part of the job planning process BEFORE starting work. Remember that gloves are a secondary level of defense when it comes to hand safety; the primary way to avoid hand injuries is by proper hand placement and using the right tool for the job. When using any cutting tool, set up your work so that you cut away from your body or anyone else working nearby and pay attention to the location of your free hand when cutting. Workers will use tube cutters when cutting tubing. No glove can eliminate the potential for cuts or punctures. Wear cut resistant (e.g., Kevlar®) gloves to reduce the hazard when handling sharp cutting tools or when exposed to sharp objects.
- Excavation Safety: No personnel will enter an excavation greater than four feet deep at any time for any reason unless appropriate excavation safety measures (e.g., sloping, shoring) are utilized. For this work, samples will be collected from the excavator bucket. Personnel will maintain a three-foot offset from the edge of an excavation deeper than four feet. Barricades (e.g., caution tape, cones) will be placed around excavations anytime the work area is left unattended.
- Getting Hit by Heavy Equipment: Wear appropriate PPE (including a high-visibility safety vest) and maintain visibility with equipment operators. Do not approach equipment while in operation. When working in an area where mechanical equipment is being used, communicate directly with operators so that they are aware that you are there and the types of activities you are performing. Do not assume that they know that you are there and what you are going to do.
- Heat/Cold Exposure: Stay apprised of the anticipated weather conditions and be aware of the heat and cold exposure information included in Attachment G-5. During cold weather, wear layered clothing and gloves/hats, as necessary. During wet weather, use rain gear and have a change of clothing available. During hot weather, try to schedule work during the cooler times of the day, keep water and fluids available at all times, and drink water/fluids regularly (i.e., at least 1 quart per hour) to prevent dehydration. To prevent sunburn, apply sunscreen of SPF 30 or greater, and keep skin covered as much as possible. Use the buddy system to let other workers know if they are getting burned or showing any signs of heat or cold exposure. As necessary, the SSO will periodically monitor for physiological signs and symptoms of heat and cold exposure during each work day using the guidance in Attachment G-5 and behavioral changes (e.g., worker disorientation and confusion, workers who exhibit unusual level of irritability). Based on the weather conditions and the results of heat and cold exposure monitoring, the SSO will implement corrective action as necessary in accordance with Attachment G-5.
- Lone Worker: Implement the use of the buddy system or have a means of communication (e.g., cell phone) available to maintain contact with other personnel and communicate emergencies. If working alone is necessary, the lone worker will make contact with another employee capable of providing assistance at regularly scheduled intervals.
- Noise: Wear ear protection, as necessary, when proximate to noisy equipment. Personnel must wear approved hearing protection when working around equipment that produces sound levels

in excess of 85 decibels (e.g., whenever voices must be raised to be heard at a distance of three feet or less) or if signs indicate that hearing protection is required.

- Overhead Obstructions/Lines: Before the start of work, all work areas and mobilization pathways will be evaluated to identify overhead obstructions.
- Pinch Points: Pinch points include vehicle doors and tailgates, drill rig components, and hand tools. Always be aware of limb or body positions proximate to moving equipment to reduce pinch point hazards. Wear appropriate hand protection.
- Portable Electric Equipment: Portable electrical tools and equipment shall only be plugged into electrical circuits protected by a properly-functioning ground fault circuit interrupter. Tools with damaged or defective cords will not be used. All electrical cords and extension cords must be inspected prior to use. Do not overload plugs.
- Slip/Trip/Fall: Keep work area free and clear of obstacles. Check work area for potential slip/trip/fall hazards and remove or mark prior to starting work. Wear sturdy shoes/boots with adequate tread, and rubber boots/boot covers for wet or slippery conditions. Maintain work site and equipment to minimize hazards. Good housekeeping practices will be employed to prevent slip/trip/fall hazards. Place tools out of the way when not in use. Use caution when walking to prevent slip/trip/fall hazards caused by terrain. Use hand rails when walking down steps and three points of contact when entering/exiting equipment. Do not use a cell phone while walking.
- Tools and Equipment: Inspect all hand tools before use to determine if they are the proper size, free of oil or grease, and in good condition. Use tools for the purposes for which they are designed (i.e., use the correct tool for the job).
- Underground Utilities: Underground utility locates must be completed prior to all intrusive activities.
- Vehicle Traffic: Use caution when working, operating equipment, and/or driving a vehicle(s). Abide by traffic-control measures implemented by the Remediation Contractor, including parking in designated areas, maximizing the distance away from areas where others are working, and assuming that other vehicles have the right-of-way. Pay particular attention to uneven terrain, and the width of roads and slope(s). Appropriate measures will be taken to avoid equipment and/or vehicles from becoming stuck. In the event equipment and/or vehicles do become stuck, appropriate measures to safely remove equipment and/or vehicles will be discussed with the SSO prior to removal. City traffic control permits will be necessary to decommission monitoring wells.
- Weather: Weather hazards include torrential rain, lightning, flooding, excessive cold, snow, blizzards, and high winds. The SSO is responsible for being up-to-date on anticipated weather conditions and preparing the crew. Discontinue all work for 30 minutes after lightning is seen or thunder is heard.

1.5.3 Biological Hazards

Biological hazards that could be encountered while performing work at the Site are stinging insects and blood-borne pathogens, which may be a concern if there is an injury to a co-worker.

- Stinging insects: Prior to digging in any areas, observe the site for several minutes to identify potential nests. Look not only at the proposed excavation area but in the area where you will be standing as well. If stung by a bee, carefully remove the stinger by gently scraping with a fingernail (do not squeeze). Wash the area with soapy water and apply a cold compress (ice) to

decrease absorption and spreading of the venom. If excessive swelling or redness appears, seek immediate medical attention. (Note: Allergic reactions to bee stings can be life threatening; therefore, identify susceptible persons prior to project start up.)

- Blood-borne Pathogens: Use latex gloves, cardiopulmonary resuscitation shield, and universal precautions whenever the potential exists for contact with bodily fluids; current First Aid and Cardiopulmonary resuscitation (CPR) training is required if providing assistance.

1.6 Site Control

Due to the nature and scope of the fieldwork being conducted by PIONEER, establishment of a formal PIONEER-specific Site control plan is not warranted. PIONEER will employ the buddy system to the extent practicable to assist in the event of an emergency. Any visitors will be escorted 100% of the time and will not be allowed in the work areas. If visitors or bystanders refuse to cooperate with these provisions, stop work and call the Port to deal with visitors/bystanders.

1.7 Personal Protective Equipment

The level of PPE for PIONEER employees and subcontractors was selected by evaluating the performance characteristics of the PPE against the requirements and limitations of the Site and task-specific conditions. Based on the nature of potential Site hazards and the nature of PIONEER's cleanup action activities, Level D PPE is recommended for all PIONEER employees and subcontractors while on Site. Level D PPE includes:

- Leather steel-toed boots
- Hard hat
- Safety glasses with side shields
- High-visibility safety vest
- Nitrile (surgical-type) gloves, as necessary
- Hearing protection, as necessary

Provisions for upgrade to Level C PPE have not been made because the potential for overexposure to chemical hazards by PIONEER employees and subcontractors is low given the nature of potential Site hazards and the nature of PIONEER's cleanup action activities.

1.8 Exposure Monitoring

Provisions for exposure monitoring of PIONEER employees and subcontractors have not been made at this time for monitoring well decommissioning and removal of RL soil exceedances because the potential for overexposure to chemical hazards is low given the nature of these activities. Airborne dust monitoring will be conducted during the installation of the soil cover as described in Appendix A of the EDR.

1.9 Personnel Decontamination

Due to the nature and scope of fieldwork being conducted by PIONEER employees, a formal personnel decontamination infrastructure is not warranted. In the event that non-disposable PPE or clothing becomes contaminated during Site activities, the PPE or clothing must either be appropriately cleaned

before put back into service, or replaced. If skin comes into contact with contaminated media, the affected skin should be washed immediately, as appropriate.

1.10 Drum/Container Issues

Sampling, managing, or handling of drums is not in the scope of the fieldwork being conducted by PIONEER. Any groundwater that is removed from the soil excavations will be temporarily stored in a large portable tank, pre-treated for suspended solids, and discharged to Lacey, Olympia, Tumwater, and Thurston County Clean Water Alliance (LOTT). If the wastewater cannot be disposed of at LOTT, it will be disposed of at an off-Site facility permitted to receive such waste.

1.11 Confined Spaces

The scope of PIONEER's cleanup action activities does not include confined space entry. Under no circumstances should a PIONEER employee or subcontractor enter a confined space during the cleanup action.

1.12 Personnel Training

All on-site PIONEER employees and subcontractors will be appropriately trained in accordance with WAC 296-843-200. For cleanup action work to be conducted by PIONEER, this entails 40-hour initial Hazardous Waste Operations and Emergency Response (HAZWOPER) training, three days of supervised fieldwork, and eight-hour annual HAZWOPER refreshers. In addition, the SSO will have completed an additional eight hours of HAZWOPER supervisor training.

PIONEER employees and subcontractors will review this HASP prior to initiating field activities. Additional training and information briefings will be conducted as necessary.

1.13 Medical Surveillance

If any on-site worker meets the medical surveillance requirements in WAC 296-843-21005[1], a medical surveillance program (e.g., medical examinations and consultations supervised by an occupational medicine physician) will be implemented for the employee in accordance with WAC 296-843-21005. If a medical surveillance program becomes necessary for project workers, each individual contractor will take responsibility for implementing the necessary medical surveillance program for their employees and will provide a medical clearance letter as requested.

1.14 Sanitation

Due to the nature and scope of fieldwork being conducted by PIONEER, PIONEER-specific sanitation facilities are not warranted. PIONEER employees and subcontractors should use potable water and toilet facilities provided by the Remediation Contractor and/or the Port. Per standard procedures,

[1]An employee who is exposed to hazardous substances at concentrations exceeding a permissible exposure limit for 30 or more days a year, who wears a respirator during any part of a day for 30 or more days a year, who is injured, becomes ill, or develops signs or symptoms from likely overexposure to hazardous substances, or who is a member of a hazardous materials response team.

PIONEER employees and subcontractors should wash hands and face before eating, drinking, smoking, or other hand to mouth contact.

1.15 Lighting

Work will be performed during daylight hours only. Due to the nature and scope of anticipated fieldwork, provisions for lighting are not necessary.

1.16 Emergency Contingency Plan

1.16.1 Emergency Phone Numbers

Contact	Name	Number
Police/Security	Police Department	911
Fire and Ambulance	Fire Department	911
Hospital	Providence St. Peter's Hospital 413 Lily Road NE Olympia, WA 98506-5166	(360) 491-9480
PIONEER Project Manager	Chris Waldron	(360) 570-1700
PIONEER Site Safety Officer	To be determined	(360) 570-1700
PIONEER Principal	Chris Waldron or Brad Grimsted	(360) 570-1700
Site/Client Contact	Rachael Jamison	(360) 528-8020
Environmental Release Contact	Washington State Department of Ecology 24-hour Emergency Response	1-800-258-5990
Regulatory Agency	Washington State Department of Ecology	(360) 407-6000

1.16.2 Directions and Map to Nearest Hospital

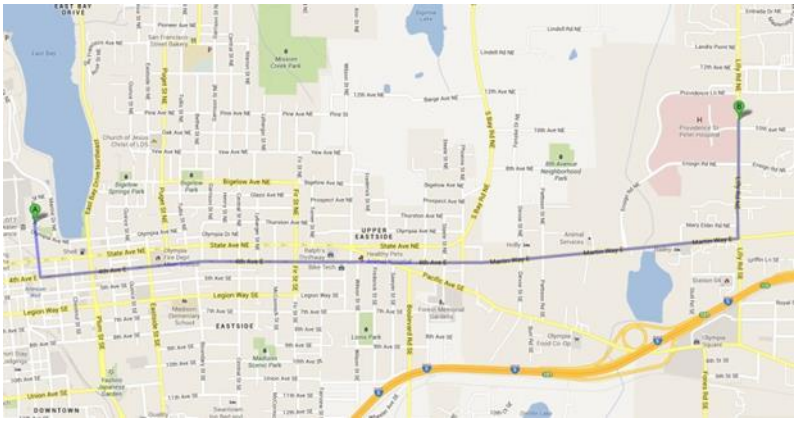
	1. Head west from State Ave. NE - go 73 ft
Directions to:	2. Turn left at Franklin St. SE - go 0.1 mi
Providence St. Peter's Hospital	3. Turn left at 4th Ave. NE - go 1.5 mi
413 Lilly Rd. NE	4. Continue on Martin Way E - go 1.0 mi
Olympia, WA 98506-5166	5. Turn left at Lilly Rd. NE - go 0.4 mi
	Total Distance is 3.1 miles.

Map to:

Providence St. Peter's Hospital

413 Lilly Rd. NE

Olympia, WA 98506-5166



1.16.3 Emergency Response Procedures

In the event of a personnel injury, fire, explosion, or spill:

- Ensure that all equipment has been shut off.
- Assess the nature of the situation.
- If appropriate, conduct corrective action if it can be done safely (e.g., bandage a minor injury, stop and contain a minor spill).
- If necessary, sound emergency alarm or phone 911 for emergency assistance.
- If appropriate, secure the area until emergency assistance arrives.
- Issue site-wide stop-work.
- If necessary, rally at designated location and take head count.
- Meet with and advise emergency crew of location and nature of situation.
- Contact the PIONEER Project Manager and/or a PIONEER Principal.
- Begin investigation of situation.

1.16.4 Emergency Equipment

A first-aid kit and fire extinguisher will be present in the field at all times.

1.17 References

PIONEER. 2009. Port of Olympia East Bay Site: Interim Action Work Plan, May.

——— 2018a. Cleanup Action Completion Report, East Bay Redevelopment Site, February.

——— 2018b. Engineering Design Report, East Bay Redevelopment Site, February.

Tables

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Table G-1: Project Roles and Responsibilities

Project Role	Contact Name, Phone Number, and Email	Project Responsibilities
Port Planning, Public Works, and Environmental Director	Rachael Jamison (360) 528-8020 Rachaelj@portolympia.com	Overall environmental project management. Communication and coordination with Ecology, Port staff, and PIONEER.
Port Senior Engineer	Tyson Carpenter, P.E. (360) 528-8006 TysonC@portolympia.com	Communication and coordination with the Port Planning, Public Works, and Environmental Director, Port staff, and PIONEER.
Ecology Site Manager	Steve Teel, L.H.G. (360) 407-6247 stee461@ecy.wa.gov	Regulatory review and approval of EDR (Lot 11). Complete public notification requirements.
PIONEER Project Manager	Chris Waldron, P.E. (360) 570-1700 waldronc@uspioneer.com	Prepare EDR (Lot 11). Oversee cleanup implementation in accordance with existing contract. Support primary organization(s) conducting oversight for environmental soil issues related to implementation of this EDR. Implementation of the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP).
Developer	Walker C. John walker@oliviabeach.com	Developer for Lot 11 Redevelopment.
Thomas Architecture Studios Project Manager	Amos Callender (360) 915-8775 amos@tasolympia.com	Architect for development activities.
SCJ Alliance Landscape Architect	Jeff Glander (360) 352-1465 jeff.glander@scjalliance.com	Softscapes
Parametrix Project Manager	Sam Nielson, P.E. (253) 604-6600 SNielson@parametrix.com	Design civil engineer for utilities and hardscapes.
General/Remediation Contractor	To be determined	
Analytical Laboratory	Friedman & Bruya, Inc. and Frontier Analytical Laboratory	Analyze soil samples and conduct laboratory quality control.
Solid Waste Disposal Facility	Off-Site Facility Permitted to Receive Solid Waste (e.g., Wasco Country Landfill in The Dalles, OR)	Permitted facility for disposal of off-site solid waste.
Material Supplier	To be determined	
Wastewater Disposal Facility	Off-Site Facility Permitted to Receive Wastewater	Permitted facility for disposal of off-site wastewater.

Notes:

CMP: Compliance Monitoring Plan

EDR: Engineering Design Report

QAPP: Quality Assurance Project Plan

QC: Quality Control

SAP: Sampling and Analysis Plan

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Table G-2: Chemical Hazard Analysis

Constituent of Concern	Maximum Soil Concentration (mg/kg)	Permissible Exposure Limit, Time-Weighted Average [1] (mg/m^3)	Symptoms of Overexposure [2]
Arsenic	52	0.010	Respiratory system irritation
Lead	170	0.050	Weakness, exhaustion
Total cPAHs	1.1	0.20	Respiratory system irritation
Total Dioxins/Furans	0.00098	No Value	Suspected carcinogen. Acute effects of overexposure have not been reported.
Total Naphthalenes	0.32	50	Irritated eyes, headaches, malaise, confusion, profuse sweating, nausea, vomiting, abdominal pain, dermatitis.
TPH-D	7,300	100 [3]	Irritated eyes and mucous membranes. CNS effects including dizziness, headaches, blurred vision, and slurred speech.
TPH-HO	21,000	100 [4]	Symptoms are dependent on constituents (may contain cPAHs and metals). Some symptoms can include fatigue, headache, nausea, drowsiness, difficulty breathing, irritation to skin, eyes, throat and stomach, and numbness.
TPH-G	31	900[5]	Irritated eyes and mucous membranes. CNS effects including dizziness, headaches, blurred vision, and slurred speech.

Notes:

CNS: Central nervous system

(1) From Chapter 296-841 WAC and/or September 2005 National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards.

(2) Exposure is assumed through the inhalation route. PPE, work practices, and hygiene will minimize incidental ingestion of and dermal contact with soil.

(3) A Threshold Limit Value from American Conference of Government Industrial Hygienists, based on total hydrocarbons.

(4) Assumed based on total petroleum hydrocarbons in the diesel range value.

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Attachments

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G-1: HASP Compliance Agreement Form

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HEALTH AND SAFETY PLAN COMPLIANCE AGREEMENT

Instructions: Circle the appropriate answer (Yes, No, or N/A) for each question, then sign and date at the bottom of the form.

HASP Review	1. Worker has read the Health and Safety Plan (HASP) as well as any applicable project safety analysis or job hazard analysis attachments?	**Yes**	**No**	**N/A**
	2. Worker understands the health and safety protocols presented in the HASP as well as any applicable project safety analysis or job hazard analysis attachments?	**Yes**	**No**	**N/A**
Training/Certifications	3. Worker has completed appropriate initial HAZWOPER training? Chose the appropriate answer from the following:			
	• 40-hour initial HAZWOPER training	**Yes**	**No**	**N/A**
	• 24-hour initial HAZWOPER training	**Yes**	**No**	**N/A**
	4. Worker has completed appropriate HAZWOPER supervised field experience? Chose the appropriate answer from the following:			
	• If 40-hour trained, 3 days of supervised field experience	**Yes**	**No**	**N/A**
	• If 24-hour trained, 1 day of supervised field experience	**Yes**	**No**	**N/A**
	• Worker is obtaining the supervised field experience as part of this project	**Yes**	**No**	**N/A**
	5. Worker has completed 8-hour annual HAZWOPER refresher in past year?	**Yes**	**No**	**N/A**
	6. Worker is medically cleared for respirator use?	**Yes**	**No**	**N/A**
	7. Worker has completed a respirator fit test?	**Yes**	**No**	**N/A**
Emergency Information	8. Emergency contact name(s):			
	8. Emergency contact number(s):			
	10. Any medical conditions that could be affected by the work (e.g., hypoglycemia, sensitivity to heat/sunlight, bee allergies, food allergies)? If yes, please describe:			
	11. Any other special considerations that might comprise the health and safety of the worker or fellow workers? If yes, please describe:			

The information presented on this form is complete, accurate, and true to the best of my understanding. I understand that providing incorrect information on this form or noncompliance with the HASP may result in dismissal from the site.

Project Name: _____

Employee Name:_____ Employer Name:_____

Signature: _____ Date: _____

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G-2: IIPP/APP Form 5 - Safety Audit Form

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IIPP/APP Form 5 - Safety Audit Form

Date:	
Site:	
Audit Team:	
Activities Audited:	
Site Contact:	
Audit Focus:	
PSA Completed?	YES NO
HASP Completed	YES NO
Project Field Team	

Audit Process:

The procedure for conducting the audit is as follows:

1. Decide on a focus (e.g., high hazard activity, recent incident or near-miss associated task).
2. Observe the work scene, looking for the selected focus.
3. Look for positive safety actions and indications of safety attitudes.
4. Make at least 10 total observations with a minimum of 5 behavioral based observations.
5. Discuss observations with the people observed.
6. Mention the positive behaviors and actions of the people observed.
7. Involve the people observed in a safety discussion, highlighting the observations.
8. Ensure that previous findings (if applicable) have been corrected.
9. Exit the audit, thanking the observed people for their time and ideas for improvement.
10. Report the audit findings to the field project team at the next daily safety briefing.
11. Document the audit by completing the attached audit form.

1 Positive Observations within Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

2 Improvement Observations within Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

3 Positive Observations OUTSIDE Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

4 Improvement Observations OUTSIDE Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

5 Hand Safety Observations:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

6 Environmental Focus:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

7 Unsafe Acts:

Observation Number:	List of Observations:
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

8 Unsafe Conditions:

Observation Number:	List of Observations:
1	
2	
3	
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G-3: Tailgate Meeting Form

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TAILGATE MEETING FORM

Date and Time of Meeting_____ **Prepared By:**_____

CHECK TOPIC(S) DISCUSSED. SOME TOPICS MAY NOT APPLY TO THIS PROJECT.

Intro / General _ Health and safety philosophy _ Roles and responsibilities _ HASP (and PSA/JHA as necessary) _ HASP Compliance Agreements _ Stop work authority _ Reporting injuries, accidents, unexpected occurrences _ Health and safety audits _ Other _____	**Health and Safety Provisions** _ PPE _ Exposure monitoring _ Site control _ Personnel decontamination _ Equipment decontamination _ Other _____ _ Other _____ _ Other _____
Potential Project Hazards _ Physical _ Chemical _ Biological _ Other _____	**Sanitation, Hygiene, and Housekeeping** _ Drinking water _ Restrooms/Portable toilets _ Personal Hygiene _ Site Housekeeping _ Other _____
Hazards Associated with Certain Equipment / Tools _ Drill rig _ Heavy equipment _ Cutting tools _ Pressure washer _ Equipment / tool inspections _ Other _____	**Emergency Procedures** _ Equipment shut-off _ Rally / headcount area _ First aid supplies _ Fire extinguishers _ Route to hospital _ Other _____
Common Hazard Topics _ Anticipated weather and heat/cold exposure _ Buddy system / lone worker provisions _ Confined space _ Cutting hazards _ Excavation safety _ Fire / explosion hazards _ Material / drum / waste handling _ Overhead / underground obstructions _ Slip / trip / fall _ Traffic control	**Miscellaneous / Other Topics** _ Communications _ Lighting _ No smoking _ Visitors _ Other _____ _ Other _____ _ Other _____ _ Other _____ _ Other _____

ATTENDEES

Name (Printed)	**Signature**

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G-4: IIPP/APP Forms for Injury/Illness, Accident, and Unexpected Occurrence Reporting

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IIPP/APP Form 2 - Employee Injury or Illness Report

Instructions: It is our policy that all work related injuries, illnesses, and near-miss incidents be reported – *no matter how minor*. This helps to identify and correct hazards before they cause serious injuries. Complete this form and submit to the supervisor as soon as possible after job injury or illness. In the event of a near-miss incident, complete IIPP/APP Form 4 – Unexpected Occurrence or Near-Miss Report.

Please Print

I am reporting a work related: ❑ Injury ❑ Illness	
Your Name:	
Job title:	
Supervisor:	
Have you told your supervisor about this incident? ❑ Yes ❑ No	
Date of incident:	Time of incident:
Name of witnesses (if any)?	
Where, exactly, did it happen?	
What were you doing at the time?	
Describe the steps that led to the accident/injury:	
What could have been done to prevent this accident/injury?	
What parts of your body were injured? How could you have been hurt?	
Did you see a doctor about this injury/illness?	❑ Yes ❑ No
If yes, print name of doctor:	Phone number of doctor:
Date:	Time:
Has this part of your body been injured before? ❑ Yes ❑ No	
If yes, when?	Employer:
Your signature (optional):	Date:
Report received by:	Date:

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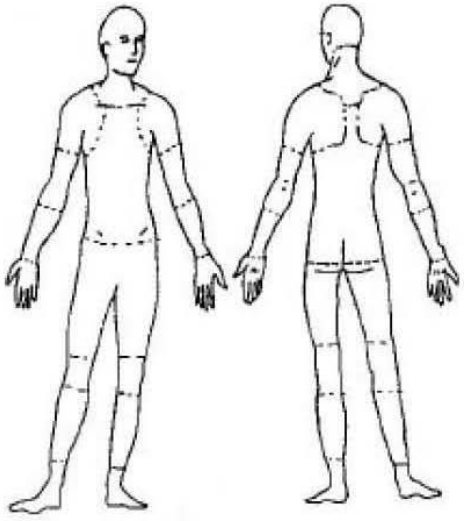
IIPP/APP Form 3 - Accident Investigation Report

Employee(s) name:	
Date & Time of Incident:	
Employee Job Title:	
Supervisor/Lead Person	
Witnesses:	
Brief Description of the Incident:	
Site:	
Site Contact:	
PSA Completed?	YES NO
HASP Completed	YES NO
Project Field Team	

Indicate body part affected:



Did the injured employee(s) see a doctor?	YES NO
If yes, did you file an employer's portion of a worker's compensation form?	YES NO
Did the injured employee(s) go home during their work shift?	YES NO
If yes, list the date and time injured employee(s) left job(s):	
Supervisor's Comments:	

What could have been done to prevent this accident/incident?	
Have the unsafe conditions been corrected?	( ) Yes ( ) NO
If yes, what has been done?	
If not, what needs to be done?	
Employer or Supervisor's signature:	
Date:	
Additional Comments/Notes:	

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IIPP/APP Form 4 - Unexpected Occurrence or Near-Miss Report

Instructions: It is our policy that all work related injuries, illnesses and near-miss events is reported – *no matter how minor*. This helps identify and correct hazards before serious injuries occur. In the event of a near-miss, complete this form and submit to the supervisor. Note: if near-miss occurred at a site, use CRG Unexpected Occurrence Report form.

Please Print

I am reporting a work related: ❑ Near miss	
Employee Name:	
Job title:	
Supervisor:	
Have you told your supervisor about this near-miss? ❑ Yes ❑ No	
Date of near-miss:	Time of near-miss:
Name of witnesses (if any)?	
Where, exactly, did it happen?	
What were you doing at the time?	
Describe step by step what led up to the near-miss:	
What could have been done to prevent this near-miss?	
What parts of your body could have been injured?	
Root Cause:	
Key Learning Objectives:	

Recommendations/Responsibility: (*What should be done to prevent a recurrence? What are other relevant assignments to the individual, or the team, to create a safe work environment? What is the completion date for these tasks? Be specific and concise.)*	
Unexpected Occurrence Investigation Team:	
Date:	

G-5: Heat and Cold Exposure Information

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HEAT EXPOSURE

Heat stress may pose a threat to the health and safety of site personnel based on the season of the year. Depending on the relative humidity, temperatures may create heat stress conditions, particularly when working in chemical-protective equipment. This section discusses heat-related health hazards and details WCD's heat stress program, which has been used successfully.

Heat Stress

Heat stress is a major hazard, especially for workers wearing protective clothing. Depending on the ambient conditions and the work being performed, heat stress can occur very rapidly within as little as 15 minutes. The key to preventing excessive heat stress is to educate personnel on the hazards associated with working in heat and the benefits of implementing proper controls and work practices.

Heat Rash

Heat rash (prickly heat) may result from continuous exposure to heat or humid air where the skin remains wet due to lack of evaporation, sweat ducts become clogged, and a skin rash appears. This uncomfortable rash can be prevented by resting in a cool place during breaks and by practicing good daily personal hygiene.

Heat Cramps

Heat cramps are muscular spasms that usually occur in the abdomen or limbs due to a loss of salt from profuse sweating. Drinking large quantities of water tends to dilute the body's fluids, while the body continues to lose salt.

- First Aid

  Apply warm, moist heat and pressure to reduce pain.

  Give electrolyte drinks by mouth (e.g., *Gatorade*®).

Heat Exhaustion

Caution: Persons with heart problems or on a low-sodium diet who work in hot environments should consult a physician about what to do under these conditions.

Heat exhaustion is a result of overexertion in hot or warm weather. It is highly possible for an on-site worker to experience heat exhaustion due to the use of protective coveralls, boots, gloves, and respiratory protection, even if ambient temperatures are mild.

- *Symptoms*

  Pale, clammy skin

  Profuse perspiration

  Weakness

  Headache

  Nausea

- *First Aid*

  Get victim into the shade or to a cooler place.

  Immediately remove any protective clothing.

  Encourage victim to drink plenty of fluids.

  Make victim lie down with feet raised.

  Fan and cool victim with wet compress.

  Transport victim to the hospital if vomiting occurs.

  Instruct victim to rest for a few days.

- *Prevention*

  If possible, schedule work for early morning or evening during warm weather.

  Have cool liquids at the Exclusion Zone border for down-range personnel to continuously replace body fluids.

  The SSO or alternate should continually monitor personnel for signs of heat stress.

Heat Stroke

The body's temperature control system, which causes sweating, stops functioning correctly in the case of heat stroke. Brain damage and death may occur if the body core temperature is extremely elevated and is not reduced.

- *Symptoms*

  Flushed, hot, dry skin

  High body core temperature (greater than 105 F)

  Dizziness

  Nausea

  Headache

  Rapid pulse

  Unconsciousness

- *First Aid*

  Immediately take precautions to cool the body core temperature by removing clothing and sponging the body with alcohol or cool water, or by placing the victim in a tub of cold water until his or her body temperature is reduced sufficiently (102 F). Stop cooling and observe the victim for 10 minutes. Once the temperature is controlled at a low enough level, dry the person off. Use fans or air conditioning, if available. Do not give the victim stimulants. Transfer to a medical facility.

Heat Stress Program

The heat stress program includes work and rest regimens employed as necessary so that personnel do not suffer adverse effects from heat stress. The SSO is responsible for monitoring heat stress throughout the day. Based on heat stress severity, the SSO will determine to what extent the elements of the heat stress program will be implemented.

Special clothing and an appropriate diet and fluid intake will be recommended to all site personnel to reduce the chance of heat-related hazards. The work and rest regimens followed by WCD were developed based on the current American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) guidelines and on National Institute of Occupational Safety and Health (NIOSH) recommendations.

Work Load

The following table will be used as a guide for establishing initial work and rest regimens. It takes into account TLV wet-bulb globe temperature (WBGT) correction factors for clothing.
The work-load category will be established by ranking each job in light, medium, or heavy load categories based on the type of operation, as follows:

- *Light Work*
  Sitting or standing to operate machinery, performing light hand or arm work.
- *Moderate*
  Walking about with moderate amounts of lifting or pushing.
- *Heavy*
  Heavy physical labor (e.g., pick and shovel work).

APPROACH FOR SETTING WORK/REST SCHEDULES FOR WORKERS WEARING NORMAL WORK CLOTHING

Adjusted Temperature* (calculated)	Light Work	Moderate Work	Heavy Work
90	Normal	Normal	Normal
91	Normal	Normal	Normal
92	Normal	Normal	Normal
93	Normal	Normal	Normal
94	Normal	Normal	Normal
95	Normal	Normal	45/15
96	Normal	Normal	45/15
97	Normal	Normal	40/20
98	Normal	Normal	35/25
99	Normal	Normal	35/25
100	Normal	45/15	30/30
101	Normal	40/20	30/30
102	Normal	35/25	25/35
103	Normal	30/30	20/40
104	Normal	30/30	20/40
105	Normal	25/35	15/45
106	45/15	20/40	Caution
107	40/20	15/45	Caution
108	35/25	Caution	Caution
109	30/30	Caution	Caution
110	15/45	Caution	Caution
111	Caution	Caution	Caution
112	Caution	Caution	Caution

Note: Adjust the temperature reading as follows before using the temperature column in the table.

Weather	Adjustment
Full Sun (no clouds)	add 13°
Partly Cloudy/Overcast	add 7°
No shadows visible/work is in the shade	No adjustment
For Relative Humidity of:	
10%	subtract 8°
20%	subtract 4°
30%	No adjustment
40%	add 3°
50%	add 6°
60%	add 9°

For example, if the temperature is 91°, it is dusk, the relative humidity is 40%, and heavy work is to be performed, such as moving heavy materials with a wheelbarrow:

Start with 91° and add 3° because the humidity is 40%: 91°+3°=94°. Go to 94° in the table; under these conditions, it would be reasonable to follow a normal work schedule.

Notes:

1. This table is based on American Conference of Governmental Industrial Hygienists for heat-acclimatized adults in effect at the time the document was published (1993). Assumptions include physically fit, well-rested, and fully hydrated workers under the age of 40; adequate water intake; 30% relative humidity; natural ventilation; and temperature readings in Fahrenheit, taken in the shade, no sunshine or shadows visible.
2. 45/15 minutes = 45 minutes work and 15 minutes rest during each hour.
3. "Caution" indicates very high levels of heat stress. Consider rescheduling activities for a time when the risk of heat illness is lower.

SOURCE: Adapted from: U.S. EPA/OSHA. 1993. A guide to heat stress in agriculture. EPA-750-b-92-001

APPROACH FOR SETTING WORK/REST SCHEDULES FOR WORKERS WEARING CHEMICAL-RESISTANT SUITS

Air Temperature	Work/Rest Schedules								
	Light Work			Moderate Work			Heavy Work		
	Full Sun	Partly Cloudy	No Sun	Full Sun	Partly Cloudy	No Sun	Full Sun	Partly Cloudy	No Sun
75° F	Normal	Normal	Normal	Normal	Normal	Normal	35/25	Normal	Normal
80° F	30/30	Normal	Normal	20/40	Normal	Normal	10/50	40/20	Normal
85° F	15/45	40/20	Normal	10/50	25/35	Normal	Caution	15/45	40/20
90° F	Caution	15/45	40/20	Caution	Caution	25/35	Stop Work	Caution	15/45
95° F	Stop Work	Stop Work	15/45	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work	Stop Work

Notes:

1. This table is based on values for heat-acclimatized adult workers under the age of 40 who are physically fit, well-rested, and fully hydrated with the assumptions of Tyvek coveralls, gloves, in the shade. Cooling vests may enable workers to work for longer periods. Adjustments must be made when additional protective gear is worn.
2. No sun refers to no shadows are visible or work is in the shade or at night.
3. 35/25 = 35 minutes of work and 25 minutes of rest each hour.
4. "Caution" indicates very high levels of heat stress. Consider rescheduling activities for a time when the risk of heat illness is lower.

SOURCE: Adapted from: U.S. EPA/OSHA. 1993. A guide to heat stress in agriculture. EPA-750-b-92-001

COLD EXPOSURE

Cold Stress

Cold injury such as frostbite and hypothermia may occur during field operations. The extent of injury caused by exposure to the cold will depend on such factors as wind velocity, temperature, and humidity. To guard against such injuries, personnel must wear appropriate clothing, have immediate access to warm shelter, carefully schedule work and rest periods, monitor workers' physical conditions, and learn to recognize warning symptoms, such as reduced coordination, drowsiness, impaired judgment, fatigue, and numbing of toes and fingers.

Frostbite

Frostbite is a localized injury that results from the freezing of tissue. It is most common to the fingers and toes (due to reduced circulation in the extremities), and on the face and ear (most commonly exposed to the weather).

For frostbite to occur, there must be subfreezing temperatures. It is most prevalent in very cold temperatures (20 F or less) or when cold temperatures are exacerbated by the wind (wind chill).

- *Symptoms*

  Prefrostbite
  The affected area feels painfully cold, but is usually flushed (rosy-red in color)

  First-Degree Frostbite (Frost Nip)
  Crystallization occurs in superficial tissues. The affected area no longer feels cold, is completely numb, and shows as a small white or grayish-yellow waxy patch. Immediate treatment will completely reverse the condition with no ill effects.

  Second-Degree Frostbite (Deep)
  A deep freezing of the fluids in the underlying soft tissues. Symptoms and treatment are the same as for first-degree frostbite. It usually results in the death of tissue (e.g., blistering black skin or a loss of toes) with possible complications from gangrene.

- *First Aid*

  Cover and protect the affected area.

  Provide extra clothes.

  Bring the victim indoors as soon as possible.

  Give the victim warm drink

  Rewarm frozen tissue quickly by immersing it in warm water (if thawed and refrozen, warm at room temperature).

  Do not rub; rubbing causes death of tissue.

  Do not apply heat.

  Do not break blisters.

  Do not allow victim to walk after feet thaw.

  Discontinue warming as soon as the frostbitten body part becomes flushed.

  Exercise the thawed body part.

  Separate fingers and toes with sterile gauze.

  Elevate frostbitten parts.

  Seek medical attention because of chance of infection or gangrene.

Hypothermia

Hypothermia is a systemic lowering of the body temperature. Extreme cases (core temperature below 90 F) result in death. Hypothermia is the most common cause of death for persons involved in outdoor/wilderness activities. It does not require freezing temperatures and can occur in ambient air temperatures as high as 70 F. Wind and wetness greatly accentuate hypothermia by causing increased cooling. An example of a hypothermic condition is a rainy, windy day with 50 F air temperatures.

- *Symptoms*

  First Stage: "goose bumps," shivering, feeling chilly

  Second Stage: violent shivering, blue lips, pale complexion, feeling extremely cold

  Third Stage: no longer feeling cold, lack of coordination, mild unresponsiveness, drowsiness, stumbling

  Fourth Stage: failing eyesight, almost total lack of responsiveness, inability to speak, inability to walk

  Fifth Stage: coma or rapid death

- *Treatment*

For all levels, remove wet, frozen, or restrictive clothing. Dry and rewarm the victim using an external heat source that completely envelops the victim (e.g., placing the victim in a warm vehicle, a warm room, a tub of warm water, or a sleeping bag with another person). Do not use a source of radiant heat that will warm only one side of the victim. Be prepared to administer cardiopulmonary resuscitation (CPR). Do not give the victim alcohol.

First Stage
Put additional clothing on the victim such as a hat, shirt, or windbreaker; give food and drink; exercise tense muscles.

Second Stage
Follow the same steps listed for the first stage, only more so; give warm drinks and provide means of rewarming if possible.

Third Stage
Rewarm the victim; give warm food and drink. **Note: In hypothermia beyond the second stage, the victim can no longer warm himself and must have an external heat source.**

Fourth Stage
Remove wet or cold clothing and gradually rewarm the victim so that blood trapped in extremities is rewarmed before it is circulated back into the inner body, in order to prevent *afterdrop*. Afterdrop is a further lowering of the body core temperature that results from recirculation of cold blood. Avoid hot, radiant heat sources that will warm surface blood before the inner blood has been warmed. Do not give warm drinks that can fool the body internally into feeling it is warm. Fourth stage hypothermia victims are best treated by supervised, experienced medical help because complications can cause death. Place the victim in a warm vehicle and evacuate immediately to a medical facility.

Fifth Stage
Gradually rewarm the victim. Requires sophisticated medical help to prevent death from *aftershock* (a recirculation of chilled blood causing heart fibrillation).