Supplemental Remedial Investigation Work Plan

Northern State Multi Service Center
Sedro-Woolley, Washington

Agreed Order No. DE 16309
Cleanup Site ID: 10048

Final

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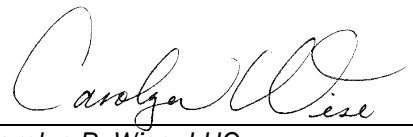
The material and data in this report were prepared under the supervision and direction of the undersigned.

Maul Foster & Alongi, Inc.



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Abbreviations

AO	Agreed Order No. DE 16309
AOC	area of concern
ARARs	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
City	City of Sedro-Woolley
COI	contaminant of interest
CSM	conceptual site model
CUL	cleanup level
cVOCs	chlorinated volatile organic compounds
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
HASP	health and safety plan
IDW	investigation-derived waste
MFA	Maul Foster & Alongi, Inc.
Mg/kg	milligrams per kilogram
MTCA	Model Toxics Control Act
NAVD88	North American Vertical Datum of 1988
PCE	tetrachloroethene
PLIA	Washington State Pollution Liability Insurance Agency
POC	point of compliance
Port	Port of Skagit
Property	2070 Northern State Road, Sedro-Woolley, Washington
RI	remedial investigation
SAP	sampling and analysis plan
SOP	standard operating procedure
Site	Northern State Multi Service Center
TCE	trichloroethene
WAC	Washington Administrative Code

1 Introduction

On behalf of the Port of Skagit (Port), Maul Foster & Alongi, Inc. (MFA) has prepared this supplemental remedial investigation (RI) work plan for the Northern State Multi Service Center (the Site). This Site is generally located at the Sedro-Woolley Innovation for Tomorrow Center (former Northern State Hospital) property at 2070 Northern State Road in Sedro-Woolley, Washington (the Property, see Figures 1-1). On July 1, 2018, the Port took title to the Property from the Washington State Department of Enterprise Services.

The Property is currently owned and managed by the Port, with buildings leased to multiple tenants, including the Cascade Job Corps, for on-site housing and educational services. A portion of the original 220-acre campus located to the south of the Property is owned by the Port and leased to the Washington Military Department, for a vehicle storage, maintenance, and fueling facility. Historically, the Property was used as a self-sustaining treatment and residence facility for people with mental illness, and included on-site patient and staff housing, a powerhouse, maintenance shops, a laundry, and a fueling station.

1.1 Regulatory Framework

This supplemental RI work plan describes additional assessment activities and the characterization of four of seven areas of concern (AOCs) identified at the Site. Additional information attained as part of the supplemental work will be included in the final RI report for the Site.

As of July 16, 2019, the Port entered Agreed Order No. DE 16309 (AO) with the Washington State Department of Ecology (Ecology) for remedial actions at the Site. Those actions include conducting the RI and a feasibility study, developing a draft cleanup action plan, and performing the interim actions at AOC 1 and AOC 4. The scope of this supplemental RI work was prepared consistent with the requirements outlined in Exhibit B of the AO. The Northern State Multi Service Center Site, as defined under the AO, is where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, or placed, or otherwise come to be located. This Site is listed in Ecology's contaminated sites database as Facility Site ID No. 65415931 and Cleanup Site ID No. 10048.

Washington State Pollution Liability Insurance Agency (PLIA) is currently overseeing assessment and cleanup activities associated with petroleum hydrocarbon releases at AOC 6 on the Site. The Site is listed in PLIA's Technical Assistance Program database as PNW087. AOC 6 is not included in the scope of this supplemental RI work but will be included in the RI report for the Site.

This supplemental RI work plan provides a scope of work for further assessment of environmental impacts associated with four AOCs (AOC 1, 4, 5, and 7) identified during previous environmental assessments at the Site (MFA 2014, 2015a,b, 2018, 2022; SES 2017). Supplemental RI activities will be conducted in general accordance with guidance put forth in the Model Toxics Control Act (MTCA) (Washington Administrative Code [WAC] 173-340, -350, and -360).

1.2 Purpose and Objectives

The purpose of this work plan is to generate data for further evaluation and characterization of environmental contamination associated with four AOCs (AOCs 1, 4, 5, and 7) identified on the Site sufficient for developing and evaluating potential cleanup actions for the Site. The activities outlined in this work plan are also intended to support the following specific project objectives:

- Develop data quality objectives for site characterization.
- Refine the conceptual site model (CSM) developed for the Site.
- Investigate hazardous substances in environmental media to identify potential sources of contamination and contaminant concentrations above MTCA cleanup levels (CULs).
- Evaluate potential risks to current and reasonably likely future human and ecological receptors.
- Obtain characterization data to support a feasibility study for the Site.
- Evaluate potential cleanup options for impacted environmental media at the Site.

1.3 Work Plan Organization

The following sections of this document are organized as follows:

- Section 2 discusses background information, including the Property history, previous investigations, the physical setting, and the AOCs identified at the Site during previous investigations.
- Section 3 discusses proposed cleanup standards, based on the CSM developed as part of the draft RI report (MFA 2022).
- Section 4 discusses the scope of work including the investigation approach, proposed field activities, laboratory analyses, and the inadvertent discovery plan.
- *Section 5* discusses the project management plan including key personnel and the proposed schedule.

This work plan defines the environmental investigation approach for meeting the project purpose and objectives defined in Section 1.2. The investigation will include collection and analysis of soil and groundwater samples from temporary sampling locations and/or monitoring wells to further delineate the extents of contaminants of interest (COI) in soil and groundwater at locations identified during previous RI activities and to assess transport pathways of COIs at the Site.

Standard field operating procedures for collecting soil and groundwater samples, installation of monitoring wells, scheduling analyses, decontaminating equipment, and managing investigation-derived waste (IDW) are described in the sampling and analysis plan (SAP) provided in Appendix A. The SAP also defines the laboratory and field analytical quality procedures and the quality assurance and quality control (QA/QC) requirements for sampling and analysis. A health and safety plan (HASP) specific to the activities described in this work plan is provided as Appendix B. A geologic cross section for the Site is provided in Appendix C. The inadvertent discovery plan is provided in Appendix D.

2 Background

A summarized description of the Property, the Property's history, the physical setting, and AOCs at the Site is provided below. Additional detail on these sections is provided in the prior RI work plan and draft RI report (MFA 2021b, 2022).

2.1 Property Description

The approximately 220-acre Property includes twelve tax parcels in the northeast corner of Sedro-Woolley (see Figure 1-1) in sections 7, 8, 17, and 18 of township 35 north and range 5 east of the Willamette Meridian. The Property is bordered to the west by Fruitdale Road and residential properties, as well as by the Northern State Recreation Area, a public open space owned and managed by Skagit County, to the north east and south.

The Property was developed in 1909 and operated as a treatment and residence facility and hospital for people with mental illness until its closure in 1973. The Northern State Hospital was designed to be self-sustaining and included on-site patient and staff housing, dedicated water supply reservoirs and an associated potable water treatment facility, a fueling station for on-site vehicles, maintenance and paint shops, and a laundry facility.

Several buildings have been demolished and based on interviews with maintenance staff, the debris from a few of those buildings has been buried and/or disposed of on the Property (MFA 2014, 2015b, 2018). Currently, the Property currently comprises over 80 buildings and structures. Some buildings are occupied by tenants, including the Cascade Job Corps, but the majority are vacant. The Cascade Job Corps uses some buildings for on-site housing and educational services. Many of the remaining buildings and structures associated with the former facility, as well as the campus landscape, are listed on the National Registry of Historic Places.

2.2 Physical Setting

2.2.1 Topography

The Site is located on a slight topographic plateau to the north of the Skagit Valley and is in the Lower Skagit-Samish watershed. In general, the Site slopes south and southeast toward the Skagit Valley and the Skagit River (Water Resource Inventory Area No. 3). Goat Hill, located in the northwest corner of the Site, includes the highest point of elevation at the Site (approximately 314 feet North American Vertical Datum of 1988 [NAVD88]). The lowest elevation point lies along the southern boundary of the Site at approximately 104 feet NAVD88.

2.2.2 Surface Water

Three creeks, Hansen, Brickyard, and an unnamed creek, intersect the Site (see Figure 1-1). Hansen Creek bounds the north, east, and southeast portions of the Site. Brickyard Creek is located along the western perimeter of the Site. Unnamed Creek is located near the southern perimeter of the Site prior to discharging to Brickyard Creek. All creeks discharge to the Skagit River south of the Site.

2.2.3 Geology

A geologic cross section for the northern end of the Site is provided in Appendix C.

According to the Geologic Map of the Sedro-Woolley North and Lyman 7.5-minute quadrangles, the Site and vicinity are underlain by Quaternary glaciomarine drift (Dragovich et al. 1999). Geologic cross sections of the surrounding area show approximately horizontally oriented, 100- to 130-foot-thick deposits of Quaternary glaciomarine drift in the vicinity of the Site thickening to between 140 and 150 feet thick below the Site.

Shallow soil below the Site generally consists of thick units of nonplastic silt and clay with varying amounts of fine sand to a depth of 9 to 15 feet below ground surface underlain by thick deposits of bluish gray silty clay to clay to approximately 25 feet below ground surface (bgs) with underlying silty sand. Minor lenses of silty sand and silty or sandy have been encountered intermittently within these silts and clays between 10 and 30 feet bgs. Near Hansen Creek north of the Power House, the surface silts are underlain by sandy and gravelly soils. Fill containing brick pieces, terracotta, woody debris, and occasionally coal fragments have been intermittently observed in borings near the Power House and Former Laundry Building (MFA 2015a,b, 2018; SES 2017).

2.2.4 Hydrogeology

Water levels measured on May 17, 2021, from nine monitoring wells on the Site indicated that groundwater was present between approximately 3.7 and 17.4 feet bgs (MFA 2022). Groundwater across the northern portion of the Site was determined to flow northeast-east-southeast toward Hansen Creek, with a southern component of flow observed from the central portion of the Site toward the Skagit River Valley (MFA 2015b, 2018, 2022; SES 2017). Groundwater in other areas of the Site is inferred to flow either southeast, because of the gradual topographic slope of the area toward the Skagit River Valley; west toward Brickyard Creek; or east toward Hansen Creek, depending on the location at the Site.

2.3 Areas of Concern

During previous investigations, several features of concern were identified and grouped into the seven AOCs outlined below (MFA 2014, 2015, 2018, 2022; SES 2017). A description of the four AOCs (AOCs 1, 4, 5, and 7) that will be further evaluated under this work plan are summarized below. All AOCs at the Site are described in greater detail in the RI work plan (MFA 2017) and the draft RI report (MFA 2022).

2.3.1 AOC 1: Former Laundry Building

The chlorinated solvents (chlorinated volatile organic compounds [cVOCs]) tetrachloroethene (PCE), trichloroethene (TCE), and cis-1,2-dichloroethene, were detected in soil, groundwater, and/or soil vapor in and adjacent to the northern portion of the former laundry building (see Figure 1-1) (MFA 2018, 2022). Historical use of chlorinated solvents in potential dry-cleaning operations has been identified as the potential source of cVOC impacts in the former laundry building AOC. Based on the data collected to date, the source of cVOCs appears primarily localized to the northern portion of the building.

The former laundry building is currently in use by the Cascade Job Corps for students learning computer-based skills (i.e., information technology). The indoor air samples in the former laundry building were non-detect for PCE and TCE, indicating that there are no immediate risks of exposure; however, concentrations of PCE and TCE below the slab of the building have potential to impact indoor air concentrations if the slab condition were compromised in the future. Therefore, an interim remedial action was implemented with the installation of an active sub-slab depressurization system in late 2022/early 2023. Activities completed during the interim remedial action in AOC 1 will be described in a forthcoming completion report.

Soil and groundwater impacts associated with this AOC within the former laundry building will be further assessed as part of this work plan, as discussed in Section 4.

2.3.2 AOC 4: Arsenic in Soil

Localized, elevated concentrations of arsenic in soil have been identified in the athletic field and former Ward building area at the Site (MFA 2018, 2022). Additional investigations on the Site have identified lead concentrations in shallow soil in the athletic field that have since been integrated into the description of AOC 4.

The athletic field and former Ward building area are open fields with a high potential for direct contact with surface soil. Between October and November 2021, elevated concentrations of lead in the athletic field and arsenic in the former Ward building area were excavated as part of an interim remedial action to mitigate direct-contact exposure risk for occupants of the Site (MFA 2021a). The final limits of the excavations included confirmation samples documenting the removal of elevated arsenic and lead concentrations. Activities completed during the interim remedial action in AOC 4 will be described in a forthcoming completion report.

Potential groundwater impacts associated with leaching of elevated concentrations of arsenic and lead in shallow soil will be further assessed as part of this work plan, as discussed in Section 4.

2.3.3 AOC 5: Property-Wide Metals in Soil

Arsenic, lead, barium, cadmium, chromium, copper, mercury, selenium, silver, and zinc have been detected in surface and subsurface soil throughout the Site. Some metals were detected at concentrations exceeding Washington State default background values for the region and/or above default MTCA criteria protective of ecological receptors (MFA 2018, 2022).

During the Phase II Environmental Site Assessment investigation, eighteen decision units were used to further investigate site-specific conditions and evaluate the distribution of metals in shallow soil (i.e., up to 0.5 feet bgs) across the Site using the incremental sampling methodology (DU01 through DU18, see Figure 2-1). Additional supplemental sampling within DU02, DU11, and DU14 was completed in 2021 to further assess the potential effects to terrestrial ecological receptors in these areas of the Site.

Localized areas of shallow soil with elevated concentrations of copper, zinc, or chromium relative to other portions of the site will be further assessed for the soil-to-groundwater leaching pathway as part of this work plan, as discussed in Section 4, due to their proximity to Hansen Creek.

2.3.4 AOC 7: Lead and Arsenic in Groundwater

During previous investigations, total and dissolved arsenic and lead were detected in samples from reconnaissance groundwater borings and monitoring wells, installed across the northeastern portion of the Site, at concentrations above MTCA Method A CULs and/or surface water criteria.

Given the proximity of elevated arsenic and/or lead concentrations to Hansen Creek, there is potential for groundwater to impact surface water within the creek. To delineate the lateral extent of groundwater contamination and its potential to impact Hansen Creek surface water, groundwater in this AOC will be further assessed during this work plan, as discussed in Section 4.

3 Proposed Cleanup Standards

The proposed cleanup standards for the Site were developed based on the CSM presented the draft RI and data collected to date (MFA 2022). The CSM and proposed cleanup standards will be reevaluated based on additional data collected under this work plan.

Preliminary CULs are provided in Tables 3-1 to 3-2 for the COIs proposed for additional investigation in this work plan, a comprehensive summary of CULs will be included in the RI report for all COIs for the Site.

3.1 Proposed Cleanup Levels

3.1.1 Soil

For human health screening, soil will be screened against the lowest of the MTCA Method B CULs for protection of human health via the direct-contact or ingestion pathways and protection of surface water via the soil-leaching-to-groundwater pathway for unsaturated soil and saturated soil, respectively. For constituents where MTCA Method B CULs are not available, Method A CULs for unrestricted land use will be applied—consistent with Ecology's guidance for mixing methods (Ecology 2022). Site-specific background values and practical quantitation limits will also inform screening criteria.

For terrestrial ecological screening, natural background concentrations and site-specific ecological screening levels were developed in the draft RI report (MFA 2022). This ecological screening was conducted in accordance with terrestrial ecological evaluation guidance presented in WAC 173-340-7493. The lowest applicable ecological indicator concentration for those applicable analytes are provided for preliminary screening (see Table 3-1).

Soil CULs for the protection of potable groundwater (leaching-to-groundwater pathway) are not currently recommended as CULs for soil on the Site. These criteria are developed to be protective of soil leaching-to-potable groundwater and are helpful in providing an initial screening of soil data to assess potential for impacts to groundwater; however, empirical groundwater data are available at the Site. Therefore, groundwater data collected on the Site are used to evaluate conditions protective of potable groundwater. Potable water for the Property is provided by the Skagit Public Utility District.

3.1.2 Groundwater

Groundwater will be screened to MTCA Method B CULs and Applicable or Relevant and Appropriate Requirements (ARARs) for freshwater surface water. For certain constituents, MTCA Method B CULs are not available and Method A CULs will be applied. For constituents where MTCA Method B CULs are not available, Method A CULs for unrestricted land use will be applied—consistent with Ecology's guidance for mixing methods (Ecology 2022). The minimum concentration of the state and federal aquatic life and human health freshwater water quality standards will be used as the surface water ARAR for preliminary screening (see Table 3-2). Site-specific background values developed for constituents and practical quantitation limits will also be used to inform screening values.

Potable water for the Property is provided by the Skagit Public Utility District. There are no known drinking water supply wells on the Property.

3.2 Proposed Points of Compliance

3.2.1 Soil

The soil point of compliance (POC) is the depth at which soil CULs shall be attained. The standard POC in soil for human direct contact is from the surface to 15 feet bgs throughout the entire Site. The standard POC in soil for ecological receptors is from the surface to 15 feet bgs. The standard POC is applied to soil on the Site.

3.2.2 Groundwater

For groundwater, the POC is the point or points where the groundwater CULs must be attained for a site to comply with the cleanup standards. Groundwater CULs shall be attained in all groundwater from the POC to the outer boundary of the hazardous-substance plume. A conditional POC may be established if it is not practicable to meet the CULs throughout the site within a reasonable restoration time frame (WAC 173-340-720(8)(c)). A conditional POC for groundwater is not proposed at this time.

4 Scope of Work

This section outlines MFA's proposed scope of work in the AOCs identified in Section 2 to further evaluate environmental conditions to complete the remedial investigation.

4.1 Investigation Approach

MFA's proposed sampling locations are shown in Figures 4-1 through 4-3, and sampling and analytical details are summarized in Table 4-1. Investigation details and supporting documentation for each AOC are discussed below.

4.1.1 AOC 1: Former Laundry Building

Detections of cVOCs were identified in soil, groundwater, and sub-slab soil gas in and adjacent to the northern portion of the former laundry building during previous investigations (MFA 2022).

Soil samples were previously collected in three locations in AOC 1 (GP23, MW09, and MW10, see Figure 4-1) with PCE and TCE detected above screening levels at MW10 to the east of the former laundry building (MFA 2018). Likewise, PCE and TCE were detected in groundwater samples collected from GP8 and MW10 with PCE exceeding the screening level in both samples. Additional soil and groundwater sampling in the vicinity of MW10 is proposed for use in the evaluation of cleanup action alternatives in the feasibility study and to determine potential for vapor intrusion risk to nearby buildings.

Four borings (GP62 through GP65, see Figure 4-1) will be advanced using direct push drilling to further delineate the lateral extent of cVOC impacts to soil. Up to two samples will be collected from vadose zone soil in each boring. Borings GP62 and GP63 will be advanced to a maximum of 15 feet bgs. Borings GP64 and GP65 will be advanced to a maximum of 30 feet bgs. Soil sample depths will be determined using field screening and/or lithologic observations. If field observations do not suggest a discrete sampling depth, soil samples will be collected at a similar depth to known contamination at nearby previous boring locations.

Reconnaissance groundwater samples will be collected from GP64 and GP65 borings to assess the lateral extent of cVOC migration at depths where cVOCs were previously observed (i.e., 25–30 feet bgs at MW10). GP64 and GP65 will be located to the east/southeast in the downgradient direction of groundwater flow identified in previous investigations at the Site (see Figures 4-4 and 4-5). The screened interval of the temporary wells at GP64 and GP65 will target the potentially partially confined water-bearing zone in which MW10 was screened (a silty sand and sandy silt unit underlying a silt at a deeper interval than surrounding wells) which at a deeper interval then surrounding wells.

To assess if cVOCs are migrating to deeper water-bearing zones and to determine the vertical extent of cVOC concentrations in this AOC, a new monitoring well (MW12) will be installed adjacent to MW10 (see Figure 4-1). The screened interval of this monitoring well will target a deeper water-bearing zone (if present) than the silty sand or sandy silt water-bearing zone screened at MW10. The boring for this proposed monitoring well will be advanced to a maximum depth of 50 feet bgs. If bedrock is encountered prior to the anticipated total depth, the screen will be set as close to the top of the competent bedrock as practical. A groundwater sample will be collected from this deep monitoring well and analyzed for cVOCs for comparison to the preliminary CULs described in Section 3 above.

An evaluation of preferential pathways for vapor migration (e.g., utility maps) to the east of the former laundry building will be included in the RI. This will inform potential preferential pathways for soil vapor migration and help ensure that vapor intrusion risk from vadose zone soil to adjacent buildings is incorporated in the feasibility study evaluation.

4.1.2 AOC 4: Athletic Field Area

Lead was detected in the athletic field area with the highest concentrations detected at 900 milligrams per kilogram (mg/kg) in the shallow soil sample from GP16 (MFA 2022). This concentration is above the site-specific background concentration of 53 mg/kg and the MTCA Method B concentration protective of the leaching pathway to groundwater and surface water for

vadose soil of 500 mg/kg. Elevated concentrations of lead in the athletic field area soil were excavated as part of the 2021 interim remedial action to mitigate direct-contact exposure risk for occupants of the Property (MFA 2021a); however, groundwater in this area has not been analyzed for lead. Therefore, additional sampling is proposed to evaluate the soil-to-groundwater leaching pathway for lead in this localized area to inform the feasibility study.

One direct-push boring (GP70) will be advanced in the vicinity of GP16 to 20 feet bgs for collection of reconnaissance groundwater sample (see Figure 4-1). A pre-packed temporary well screen will be used during reconnaissance groundwater sampling to reduce likelihood of increased turbidity during sampling. The groundwater sample will be analyzed for total and dissolved lead for comparison to the preliminary CULs described in Section 3 above to inform the nature and extent of lead concentrations in groundwater within this AOC.

4.1.3 AOC 4: Ward Building Area

Arsenic was detected in shallow soil at concentrations up to 71 mg/kg at GP36 in the former Ward Building area (MFA 2022). This concentration is above the site-specific background concentration of 18.9 mg/kg and the MTCA Method B concentration for the leaching-to-groundwater pathway protective of surface water of 2.9 mg/kg. Elevated concentrations of arsenic in soil in the former Ward building area were excavated as part of the 2021 interim remedial action to mitigate direct-contact exposure risk for occupants of the Property (MFA 2021a); however, groundwater samples have not been collected in this area for arsenic analysis. Therefore, additional sampling is proposed to evaluate the soil-to-groundwater leaching pathway for arsenic in this localized area to inform the feasibility study.

One direct-push boring (GP71) will be advanced in the vicinity of GP36 to 20 feet bgs for collection of reconnaissance groundwater (see Figure 4-2). A pre-packed temporary well screen will be used during reconnaissance groundwater sampling to reduce likelihood of increased turbidity during sampling. The groundwater sample will be analyzed for total and dissolved arsenic for comparison to MTCA B CULs and federal or state ARARs or site specific background value developed for the RI (whichever is higher) to inform the nature and extent of arsenic concentrations in this AOC.

4.1.4 AOC 5: Chromium in Soil

Concentrations of chromium were detected above the site-specific background concentration of 101 mg/kg in shallow soil in two decision units along the eastern boundary of the Site near Hansen Creek (DU11 and DU14, see Figure 2-1). Given the proximity to Hansen Creek, additional assessment is proposed to evaluate the potential for leaching from soil to groundwater to the nearby creek.

One direct-push boring (GP66) will be advanced to a depth of 15 feet bgs in the vicinity of SS70, a surface soil sample with elevated chromium concentration nearest to Hansen Creek (see Figure 4-3). If groundwater is not encountered at 15 feet bgs, the boring will be advanced until sufficient groundwater is available for sampling. A saturated soil sample will be collected at this boring and screened against the higher value of the site-specific background or the soil protective of groundwater to fresh surface water criteria for saturated soil.

In addition, a reconnaissance groundwater sample will be collected at this boring location and held for analysis pending the results of the saturated soil sample. A pre-packed temporary well screen will be used during reconnaissance groundwater sampling to reduce likelihood of increased turbidity during sampling. If the saturated soil sample exceeds screening criteria, the groundwater sample will

be analyzed for total and dissolved chromium for comparison to the MTCA B CULs and federal or state ARARs. The results of the saturated soil sample and reconnaissance groundwater sample (if analyzed) will be used to inform the nature and extent of chromium in this AOC.

4.1.5 AOC 5: Zinc and Copper in Soil

Shallow soil concentrations of zinc and copper were detected above the site-specific background concentrations of 179 and 76.1 mg/kg, respectively, in DU02 north of the Power House (see Figure 2-1). The highest concentration of zinc was detected in surface soil at 455 mg/kg at SS113 and the highest concentration of copper was detected in surface soil at 1050 mg/kg at SS38 (see Figure 4-3) (MFA 2022). Given the proximity of these zinc and copper concentrations to Hansen Creek, additional assessment is proposed to evaluate the potential for leaching from soil to groundwater to the nearby creek.

Zinc

One direct-push boring (GP67) will be advanced to a depth of 15 feet bgs in the vicinity of the surface soil sample SS113 (see Figures 4-1 and 4-3). A saturated soil sample will be collected for zinc analysis at this boring and screened against the higher value of the site-specific background value or the soil protective of groundwater to fresh surface water criteria for saturated soil.

Additionally, a groundwater will be collected from the proposed monitoring well MW13 (see Section 4.1.6 below). This monitoring well is positioned downgradient of the localized elevated zinc concentrations and near Hansen Creek. The groundwater sample will be held for analysis pending the results of the saturated soil sample. If the saturated soil sample zinc concentration exceeds the preliminary screening criteria described above, the groundwater sample will be analyzed for total and dissolved zinc. The results of the saturated soil sample and reconnaissance groundwater sample (if analyzed) will be used to inform the nature and extent of zinc in this AOC.

Copper

One direct push boring (GP68) will be advanced to a depth of 20 feet bgs in the vicinity of SS38 for the collection of a saturated soil sample for analysis of copper (Figure 4-1). A saturated soil sample will be collected for copper analysis at this boring and screened relative to the site-specific background value or the soil protective of groundwater to fresh surface water criteria for saturated soil (whichever is higher).

In addition, a groundwater sample will be collected from the nearby monitoring well MW01. The groundwater sample will be held for analysis pending the results of the saturated soil sample. If the saturated soil copper concentration exceeds the preliminary screening criteria described above, the groundwater sample will be analyzed for total and dissolved copper. The results of the saturated soil sample and reconnaissance groundwater sample (if analyzed) will be used to inform the nature and extent of copper in this AOC.

4.1.6 AOC 7: Arsenic in Groundwater

Prior investigations have identified concentrations of arsenic in groundwater near Hansen Creek above the site-specific natural background concentration criteria (MFA 2022). To delineate the lateral extent of groundwater with elevated arsenic concentrations near Hansen Creek, additional groundwater sampling is proposed near MW01 and GP18.

One monitoring well (MW13) will be installed northeast of the Power House in the vicinity of GP18 (see Figure 4-1) to evaluate the influence of suspended sediments on reconnaissance groundwater arsenic concentrations at this location and confirm the reconnaissance groundwater sample concentrations previously identified at GP18. The boring for this monitoring well will be advanced to a maximum depth of 20 feet bgs with the 5-foot-long monitoring well screen installed from 12 to 17 feet bgs, consistent with the collection depth at GP18. After installation and development, a groundwater sample will be collected for analysis of total and dissolved arsenic to inform the feasibility study assessment of this AOC.

One reconnaissance groundwater sample will be collected from a boring (GP69) northeast and downgradient of MW01, near Hansen Creek. There is a significant topographic depression to the north-northeast of MW01; therefore, access to this location will be attempted via a historical road grade along the southern boundary of the creek. The boring will be advance to a maximum depth of 15 feet bgs for collection of a reconnaissance groundwater sample to be analyzed for total and dissolved arsenic. A pre-packed temporary well screen will be used during reconnaissance groundwater sampling to reduce likelihood of increased turbidity during sampling. Prior to collecting groundwater samples at both proposed locations, attempts to reduce turbidity to below 10 NTUs will be made via low flow purging and minimal agitation of the water column.

4.2 Field Activities

MFA will coordinate with subcontractors, including a subsurface utility locator, driller, and analytical laboratory, to complete this scope of work. The SAP (see Appendix A) will guide environmental field sampling methods. A site-specific HASP for field activities specific to this scope of work is provided in Appendix B.

Before field activities begin, boring locations will be cleared for subsurface utilities by public utility locators (i.e., Underground Utility Notification Center). MFA will also coordinate with a private subsurface utility locator to locate subsurface utilities and structures (e.g., pipes).

MFA will coordinate with a licensed driller to provide drilling services; it is assumed that a standard track drilling rig will be able to access each proposed boring location. Borings will be advanced using direct-push drilling to depths up to 30 feet bgs, as described in the investigation approach above and in Table 4-1. Reconnaissance groundwater samples will be collected using low-flow methods from temporary borings (see Table 4-1). Boring locations are shown on Figure 4-1 through 4-3. Boring locations will be determined in the field using a handheld global positioning system device with submeter accuracy or by measurement from existing Site features.

Two monitoring wells are proposed for installation at the Site, as described in the investigation approach above. In AOC 1, MW12 will be advanced using sonic drilling to a maximum depth of 50 feet or until refusal. In AOC 7, MW13 will be advanced to a maximum depth of 20 feet bgs by direct push drilling.

During drilling monitoring wells and temporary borings, a description of soil conditions and visual and olfactory observations will be recorded on boring logs by a geologist or hydrogeologist licensed in the State of Washington, or by a person working under the direct supervision of a Washington-State-licensed geologist or hydrogeologist. Soil and groundwater observations and sample parameters will be recorded on field sampling data sheets.

Groundwater samples will be collected from reconnaissance and monitoring wells using low-flow sampling methods as described in SAP (Appendix A). The existing monitoring well to be sampled, MW01, will be redeveloped at least 24 hours prior to collection of groundwater samples as it has been over a year since groundwater samples were lasted collected. The newly installed monitoring wells, MW12 and MW13, will be developed after installation and at least 24 hours prior to sample collection.

After sample collection, temporary borings will be abandoned by filling with hydrated bentonite chips or with bentonite grout to the surround grade, in accordance with WAC 173-160.

Nondedicated sampling equipment will be decontaminated following the procedures in the SAP (Appendix A). All downhole drilling equipment will be pressure-washed with hot, potable water before and after each use. All IDW will be containerized in Washington State Department of Transportation-approved containers and properly labeled. MFA will coordinate IDW disposal with an approved subcontractor to transport and dispose of the IDW after proper characterization. In accordance with WAC 173-340-350(5)(g)(viii), documentation of proper IDW disposal will be included in the remedial investigation report described in Section 4.5.

4.3 Laboratory Analysis and Quality Assurance and Quality Control

Laboratory analyses will be completed consistent with the protocols described in the SAP (Appendix A). The SAP was designed to guide aspects of laboratory and field analytical quality procedures and QA/QC requirements for analytical sampling and analysis.

Soil and groundwater samples collected by MFA will be submitted under standard chain-of-custody procedures and will be analyzed for one or more of the following (see Table 4-1):

- Total and dissolved metals (arsenic, chromium, copper, lead, or zinc) by EPA Method 6020B.
- cVOCs by EPA Method 8260D, including:
  - 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, 1,1-Dichloroethane, 1,1-Dichloroethene, 1,2-Dichloroethane, cis-1,2-Dichloroethene, Tetrachloroethene, trans-1,2-Dichloroethene, Trichloroethene, and vinyl chloride

Groundwater samples collected for analysis of dissolved metals will be field filtered. Groundwater samples analyzed for total metals will not be field filtered.

4.4 Inadvertent Discovery Plan

Under the Washington State Governor's Executive Order 05-05, archaeological and cultural resources must be evaluated to satisfy federal regulations 36 CFR 800. RCW 27.44 (Indian Graves and Records) addresses the need to protect graves, cairns, and glyptic marks, and provides associated penalties, civil actions, and procedures. RCW 27.5 (Archaeological Sites and Resources) lays out the State of Washington's interest in protecting archaeological resources and establishes and empowers the Washington State Department of Archaeology and Historic Preservation to complete an inventory, conduct studies, make National Register of Historic Places nominations, and identify and excavate the "state's archaeological resources" (RCW 27.53.020). WAC 25-48 establishes procedures for implementing the permit sections of RCW 27.53. WAC 25-46 establishes

regulation procedures for historic archaeological resources on, in, or under aquatic lands owned by the state; RCW 79.105.600 deals with "archaeological activities" on state aquatic lands and addresses shoreline management (via RCW 79.105). RCW 42.56.300 exempts disclosure of the location of archaeological sites.

An IDP detailing procedures to ensure that cultural resources are identified if encountered during soil disturbing activity, and appropriate procedures in such an event, has been provided as Appendix C.

4.5 Reporting

The work completed under this work plan will be included in the RI report submitted to Ecology in accordance with the AO. Following preparation of the RI report, MFA will prepare a public review draft RI report after incorporating Ecology's comments on the initial draft and the RI report. Following public review and comment on the public review version, MFA will prepare the final RI report that incorporates any additional comments from Ecology and the public. MFA will provide documentation of the fieldwork, data validation and QA/QC, and evaluation of the analytical results, and will include recommendations for further assessment, if applicable.

5 Project Management Plan

5.1 Key Personnel

Heather Rogerson will be the project manager for the Port. Heather will be kept informed of the status of the project and of project activities. She will be provided with data, reports, and other project-related documents prepared by MFA before their submittal to Ecology. Heather will be responsible for communicating with the tenants on the Site, will participate in discussions with Ecology, and will coordinate on-site activities with the tenants and MFA.

Phil Wiescher will be the program manager for MFA and will be responsible for managing the overall completion of the site assessment and for communication of project status to the Port and Ecology project managers. Phil will review data, reports, and other project-related documents prepared by MFA before their submittal to the Port or Ecology. Phil will review the baseline human health and ecological risk screening. Phil will also assist project staff with technical issues.

Carolyn Wise will be the project manager for MFA. Carolyn will coordinate with project task leaders and will communicate with Heather and Port staff. She will be responsible for allocating the resources necessary to ensure that the objectives of the site assessment are met. Carolyn will also be responsible for technical assistance to assigned staff, as appropriate; assist with resolution of technical or logistical challenges that may be encountered during the investigation; assist with field activities and write and review reports; and participate in discussions with Ecology at the request of the Port.

Christian Sifford will be the field team leader for MFA. Christian will oversee and assist with field activities and will write and review reports.

Mary Benzinger will be the quality assurance manager, database manager, and project chemist for MFA. Mary and will be involved with the overall data management and data quality assurance oversight.

5.2 Schedule

The following is the anticipated schedule:

Task	Start Date	Weeks to Complete
Ecology work plan review	April 1, 2024 – May 1, 2024	4
Prepare final work plan	May 1, 2024 – May 15, 2024	2
Fieldwork	After receipt of Ecology's comments and approval of the final work plan. Timeframe includes fieldwork and laboratory analyses and appropriate follow-up analyses.	12
Draft remedial investigation report	After completion of fieldwork and receipt of final data packages	12
Final remedial investigation report	Within 45 days of receipt of Ecology and public comments on draft public review remedial investigation report.	6

The timeframes for the work to be performed may change, based on changes to the scope of work, and subject to subcontractor availability and Ecology approval.

References

Artifacts Consulting. 2008. *North Cascades Gateway Center (Northern State Hospital) cultural resources assessment for Washington State Department of General Administration.* Artifacts Consulting, Inc.: WA. February.

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SES. 2017. *Preliminary Planning Assessment*. Prepared for Pollution Liability Insurance Agency, Lacey, Washington. South Earth Strategies, Inc., Seattle, Washington. October 25.

Limitations

The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

Figures

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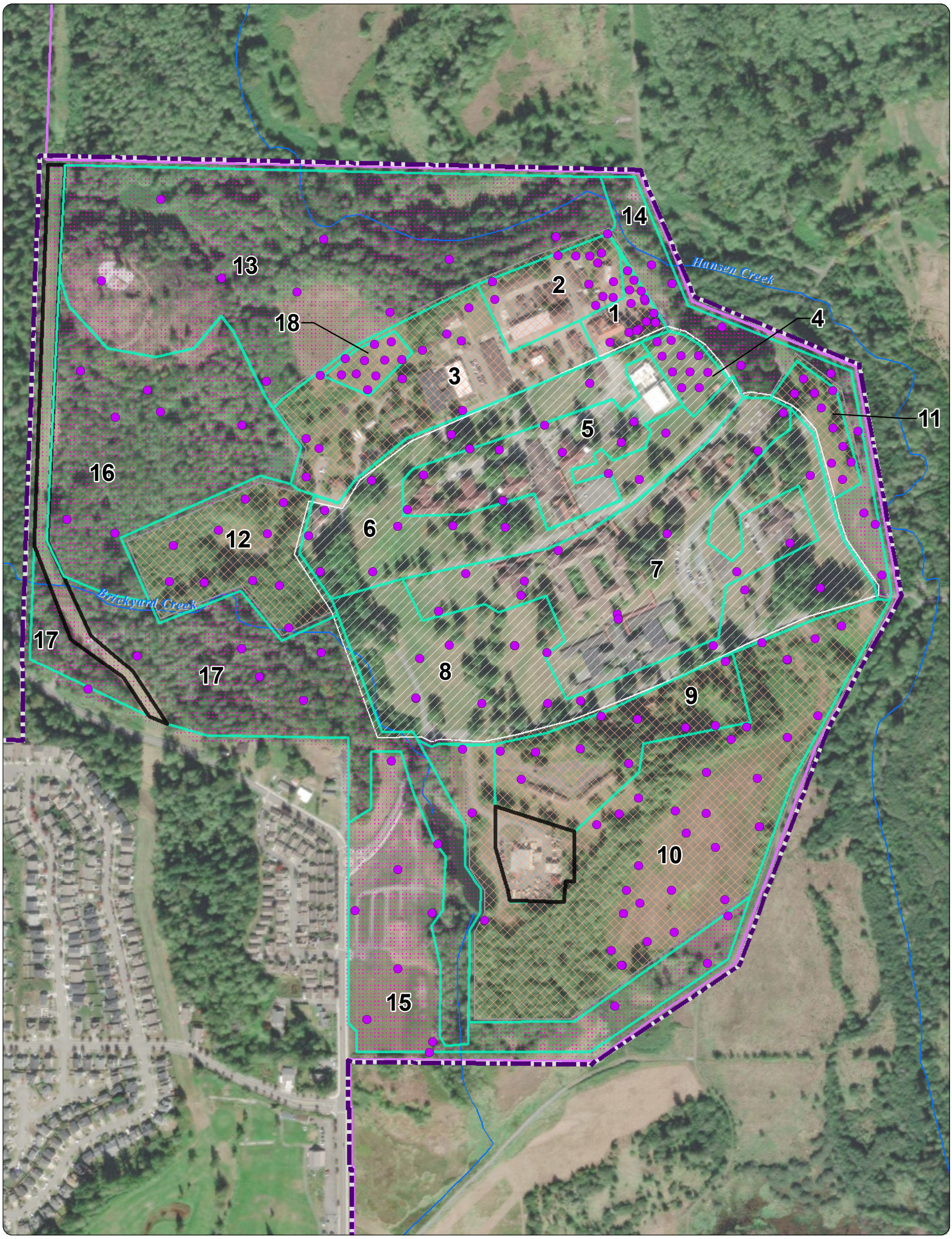
Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads and streams data sets obtained from Skagit County; city limits data set obtained from City of Sedro-Woolley.

Legend

- Property Parcel and Parcel Name
- Northern State Recreational Area
- Sedro-Woolley City Limits (Post Annexation)
- Stream

0 500 1,000
Feet

Figure 1-1
Property Vicinity
Former Northern State Hospital
Port of Skagit
Sedro-Woolley, Washington



NOTES:
GPS = global positioning system.
ISM = incremental sampling methodology.

Source: Aerial photograph obtained from Esri ArcGIS Online; parcels and roads and streams data sets obtained from Skagit County; city limits data set obtained from City of Sedro-Woolley.

Legend

- GPS Sample Point Location
- Sedro-Woolley City Limits (Post Annexation)
- Northern State Recreational Area
- Decision Unit Boundary with Identification No.
- Area Excluded from Soil Sampling
- Stream

Subarea Plan

- Core Area
- Influence Area
- Open Space

0 500 1,000
Feet

Figure 2-1
Metals in Soil
ISM Decision Units

Northern State Multi Service Center
Port of Skagit
Sedro-Woolley, Washington

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Approved By: cwise
Produced By: abixby
Project: M0624.04.018

Figure 4-1
Northern Discrete Sample Locations

Northern State Multi Service Center
Port of Skagit
Sedro-Woolley, Washington

Legend

Proposed Sample Locations
- Soil Boring
- Groundwater Boring
- Soil and Groundwater Boring
- Monitoring Well

Previous Sample Locations
- Soil Boring
- Groundwater Boring
- Soil and Groundwater Boring
- Monitoring Well
- Hand Auger (Approximate)
- Transformer Vault

0 50 100
Feet

Source: Aerial photograph obtained from Bing; streams dataset obtained from Skagit County; monitoring wells surveyed by Skagit Surveyors and Engineering.

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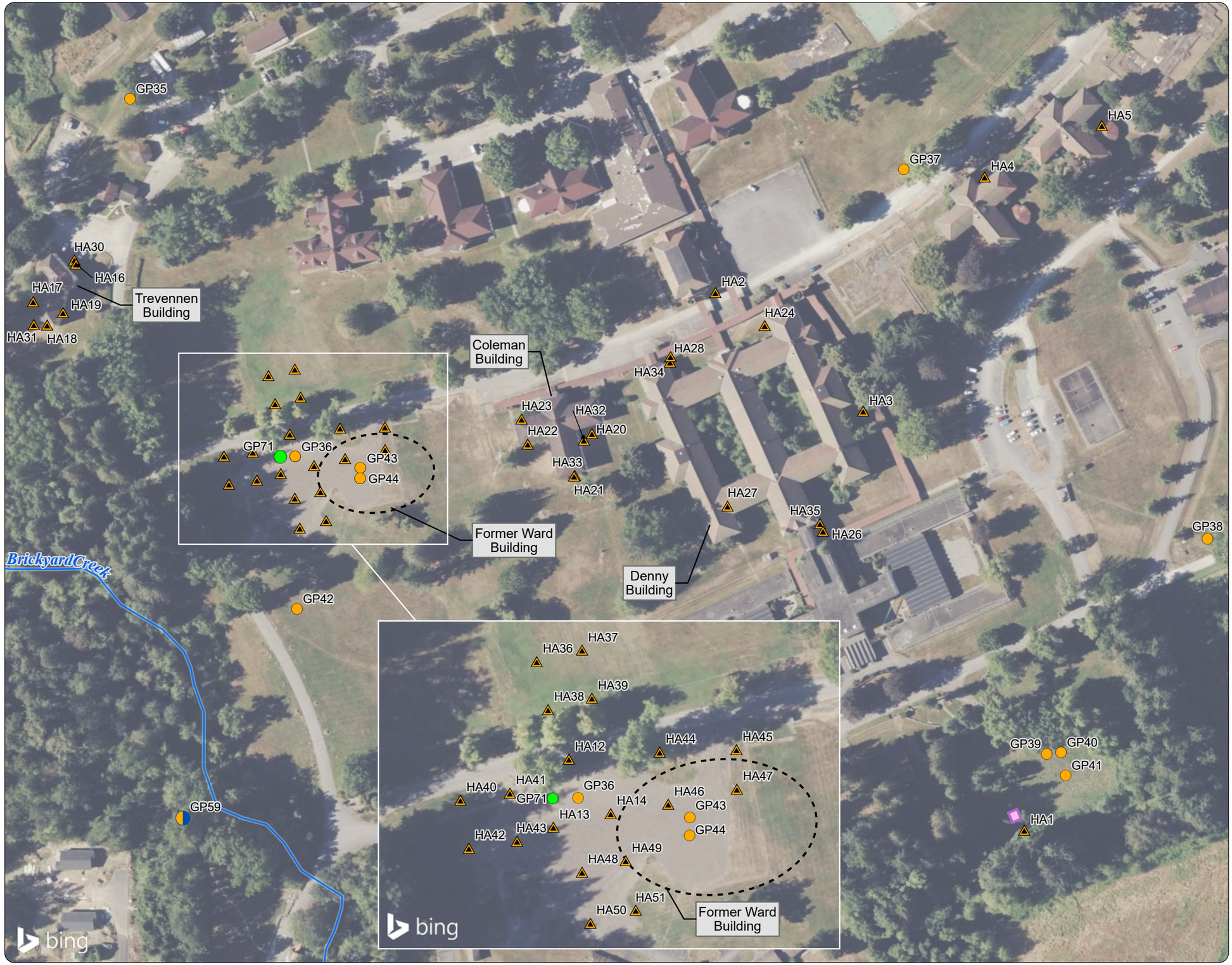
Print Date: 3/21/2024
Approved By: cwise
Produced By: gianavata
Project: 0624.04.18

Figure 4-2
Southern Discrete Sample Locations

Northern State Multi Service Center
Port of Skagit
Sedro-Woolley, Washington



Legend

Proposed Sample Locations
- Groundwater Boring

Previous Sample Locations
- Soil Boring
- Soil and Groundwater Boring
- Hand Auger
- Transformer Vault

0 100 200
Feet

Source: Aerial photograph obtained from Bing; streams dataset obtained from Skagit County.

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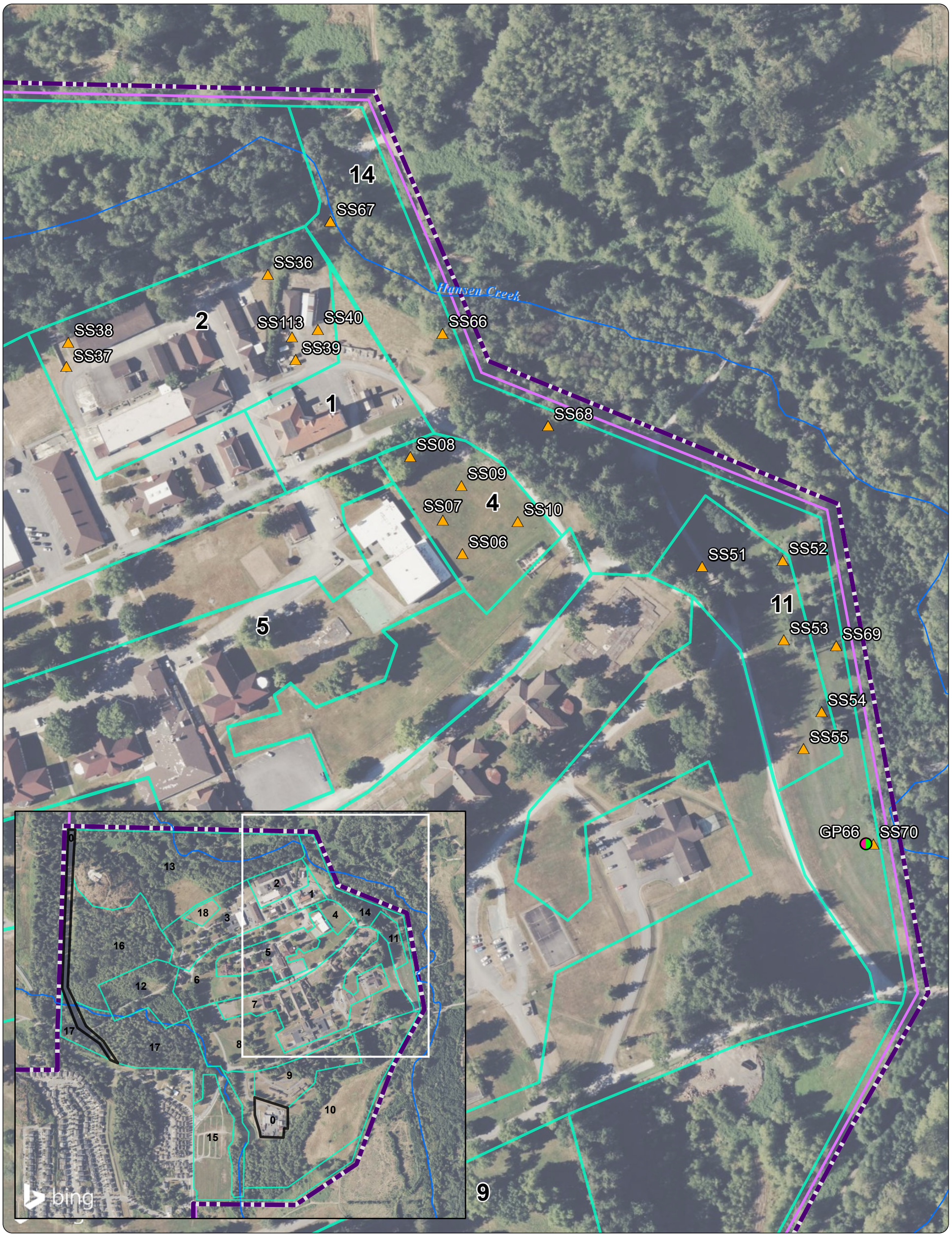

Note: AOC = area of concern.
Additional surface soil samples were collected in the vicinity of SS37, SS38, SS39, and SS40 are provided in the draft remedial investigation report (MFA 2022).

Source: Aerial photograph obtained from Bing; parcels and roads and streams datasets obtained from Skagit County; city limits dataset obtained from City of Sedro-Woolley.

Legend

- Previous Surface Soil Sample
- Proposed Soil and Groundwater Boring
- Area Excluded from Soil Sampling
- Decision Unit Boundary with Identification No.
- Sedro-Woolley City Limits
- Northern State Recreational Area
- Stream

Figure 4-3
AOC 5-Metals in Soil
Discrete Sample Locations

Northern State Multi Service Center
Port of Skagit
Sedro-Woolley, Washington

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0 250 500
Feet

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Approved By: cwise
Produced By: gjaravata
Project: 0624.04.18

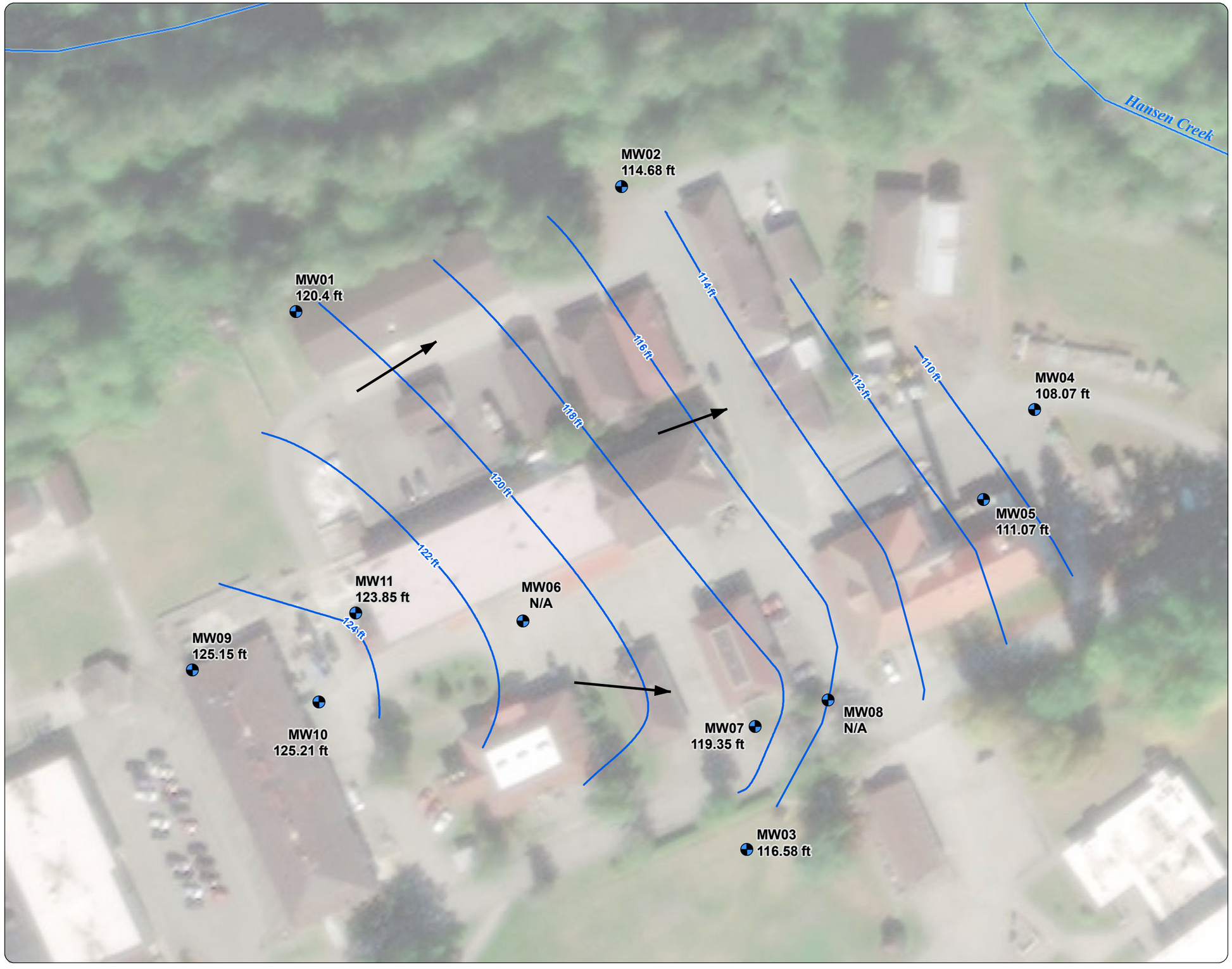

Figure 4-4
May 2018 Groundwater Elevation Contours

Northern State Multi Service Center
Port of Skagit
Sedro-Woolley, Washington

Legend

- Monitoring Well
- MW01 119.47 ft — Well ID and GW Elevation (NAVD 88)
- Groundwater Elevation Contour
- Groundwater Flow Direction

NOTES:
Water levels were collected on May 1, 2018.
ft. = feet.
GW = groundwater.
ID = identification.
N/A = not accessible; water level could not be collected.
NAVD 88 = North American Vertical Datum of 1988.

0 50 100
Feet

Source: Aerial photograph obtained from Esri ArcGIS Online; streams dataset obtained from Skagit County; monitoring wells surveyed by Skagit Surveyors and Engineers.

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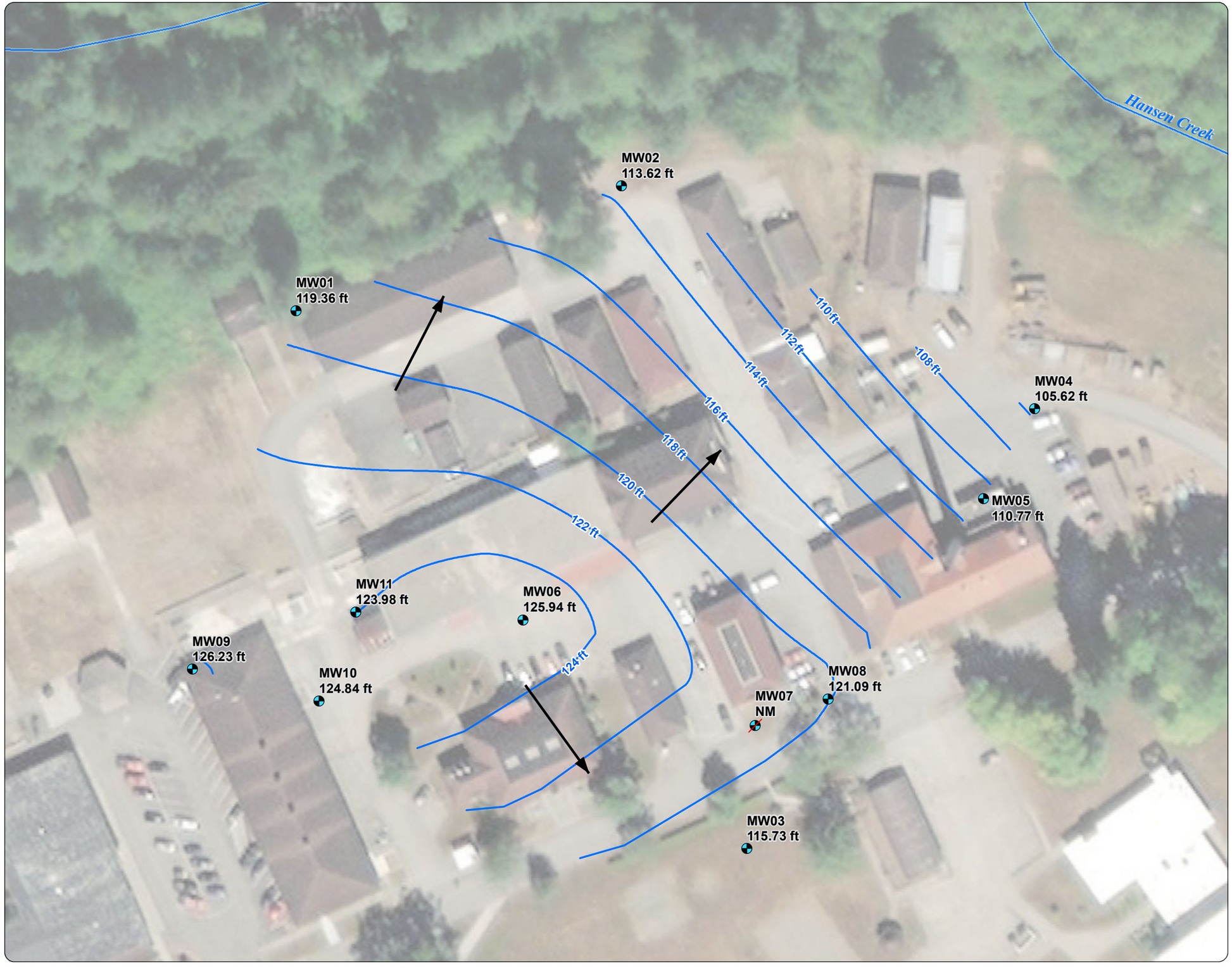

Figure 4-5
May 2021 Groundwater Elevation Contours

Northern State Multi Service Center
Port of Skagit
Sedro-Woolley, Washington

Legend

- Monitoring Well
- Decommissioned Monitoring Well
- MW01 119.36 ft — Well ID and GW Elevation
- Groundwater Elevation Contour
- Groundwater Flow Direction

NOTES:
Groundwater elevations are in NAVD 88.
Water levels were collected on May 17, 2021.
ft = feet.
ID = identification.
NAVD 88 = North American Vertical Datum of 1988. NM = not measured.

0 50 100
Feet

Source: Aerial photograph obtained from Esri ArcGIS Online; streams dataset obtained from Skagit County.

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Tables

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Table 3-1
Preliminary Soil Screening Levels
Northern State Multi Service Center
Sedro-Woolley, Washington

Analyte	MTCA A, Unrestricted Land Use[1]	MTCA B Direct Contact (cancer and noncancer)[1]	MTCA B Protection of Groundwater to Surface Water (freshwater; vadose and saturated)[1]	Lowest Applicable EIC[a]
Metals (mg/kg)				
Arsenic	20	0.67	0.15	18.9
Chromium	2,000[b]	120,000	74	101
Copper	NV	3,200	0.25	76.1
Lead	250	NV	25	118
Zinc	NV	24,000	6.2	179
cVOCs (mg/kg)				
1,1,1-Trichloroethane	2	160,000	4.2	260
1,1,2-Trichloroethane	NV	18	0.00013	28.6
1,1-Dichloroethane	NV	180	--	210
1,1-Dichloroethene	NV	4,000	--	11
1,2-Dichloroethane	NV	11	0.0029	0.85
cis-1,2-Dichloroethene	NV	160	--	24
Tetrachloroethene	0.05	480	--	0.18
trans-1,2-Dichloroethene	NV	1,600	--	24
Trichloroethene	0.03	12	--	42
Vinyl chloride	NV	0.67	--	0.12

Notes

-- = not applicable.

CUL = cleanup level.

cVOC = chlorinated volatile organic compound.

EIC = ecological indicator concentration.

EPA = U.S. Environmental Protection Agency.

mg/kg = milligrams per kilogram.

MTCA = Model Toxics Control Act.

NV = no value.

[a]Preliminary screening level selection provided in Draft Remedial Investigation Report[5], Appendix G, Table G-2.

[d]Value is for chromium III.

[c]Eco-SSL obtained from EPA's soil screening document.

References

[1]Ecology, Cleanup Levels and Risk Calculation (CLARC) table. February 2024. Available at https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC (accessed March 8, 2024)

[2]MFA. Site-specific natural background value. Maul Foster & Alongi, Inc. Bellingham, Washington. 2018.

[3]MTCA Table 749-3.

[4]EPA. *Interim Ecological Soil Screening Level Documents.* U.S. Environmental Protection Agency. September 8, 2021.

[3]MFA. 2022. Draft Remedial Investigation Report, Former Northern State Hospital, Sedro-Woolley, Washington. Prepared for Port of Skagit. Maul Foster & Alongi, Inc.: Bellingham, WA. June 9.

Table 3-2
Preliminary Groundwater Screening Levels
Northern State Multi Service Center
Sedro-Woolley, Washington

Analyte	MTCA A CUL[1]	MTCA B CUL[a][1]	Federal and State ARARs [1]	Site-Specific Natural Background[b][2]
Total and Dissolved Metals (ug/L)				
Arsenic	5	0.058	10	16.65/8.35[c]
Chromium[d]	100	24,000	100	--
Copper	NV	640	1300	--
Lead	15	NV	15	--
Zinc	NV	4800	5000	--
VOCs (ug/L)				
1,1,1-Trichloroethane	20	16000	20	**--**
1,1,2-Trichloroethane	NV	0.77	5	**--**
1,1-Dichloroethane	NV	7.7	NV	--
1,1-Dichloroethene	NV	400	7	--
1,2-Dichloroethane	5	0.48	5	--
cis-1,2-Dichloroethene	NV	16	70	--
Tetrachloroethene	5	21	5	--
trans-1,2-dichloroethene	NV	160	100	--
Trichloroethene	5	0.54	5	--
Vinyl chloride	0.2	0.029	2	--

Notes

Data are compared to the federal and state ARARs and MTCA B CULs. When a MTCA B value was not available, data were compared to the MTCA A CUL. Non-detect data are not compared to a CUL.

-- = not applicable.

ARARs = Applicable or Relevant and Appropriate Requirements.

CUL = cleanup level.

MTCA = Model Toxics Control Act.

NV = no value.

ug/L = micrograms per liter.

VOC = volatile organic compound.

[a]The lower of the Method B Cancer and Noncancer CULs is shown.

[b]Site-specific natural background value calculated nonparametric distribution in MTCA Stat program (see Appendix G of the Draft Remedial Investigation Report[3]).

[c]The calculation for a final screening level for arsenic is in process, and both the value calculated in the for the Draft Remedial Investigation Report[3] and the value provided by the Washington State Department of Ecology are provided for screening at this time to ensure reporting limits can be achieved.

[d]Value is for chromium III.

References

[1]Ecology, Cleanup Levels and Risk Calculation (CLARC) table. February 2024. Available at https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools/CLARC

[2]Washington State Department of Ecology. Online tools for cleaning up sites. https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Contamination-clean-up-tools.

[3]MFA. 2022. Draft Remedial Investigation Report, Former Northern State Hospital, Sedro-Woolley, Washington. Prepared for Port of Skagit. Maul Foster & Alongi, Inc.: Bellingham, WA. June 9.

Table 4-1
Proposed Supplemental Investigation Scope
Northern State Multi Service Center
Sedro-Woolley, Washington

AOC	Objective		Location Type	Location ID	Drilling Method	Total Depth	Sample Matrix	Number of samples	Sample Collection Depth/ Screened Interval (ft bgs)	Analytical Suite					
										cVOCs	Chromium	Copper	Zinc	Lead	Arsenic
1	To delineate extent of cVOC in vadose soil to the east of the laundry building		Boring	GP62	Direct Push	15	Soil	up to 2	Vadose Zone	X	--	--	--	--	--
			Boring	GP63	Direct Push	15	Soil	up to 2	Vadose Zone	X	--	--	--	--	--
	Deeper groundwater sampling to determine vertical extent of cVOCs in groundwater		Monitoring Well	MW12	Sonic	50	GW	1	base of WBZ or WBZ below deeper aquitard (if present)	X	--	--	--	--	--
	Define the lateral extent of cVOC concentrations in groundwater within same WBZ as MW10, and determine lateral extent of cVOC concentrations in vadose soil		Boring	GP64	Direct Push	30	Soil	up to 2	Vadose Zone	X	--	--	--	--	--
							GW	1	25-30	X	--	--	--	--	--
			Boring	GP65	Direct Push	30	Soil	up to 2	Vadose Zone	X	--	--	--	--	--
							GW	1	25-30	X	--	--	--	--	--
5	Soil-to GW pathway for chromium	Collection of saturated soil sample at SS70	Boring	GP66	Direct Push	15	Soil	1	Saturated Zone	--	X	--	--	--	--
		To determine chromium concentrations in groundwater					GW	1	10-15	--	O	--	--	--	--
	Soil-to GW pathway for zinc	Collection of saturated soil sample at SS113	Boring	GP67	Direct Push	15	Soil	1	Saturated Zone	--	--	--	X	--	--
		To determine zinc concentrations in groundwater	Monitoring Well	MW13	Direct Push	15	GW	1	12-17	--	--	--	O	--	--
	Soil-to GW pathway for copper	Collection of saturated soil sample at SS38	Boring	GP68	Direct Push	20	Soil	1	Saturated Zone	--	--	X	--	--	--
		To determine copper concentrations in groundwater	Monitoring Well	MW01	Existing Well	25	GW	1	20-25	--	--	O	--	--	--
4	To assess potential groundwater impacts from lead in shallow soil near GP16		Boring	GP70	Direct Push	20	GW	1	15-20	--	--	--	--	X	--
	To assess potential groundwater impacts from arsenic in shallow soil near GP36		Boring	GP71	Direct Push	20	GW	1	15-20	--	--	--	--	--	X
7	Arsenic in groundwater north/northeast of MW01		Boring	GP69	Direct Push	15	GW	1	10-15	--	--	--	--	--	X
	Arsenic in groundwater at GP18		Monitoring Well	MW13	Direct Push	20	GW	1	12-17	--	--	--	--	--	X

Table 4-1
Proposed Supplemental Investigation Scope
Northern State Multi Service Center
Sedro-Woolley, Washington

Notes

-- = analysis not performed.

AOC = area of concern.

cVOC = chlorinated volatile organic compound.

ft bgs = feet below ground surface.

GW = groundwater.

O = archive.

X = analyze.

WBZ = water-bearing zone.

Appendix A

Sampling and Analysis Plan

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Sampling and Analysis Plan

Northern State Multi Service Center
Sedro-Woolley, Washington

Agreed Order No. DE 16309
Cleanup Site ID: 10048

Final

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Abbreviations

AO	Agreed Order DE 16309
bgs	below ground surface
COC	Chain of Custody
cVOC	chlorinated volatile organic compounds
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FSDS	field sampling data sheet
IDW	investigation-derived waste
LCS	laboratory control samples
MFA	Maul Foster & Alongi, Inc.
MS/MSD	matrix spike and matrix spike duplicate
Port	Port of Skagit
Property	2070 Northern State Road, Sedro-Woolley, Washington
QA	quality assurance
QC	quality control
RI	remedial investigation
RPD	relative percent difference
SAP	sampling and analysis plan
Site	Northern State Multi Service Center
SOP	standard operating procedure

1 Introduction

This sampling and analysis plan (SAP) guides aspects of field sampling and laboratory analytical activities to be conducted as part of soil and groundwater sampling at the Northern State Multi Service Center (the Site; cleanup site ID 10048). This Site is located at the Sedro-Woolley Innovation for Tomorrow Center (former Northern State Hospital) property at 2070 Northern State Road in Sedro-Woolley, Washington (the Property, see Figure 1-1 of the supplemental remedial investigation (RI) work plan, to which this SAP is an appendix). This SAP was prepared by Maul Foster & Alongi, Inc. (MFA) consistent with the requirements of Washington Administrative Code 173-340-820 for SAPs.

1.1 Regulatory Framework

MFA prepared this SAP on behalf of Port of Skagit (the Port) to support the supporting the remedial investigation (RI) at the Site being conducted through Agreed Order DE 16309 (AO) between the Port and the Washington State Department of Ecology (Ecology).

1.2 Scope and Purpose

The purpose of this SAP is to describe the requirements for field sampling and laboratory analytical activities associated with the soil and groundwater sampling. This SAP supplements and is provided as Appendix A to the supplemental RI work plan, which provides Site-specific background information, summarizes areas of concern identified through prior investigations, discusses preliminary screening levels, and defines the scope of the soil and groundwater sampling.

If an unforeseen change in methodology requires modification to this SAP, an addendum describing the specific revision(s), or the alternative procedures used, will be prepared and documented in the RI report. Procedures are provided that will be used to direct the investigation process so that the following conditions are met:

- Data collected are of high quality, representative, and verifiable.
- Data can be used to support development and evaluation of cleanup options.

This SAP describes methods that will be used for sampling environmental media, decontaminating equipment, and managing investigation-derived waste (IDW). It also includes procedures for collecting, analyzing, evaluating, and reporting useful data. This SAP includes quality assurance (QA) procedures for field activities; quality control (QC) procedures; and data validation information.

1.3 Report Organization

This document is organized as follows:

- Section 2 describes access and site preparation for fieldwork.

- Section 3 presents soil sampling procedures to be followed during the environmental investigation.
- Section 4 presents groundwater monitoring procedures to be followed during the environmental investigation.
- Section 5 describes field procedures.
- Section 6 describes the chemicals of interest and the laboratory test methods.
- Section 7 describes the sample handling procedures.
- Section 8 presents field and laboratory QC practices.
- Section 9 summarizes the review processes to ensure data usability.
- Section 10 defines data quality objectives (DQO) specific to the environmental investigation.
- Section 11 summarizes the reporting objectives.

2 Access and Preparation

2.1 Access

The Port is the owner of the Property and will coordinate with MFA, tenants of the Property, and on-site personnel to provide access to perform the fieldwork described in this plan.

2.2 Preparation and Coordination

Before subsurface field sampling programs begin at the Site, public and private utility locates will be conducted to identify underground utilities and pipelines near the proposed sample locations. MFA will coordinate fieldwork with the Port to define the locations of possible utilities, piping, or other subsurface obstructions (see standard operating procedure [SOP] 18, Appendix A). MFA will notify the Port and Ecology a minimum of 48 hours before field activities begin. A contact list is provided as Table 2-1.

3 Soil Sampling

The proposed locations of soil samples are shown on Figures 4-1 through 4-3 of the supplemental RI work plan, to which this SAP is the appendix. Visual and olfactory observations will be noted during soil sample collection. If there is evidence of contaminant impacts in the field, the sample depths may be altered in order to collect samples in and/or beneath the impacted areas. Additional analyses may be recommended based on field observations.

3.1 Sampling Methodology

Subsurface soils will be collected from borings advanced with the direct-push drill rig or sonic rig operated by a Washington State-certified driller using industry-standard sampling techniques (see SOPs 02, 03, 04, and 07 in Appendix A). Borings will be advanced up to a maximum depth of 50 feet bgs as described in the Table 4-1 and the investigation approach section of the supplemental RI work plan, to which this SAP is an appendix. Soil conditions will be noted on field sampling data sheets (FSDSs; see Appendix B).

When a boring is no longer needed, it will be decommissioned with bentonite chips or with bentonite grout in accordance with the Washington Administrative Code for Minimum Standards for Construction and Maintenance of Wells (Washington Administrative Code 173-160, 1998).

Soil samples will be collected for lithologic description, field screening, and chemical analyses, as described below. The anticipated sampling intervals, depths, and initial sample analysis schedule are specified in Table 4-1 of the supplemental RI work plan. Soil sample material will be collected throughout the soil column, observed for visual or olfactory indications of contamination, and screened for volatiles with a photoionization detector. More than one soil sample may be submitted per sample location, based upon observed impacts.

Samples will be prepared, handled, and documented as follows:

- Soil-sampling equipment will be decontaminated before it is used at each sampling location (see Section 5.1 and SOP 01 [Appendix A]).
- Soil samples will be transferred directly from the sampling device into laboratory-supplied glass jars by hand, using a new, uncontaminated glove; or with a decontaminated stainless-steel spoon, trowel, or knife; or with a laboratory supplied sampling device if applicable for the analysis.
- Large particles (i.e., larger than 0.25 inch) may be removed before the sample is placed in a laboratory-supplied container.
- Sample containers will be labeled, packed in iced shipping containers with chain-of-custody (COC) documentation, and delivered or shipped to the laboratory (see Section 7).
- Sampling information will be recorded in the field notebook, on the geologic boring log (see Appendix B) and on the COC form.

3.2 Sample Nomenclature

Soil samples will be labeled with a prefix to describe the location identification number, an “S” to indicate a soil sample matrix, and the sample depth in feet below ground surface (bgs). The depth interval should be specified as the middle of the sampling interval. For example, a soil sample collected from location GP62 with a sampling interval from 9 to 10 feet bgs will have the sample nomenclature of GP62-S-9.5.

Duplicate soil samples will replace the location number with “DUP,” and the sample will have the same sample time as the primary sample. A duplicate sample of the abovementioned sample would appear as GPDUP-S-9.5.

Relevant soil sample information will be documented on a soil FSDSs (see Appendix B).

4 Groundwater Sampling

4.1 Sampling Methodology

Reconnaissance groundwater samples will be collected from borings advanced with the direct-push drill rig consistent with industry-standard techniques (see SOP 07 in Appendix A). Reconnaissance groundwater samples will be collected using a temporary polyvinyl chloride well screen and riser in conjunction with a peristaltic pump and dedicated polyethylene tubing (see SOP 09 in Appendix A).

In addition to the collection of reconnaissance groundwater samples from temporary wells, groundwater samples will also be collected from monitoring wells at the Site. Groundwater samples will not be collected from well within 24 hours of a well's development or redevelopment. Field staff will follow the well development procedures described in SOP 12 (Appendix A). New monitoring wells will be installed following SOP 11 for installation of monitoring wells and the WAC for Minimum Standards for Construction and Maintenance of Wells (WAC 173-160).

Before collecting groundwater samples from temporary wells or monitoring wells, the water level will be measured (see SOP 13 in Appendix A), and the well will be purged. The well should be purged at a low flow rate (e.g., 0.1 to 0.5 liter per minute). A minimum of one well volume will be purged before sample collection, or purging will continue until selected water quality field parameters (e.g., temperature, specific conductance, pH, turbidity) have stabilized. If the well goes dry during purging, a sample can be collected once the boring recharges enough water.

During purging, the flow rates, water levels, and water quality parameters will be recorded on an appropriate field form or in the field notes. Groundwater will be transferred directly into laboratory-supplied containers specific to the analysis required.

Sample containers will be labeled, packed in iced shipping containers with COC documentation, and delivered or shipped to the laboratory (see Section 7). Sampling information will be recorded in a field notebook, on an FSDS (see Appendix B), and on the COC form.

4.2 Sample Nomenclature

Groundwater samples will be labeled with a prefix to describe the sampling location identification number, a "W" to indicate a groundwater sample matrix, and the midpoint of the screened or open area sample depth in feet. For example, a groundwater sample collected from monitoring well MW01 with its screen interval from 20 feet to 25 feet bgs will have the sample nomenclature of MW01-W-22.5.

Duplicate reconnaissance groundwater samples will replace the location number with "DUP," and the sample will have the same sample time as the primary sample. A duplicate sample of the abovementioned sample would appear as MWDUP-W-22.5.

Relevant sample information will be documented on the exploratory boring log or an FSDS (see Appendix B); documentation may include items such as the screened interval or open space, equipment used, water quality field parameters, and the amount of water purged before sampling. The screened interval of temporary wells and new monitoring wells will be recorded on the boring log.

5 Field Procedures

5.1 Sampling Equipment Decontamination

Non-disposable sampling equipment and reusable materials that contact the soil or water will be decontaminated on Property and before and after each sample collection (see SOP 01 in Appendix A). Decontamination will consist of the following:

- Tap-water rinse. Visible soil to be removed by scrubbing.
- Non-phosphate detergent wash, consisting of a dilute mixture of Liqui-Nox (or equivalent) and tap water.
- Distilled-water rinse.
- Allow equipment to air dry, or dry it with paper towels.

Decontamination fluids will be transferred to drums and managed as described in Section 5.2.

5.2 Management of Investigation-Derived Waste

IDW may include items such as soil cuttings, decontamination fluids, sampling debris, and personal protective equipment. The IDW will be separated into solids, liquids, and sampling debris (e.g., personal protective equipment). IDW will be stored in a designated area on the Property in a secure drum(s).

Drums will be labeled with their contents, the approximate volume of material, the date of collection, and the origin of the material. The drums will be sealed, secured, and transferred to a designated area on the Property, pending characterization. Analytical data from the soil and groundwater sampling activities may be used to characterize the soil cuttings, sampling debris, purge water, and decontamination fluids generated during the investigation.

6 Analytical Methods

In accordance with the QA/QC requirements set forth in this SAP, Friedman & Bruya, a laboratory accredited by the State of Washington and the National Environmental Laboratory Accreditation, will perform the laboratory analyses for the soil and groundwater samples collected at the Property. Soil and groundwater samples collected at the Property will be analyzed for one or more of the following (see Table 4-1 of the supplemental RI work plan):

- Chlorinated volatile organic compounds (cVOCs) by U.S. Environmental Protection Agency (EPA) Method 8260D.
- Metals (arsenic, chromium, copper, lead, or zinc) by USEPA Method 6020B.

The analytical methods and performance criteria for the analyses are provided in Tables 6-1 and 6-2.

7 Sample Handling

7.1 Preservation

Soil and groundwater samples will be collected in laboratory-supplied containers with appropriate preservation per analytical method requirements, as outlined in Table 7-1. The samples will be stored in iced coolers at approximately 4 degrees Celsius.

7.2 Sample Packing and Shipping

Soil and groundwater samples will be stored in iced coolers, and then transported to the analytical laboratory via courier or shipping service.

7.3 Sample Custody

Sample custody will be tracked from point of origin through analysis and disposal using a COC form filled out with the appropriate sample and analytical information.

The following items will be recorded on the COC form:

- Project name
- Project number
- MFA project manager
- Sampler name(s)
- Sample number, date and time collected, media, number of bottles submitted
- Requested analyses for each sample
- Type of data package required
- Turnaround requirements
- Signature, printed name, and organization name of persons having custody of samples, and date and time of transfer
- Additional instructions or considerations that would affect analysis (nonaqueous layers, archiving, etc.)

Persons in possession of the samples will be required to sign and date the COC form whenever samples are transferred between individuals or organizations. The COC will be included in the shipping containers. The laboratory will implement its in-house custody procedures, which begin when sample custody is transferred to laboratory personnel.

At the analytical laboratory, a designated sample custodian will accept custody of the samples and will verify that the COC form matches the samples received. The shipping container or set of containers is given a laboratory identification number, and each sample is assigned a unique sequential identification number.

8 Quality Control

8.1 Field Quality Control Samples

The occurrence of field contamination will be assessed through the analysis of a variety of sample blanks described below (see Table 8-1).

8.1.1 Field Duplicates

Field duplicate samples are collected to assess reproducibility of field procedures. One duplicate sample will be collected per twenty (or fewer) samples per soil and aqueous matrix. It is anticipated that at least one field duplicate soil and one field duplicate groundwater sample will be collected. It is noted that sample heterogeneity for nonaqueous matrices may affect the measured precision for the duplicate sample.

8.1.2 Equipment Rinsate Blanks

If nondedicated equipment is used, equipment blanks will be used to assess the efficiency of field equipment decontamination procedures in preventing cross-contamination of samples.

Analyses of equipment rinsate blanks will be used to assess the efficiency of field equipment decontamination procedures in preventing cross-contamination of samples. Rinsate blanks used to assess the efficiency of field equipment decontamination procedures will be collected at the end of each day of field sampling. Equipment rinsate blanks will be collected by pouring certified distilled water over or through decontaminated (clean) sampling equipment used in the collection of investigative samples and subsequently collected in prepared sampling containers. Additives or preservatives will be included in the equipment rinsate blanks as required for analysis. The rinsate blank will be shipped with the associated field samples.

For each sample matrix, a rinsate blank will be collected and analyzed at a minimum frequency of one equipment rinsate blank per 20 samples for each day of sample collection. Rinsate blanks will also be collected from precleaned, disposable equipment for each lot of disposable equipment used to demonstrate the cleanliness of the equipment lot. Rinsate blanks will not be required if dedicated equipment is used for sampling. The rinsate blanks will be analyzed for the same parameters as the investigative samples.

8.1.3 Filter Blanks

Filter blanks are collected to assess the contamination of aqueous samples from target analytes in the filters used to collect samples for dissolved analyses during field filtration. Filter blank samples are collected by filtering deionized water into a prepared sample container. Filters will be selected from the same manufacturing lot of filters used for the associated investigative samples. Filter blanks will be collected at a frequency of one filter blank per 20 field-filtered samples.

8.1.4 Trip Blanks

Trip blanks are collected for cVOC sample analysis to assess the contamination of samples during transport to the Property, sampling collection, and transport to the laboratory. Trip blanks are prepared in the laboratory, using analyte-free water. Trip blanks should be inspected for air bubbles by both the laboratory (before shipping) and the field team. Any vials containing visible air bubbles should be discarded. One trip blank is included for each sample cooler collected for analysis of cVOCs and shipped to the laboratory. The criterion for trip blanks is that target analyte concentrations must be below the method reporting limits. Consistent with EPA data validation guidelines, analytical results for investigative samples will be qualified if the target analyte is detected in the trip blank.

One trip blank will be included per batch of samples submitted to the analytical laboratory.

8.1.5 Temperature Blanks

Temperature blanks are prepared by the laboratory, using analyte-free (reagent) water. Temperature blanks are used by the laboratory to record the temperature of each cooler used to transport samples from the field to the laboratory. Each cooler containing samples that require temperature preservation will contain a temperature blank. The laboratory will verify that the temperature blank measurement is within the acceptable range specific to the analytical method.

8.2 Laboratory Quality Control Samples

In the laboratory, QC samples may include matrix spike and matrix spike duplicate (MS/MSD) samples, laboratory control samples (LCSs), surrogate spike samples, and method blanks, as well as other QC samples and procedures as required by the individual methods.

8.2.1 Calibration Verification

Instruments will initially be calibrated at the start of the project or sample run, as required, and when any ongoing calibration does not meet control criteria. The number of points used in the initial calibration is defined in the analytical method. Calibration will be continued as specified in the analytical method to track instrument performance. If a continuing calibration does not meet control limits, analysis of project samples will be suspended until the source of the control failure is either eliminated or reduced to within control specifications.

8.2.2 Method Blanks

Method blanks are prepared using analyte-free (reagent) water and are processed with the same methodology (e.g., extraction, digestion) as the associated investigative samples. Method blanks are used to document contamination resulting in the laboratory from the analytical process. A method blank shall be prepared and analyzed in every analytical batch. The method blank results are used to verify that reagents and preparation do not impart unacceptable bias to the investigative sample results. The presence of analytes in the method blank sample will be evaluated against method-specific thresholds. If analytes are present in the method blank above the method-specific threshold, corrective action will be taken to eliminate the source of contamination before proceeding with

analysis. Investigative samples of an analytical batch associated with method blank results outside acceptance limits will be qualified as appropriate by the data validation contractor.

8.2.3 Laboratory Control Samples

LCSs are prepared by spiking laboratory-certified, reagent-grade water with the analytes of interest or a certified reference material that has been prepared and analyzed. The result for percent recovery of the LCS is a data quality indicator of the accuracy of the analytical method and laboratory performance.

8.2.4 Laboratory Duplicate Samples

Laboratory duplicate samples are prepared by the laboratory by splitting an investigative sample into two separate aliquots and performing separate sample preparation and analysis on each aliquot. The results for relative percent difference (RPD) of the primary investigative sample and the respective laboratory duplicate samples are used to measure precision in the analytical method and laboratory performance. For nonaqueous matrices, sample heterogeneity may affect the measured precision for the laboratory duplicate samples.

8.2.5 Matrix Spike/Matrix Spike Duplicate

MS samples are analyzed to assess the matrix effects on the accuracy of analytical measurements. MS/MSD samples will be prepared by spiking investigative samples with known amounts of analytes before extraction and preparation and analysis. The recoveries for the MS/MSD samples will be used to assess the accuracy and precision in the analytical method by measuring how well the analytical method recovers the target compounds in the investigative matrices. For each matrix type, at least one set of MS/MSD samples will be analyzed for each batch of samples for every 20 (or fewer) samples received.

8.2.6 Surrogate Spikes

Surrogate spiking consists of adding reference compounds to samples before sample preparation for organic analysis. Surrogate compound spiking is used to assess method accuracy on a sample-specific basis. Surrogate compounds will be added to samples in accordance with the analytical method requirements. Surrogate recoveries will be reported by the laboratory along with method-based or method performance-based surrogate percent recovery acceptance limits. The laboratory will not correct sample results using these recoveries.

8.3 Instrumentation

8.3.1 Field Instrumentation Calibration and Maintenance

Field instruments may be used during the investigations. The following field equipment may require calibration before use and periodically during sampling activities:

- Photoionization detector
- Water quality meter, including pH, conductivity, and temperature
- Turbidity meter

- Electronic water-level probe

Field-instrument calibration and preventive maintenance will follow the manufacturers' guidelines, and deviations from the established guidelines will be documented. Generally, field instruments should be calibrated before work begins. Field personnel may decide to calibrate more than once a day if inconsistent or unusual readings occur, or if conditions warrant more frequent calibration. Calibration activities should be recorded in logbooks or field notebooks. To ensure that field instruments are properly calibrated and remain operable, the following procedures will be used, at a minimum:

- Operation, maintenance, and calibration will be performed in accordance with the instrument manufacturers' specifications.
- Standards used to calibrate field instruments will meet the minimum requirements for source and purity recommended in the equipment operation manual. Standards will be checked for expiration dates that may be printed on the bottle. Standards that have expired should not be used.
- Acceptable criteria for calibration will be based on the limits set in the operations manual.
- Users of the equipment should be trained in the proper calibration and operation of the instrument.
- Operation and maintenance manuals for each field instrument should be available to persons using the equipment.
- Field instruments will be inspected before they are taken to the Property.
- Field instruments will be calibrated at the start of each workday. Meters will be recalibrated, as necessary, during the work period.
- Calibration procedures (including items such as time, standards used, and calibration results) should be recorded in a field notebook. The information should be available if problems are encountered.

Preventive maintenance of field instruments and equipment will follow the operations manuals. A schedule of preventive-maintenance activities should be followed to minimize downtime and ensure the accuracy of measurement systems. Maintenance will be documented in the field notebook.

8.3.2 Laboratory Instrumentation Calibration and Maintenance

Specific laboratory instrument calibration procedures, frequency of calibration, and preparation of calibration standards will be according to the method requirements as developed by the EPA, following procedures presented in EPA Method Solid Waste-846 (EPA 1986).

Preventive maintenance of laboratory equipment will be the responsibility of the laboratory personnel and analysts. This maintenance includes routine care and cleaning of instruments and inspection and monitoring of carrier gases, solvents, and glassware used in analyses. The preventive-maintenance approach for specific equipment should follow the manufacturers' specifications, good laboratory practices, and industry standard techniques.

Precision and accuracy data will be examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance should be performed when an

instrument begins to change, as indicated by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet any QC criterion.

9 Data Reduction, Validation, and Reporting

The analytical laboratory will submit analytical data packages that include laboratory QA/QC results to permit independent and conclusive determination of data quality. MFA will determine data quality, using the data evaluation procedures described in this section. The results of the MFA evaluation will be used to determine if the project data quality objectives are met.

9.1 Field Data Reduction

Daily internal QC checks will be performed for field activities. Checks will consist of reviewing field notes and field activity memoranda to confirm that the specified measurements, calibrations, and procedures are being followed. The need for corrective action will be assessed on an ongoing basis, in consultation with the project manager.

9.2 Laboratory Evaluation

Initial data reduction, evaluation, and reporting at the analytical laboratory will be carried out as described in EPA SW-846 manuals for analyses (EPA 1986), as appropriate. Additional laboratory data qualifiers may be defined and reported to further explain the laboratory's QC concerns about a particular sample result. Additional data qualifiers will be defined in the laboratory's case narrative reports.

9.3 Data Deliverables

Laboratory data deliverables are listed below. Electronic deliverables will contain the same data that are presented in the hard-copy report.

- Transmittal cover letter
- Case narrative
- Analytical results
- COC form
- Method blank results
- Laboratory duplicate results
- MS/MSD results
- Surrogate recoveries

9.4 MFA Evaluation

9.4.1 Data QA/QC Review

MFA will evaluate the laboratory data for precision, completeness, accuracy, and compliance with the analytical method. MFA will review data according to applicable sections of EPA inorganics and organics procedures (EPA 2020a, 2020b), as well as appropriate laboratory, method-specific guidelines (EPA 1986).

Data qualifiers, as defined by the EPA, are used to classify sample data according to their conformance to QC requirements. Common qualifiers are listed below:

- J—Estimate, qualitatively correct but quantitatively suspect.
- R—Reject, data not suitable for any purpose. The analyte may or may not be present in the sample.
- U—Not detected at a specified reporting limit.

Poor surrogate recovery, blank contamination, or calibration problems, among other things, can require qualification of the sample data. The reasons for sample qualification should be stated in the data evaluation report.

QC criteria not defined in the guidelines for evaluating analytical data are adopted, where appropriate, from the analytical method.

The following information will be reviewed during data evaluation, as applicable:

- Sampling locations and blind sample numbers
- Sampling dates
- Requested analysis
- COC documentation
- Sample preservation
- Holding times
- Method blanks
- Surrogate recoveries
- LCS results
- Laboratory duplicates (if analyzed)
- MS/MSD results
- Field duplicates
- Field blanks
- Method reporting limits above requested levels
- Additional comments or difficulties reported by the laboratory
- Overall assessment

The results of the data evaluation review will be summarized for each data package. Data qualifiers will be assigned to sample results on the basis of EPA guidelines, as applicable.

9.4.2 Data Management and Reduction

MFA uses a database (e.g., EQuIS) to manage laboratory data. The laboratory will provide the analytical results in electronic, EQuIS-compatible format. Following data evaluation, data qualifiers will be entered into the database.

Data may be reduced to summarize particular data sets and to aid interpretation of the results. Statistical analyses may also be applied to results. Data reduction QC checks will be performed on hand-entered data, calculations, and data graphically displayed. Data may be further reduced and managed using one or more of the following computer software applications:

- Microsoft Excel (spreadsheet)
- EQuIS (database)
- Microsoft Access (database)
- AutoCAD and/or ArcGIS (graphics)
- EPA ProUCL (statistical software)

10 Data Quality Objectives

The DQOs are used to establish performance and acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of the study (EPA 2006). The seven steps of the DQO process outlined by the EPA are as follows:

- State the problem—Define the problem; identify members of the planning team; define the budget and schedule
- Identify the goal of the study—State how environmental data will be used to meet study objectives and solve the problem; identify study questions; define alternative outcomes
- Identify information inputs—Identify data and information needed to answer study questions
- Define the boundaries of the study—Specify target population and characteristics of interest; define spatial and temporal limits; define scale of inference
- Develop the analytic approach—Define parameters of interest; specify type of inference; develop logic for drawing conclusions from findings
- Specify performance or acceptance criteria—Specify criteria for new data collection (performance metrics) and decision making (probability limits)
- Develop the plan for obtaining data—Develop the SAP

This SAP for environmental data collection was developed using the DQO process and presents performance metrics for collection and analysis for soil and water that will be sampled.

Decision criteria will be identified and based on comparison of analytical laboratory results to applicable screening and action levels.

10.1 Data Precision

Precision is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions, calculated as either the range or the standard deviation (EPA 2002). Precision is measured by making repeated analyses on the same analytical instrument (laboratory duplicates) or replicate collections of samples in the field (field duplicates). Precision criteria are expressed as the RPD between the primary and duplicate samples. The acceptance limits for RPD are based on the sample matrix and the analytical method used.

10.2 Data Bias

Bias is defined as the systematic or persistent distortion of a measurement process that causes error in one direction (EPA 2002). Data bias is addressed in the field and the laboratory through equipment calibration, collection and analysis of QC blank samples, and analysis of QC standard samples.

10.3 Data Accuracy

Accuracy is defined as the measure of the overall agreement of a measurement to a known value and includes a combination of random error (precision) and systematic error (bias) components of both sampling and analytical operations (EPA 2002). Since the "true" concentration of sampled media is not known, the degree of accuracy in the measurement is inferred from recovery data determined by sample spiking and/or the analyses of reference standards. The criterion for accuracy is expressed as the percent recovery of the sample spiking. The acceptance limits for percent recovery are based on the analytical method used.

Percent recovery is calculated using the equation:

$$Percent\ Recovery = \frac{x_{ss} - x_s}{T} \times 100\%$$

Where:

x_{ss} = result for spiked sample

x_s = result for sample

T = true value of added spike

10.4 Data Completeness

Data completeness is defined as a measure of the amount of valid data needed from a measurement system (EPA 2002). It is measured as the total number of samples collected for which the valid analytical data are obtained divided by the total number of samples collected and multiplied by 100.

10.5 Data Representativeness

Data representativeness is a qualitative term that expresses “the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition” (EPA 2002). Data representativeness is evaluated by assessing the accuracy and precision of the sampling program. The criterion for evaluating representativeness will be satisfied by confirming that the sample collection procedures are consistently followed.

10.6 Data Comparability

Data comparability is a qualitative term expressing the measure of confidence with which one data set can be compared to another and can be combined for decision-making purposes (EPA 2002). Data comparability will be achieved by using standard sampling and operating procedures and analytical methods. Data comparability will be assessed using documentation of QA/QC procedures.

10.7 Data Sensitivity

Data sensitivity is defined as the capability of a method or instrument to discriminate between measurement responses representing different levels of the variable of interest (EPA 2002). Results measured between the reporting limits and method detection limits will be reported for all analytes and assigned the appropriate qualifier.

11 Reporting

The data and its comparison to the preliminary screening levels identified in the draft RI report and supplemental RI work plan will be included in the updated RI report submitted to Ecology. Environmental data will be submitted to Ecology using the Environmental Information Management System.

References

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EPA. 2020a. *National Functional Guidelines for Inorganic Superfund Methods Data Review.* EPA 542-R-20-006. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation: Washington, DC. November.

EPA. 2020b. *National Functional Guidelines for Organic Superfund Methods Data Review.* EPA 540-R-20-005. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation: Washington, DC. November.

Limitations

The services undertaken in completing this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this report.

Tables

MAUL
FOSTER
ALONGI

Table 2-1
Contact List
Northern State Multi Service Center
Port of Skagit

Contact Name	Title	Organization	E-mail	Telephone
Heather Rogerson	Remedial Action Grant Recipient	Port of Skagit	heatherr@portofskagit.com	360-757-9828
Chris DeBoer	Ecology Site Manager	Ecology	chde461@ecy.wa.gov	425-466-8732
Phil Wiescher	MFA Program Manager	MFA	pwiescher@maulfoster.com	503-407-1036
Carolyn Wise	MFA Project Manager	MFA	cwise@maulfoster.com	360-690-5982
Nicole Bruneel	MFA Health and Safety Coordinator	MFA	nbruneel@maulfoster.com	208-949-3981
Christian Sifford	MFA Field Team Leader/On-Site Safety Officer	MFA	csifford@maulfoster.com	541-391-3652
Mary Benzinger	MFA Quality Assurance Manager	MFA	mbenzinger@maulfoster.com	503-501-5247

Notes

Ecology = Washington State Department of Ecology.

MFA = Maul Foster & Alongi, Inc.

Table 6-1
Soil: Analytical Methods and Performance Criteria
Northern State Multi Service Center
Port of Skagit

Analyte	MRL (mg/kg)[a]	Preferred Analytical Method	MS Accuracy (Percent)[b]	Precision (RPD)[b]	LCS Accuracy (Percent)[b]	Completeness (Percent)
Total Metals						
Arsenic	0.2	EPA 6020B	75-125	20	80-120	90
Chromium	0.2	EPA 6020B	75-125	20	80-120	90
Copper	1	EPA 6020B	75-125	20	80-120	90
Zinc	2.5	EPA 6020B	75-125	20	80-120	90
cVOCs						
1,1,1-Trichloroethane	0.05	EPA 8260D	10-156	20	62-131	90
1,1,2-Trichloroethane	0.05	EPA 8260D	10-205	20	62-131	90
1,1-Dichloroethane	0.05	EPA 8260D	19-140	20	64-135	90
1,1-Dichloroethene	0.05	EPA 8260D	10-160	20	47-128	90
1,2-Dichloroethane	0.05	EPA 8260D	12-160	20	56-135	90
cis-1,2-Dichloroethene	0.05	EPA 8260D	25-135	20	64-135	90
Tetrachloroethene	0.025	EPA 8260D	20-133	20	20-133	90
trans-1,2-Dichloroethene	0.05	EPA 8260D	14-137	20	64-132	90
Trichloroethene	0.02	EPA 8260D	21-139	20	21-139	90
Vinyl chloride	0.05	EPA 8260D	10-138	20	22-139	90

Table 6-1
Soil: Analytical Methods and Performance Criteria
Northern State Multi Service Center
Port of Skagit

Notes

EPA = U.S. Environmental Protection Agency.

LCS = laboratory control sample.

mg/kg = milligrams per kilogram.

MRL = method reporting limit.

MS = matrix spike.

MTCA = Model Toxics Control Act.

NV = no value.

RPD = relative percent difference.

[a]MRL based on values received from Friedman & Bruya, Inc. Actual MRL may differ, based on percent moisture, sample matrix, and/or dilutions.

[b]MS accuracy, precision, and LCS accuracy acceptance criteria are performance-based and may be updated by the laboratory.

Table 6-2
Groundwater: Analytical Methods and Performance Criteria
Northern State Multi Service Center
Port of Skagit

Analyte	MRL (mg/kg)[a]	Preferred Analytical Method	MS Accuracy (Percent)[b]	Precision (RPD)[b]	LCS Accuracy (Percent)[b]	Completeness (Percent)
Total Metals						
Arsenic	1.0	EPA 6020B	75-125	20	80-120	90
Chromium	1.0	EPA 6020B	75-125	20	80-120	90
Copper	5.0	EPA 6020B	75-125	20	80-120	90
Lead	1.0	EPA 6020B	75-125	20	80-120	90
Zinc	5.0	EPA 6020B	75-125	20	80-120	90
cVOCs						
1,1,1-Trichloroethane	1.0	EPA 8260D	50-150	20	70-130	90
1,1,2-Trichloroethane	0.50	EPA 8260D	50-150	20	70-130	90
1,1-Dichloroethane	1.0	EPA 8260D	50-150	20	70-130	90
1,1-Dichloroethene	1.0	EPA 8260D	50-150	20	64-140	90
1,2-Dichloroethane	0.20	EPA 8260D	50-150	20	70-130	90
cis-1,2-Dichloroethene	1.0	EPA 8260D	10-211	20	70-130	90
Tetrachloroethene	1.0	EPA 8260D	50-150	20	70-130	90
trans-1,2-Dichloroethene	1.0	EPA 8260D	50-150	20	70-130	90
Trichloroethene	0.50	EPA 8260D	35-149	20	70-130	90
Vinyl chloride	0.020	EPA 8260D	50-150	20	64-142	90

Table 6-2
Groundwater: Analytical Methods and Performance Criteria
Northern State Multi Service Center
Port of Skagit

Notes

EPA = U.S. Environmental Protection Agency.

LCS = laboratory control sample.

mg/kg = milligrams per kilogram.

MRL = method reporting limit.

MS = matrix spike.

MTCA = Model Toxics Control Act.

NV = no value.

RPD = relative percent difference.

[a]MRL based on values received from Friedman & Bruya, Inc. Actual MRL may differ, based on percent moisture, sample matrix, and/or dilutions.

[b]MS accuracy, precision, and LCS accuracy acceptance criteria are performance-based and may be updated by the laboratory.

Table 7-1
Containers, Preservation, and Holding Times
Northern State Multi Service Center
Port of Skagit

Matrix	Method	Analysis	Field Container Preservative	Holding Time (Days)	Sample Container
Soil	EPA 6020B	Total Metals[a]	4 deg C	180	8 oz Glass jar
	EPA 8260D	cVOCs	4 deg C, methanol	14	5035A Sample kit[b]
Groundwater	EPA 6020B	Total Metals[c]	HNO_3 to pH < 2	180	250 mL Poly bottle
	EPA 6020B	Dissolved Metals[d]	Field Filter, HNO_3 to pH <2	180	250 mL Poly bottle
	EPA 8260D	cVOCs	4 deg C, HCl pH <2	14	3 x 40 mL VOA vial

Notes

ASTM = ASTM International.

cVOCs = chlorinated volatile organic compounds.

deg C = degrees Celsius.

EPA = U.S. Environmental Protection Agency.

HCl = hydrochloric acid.

HNO_3 = nitric acid.

mL = milliliter.

VOA = volatile organic analysis.

[a]Total metals includes arsenic, chromium, copper, and zinc.

[b]5035A sample kit includes one pre-tared 40-mL VOA vial with 5 mL of sodium bisulfate, two pre-tared 40-mL VOA vials with 5 mL of methanol, and one 2-ounce jar for moisture content determination

[c]Total metals includes arsenic, chromium, copper, lead, and zinc.

[d]Dissolved metals includes arsenic, chromium, copper, lead, and zinc.

Table 8-1
QC Sample Requirement Summary
Northern State Multi Service Center
Port of Skagit

QC Check Sample	Sample Matrix		Frequency
	Soil	GW	
Equipment Rinsate Blanks	Yes	Yes	One per every 20 samples (or fewer) each day of sample collection for samples collected with non-dedicated equipment
Filter Blank (Aqueous)	No	Yes	One per every 20 samples (or fewer) collected for dissolved metals analysis
Field Duplicate Samples	Yes	Yes	One per every 20 samples (or fewer) per sample matrix
Trip Blank	Yes	Yes	One per sample cooler collected for analysis of cVOCs
Temperature Blank	Yes	Yes	One per sample cooler
Matrix Spike/Matrix Spike Duplicate	Yes	Yes	Each analytical batch of samples of every 20 (or fewer) samples received
Surrogate Spiking	Yes	Yes	Added to all project and QC samples (for organic analyses only)
Method Blanks	Yes	Yes	Each analytical batch of samples of every 20 (or fewer) samples received
Laboratory Control Sample	Yes	Yes	Each analytical batch of samples of every 20 (or fewer) samples received
Laboratory Duplicate Sample	Yes	Yes	Each analytical batch of samples of every 20 (or fewer) samples received

Notes

GW = groundwater.

QC = quality control.

Appendix A

Standard Operating Procedures

MAUL FOSTER ALONGI

Standard Operating Procedure

Decontamination of Field Equipment

SOP Number: 1
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the decontamination procedure for field equipment that may come in contact with contaminated media and that Maul Foster & Alongi, Inc. (MFA) staff may reuse at multiple sample locations or sites. Decontamination is performed to reduce the potential for cross-contamination of samples that will be collected with multiuse equipment and that will undergo physical or chemical analyses. Other equipment that is multiuse—not used specifically for sample collection (e.g., water level meter, pump used for well development)—also requires decontamination. Finally, decontamination is necessary to minimize the potential for MFA staff's exposure to chemicals.

Typically, decontamination is not necessary for field equipment that is disposable and intended to be used only once (e.g., disposable bailer). Additionally, this SOP does not apply to equipment used by subcontractors, such as drilling equipment. However, MFA staff should confirm that subcontractors are implementing appropriate decontamination procedures to minimize the potential for cross-contamination of samples or MFA staff's exposure to chemicals.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Nonphosphate detergent solution (e.g., Alconox, Liquinox)
- Distilled and potable water
- Personal protective equipment (as specified in the site-specific health and safety plan)
- Buckets to contain rinsate, brushes, paper towels

Depending on the site conditions and the types of contaminants that may be present, the use of other decontamination materials, such as deionized water, methanol, hexane, or isopropyl alcohol, may be necessary. The need for other materials should be determined prior to fieldwork. The decontamination procedures using other materials should be described in a site-specific sampling and analysis plan (SAP).

Methodology

When the site-specific SAP specifies additional or different requirements for decontamination, it takes precedence over this SOP. In the absence of a SAP, the following procedures shall be used.

General Sampling Procedure:

1. Rinse the equipment with potable water to remove visible soil, petroleum sheen, or contamination.

2. Scrub the equipment with a brush and solution of distilled water and nonphosphate detergent.

3. Rinse the equipment with distilled water.

4. Allow equipment to air dry, or dry it with paper towels.

5. At all times, ensure that the decontaminated equipment is stored so as to prevent it from becoming contaminated while not in use. Depending on the size of the equipment, it can be wrapped with new aluminum foil or placed in a new plastic bag.

Rinsate Storage:

All fluids resulting from equipment decontamination shall initially be contained in a bucket and then transferred to a Department of Transportation-approved container (e.g., 55-gallon drum) stored on site at a location that does not interfere with on-site activities (e.g., vehicle traffic, pedestrian areas). Place a label on each container and include the following information:

- The date on which fluids were placed in the container
- Contents (e.g., “water from equipment decontamination”)
- Contact information, including MFA staff or client phone number

Note that labels on containers exposed to sunlight or precipitation are prone to fading. Use a waterproof, indelible ink pen (e.g., Sharpie®) whenever possible. In the field notebook, keep a detailed inventory of all containers, including the number of containers, the approximate quantity of liquids generated, and a description of the source of the fluids. Provide this information to the MFA project manager. For future reference, take photographs of (1) each drum label, (2) the drum(s), and (3) the drum storage vicinity on site.

Note that some clients and site owners have specific requirements for labeling and storage of containers. The requirements should be determined in advance of the fieldwork.

Standard Operating Procedure

Lithologic Logging

SOP Number: 2
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the methods for observing and documenting the physical characteristics of unconsolidated geologic materials (soil and sediment) encountered during field investigations. If a Maul Foster & Alongi, Inc. (MFA) project requires hard rock drilling and description of rock core or cuttings, procedures for describing rock should be specified in a project-specific sampling and analysis plan (SAP).

Equipment and Materials Required

The following materials are necessary for this procedure:

- Blank field forms (e.g., boring logs) for documenting observations
- Dry-erase board
- Camera
- Munsell soil color chart (where required)
- MFA field logging checklist

Methodology

When the project-specific SAP specifies additional or different requirements for lithologic logging, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used. MFA uses a combination of the Unified Soil Classification System (USCS) and the ASTM International method D2487 for describing and classifying soil and sediment by visual and manual examination. Before beginning fieldwork, verify with the project manager the logging standard to be used.

Logging Process:

The objective of lithologic logging is to document the physical characteristics of soil and sediment encountered and the changes in characteristics with depth. Typically, changes with depth will define the strata encountered. Therefore, each stratum encountered should be identified and the following characteristics described in the order given:

- Depth interval of each stratum to the nearest tenth of a foot below ground surface
- USCS classification Group Name and Symbol
- Color, using the Munsell color chart
- Grain-size distribution, as percentages of fines (silt and clay combined), sand, and gravel
- Percentages of larger gravels (cobbles and boulders) if present.
- Consistency when the content of fines is 50 percent or greater

- Density when the combined percentage of sand and gravel is 50 percent or greater
- Sand and gravel grain shapes
- Chemical odors, if noticeable
- Structures, if present (e.g., laminae, pores)
- Presence of organic matter (e.g., roots, leaves, twigs, wood fragments)
- Moisture content as “dry,” “moist,” or “wet”
- If possible, a description of the origin of each stratum (e.g., fill, alluvium)

Standard Operating Procedure

Field Screening for VOCs in Soil

SOP Number: 3
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the use of a photoionization detector (PID) to field screen soil for evidence of organic vapors. The PID measures the organic vapor concentration in parts per million, is not compound-specific.

Never rely on a stand-alone PID reading to identify organic chemical contamination in soil. Always collect multiple PID readings (e.g., at multiple depths along the length of a soil core), since it is the relative difference in concentration between multiple readings (e.g., a sudden increase in concentration at a certain depth interval) that is the typical indictor of contamination. Additionally, PID readings should always be accompanied by observation of the soil samples for other indictors of contamination, such as soil staining or chemical odors, so that these multiple lines of evidence can be used together to identify potential organic chemical contamination in the field.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- PID with calibration gas
- Ziploc®-type bags
- Field forms or notebook for documenting PID readings

Methodology

When the project-specific sampling and analysis plan (SAP) specifies additional or different requirements for organic vapor field screening, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

The electron volt (eV) rating for the PID lamp (e.g., 9.8, 10.6, 11.7) must be greater than the ionization potential (in eV) of a compound in order for the PID to detect the compound. A lamp of at least 9.8 eV should be used for petroleum hydrocarbons. A lamp of at least 10.6 eV should be used for typical chlorinated alkenes. If the project health and safety plan does not specify the lamp size, verify the compatibility of the lamp size with the anticipated compounds expected to be present in soil prior to the field activities, and confirm with the project manager.

General Sampling Procedure (Heading 3 No Number Style):

Calibration:

- The PID should be calibrated daily (or more frequently, as needed).
- Calibrate the PID according to the manufacturer's instructions.

- Document the calibration activities and results in the field notebook.

Measuring organic vapor content:

- Place a representative volume (generally, a "handful") of freshly exposed soil into a Ziploc-type bag.
- Seal the bag and gently knead the bag to loosen the soil.
- Let the bag set for several minutes to allow organic vapors, if present, to volatilize from the soil into the headspace of the bag.
- Partially open the bag so that the tip of the PID intake tube can be inserted into the bag but is not in contact with the soil, then close the bag seal around the intake tube.
- Record the PID measurement and document results in the field notes or boring log.

Static Sheen Test Procedure and Observations:

Sheen Test Procedure:

- Following the PID screen discussed above, add enough water to cover the soil in the container.
- Observe the water for signs of discoloration/sheen and characterize per the table below.

When static sheen testing is required or when making observations of a water surface the following table presents descriptions to be used (consistent with Department of Ecology Guidance)[1].

No Sheen (NS)	No visible sheen on the water surface
Slight Sheen (SS)	Light, colorless, dull sheen; spread is irregular, not rapid. Natural organic oils or iron bacteria in the soil may produce a slight sheen.
Moderate Sheen (MS)	Pronounced sheen over limited area; probably has some color/iridescence; spread is irregular, may be rapid; sheen does not spread over entire water surface.
Heavy Sheen (HS)	Heavy sheen with pronounced color/iridescence; spread is rapid; the entire water surface is covered with sheen.
Biogenic Film (BF)	False positive results may be generated by the presence of decaying organic matter and iron bacteria, which can produce a rainbow-like sheen similar to an oil sheen. These sheens, unlike oil sheens, can typically be broken up creating platy or blocky fragments when agitated or disturbed. Biogenic films can also be foamy.

[1] Department of Ecology. 2016. Guidance for remediation of petroleum contaminated sites. June.

Standard Operating Procedure

Surface and Subsurface Soil Sampling Using Hand Tools

SOP Number: 4
Date: 09/13/2023
Revision Number: 0.2

Scope and Application

This standard operating procedure (SOP) describes the use of hand tools for obtaining surface and subsurface soil samples for physical and/or chemical analysis.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the Health and Safety Plan)
- Tools appropriate for the conditions that may be encountered (e.g., spoon, trowel, shovel, hand auger); tools constructed of stainless steel are preferred.
- Stainless steel bowls
- Tape measure with increments in feet and tenths of a foot.
- Laboratory-supplied sample containers
- Laboratory chain-of-custody form and cooler with ice.
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures).
- Field forms or notebook for documenting the sampling procedures.

Methodology

When the project-specific sampling and analysis plan (SAP) specifies additional or other requirements for soil sampling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

General Sampling Procedure:

- Don gloves as specified in the Health and Safety Plan; replace gloves with new gloves after each sample is collected.
- Clear the ground surface of brush, root mat, grass, leaves, and other debris.
- Use the selected hand tool to remove soil to the targeted sample depth. Use a measuring tape to verify that the sample depth is correct and record the depth in the field notebook or boring log.
- Describe and document the soil lithology in accordance with SOP 2.
- Use the selected hand tool to collect soil and homogenize in a decontaminated stainless-steel bowl or a dedicated Ziploc® bag and then transfer the sample to the sample container using hand tools.

- Before sample collection, and to the extent possible, use the selected hand tool to remove organic debris, anthropogenic material (e.g., brick, metal, glass), and gravels larger than 4 millimeters, unless a project-specific SAP directs otherwise.
- When sampling for gasoline-range total petroleum hydrocarbons (gasoline) or volatile organic compounds (VOCs), a subsample will be obtained from a discrete portion of the collected sample. To minimize the potential loss of volatiles during sampling, the subsample shall not be composited or homogenized. The sample container for gasoline and/or VOC analysis will be filled first if additional containers are necessary for other analysis. Specific procedures for collecting samples for gasoline and/or VOC analysis using the U.S. Environmental Protection Agency Method 5035 are specified in SOP 5.
- The sampling device and field equipment will be decontaminated between sample locations in accordance with SOP 1. Alternatively, new, disposable equipment can be used to collect each sample to preclude the need for equipment decontamination.

Backfilling Sample Locations:

Backfill in accordance with federal and state regulations (e.g., Oregon bentonite requirements per OAR 690-240-0035). Otherwise, manual excavations can be backfilled with excess soil remaining after sample collection, unless the project-specific SAP requires a different backfill procedure.

Standard Operating Procedure

EPA Method 5035 Soil Sampling

SOP Number: 5
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the methods for obtaining soil samples for chemical analysis for gasoline-range petroleum hydrocarbons (gasoline) and volatile organic compounds (VOCs) by U.S. Environmental Protection Agency Method 5035A.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Sampling equipment (e.g., Terra Core Sampler™ or similar sampler capable of collecting a 5-gram soil sample).
- Laboratory-supplied sample containers:
  - Preweighed and labeled 40-milliliter volatile organic analysis (VOA) vials, including preservative (typically methanol)
  - Two-ounce jar for percent total solids/moisture (if required, confirm with the laboratory)
- Laboratory chain-of-custody form and cooler with ice.
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures).
- Field forms or notebook for documenting the sampling procedures.

Methodology

When the site-specific sampling and analysis plan (SAP) specifies additional or different requirements for soil sampling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Laboratory Analytical Considerations:

- VOCs must be analyzed within 14 days of sample collection.
- Samples must be maintained at less than 4°±2°C.
- Discrete VOC samples may be composited at the laboratory.

General Procedure:

- When using the Terra Core Sampler, seat the plunger in the handle.
- Collect the sample by pushing the sampler into the soil until the soil has filled the sampler.
- Remove the sampler and confirm that the soil in it is flush with the mouth of the sampler.

- Wipe all debris from the outside of the sampler. Remove any excess collected soil that extends beyond the mouth of the sampler.
- Rotate the plunger handle 90 degrees until it is aligned with the slots in the body of the sampler. Place the mouth of the sampler into the sample container and extrude the sample into the sample container by pushing the plunger down. Hold the sample at an angle when extruding to minimize splashing of the preservative.
- Immediately remove any soil or debris from the threads of the vial and place the lid on the vial.
- Gently swirl the vial (do not shake) to allow the preservative to uniformly penetrate and wet the soil.
- Repeat process for each additional sample container.
- If required by the laboratory, fill a 2-ounce container to capacity for percent total solids determination.

Standard Operating Procedure

Push-Probe Drilling

SOP Number: 7
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the use of a push probe (i.e., Geoprobe™) to observe subsurface conditions and collect samples of various environmental media (e.g., soil, sediment, groundwater, soil vapor) for laboratory analysis. Push-probe drilling is generally not suitable for soils with gravel/rock clast larger than about 4 inches in diameter. If gravelly/rocky soils are expected at the project site, consider use of the sonic drilling method described in SOP 8.

Push-probe drilling can be used for a variety of purposes, including:

- Retrieving cores to document subsurface soil or sediment conditions and to obtain samples for physical and/or chemical evaluation
- Sampling soil vapors, using temporary well points
- Collecting reconnaissance groundwater samples from temporary well screens
- Installing permanent monitoring wells

Equipment and Materials Required

The following equipment and materials are necessary for this procedure:

- Push-probe drill rig and operator provided by a subcontractor to MFA. Ensure that the subcontractor is licensed to perform the drilling work.
- Sampling equipment appropriate for the media to be sampled (e.g., water level meter, pumps, hand tools, and pump tubing).
- Laboratory-supplied sample containers.
- Traffic cones, measuring tape, buckets.
- Department of Transportation (DOT)-approved containers (e.g., 55-gallon drum) for storing excess soil and decontamination water; the drums are typically provided by the drilling subcontractor.
- Boring log form and notebook.
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures).
- Personal protective equipment (as required by the project health and safety plan).

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for push-probe drilling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Utility Locate:

- Before beginning the fieldwork, assess the proposed drilling location(s) for the presence of overhead and underground utilities, and adjust the locations, as needed, to avoid identified utilities.
- See SOP 18 for the utility locating procedures.

Push-Probe Drilling Process:

- The push-probe drilling rig is equipped with a soil sampling device that retrieves a continuous soil core. A combination of static force and percussion is used to drive the soil sampler into unconsolidated geologic material. A plastic liner placed inside the sampler contains the soil core and permits its removal from the sampler for examination. The sampler is driven into the subsurface, typically in 4- or 5-foot intervals, depending on the length of the sampling device. When each interval depth is reached, the soil sampler is removed from the ground, and the liner is removed to facilitate soil observation and sampling.
- This process is repeated for each soil sample interval until the targeted boring depth is reached.
- Ensure that the drilling subcontractor decontaminates all subsurface equipment before and after each boring. Document the decontamination procedures in the field notebook. Store decontamination water in DOT-approved containers for later off-site disposal.

Logging and Soil Sampling Process:

- Remove the soil core from the sampler for field screening, description, and sampling.
- Describe the lithology in accordance with SOP 2.
- Confirm the required depth interval(s) for soil sample collection and field screening with the MFA project manager, or conduct the work in accordance with the SAP. The sample interval may require adjustment based on core recovery, soil stratigraphy and characteristics, and evidence of contamination. Confirm any adjustments to the sample intervals with the project manager.
- If the project requires field screening for organic vapor, conduct it in accordance with SOP 3.
- If the project requires laboratory analyses for gasoline-range petroleum hydrocarbons or volatile organic compounds, conduct the sampling in accordance with SOP 5.
- Contain all soil core remaining after sample collection in DOT-approved containers for later off-site disposal. See SOP 1 for drum storage, labeling, and documentation procedures.

Reconnaissance Groundwater Sampling Process:

- Typically, reconnaissance groundwater samples are collected at the first occurrence of groundwater in a boring. Confirm the required depth and procedures for groundwater sample collection with the MFA project manager, or conduct the work in accordance with the SAP. If the project requires use of the low-flow sampling method, refer to SOP 9 for the low-flow sampling procedures.
- Reconnaissance groundwater samples are collected using a decontaminated stainless steel or disposable, temporary polyvinyl chloride well screen placed in the boring. If the soils in the boring are fine-grained and may cause excessive turbidity in groundwater, consider using a filter pack

around the screen to reduce turbidity. Alternatively, purging the well screen of groundwater prior to sample collection may also reduce the turbidity. See SOP 9 for purging procedures.

- Purging and sampling will be conducted using a peristaltic pump unless otherwise specified in the SAP. New tubing will be used for each boring. Field parameters (e.g., temperature, conductivity, and pH) will be recorded in accordance with SOP 9 during purging and sampling.

Monitoring Well Installation:

- If the project requires installation of a monitoring well in the boring, refer to SOP 11 for the well installation procedures. Confirm the procedures with the MFA project manager.

Borehole Abandonment Process:

- Abandon each borehole in accordance with local and state regulations/procedures. The abandonment will be performed by the drilling subcontractor.
- The abandonment procedure typically consists of backfilling the boring with granular bentonite and hydrating the bentonite with potable water.
- If the boring was advanced through concrete or asphalt, backfill the boring to about 6 inches below grade to allow for placement of asphalt or concrete in the remaining 6 inches to match the surface conditions.

Standard Operating Procedure

Low-Flow Groundwater Sampling

SOP Number: 9
Date: 06/29/2023
Revision Number: 0.2

Scope and Application

This standard operating procedure (SOP) describes use of the low-flow sampling method for collection of reconnaissance groundwater samples from borings and groundwater samples from monitoring wells. The method uses low pumping rates during purging and sample collection to minimize water-level drawdown and hydraulic stress at the well-aquifer interface.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Water quality meter (e.g., Oakton, YSI Inc. multiparameter meter)
- Turbidity meter
- Water-level meter
- Peristaltic pump and tubing
- Laboratory-supplied sample containers
- Laboratory chain-of-custody form and cooler with ice
- Filter if dissolved analyses will be performed
- Well construction logs documenting the screen depth and interval for all wells to be sampled
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures)
- 5-gallon buckets with lids
- Department of Transportation-approved storage containers (e.g., drums, totes)
- Groundwater field sampling datasheet and notebook

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for low-flow groundwater sampling, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

General Sampling Procedure (Heading 3 No Number Style):

Water Level Measurement

- Water-level measurement procedures are described in detail in SOP 13.

- Open the well cap to allow the water level to equilibrate (approximately ten minutes).
- Measure the water level in the well, using an electronic water-level meter to the nearest 0.01 foot to determine the depth to groundwater below the top of the well casing.
- If light nonaqueous-phase liquid (LNAPL)is present (typically indicated by a dark, oily sheen on the top of the water level meter), discuss with the MFA project manager how to proceed.

Purging

- If the water level is above the top of the well screen, place the end of the sample tubing in the middle of the well screen interval. If the water level is below the top of the screen, place the end of the sample tubing at the midpoint between the water level and the bottom of the well screen.
- Typical low-flow sampling pumping rates range from 0.1 to 0.5 liters per minute, depending on the hydrogeologic characteristics at the site. The objective of the rate selected is to minimize excessive drawdown (<0.3 feet) of the water level.
- Measure water quality parameters (dissolved oxygen, pH, electrical conductivity, turbidity, and temperature) using a flow-through cell connected to the discharge end of the peristaltic pump tubing. Purging will be considered complete when the water quality parameters stabilize per the following for three consecutive readings taken over 3-minute intervals (consistent with EPA guidance)[1]:

Dissolved Oxygen (10% for values greater than 0.5 mg/L, if three Dissolved Oxygen values are less than 0.5 mg/L, consider the values as stabilized),
Specific Conductance (3%),
Temperature (3%),
pH (± 0.1 unit),
Oxidation/Reduction Potential (±10 millivolts).

- Document the purge procedures, including pumping rates, water quality parameter measurements, and the water level during purging, on the groundwater field sampling datasheet.
- Place purge water in Department of Transportation-approved containers (e.g., 55-gallon drum) stored on site. See SOP 1 for drum storage, labeling, and documentation procedures.

Sample Collection

- Following the purging process, collect groundwater samples in laboratory-supplied containers.
- Confirm the laboratory analytical methods and sample container requirement with the MFA project manager or project chemist. If analysis for gasoline-range petroleum hydrocarbons or volatile organic compounds (VOCs) is proposed, fill the sample containers for gasoline and VOC analysis before filling sample containers for other analytical methods. Sample containers for gasoline and VOC analysis shall be filled to capacity without overfilling and capped so that no headspace or air bubbles remain in the container.

[1] EPA. 2017. Low stress (low flow) purging and sampling procedure for the collection of groundwater samples from monitoring wells. September 19.

Low Yield (Alternate Method)

- If drawdown of the water table cannot be avoided by reducing the pumping rate, and the well goes dry during purging, discontinue pumping and water quality parameter measurements.
- Collect the groundwater sample after the water level above the well bottom recovers to 90 percent of the prepurge water level. For example, if the water level was 10 feet above the well bottom before purging, begin sampling when the water level has recovered to 9 feet or more above the well bottom.
- If the water column volume is insufficient to meet the sample volume requirement, allow the water level to again recover to 90 percent before continuing sampling. Repeat this procedure until all sample containers are filled.

Standard Operating Procedure

Well Installation

SOP Number: 11
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the use of conventional machine slotted polyvinyl chloride (PVC) or prepacked well screens to install monitoring wells. The screen permits water to enter the well from the saturated aquifer, prevents soil from entering the well, and serves structurally to support the aquifer material. The slot size of the well screen is typically based on selection of the filter pack material. Monitoring wells must be designed and installed to ensure that low-turbidity groundwater samples, groundwater levels, and hydraulic conductivity data that are representative of conditions in the aquifer can be obtained.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Drill rig and operator provided by a subcontractor to MFA. Ensure that the subcontractor is licensed to perform the well installations.
- Personal protective equipment (as specified in the health and safety plan).
- Water-level meter.
- Monitoring well construction log and notebook.

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for well installation, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

The drilling contractor will be responsible for conforming to all applicable local and state regulations for well construction.

The proposed well construction should be provided to the driller in advance so that (1) the driller can confirm that the proposed construction is consistent with state regulations, and (2) the driller comes to the project site with sufficient materials for the well construction.

General Procedure:

Drilling and Well Construction. This SOP assumes that a boring has already been drilled and is ready for well installation. See SOPs 7 and 8 for drilling procedures. If the boring was advanced to a depth below the targeted well screen interval, backfill the boring with cement-bentonite slurry or bentonite chips so that the boring bottom is at a depth about 2 feet below the lower screen interval depth. Well construction will include flush-threaded Schedule 40 PVC casing and conventional PVC well screen or stainless steel mesh prepacked well screen, placed at the bottom of the boring.

Filter Pack. Clean silica sand pack will be placed between the boring wall and the PVC screen/riser (i.e., the annulus) from the bottom of the well to approximately 1 to 2 feet above the screened interval. The filter pack should have greater hydraulic conductivity than the surrounding formation so that water can be drawn into the well. Before installation of the seal, the well may be surged using a surge block or similar technique to consolidate the filter pack and eliminate voids. Measure and document the depth to the sand filter pack before setting the seal.

Seal. A bentonite seal 1 to 2 feet thick will be placed above the sand. The bentonite will be hydrated and allowed to sit for a minimum of 30 minutes for proper hydration and sealing. Measure and document the depth to the top of the seal before placing grout.

Grout. Cement-bentonite slurry or bentonite chips (hydrated after installation) will be placed above the bentonite seal following proper hydration of the seal. The cement-bentonite slurry will be placed to within 1 foot of the ground surface.

Surface Seal and Monument. A concrete surface seal will secure a flush-mounted, traffic-rated monument, or a bollard-protected stickup monument. Flush-mounted surface monuments will be completed slightly above grade to prevent ponding of water on the monument lid. A locking cap and lock will secure the top of the well casing in a surface monument. Tamper-resistant bolts (e.g., pentagonal) may be used to secure the lid of a flush-mounted monument. The lid of a stickup monument should be secured with a lock.

The well constructor shall permanently affix a well identification label to the wellhead. In addition, the well number should be marked on the well (e.g., punched into monument ring, written on the well casing/cap with permanent marker). A v-notch is typically cut into the north side of the PVC riser for use as a survey point and for water level measurements.

Documentation. The field representative will produce the following documentation during the well installation:

- Length of well components, including blank casing, well screen, and sump (if included).
- Preinstallation boring depth below ground surface (bgs).
- Depth bgs to top and bottom of screen.
- Depth bgs to top of filter pack and seal.
- Types, brands, and amounts of materials (sand, bentonite, grout) used.
- Decontamination procedures followed, if needed (see SOP 1 for equipment decontamination procedures).
- If potable water was placed into the boring or well during installation, document the total volume of water placed; this information will be needed for well development (see SOP 12).
- Any deviation from standard procedures or any problems encountered during the installation activities.

Standard Operating Procedure

Well Development

SOP Number: 12
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the methods for developing new monitoring well installations. New wells should be developed no sooner than a period of 24 hours after the grout seal has been placed; longer periods of 48 to 72 hours may be necessary, depending on applicable local or state regulations. The objective of well development is to ensure that low-turbidity groundwater samples, groundwater levels, and hydraulic conductivity data representative of conditions in the aquifer can be obtained from the well. This SOP is also applicable to the redevelopment of existing monitoring wells.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Well purge equipment (e.g., Waterra Pump, bailer, and peristaltic pump)
- Water-quality meter (e.g., Oakton and turbidity meter)
- Water-level meter
- Well construction logs for all wells to be developed
- Equipment decontamination supplies if sampling equipment will be reused between sample locations (see SOP 1 for equipment decontamination procedures)
- Five-gallon buckets with lids
- Department of Transportation-approved storage containers (e.g., drums, totes)
- Well development log and notebook

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for well development, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Owing to the potential for hazardous substances in groundwater, well development requires consideration of the work area and equipment setup, health and safety procedures, use of appropriate personal protective equipment, procedures for equipment decontamination, and disposal of expendable development supplies. Confirm all procedures in advance with the MFA project manager and the MFA health and safety professional.

1. Cut a segment of plastic sheeting to an approximate 10-foot-by-10-foot dimension. Cut a hole in the center of the sheeting and place the sheeting over the well so that the well monument can be accessed through the hole and the sheeting lies flat on the ground. The sheeting defines the

work area for well development. All equipment that may come in contact with groundwater should remain in this work area until it has been decontaminated or containerized for disposal.

2. Measure the depth to water and the total depth of the well before development. Confirm that the entire screen length is below the water level; if it is not, contact the MFA project manager to discuss potential modification of the well-development procedures.

3. Subtract the depth to water from the total well depth to determine the height of the column of groundwater present in the well casing. Multiply the height by the gallon-per-foot value in the table below, corresponding to the diameter of the well being developed, to calculate the volume of water in the well casing. Record the readings and casing volume on the well development log.

Casing Diameter (inches)	Volume (gallons per foot)
1	0.04
2	0.17
3	0.37
4	0.65
5	1.02
6	1.46

4. Surge groundwater through the entire well screen interval with a weighted bailer or Waterra pump with tubing equipped with surge block. Begin surging at the top of the well screen by vigorously moving the bailer or surge block in approximately 1-foot vertical increments. Gradually increase the surge depth until the entre screen interval has been surged. The surge time for each 1-foot increment will depend on type of drilling, lithology, and well completion details. Generally, there should be at least one minute of surging across each increment.

5. After surging the well screen, purge groundwater from the well into buckets at a higher purging rate than the expected purging rate of groundwater sampling. Ideally, purging will be completed using a method that does not continue to surge the well (i.e., peristaltic or submersible pump). If a Waterra pump is used, remove the surge block from the tubing and set the tubing intake above the well screen for purging. Measure the water level during the purging process and adjust the pumping rate to maintain a water level above the top of the screen interval if possible. Document the volume of water removed.

6. When the volume of water purged equals the casing volume, use the water-quality meter to measure the temperature, pH, conductivity, and turbidity of the purge water. Repeat the measurements for each casing volume removed. Note that a YSI water-quality meter or similar meters should not be used in highly turbid water, per the manufacturer's recommendation.

7. After the removal of five casing volumes, review the stability of the water quality meter readings. The well will be considered developed if the water quality readings have stabilized for three consecutive casing volumes for the following:

pH (± 0.1 unit),
Specific Conductance (3%),
Turbidity (10% for values greater than 5 NTU; if three Turbidity values are less than 5 NTU, consider the values as stabilized),

8. If the water-quality readings stabilize before a total of ten casing volumes are removed, development is complete. If the water-quality readings do not stabilize, well development will be consider complete after ten casing volumes have been removed.
9. If the water level cannot be maintained above the well screen or the well pumps dry during purging, contact the MFA project manager for further instructions.
10. If potable water was placed into the boring during drilling or into the well during installation, remove that volume of water and then begin purging as described in step 5.

Standard Operating Procedure

Monitoring Well—Water Elevation

SOP Number: 13
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the methods for obtaining groundwater level measurements and light nonaqueous-phase liquid (LNAPL) measurements from monitoring wells. Measurement may be collected as an independent event or in conjunction with groundwater sampling or sampling of removed LNAPL.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the health and safety plan)
- Equipment decontamination supplies if equipment will be reused between well locations (see SOP 1 for equipment decontamination procedures)
- Field notebook
- Water-level meter or oil/water interface probe if water levels and LNAPL levels will be measured
- Bailers or tape/paste to confirm LNAPL detections if required; see SOP 10 for procedures for managing LNAPL when removing LNAPL from a well

Methodology

When the project-specific sampling and analysis plan (SAP) provides additional or different requirements for water-level and LNAPL measurements, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

General Sampling Procedure:

Review well construction details and historical groundwater and LNAPL levels and thicknesses if available.

During groundwater sampling events, measurements should be collected before, during, and after purging and sampling. During purging and low-flow sampling, water-level measurements are conducted to ensure that drawdown is not occurring. Low-flow sampling methods are described in SOP 9. The following procedures should be followed when collecting groundwater-level and LNAPL measurements from wells.

Water Level Measurement

1. Test the water-level meter to ensure proper instrument response. This can be accomplished by immersing the probe tip in a small container of water.
2. Open the well cover and cap and allow the water level to equilibrate with atmospheric pressure for several minutes so that a static water level is attained. Audible air movement into or out of

the well upon loosening of the well cap is an indication that the water level is not in equilibrium with atmospheric pressure.

3. Locate the measurement reference point at the top of the well casing. Typically, this is a small notch in the casing or a point marked with a pen. If no measure point is present, measure the water level from the north side of the casing and note the result in the field notebook.
4. Lower the water-level meter probe into the well casing until the probe signal indicates that water has been contacted.
5. Observe the depth-to-water (DTW) reading from the measurement reference point at the top of the well casing to the nearest 0.01 foot. Over the course of about a minute, raise and re-lower the probe and observe the resulting DTW reading. If the reading remains unchanged to within 0.01 foot, this is an indication that the water level has equilibrated with atmospheric pressure; the reading can then be recorded in the field notebook as the static water level reading. If the reading changes, allow more time for the water level to become static.
6. If the work scope or SAP requires measurement of the depth-to-bottom (DTB), lower the probe to the bottom of the well and record the DTB reading from the reference point to the nearest 0.01 foot.
7. Remove the probe and decontaminate the probe and the portion of the probe tape inserted into the well casing.

Water Level and LNAPL Measurement

1. Repeat above steps 1 through 7.
2. Lower the interface probe into the well casing until the probe signal indicates that LNAPL has been contacted. Typically, the interface probe will signal by a repeating beep when LNAPL is present. A steady signal indicates that LNAPL is absent and that the probe is recording the DTW.
3. Observe the LNAPL reading as described in step 5 above until a static reading to the nearest 0.01 foot is achieved, and record the reading in the field notebook.
4. Lower the probe until a steady signal indicates that water has been contacted. Observe the water-level reading as described in step 5 above to confirm a static water level, and record the reading in the field notebook.
5. If LNAPL is detected in a well with no prior history of LNAPL presence, or the LNAPL thickness is greater than in prior observations, verify the presence and thickness using an alternative technique (e.g., bailer, tape, and water/petroleum colorimetric paste). See SOP 10 for procedures for managing LNAPL when removing LNAPL from a well.
6. Remove the interface probe and decontaminate the probe and the portion of the probe tape inserted into the well casing.

Standard Operating Procedure

Underground Utility Locates

SOP Number: 18
Date: 03/09/2021
Revision Number: 0.1

Scope and Application

This standard operating procedure (SOP) describes the practices for locating underground utilities. Refer to the MFA health and safety plan (HASP) for additional information regarding communication procedures to be followed when an inadvertent utility strike occurs, as well as regarding methods for mitigating hazards during a utility strike.

Equipment and Materials Required

The following materials are necessary for this procedure:

- Personal protective equipment (as specified in the HASP)
- Marking materials (e.g., marking paint, stakes, flags)
- Field documentation materials

Methodology

When the project-specific sampling and analysis plan (SAP) specifies additional or different requirements for underground utility locates, it takes precedence over this SOP. In the absence of a SAP, the procedures in this SOP shall be used.

Before Conducting Utility Locates:

- Ensure that the locate will be conducted reasonably soon before the excavation work begins, e.g., within 48 hours. There may be project-specific conditions, e.g., weather and/or ground features that could cause markings to fade, which would require scheduling of the excavation work sooner than 48 hours after the locate.
- Clearly define the boundary of the work and the locations of all proposed excavations. Prepare a map of the project area showing the excavation locations.
- Interview site managers/property owners and obtain plans or drawings, if available, showing on-site utilities.
- For project work that will not take place in the public right-of-way, ensure that the public rights-of-way nearest to the project are identified and communicated during the one-call notification.
- Identify the township and range of the project area. This information can be easily attained by a quick email to MFA's GIS Exchange.
- If feasible, conduct a site visit to identify site conditions that could cause fading or disruption of marking paint. Such conditions could include gravel or ground sensitive to erosion and high traffic.
- Check the weather forecast to assess the potential for snow or rain to make marking utilities difficult or cause the markings to fade.

One-Call Utility Notification:

- If possible, initiate the one-call utility notification at least one week before the proposed work begins.
- Include a map or GPS coordinates when submitting the notification.
- Before conducting any excavation activities, confirm with each public utility that the utility locate has been completed.
- On remote or complicated sites, consider meeting public locators on site.
- Document the one-call ticket number and results in the project files.
- Provide the one-call ticket number to subcontractors who will be doing the excavations.

Private Utility Locate:

- Conduct the private utility locate only after confirmation that the public utility locate has been completed and all public utilities have been marked and the results reviewed by MFA staff who will be overseeing the excavations.
- Meet the private locator on site and participate in the entire private utility locate. Be engaged in the process, ask questions, and take time to walk the site thoroughly with the locator.
- Bring a copy of the one-call utility ticket and results of the one-call utility locater to check against the utility markings on the ground.
- If possible, have a site/property representative knowledgeable of on-site utilities participate in the private utility locate.
- If paint alone may not suffice to ensure clear marking of utilities, add vertical markers such as stakes or flags.
- Visually assess the area of the proposed excavation(s) to identify features potentially indicative of buried utilities. Have the private utility locator examine each feature identified below to assess the presence of buried utilities.
  - Examine adjacent public rights-of-way where public utilities have been marked for evidence of utilities that may extend onto the project site.
  - Identify nearby light poles, telephone poles, electrical utility poles, or other overhead utility poles with wires or conductors that run from the overhead utility, down the pole, and into the ground.
  - Identify the location of gas meters, water meters, or other aboveground junction boxes for evidence of utilities extending from these features into the ground.
  - Examine asphalt and concrete ground surfaces for discontinuities in the surface indicative of utility installations. Discontinuities may include recent patches of asphalt or concrete inlaid within older concrete or asphalt surfaces.
  - Identify manholes and catch basins indicative of buried storm or sanitary sewer pipes. Open manholes to examine the orientation of associated pipes to assess whether the utilities may be present near proposed excavations.
  - Identify tank ports and vent pipes.

- Identify irrigation systems and associated features such as valve boxes and controllers.
- Identify any other signs indicating the presence of buried utilities.
- Be wary of utility marks that suddenly begin or dead end.

Preparing to Perform Subsurface Activities after a Locate:

- Ensure that the markings are still visible when the work begins.
- Adjust locations, as needed, to avoid identified utilities, or use alternative methods such as nonmechanical excavation means (i.e., manual excavation or air-knifing) to a minimum depth of 5 feet.

Table
APWA UNIFORM COLOR CODE

	WHITE—Proposed Excavation
	PINK—Temporary Survey Markings
	RED—Electric Power Lines, Cables, Conduit and Lighting Cables
	YELLOW—Gas, Oil, Steam, Petroleum or Gaseous Materials
	ORANGE—Communication, Alarm or Signal Lines, Cables or Conduit
	BLUE—Potable Water
	PURPLE—Reclaimed Water, Irrigation and Slurry Lines
	GREEN—Sewers and Drain Lines

Source: Uniform Color Codes, ANSI Standard Z535.1. American Public Works Association. Revised 1999.

Appendix B

Field Sheets

MAUL FOSTER ALONGI

Maul Foster & Alongi, Inc.

Geologic Borehole Log/Well Construction

Project Number	Well Number	Sheet

Project Name
Project Location
Start/End Date
Driller/Equipment
Geologist/Engineer
Sample Method

TOC Elevation (feet)
Surface Elevation (feet)
Northing
Easting
Hole Depth
Outer Hole Diam

Depth (feet, BGS)	Well Details	Sample Data: Interval	Sample Data: Percent Recovery	Sample Data: Collection Method	Sample Data: Number	Sample Data: Name (Type)	Sample Data: Blows/6"	Lithologic Column	Soil Description
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

NOTES:

MAUL FOSTER ALONGI

109 East 13th Street, Vancouver, WA 98660 (360) 694-2691 www.maulfoster.com

Water Field Sampling Data Sheet

Client Name		**Sample Location**			
Project #		**Sampler**			
Project Name		**Sampling Date**			
Sampling Event		**Sample Name**			
Sub Area		**Sample Depth**			
FSDS QA:		**Easting**		**Northing**	**TOC**

Hydrology/Level Measurements

					(Product Thickness)	(Water Column)	(Gallons/ft x Water Column)
Date	**Time**	**DT-Bottom**	**DT-Product**	**DT-Water**	**DTP-DTW**	**DTB-DTW**	**Pore Volume**

(0.75" = 0.023 gal/ft) (1" = 0.041 gal/ft) (1.5" = 0.092 gal/ft) (2" = 0.163 gal/ft) (3" = 0.367 gal/ft) (4" = 0.653 gal/ft) (6" = 1.469 gal/ft) (8" = 2.611 gal/ft)

Water Quality Data

Purge Method	**Time**	**Purge Vol (gal)**	**Flowrate l/min**	**pH**	**Temp (C)**	**E Cond (uS/cm)**	**DO (mg/L)**	**ORP**	**Turbidity**	**Water Level**
Final Field Parameters										

Methods: (1) Submersible Pump (2) Peristaltic Pump (3) Disposable Bailer (4) Vacuum Pump (5) Dedicated Bailer (6) Inertia Pump (7) Other (specify)

Water Quality Observations:

Sample Information

Sampling Method	**Sample Type**	**Sampling Time**	**Container Code/Preservative**	**#**	**Filtered**
	Groundwater		VOA-Glass		
			Amber Glass		
			White Poly		
			Yellow Poly		
			Green Poly		
			Red Total Poly		
			Red Dissolved Poly		
			Total Bottles		

General Sampling Comments

Began purging at

Signature _____

Appendix B

Health and Safety Plan

MAUL FOSTER ALONGI

Health and Safety Plan

Northern State Multi Service Center

2070 Northern State Road

Sedro-Woolley, Washington

Prepared for:

Port of Skagit

Burlington, Washinton

May 29, 2024

Project No. M0624.04.018

Prepared by:

Maul Foster & Alongi, Inc.
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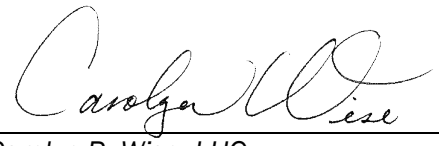
MAUL FOSTER ALONGI

Health and Safety Plan

Northern State Multi Service Center
2070 Northern State Road
Sedro-Woolley, Washington

The material and data in this plan were prepared under the supervision and direction of the undersigned.

Maul Foster & Alongi, Inc.



Carolyn R. Wise, LHG
Project Hydrogeologist

Christian Sifford, GIT
Staff Geologist

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Abbreviations

AED	automated external defibrillator
CFR	Code of Federal Regulations
COPC	chemical of potential concern
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSC	health and safety coordinator
JHA	job hazard analysis
MFA	Maul Foster & Alongi, Inc.
PIC	principal in charge
PPE	personal protective equipment
the Property	2070 Northern State Road in Sedro-Woolley, Washington
the Site	Northern State Multi Service Center
SSO	site safety officer

bing maps

A Northern State Rd, Sedro-Woolley, WA 98284

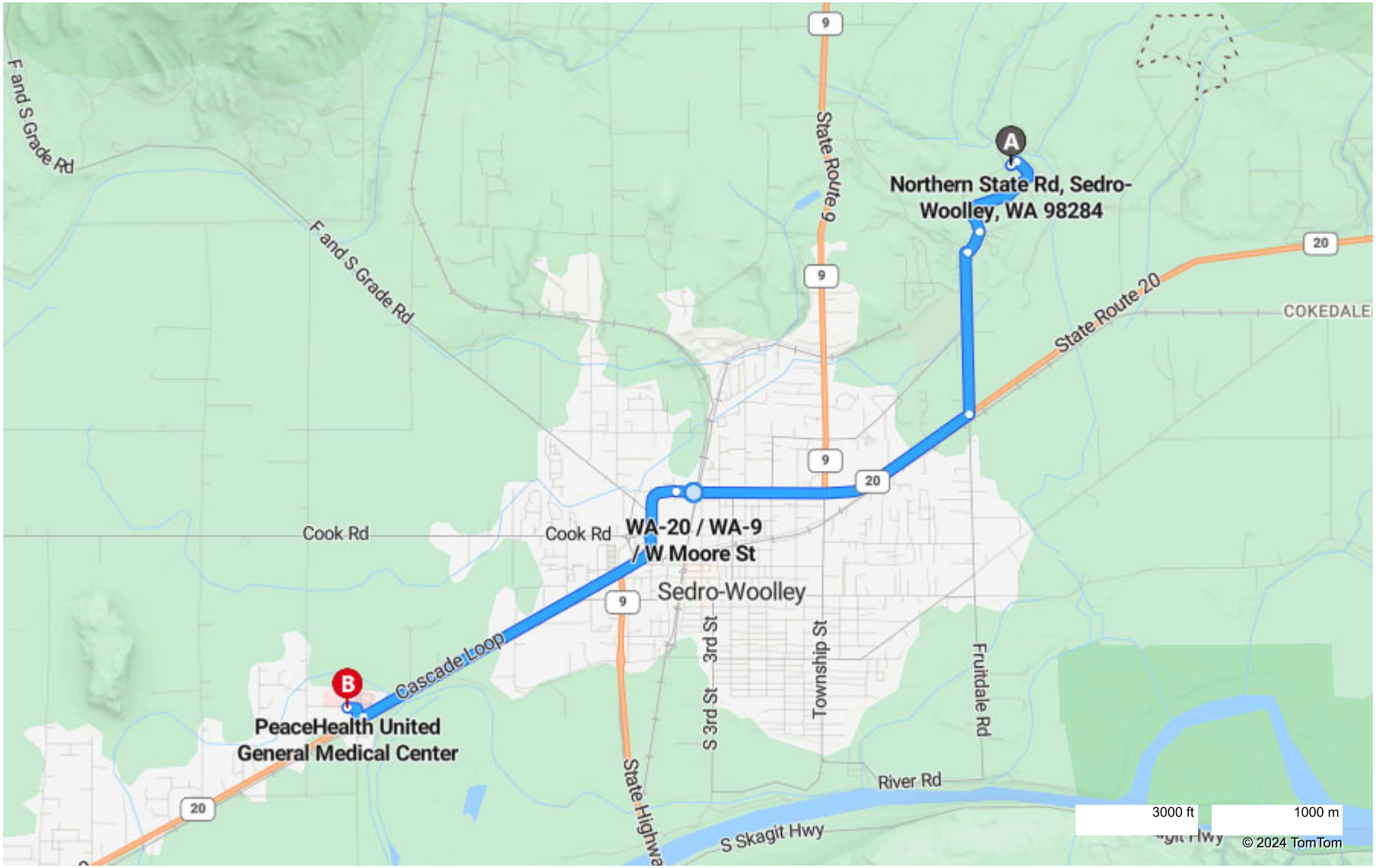
B PeaceHealth United General Medical Center, 2000 Hospital Dr, Sedro-Woolley, WA 98284

12 min , 5.2 miles

Light traffic (Leave at 1:00 AM)

Via Fruitdale Rd, WA-20

· Local roads



1 Nearest Hospital/Emergency Medical Center

1.1 Nearest Hospital

United General Hospital
2000 Hospital Drive
Sedro-Woolley, WA 98284

Phone: 360-856-6021

Distance: 5.2 miles

Travel Time: 12 minutes

1.2 Route to Hospital from the Site

See the map on the first page of this document.

1.2.1 Driving Directions to Hospital from the Site

1. Head west on Hub Drive toward Thompson Drive
2. Continue straight onto Thompson Drive
3. Turn left onto Fruitdale Road
4. Turn right onto WA-20 West/East Moore Street
5. At the traffic circle continue straight onto West Moore Street
6. Continue onto WA-20 West/Bingham Street/Borseth Street
7. At the traffic circle, continue straight onto WA-20
8. Turn right onto Hospital Drive

1.3 Emergency Phone Numbers

Ambulance, Police, Fire	Dial 911
Carolyn Wise Project Manager	Phone: 360-594-6255 Cell: 360-690-5982
Phil Wiescher Principal in Charge (PIC)	Phone: 360-433-0224 Cell: 360-903-8633
Nicole Bruneel Health and Safety Coordinator (HSC)	Phone: 208-784-1090 Cell: 208-949-3981

2 Plan Summary

This health and safety plan (HASP) was developed to describe the procedures and practices necessary for protecting the health and safety of Maul Foster & Alongi, Inc. (MFA), employees conducting activities at the Northern State Multi Service Center (former Northern State Hospital) site (Site). This Site is generally located at the Sedro-Woolley Innovation for Tomorrow Center (SWIFT Center) property at 2070 Northern State Road in Sedro-Woolley, Washington (the Property). Other employers, including contractors and subcontractors, are expected to develop and implement their own HASPs to manage the health and safety of their personnel.

MFA personnel conducting activities at the Site are responsible for understanding and adhering to this HASP. Before fieldwork begins, the on-Site personnel will designate a site safety officer (SSO) who is familiar with health and safety procedures and with the Site. Safety deficiencies should be immediately communicated to the SSO and, if necessary, to the project manager, PIC/program manager, or MFA's HSC.

All contractors and subcontractors have the primary responsibility for the safety of their own personnel on the Site. All personnel on the Site have stop work authority if they observe conditions that they believe create an imminent danger.

If MFA employees work on the Site for more than a year, this HASP will be reviewed at least annually. Additionally, this HASP will be updated as new or changed conditions are encountered to ensure that it reflects the current known hazards and requirements associated with the Site.

MFA personnel who will be working on the Site are required to read and understand this HASP. MFA personnel entering the work area must sign the personnel acknowledgment sheet (Section 16), certifying that they have read and that they understand this HASP and agree to abide by it.

3 Key Project Personnel

Name	Responsibility
Phil Wiescher	PIC
Carolyn Wise	Project Manager
Christian Sifford	Field Personnel
Brenden Murphy	Field Personnel
Nicole Bruneel	HSC

4 Emergency Supplies and Equipment List

Equipment	Location and Notes
First Aid Kit	Inside work vehicle.
Fire Extinguishers	Inside work vehicle.
Mobile Phones	On MFA staff.
Traffic Cones	Inside work vehicle, will be used as needed.
Water and Other Fluid Replenishment	Inside work vehicle in food-only cooler.
Eyewash	In work vehicle.
Spill Kit	In work vehicle.
Health and Safety Plan	In work vehicle.

5 Property Description and Background

5.1 Type of Property

The approximately 220-acre Property includes twelve tax parcels in the northeast corner of Sedro-Woolley in sections 7, 8, 17, and 18 of township 35 north and range 5 east of the Willamette Meridian. The Property is bordered on the north, east, and south by the Northern State Recreation Area, a public open space owned and managed by Skagit County and historically associated with the

Northern State Hospital. The Property is bordered by Fruitdale Road and residential properties to the west.

5.2 Buildings/Structures

The Property and is located within the Sedro-Woolley, Washington, city limits and is currently zoned as Public under the City Comprehensive Plan Land Use Map which allows for a range of potential uses in the public interest, not restricted to only open-space use.

The Property currently comprises over 80 buildings and structures. Some buildings are occupied by tenants, including the Cascade Job Corps, but the majority are vacant. The Cascade Job Corps uses some buildings for on-site housing and educational services.

5.3 Topography

The Property is located on a slight topographic plateau to the north of the Skagit Valley and is in the Lower Skagit-Samish watershed. In general, the Property slopes south and southeast toward the Skagit Valley and the Skagit River (Water Resource Inventory Area No. 3). Goat Hill, located in the northwest corner of the Property, includes the highest point of elevation at the Property (approximately 310 feet above mean sea level). The lowest elevation point lies along the southern boundary of the Property at approximately 100 feet above sea level.

5.4 General Geologic/Hydrologic Setting

According to the Geologic Map of the Sedro-Woolley North and Lyman 7.5-minute quadrangles, the Site and vicinity are underlain by Quaternary glaciomarine drift.[1] The glaciomarine deposits typically consist of, "...poorly sorted, poorly compacted diamicton consisting of silty, sandy, gravelly clay to clayey gravel; moderately well- to well-sorted sandy silt, sandy clay, clayey silt, and clay..."[1]

Groundwater was encountered during previous investigations at depths between 3.7 and 17.4 feet bgs.[2] Groundwater across the northern portion of the Site was determined to flow towards the east. Due to the large size of the Site and the limited area represented by the monitoring wells, it is possible that the groundwater flow direction varies throughout the Site. It is inferred that groundwater in other areas of the Site flows either southeast, due to the gradual topographic slope of the area toward the Skagit River Valley; west towards Brickyard Creek; or east towards Hansen Creek, depending on the location at the Site.

5.5 Property Status

The Property is currently owned and managed by the Port of Skagit, with buildings leased to multiple tenants, including the Cascade Job Corps, for on-site housing and educational services. A portion of

[1] Dragovich et al. 1999. Geologic map of the Sedro-Woolley North and Lyman 7.5-minute quadrangles, Western Skagit County, Washington. Geology and Earth Resources, Washington Division.
[2] MFA. 2022. *Draft Remedial Investigation Report, Former Northern State Hospital, Sedro-Woolley, Washington*. Prepared for Port of Skagit. Maul Foster & Alongi, Inc.: Bellingham, WA. June 9.

the original 220-acre campus located to the south of the Property is owned by the Port and leased to the Washington Military Department, for a vehicle storage, maintenance, and fueling facility.

5.6 General Property History

The Site was developed in 1909 and operated as a treatment and residence facility and hospital until its closure in 1973. The approximately 225-acre campus, which includes the former treatment and residence facility, hospital, and grounds, was designed to be self-sustaining and included on-site patient and staff housing, dedicated water supply reservoirs and an associated potable water treatment facility, a fueling station for on-site vehicles, maintenance and paint shops, and a laundry facility. After the facility's closure, the Site was transferred from the Department of Social and Health Services to the General Services Administration (known today as the Department of Enterprise Services). On July 1, 2018, the Port took title to the Property from Department of Enterprise Services.

6 Hazard Evaluation

6.1 Site Tasks and Operations

MFA has completed job hazard analyses (JHAs) for specific tasks that may be conducted on the Property, depending on the scope of work. JHAs are provided in Appendix A. The following list summarizes planned tasks and operations:

- General work near heavy equipment
- Collecting soil samples
- Collecting groundwater samples

The control measures that field personnel must implement to eliminate or minimize these hazards, such as air monitoring, personal protective equipment (PPE), engineering controls, and decontamination procedures, are detailed in the JHAs and in subsequent sections of this HASP.

6.2 Areas of Concern

Given the analytical results of prior investigations conducted on the Site, environmental impacts associated with the following areas of concern (AOCs) were identified:2

- AOC 1: Former Laundry Building—tetrachloroethene and associated daughter products in shallow soil, groundwater, and soil vapor near the former laundry building.
- AOC 2: Power House Building—heavy oil-range organics and carcinogenic polycyclic aromatic hydrocarbons in surface soil and heavy oils in groundwater in the area to the north and northeast of the Power House.
- AOC 3: Lead—lead in shallow soil adjacent to historic buildings and in the athletic field.
- AOC 4: Arsenic—arsenic in soil in the athletic field and near the former Ward building.

- AOC 5: Property-Wide Metals in Soil—slightly elevated and relatively consistent metals concentrations were detected in soil throughout the Site
- AOC 6: Maintenance Building—benzene, toluene, ethylbenzene, and total xylenes and gasoline in subsurface soil and groundwater adjacent to the maintenance building.
- AOC 7: Lead and Arsenic in Groundwater—lead and arsenic in groundwater in the northeastern portion of the Site.

These AOCs are considered preliminary and may be refined through the development of and screening to cleanup levels and additional background assessment and/or site characterization.

6.3 Chemical Hazard Evaluation

Chemicals of potential concern (COPCs) are summarized in Appendix B. Air monitoring action levels and associated controls are specified in Appendix C.

6.4 Physical Hazards

The specific physical hazards and associated controls for work at the Site are described in the JHAs provided in Appendix A.

7 Site-Control Measures

Control of access to the Site will be established before the work begins. Control measures may include fencing, gates, and signs limiting access to everyone except authorized personnel. Work/exclusion zones and contaminant reduction zones (and other relevant features, if any) will be designated by the SSO. The exclusion zone is defined as the area of known or suspected contamination (e.g., the area where a well is being installed), and the contaminant reduction zone is where support activities take place (e.g., packing sample coolers, decontamination activities).

MFA requires the buddy system if personnel conducting the work may potentially be exposed to chemical or physical hazards that would require immediate medical attention or rescue. The buddy system may involve working with non-MFA personnel.

8 Health and Safety Training

MFA personnel who could be exposed to COPCs while conducting work on the Site will have completed training consistent with the Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements in 29 Code of Federal Regulations (CFR) 1910.120(e) before beginning work on the Site. The training will include the following:

- Identification of an SSO, and other safety and health personnel, if applicable

- Identification of safety and health hazards specific to work being conducted
- Proper use of required PPE
- Safe work practices required (e.g., fall protection, confined-space entry procedures, hot-work permits, general safety rules)
- Safe use of engineering controls and equipment
- Medical surveillance requirements, including the recognition of signs and symptoms that might indicate overexposure to hazards
- The project-specific emergency response plan/spill containment plan

The HSC will oversee training for MFA personnel conducting fieldwork. Training records, including an outline, signoffs, and competency records, will be maintained by the HSC.

While the HSC is responsible for maintaining training records, the project manager is responsible for verifying that the training status of field personnel is current before these personnel deploy to the field.

9 Safety Equipment

9.1 Personal Protective Equipment

Individuals on the Site must wear PPE to protect against physical hazards. PPE required on the Site is typically modified Level D, which consists of the following:

- Hard hat
- High-visibility vest
- Work boots
- Safety glasses with side shields
- Nitrile gloves or equivalent if handling media potentially impacted or known to be impacted
- Work gloves (if handling materials that might have sharp edges, protrusions, or splinters)

Additional PPE may be necessary for specific tasks with additional hazards. The SSO will be responsible for designating additional PPE for specific tasks. Depending on the activity, additional PPE may include the following:

- Hearing protection (to be worn during high-noise tasks)
- Chemical-resistant clothing, (e.g., Tyvek coveralls)
- Chemical-resistant boots
- Chemical-resistant goggles
- Chemical-resistant gloves

- Faceshield
- Respiratory protection

Additional PPE may be required if workers discover unexpected contamination. Characteristics of unexpected contamination could include unusual odors, discolored media, or a visible sheen. MFA employees should contact the SSO and, if necessary, the project manager and/or the HSC as soon as possible after the discovery of unexpected contamination. The SSO and, if applicable, the project manager and/or HSC will determine any need for additional controls and/or training.

PPE used at the Site must meet the requirements of recognized consensus standards (e.g., American National Standards Institute, National Institute for Occupational Safety and Health), and respiratory protection will comply with the requirements set forth in 29 CFR 1910.134.

Project personnel are not permitted to reduce the specified level of required PPE without approval from the SSO or the project manager and/or HSC.

9.2 Safety Equipment

The SSO will be responsible for ensuring that the following safety equipment is available during fieldwork and is properly inspected and maintained:

- Soap and water for decontamination
- Caution tape, traffic cones, and/or barriers
- First aid kit
- Automated external defibrillator (AED)
- Fire extinguisher
- Fluids for hydration, (e.g., drinking water or sports drink)
- Canopy for shade
- Hand-washing station
- Eye-flushing station

9.3 Air Monitoring Equipment

The following air monitoring equipment will be available to identify conditions that may require additional controls. See Appendix C for specified action levels and follow-up response actions.

- Photoionization detector

9.4 Communications Equipment

MFA personnel should have a mobile phone or a radio available in case of emergency.

10 Decontamination Procedures

10.1 Partial Decontamination Procedures

MFA employees will implement the following partial decontamination procedures when exiting the work zone but remaining on the Site.

- Remove and inspect gloves. If they are ripped or otherwise damaged, discard them in a container labeled for disposable items.
- Wash hands and face with soap and water.

10.2 Full Decontamination Procedures

When exiting the work zone and leaving the Site (e.g., at the end of the work shift), MFA employees will follow the full decontamination procedures listed below.

- Remove work boots and put on street shoes. Place work boots in a plastic bag or container.
- Remove gloves and deposit in a container labeled for disposable items.
- Wash hands and face with soap and water.
- Shower as soon after the work shift as practicable.

11 Medical Surveillance

MFA will ensure that its employees who meet the following criteria are enrolled in a medical surveillance program consistent with 29 CFR 1910.120(f):

- The employees are, or may be, exposed to hazardous substances or health hazards at or above established permissible exposure limits for 30 or more days per year.
- The employees are required to wear a respirator for 30 or more days per year.

MFA employees who exhibit signs or symptoms consistent with overexposure to COPCs will be offered medical surveillance consistent with HAZWOPER requirements.

MFA will ensure that its employees who are authorized to wear respirators are medically evaluated and approved for respirator use, consistent with the respiratory protection standard (29 CFR 1910.134). The HSC or administrative designee (e.g., human resources manager) will maintain medical evaluation records, including respirator clearance documentation.

Personnel medically cleared for respirator use will undergo an annual qualitative fit test. The MFA HSC or administrative designee will conduct the annual qualitative fit tests and will manage the documentation.

If employees are required to wear a respirator on the Site, the project manager will verify that the employee has a current annual respirator fit test.

12 Air Monitoring

Based on Site conditions, it is not anticipated that air monitoring will be necessary; however, air monitoring equipment will be available in case workers encounter conditions, such as unusual odors, discolored media, or a visible sheen, that indicate the presence of unexpected contamination. If such conditions are discovered, workers will exit the area and contact the SSO and, as needed, the project manager or the HSC. If necessary, MFA will use the air monitoring equipment to evaluate the conditions and determine whether additional controls and/or training are required. Action levels and follow-up actions are provided in Appendix C.

If air monitoring is necessary, it must be performed by individuals familiar with the calibration, use, and care of the required instruments. Measurements will be documented, and the records must include the following information:

- The name of the person conducting the measurements
- The identity of workers, if any, who have exposure indicated by the measurement results
- Information about the instrument (e.g., type, make, model, serial number)
- The location where the measurement was taken
- The measurement date and start/stop time
- Conditions represented by the measurement, including applicable activities, work practices, weather conditions, Site conditions, and controls in place
- Measurement results
- Other relevant observations or notes

12.1 Air Monitoring Action Levels

If air monitoring is conducted, the results will be compared to the action levels provided in Appendix C. These levels have been established to comply with Occupational Safety and Health Administration permissible exposure limits, American Conference of Governmental Industrial Hygienists threshold limit values, and National Institute for Occupational Safety and Health recommendations for the chemicals that may be encountered on the Site. The action levels have been adjusted for the relative response of common photoionization detection instruments to motor-fuel vapors.

12.2 Instrument Calibrations

Instruments will be calibrated consistent with manufacturers' recommendations. Calibrations will be coordinated by the SSO and the project manager. Calibration and monitoring records will be maintained by the SSO and/or the project manager.

13 Emergency Response, Spill Containment, and Confined Space

MFA employees will follow the emergency response, spill response, and confined-space procedures described in the MFA Policies and Procedures Manual. Incidents will be documented on the incident report form included as Appendix D.

14 Pre-entry Briefing

MFA employees will conduct pre-entry briefings prior to beginning work on the Site (e.g., tailgate meetings; see the checklist provided as Appendix E). Additional briefings shall be conducted as the scope of work or conditions change throughout the project to ensure that employees are familiar with and are adhering to the appropriate safety and health protocol. Attendance and discussion topics will be documented on sign-in sheets that will be maintained by the SSO.

15 Periodic Evaluation

The project manager or designee will evaluate the effectiveness of this HASP by conducting periodic HASP audits. A HASP audit form is included as Appendix F. In addition, HASP effectiveness will be evaluated by tracking ongoing health and safety feedback from field personnel working on the project. This feedback will be reviewed and incorporated into either immediate or annual updates of this HASP, as appropriate. This HASP will be reviewed and updated at least annually. Updating this HASP as necessary ensures that it reflects the known hazards, conditions, and requirements associated with the project. MFA will maintain HASP audit or other periodic evaluation records and track all revisions to this HASP.

16 Safe Work Practices

The following safe work practices are provided to supplement the other information in this HASP.

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in areas with potentially contaminated materials.

2. Whenever practicable, field personnel will remain upwind of drilling rigs, open excavations, and other ground-disturbing activities.
3. Subsurface work will not be performed at any location until the area has been confirmed by a utility-locator firm to be free of underground utilities or other obstructions.

17 Acknowledgment

MFA cannot guarantee the health or safety of any person entering the Site. Because of the potentially hazardous nature of active sites, it is not possible to discover, evaluate, and provide protection against all possible hazards that may be encountered at the Site. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness. The health and safety guidelines in this HASP were prepared specifically for the Site and should not be used on any other site without prior evaluation by trained health and safety personnel.

MFA personnel who will work at the Site are to read, understand, and agree to comply with the specific practices and guidelines described in this HASP regarding field safety and health hazards.

This HASP has been developed for the exclusive use of MFA personnel. MFA may make this HASP available for review by contracted or subcontracted personnel for information only. This HASP does not cover the activities performed by employees of any other employer on the project. All contracted or subcontracted personnel are responsible for implementing their own health and safety program, including generating and using their own HASP.

I have read and I understand this HASP and all attachments, and agree to comply with the requirements described herein:

Name	Title	Date

Appendix A

Job Hazard Analyses

MAUL FOSTER ALONGI

Job Hazard Analysis

Task/Operation: Conducting Fieldwork	
Project Number: M0624.04.018	**Location Where Task/Operation Performed:** 2070 Northern State Road in Sedro-Woolley, Washington
Date Prepared: 3/08/2024 **Date Reviewed:** 3/18/2024	**Employee Preparing this Job Hazard Analysis (JHA):** Christian Sifford **Employee Reviewing and Certifying this JHA:** Carolyn Wise

Job/Task Description
This JHA describes hazards and required safe-work practices that are common to most types of fieldwork. See the separate task-specific JHA for hazards and safe-work practices that are unique to certain tasks (e.g., sampling contaminated media).

Physical Hazards		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Heat/cold/sunburn	Weather.	Be aware of seasonal dangers, including frostbite, hypothermia, snow blindness, trench foot, and heat stress. Drink plenty of fluids, especially when perspiring. Wear sunscreen on exposed skin. Stop work if an employee feels symptoms of dehydration, overheating, or heat stroke. Move to a shaded area and drink water. During cold or wet conditions, wear adequate clothing to reduce the potential for hypothermia. If there is lightning in the area, seek indoor shelter immediately, if possible. If outdoors, get into a hard-topped vehicle and away from trees. Turn off all radios and electronic equipment.
Eye injury	Debris (e.g., soil, water, injection fluids) coming into contact with eyes; working in areas with low, dense vegetation.	Wear eye protection with side shields. If there is a splash hazard, wear tight-fitting chemical goggles. If chemicals come into contact with eyes, immediately wash chemicals out with water. Identify the location of the eyewash station before beginning the work.
Head injury	Heavy equipment, tools, overhead hazards impacting the head.	Wear a hard hat. Do not work near moving or heavy equipment or under overhead hazards.
Foot injury	Sharp objects that could be stepped on; large objects falling on feet.	Wear protective boots (composite or steel-toe).
Hand injury	Pinch points, sharp objects, stress from pulling rope, dermal contact with chemicals and contaminated media.	Wear protective gloves. Avoid placing hands near operating equipment.
Hearing loss	Noise generated by heavy equipment/machinery.	Wear hearing protection such as earplugs or earmuffs.

Task/Operation: Conducting Fieldwork		
Bodily harm, including to bystanders and the public and pedestrians in the locality of work	Heavy equipment, drilling rigs, support vehicles, traffic and public rights-of-way; potential to be struck, crushed, or impacted by moving objects.	Wear a safety vest for enhanced visibility. Use cones and caution tape to cordon off the immediate work area. Watch for and escort pedestrians away from the work area. Pause work if necessary. Ensure traffic control measures (e.g., traffic cones, signage) are in place. Do not work near moving or heavy equipment or under overhead hazards. Maintain eye contact with equipment operators. When working around vehicles or heavy equipment, know the locations of emergency equipment (e.g., fire extinguishers, emergency shutoff features).
Physical stress	Lifting heavy equipment and objects; conducting strenuous activities; kneeling on hard or gravel surfaces.	Use proper lifting techniques, i.e., bending and lifting with the legs and not the back. Do not twist at the waist when turning. Use the buddy system for heavy objects. Use knee pads or a kneeling pad. Take breaks and rest as needed.
Accidents with equipment/tools	Sample-collection equipment/tools.	Verify that you have the appropriate equipment/tools for your tasks. Use equipment/tools as intended by the manufacturer. Only use open blades or sharp-edged tools for their intended purposes. Stow tools in the vehicle properly; use appropriate cases and bags. Secure equipment (including compressed-gas cylinders) in the vehicle with netting and straps; do not leave loose—it can cause property damage or serious injuries to others or yourself.
Slips, trips, and falls	Uneven or unstable ground.	Maintain good housekeeping in work areas to minimize or eliminate slip/trip/fall hazards from equipment and supplies. Walk around rather than over hazards on the ground. Use caution when walking on uneven ground or in snowy and/or icy conditions. Dense vegetation may obscure dangerous features, including biological hazards, riverbanks, cliffs, unstable/steep slopes, and excavations. Flagging or marking dangerous areas can help reduce the likelihood of injury.

Task/Operation: Conducting Fieldwork		
Biological/Chemical Hazards		
Biological/Chemical Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Biological—animals	Livestock, deer; biting or stinging insects, spiders, and snakes; animal feces.	Do not turn your back on animals even if they seem docile. Make sure you have an escape plan in case an animal becomes aggressive. Use bug repellent. Insect nests should never be disturbed. Use snake chaps or shin guards when grass is above the ankle. Employees who are allergic to stings should not work in areas where there is a high risk of encountering stinging insects. Use a bar to clear spiders and/or snakes from objects and/or vegetation. Check well vaults and security lids for insects; use caution when opening. Avoid contact with animal feces. When working indoors, remove animal feces from the work area—if possible, without creating dust.
Biological—plants	Poisonous plants and other irritant vegetation (e.g., blackberry canes).	Do not touch or approach poisonous or irritant vegetation. Wear long pants and a long-sleeved shirt while on the site if poisonous plants and other irritant vegetation is present.
Exposure to chemicals in environmental media	Chemicals or hazardous materials in soil, sediment, surface water, groundwater, NAPL, stormwater, building materials, indoor air, outdoor air, soil vapors, monitoring wells, borings, excavations, and manholes.	See the task-specific JHA.
Additional Control Measures and Guidance		
Engineering Controls: No engineering controls specified.		
General Safe-Work Practices and Guidance: • Employees should not eat or drink in the immediate area where sampling is being conducted. Employees should wash their hands and faces before eating or drinking. If used, nitrile gloves should be disposed of in a container labeled for disposable items. • Cones, barrier tape, or equivalent methods will be used to establish the work area, if feasible. • Tasks that must be conducted in the work area must be coordinated with equipment operators before work begins. Methods of communication, such as direct eye contact, hand signals, and/or verbal communication, will be established before work begins. • Employees should carry a cellular phone and/or a security radio.		
PPE: Hard hat (when working around heavy equipment, including drill rigs, or overhead hazards), work boots (protective composite or steel-toe boots when working around heavy equipment), high-visibility vest or outer garment, safety glasses with side shields, nitrile gloves (or other hand protection appropriate for the type of physical or chemical hazards present), hearing protection (earplugs or earmuffs) as needed. Use chemical goggles if there is a chemical splash hazard.		

Job Hazard Analysis

Task/Operation: Task-Specific Hazards		
Project Number: M0624.04.018	**Location Where Task/Operation Performed:** 2070 Northern State Road in Sedro-Woolley, Washington	
Date Prepared: 3/08/2024 **Date Reviewed:** 3/18/2024	**Employee Preparing this Job Hazard Analysis (JHA):** Christian Sifford	
	Employee Reviewing and Certifying this JHA: Carolyn Wise	
Job/Task Description		
This JHA is specific to certain elements of fieldwork that have unique hazards and require specific safe-work practices to mitigate those hazards. See the separate General Fieldwork Hazards JHA for hazards and safe-work practices that are common to most types of fieldwork.		
Sampling Contaminated Solid and Liquid Media		
Hazard/Risk	**Source of Hazard/Risk**	**Hazard/Risk Mitigation**
Exposure to chemicals or hazardous substances via direct contact.	Chemicals or hazardous materials in soil, and groundwater.	See the chemical hazards summary table for applicable chemical hazards.
		Consult the HASP to identify the required PPE for preventing direct contact with contaminated media.
		Consult the HASP to identify required air monitoring equipment, respiratory protection, and action for preventing inhalation of contaminated dust and vapors.
		When around monitoring wells, avoid working with your breathing zone directly above the opening of the well casing. When possible, work upwind of the well casing. Keep your face away from the monument when removing the well cap.
		Use plastic garbage bags or plastic sheeting to cover the work area. It is preferable to roll/berm the edges to catch any drips/spills. If it is raining, work under a rain canopy.
Additional Control Measures and Guidance		
Engineering Controls: No engineering controls specified.		
General Safe-Work Practices and Guidance: • See the General Fieldwork Hazards JHA for safe-work practices and guidance common to most types of fieldwork.		

Appendix B

Chemicals of Potential Concern

MAUL FOSTER ALONGI

Table
Chemical Hazards

Analyte	OSHA PEL (TWA)	ACGIH TLV (TWA)	NIOSH IDLH[1]	LEL (%)	IP (eV)	Other Hazard
VOCs						
1,1-Dichloroethane	100 ppm	100 ppm	3,000 ppm	5.4	11.06	
1,2-Dichloroethane	50 ppm	NE	50 ppm	6.2	11.05	
cis-1,2-Dichloroethene	200 ppm	NE	1,000 ppm	5.6	9.32	P
Tetrachloroethene	100 ppm	25 ppm	150 ppm	NA	9.32	C
Trichloroethylene	100 ppm	300 ppm	1,000 ppm	NA	9.45	C, P
Vinyl chloride	1 ppm	5 ppm	NA	3.6	9.99	C, F
Metals						
Arsenic	0.01 mg/m^3	0.01 mg/m^3	5 mg/m^3	NA	NA	C, P
Cadmium	0.0050 mg/m^3	0.002 mg/m^3	9 mg/m^3	NA	NA	C
Chromium	1 mg/m^3	0.5 mg/m^3	250 mg/m^3	NA	NA	R, P
Copper	1 mg/m^3	0.2 mg/m^3	100 mg/m^3	NA	NA	
Lead	0.05 mg/m^3	0.05 mg/m^3	100 mg/m^3	NA	NA	C, P
Zinc	10 mg/m^3	2 mg/m^3	500 mg/m^3	NA	NA	

Table
Chemical Hazards

Notes

ACGIH = American Conference of Governmental Industrial Hygienists.
C = carcinogen.
cc = cubic centimeter.
CE = ceiling concentration.
E = explosive.
F = flammable.
IDLH = immediately dangerous to life and health.
IP (eV) = ionization potential.
LEL = lower explosive limit.
mg/kg = milligrams per kilogram.
mg/m^3 = milligrams per cubic meter.
NA = not available.
NE = not established.
NIOSH = National Institute for Occupational Safety and Health.
OSHA = Occupational Safety and Health Administration.
P = poison.
PAH = polycyclic aromatic hydrocarbon.
PEL = permissible exposure level.
ppb = parts per billion.
ppm = parts per million.
R = reactive.
SC = suspected carcinogen.
TLV = threshold limit value.
TPH = total petroleum hydrocarbons.
TWA = time-weighted average.

Reference

[1]CDC. 2019. "Immediately Dangerous to Life or Health (IDLH) Values." Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health (NIOSH). October 8. Accessed September 13, 2022. http://www.cdc.gov/niosh/idlh/intridl4.html.

Appendix C

Air Monitoring Action Levels

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Air Monitoring Procedures and Toxicity Action Levels

Instrument	Action Level	Initial Action	Follow-Up Action
PID[a]	Detection of 10 ppm (above ambient) in breathing zone.	Upgrade to Level C and continue to monitor breathing zone. If 50 ppm, leave exclusion zone. Return only if levels decrease to below 50 ppm.	Ventilate area; always work upwind.

Notes
HSC = health and safety coordinator.
PID = photoionization detector.
ppm = parts per million.
[a]Some PIDs do not work in high (e.g., greater than 90%) humidity or rainy weather. Under these atmospheric conditions, only PIDs certified for use in high humidity should be used.

Appendix D

Incident Report Form

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Health and Safety Incident Report

This report must be completed in full and submitted within 24 hours to the MFA health and safety coordinator.

Project Name: _____

Project Number: _____

Date and Time of Incident: _____

Location: _____

Type of Incident (check all applicable items):

☐ Illness	☐ Health and safety infraction	☐ Vehicular accident
☐ Injury	☐ Fire, explosion, flash	☐ Electric shock
☐ Property damage or theft	☐ Chemical exposure	☐ Near miss
☐ Spill	☐ Other (describe):	

Description of Incident

Describe what happened and the possible cause of the incident. If reporting a spill, include the quantity or estimated quantity. Identify individual(s) involved, witnesses, and their affiliations. Describe emergency or corrective action taken. Attach additional sheets, drawings, or photographs as needed.

Incident Reporter:

Name	Signature	Date

Health and Safety Coordinator:

Name	Signature	Date

Appendix E

Tailgate Safety Meeting Checklist

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Tailgate Safety Meeting Checklist

Client Name:	
Project No.:	
Communicated By:	
Date:	

Yes	NA	Information Reviewed
☐	☐	Emergency Response Procedures and Site Evacuation Routes
☐	☐	Route to Hospital
☐	☐	HASP Review and Location
☐	☐	Key Project Personnel
☐	☐	Emergency Phone Numbers
☐	☐	Stop Work Authority
☐	☐	General Site Description/History and Chemical Hazards
☐	☐	For Active Sites—Site Activities and Vehicular/Equipment Traffic
☐	☐	Site-Specific Physical Hazards
☐	☐	Required Personal Protective Equipment
☐	☐	Available Safety Equipment and Location
☐	☐	Daily Scope of Work (reference JHAs as applicable)
☐	☐	Decontamination Procedures
☐	☐	Identify Work Zones, Exclusion Zones, and Decontamination Zones
☐	☐	Hazardous Atmospheres
☐	☐	Air Monitoring Equipment and Procedures
☐	☐	Identify Potential Site-Specific Slip, Trip, and Fall Hazards
☐	☐	Dust and Vapor Control
☐	☐	Confined Space(s)
☐	☐	Open Pits and Excavation
☐	☐	Extreme Temperatures
☐	☐	Incident Reporting
☐	☐	Other: _____

Additional Health and Safety Practices and Considerations

Attendees		
Name	Signature	Company
1)		
2)		
3)		
4)		
5)		
6)		
7)		
8)		

Appendix F

HASP Audit Checklist

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HASP Audit Checklist

Project Name:	
Project No.:	
Project Location:	
Audit Date / Time:	
Person / Persons Performing Audit:	
MFA Personnel Interviewed or Conducting Fieldwork:	

	Status			Comment	Recommendation	Assigned to:	Scheduled Completion Date:	Actions Completed:	Person Who Completed Actions:	Date Completed:	Current Status / Notes:
	Yes	No	N/A								
Audit Checklist Item											
1. Is there a written HASP for this project? If so, what is the revision date?											
2. Is the HASP available to project personnel?											
3. Does the HASP appear accurate and complete? For example, are the directions to the hospital and the emergency contact numbers accurate? Are the site contaminants listed?											
4. Do the JHAs appear accurate and complete? For example, do there appear to be risks addressed for all of the applicable activities?											
5. Do you observe violations of the HASP requirements?											
6. If applicable, are employees adhering to the respirator program (see SOP 03, Respiratory Protection)?											
Interview Questions											
7. Where do you keep the HASP for this project?											
8. Have you reviewed the HASP for this project? If so, what was your review process?											
9. Can you tell me how you conduct your site activities? Note to auditor—pick a JHA activity and identify major discrepancies between the answer and the JHA, if any.											
10. Do you have any health and safety questions or concerns? For example, have you observed things on this project that you thought were unsafe? Note to auditor—make sure we come up with a plan to promptly address any listed concerns.											

Signature of Person / Persons Conducting Audit			
Name	Signature	Date	

Signature of Project Manager and Principal in Charge Acknowledging Review of Completed HASP Audit Checklist			
Name	Signature	Date	

Appendix C

Geologic Cross Section

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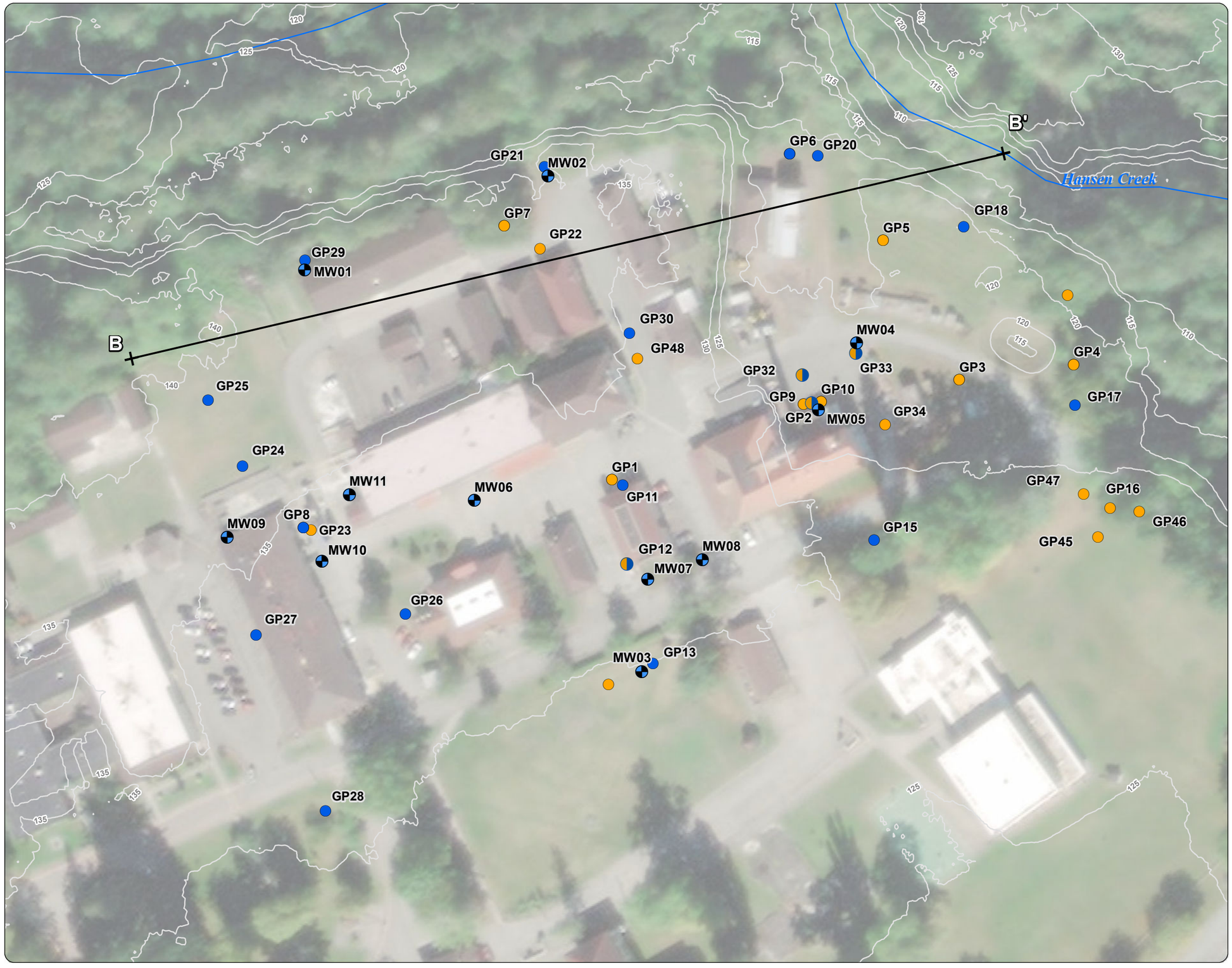
Figure C-1
Cross Section Transect

Northern State Multi Service Center
Port of Skagit
Sedro-Woolley, Washington



Legend

- Monitoring Well
- Soil Boring
- Groundwater Boring
- Soil and Groundwater Boring
- Transect Line
- Topographic Surface Contour (5 ft.; NAVD 88)

NOTES:
All features are approximate.
ft. = feet.
NAVD 88 = North American Vertical Datum of 1988.

0 50 100
Feet

Source: Aerial photograph obtained from Esri ArcGIS Online; streams data set obtained from Skagit County.

MAUL FOSTER ALONGI
p. 971 544 2139 | www.maulfoster.com

Path: X:\0624.04 Port of Skagit\18\Projects\Fig5-4. CrossSectionTransect.mxd
Print Date: 4/18/2022
Approved By: cwise
Produced By: abixby
Project: M0624.01.018

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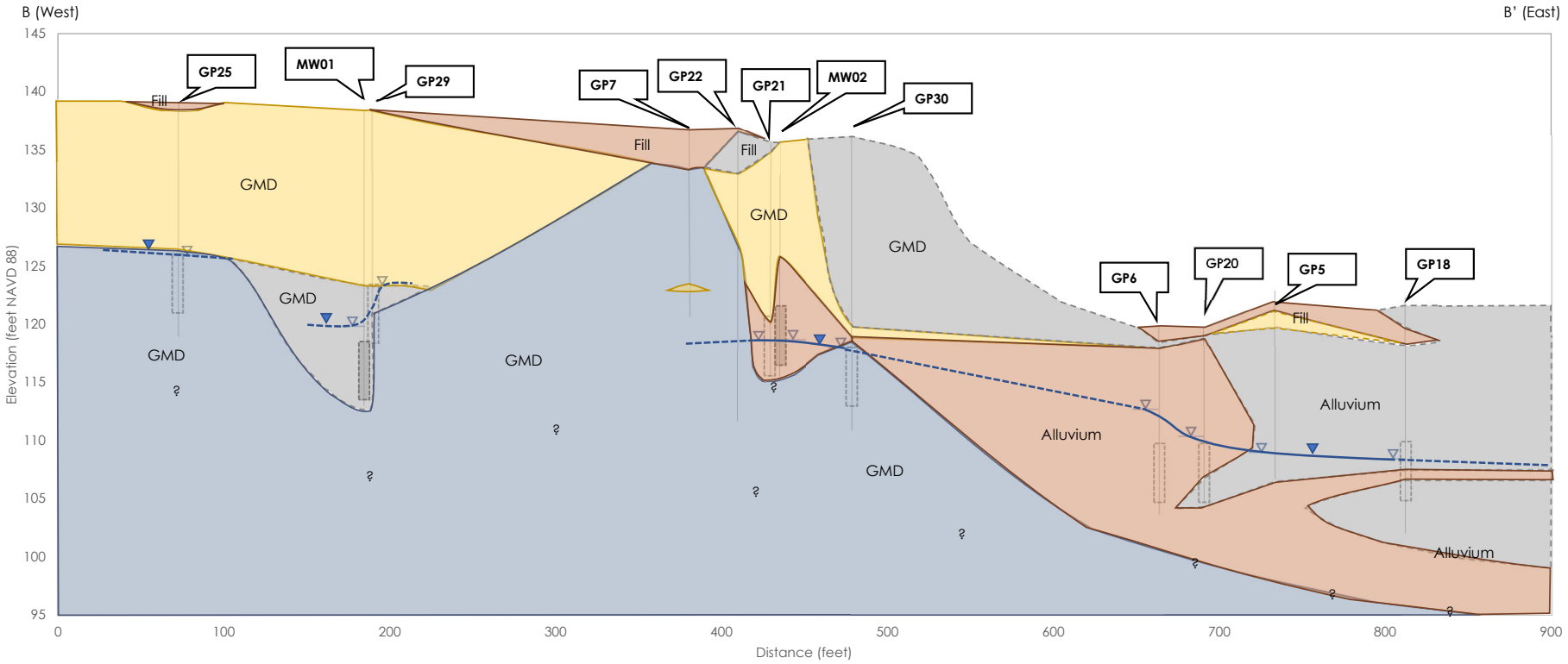
Figure C-2
Geologic Cross Section
Northern State Multi Service Center
Sedro-Woolley, Washington



Legend

- Gravelly sand to sandy gravel
- Clay
- Silt
- Silty sand to sandy silt
- Water table
- Water level observed during drilling
- Monitoring well screen interval
- Temporary well screen interval
- Location ID

NOTES:
All feature locations are approximate.
Units and water table are dashed where inferred.
Water levels shown were observed during drilling.
2.5 times vertical exaggeration.
GMD = glaciomarine drift.
NAVD 88 = North American Vertical Datum of 1988.
U = not detected at or above the reporting limit.
ug/L = micrograms per liter.
? = inferred contact

Appendix D

Inadvertent Discovery Plan

MAUL FOSTER ALONGI

INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): Northern State Multi Service Center Location: 2070 Northern State Road, Sedro-Woolley, WA

Project Lead/Organization: Maul Foster & Alongi, Inc. County: Skagit

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

Once completed, **the IDP should always be kept at the project site** during all project activities. All staff, contractors, and volunteers should be familiar with its contents and know where to find it.

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move.***
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact		Alternate Contact	
Name:	Carolyn R. Wise	Name:	Phil Wiescher
Organization:	Maul Foster & Alongi, Inc.	Organization:	Maul Foster & Alongi, Inc.
Phone:	360-594-6255	Phone:	360-594-6267
Email:	cwise@maulfoster.com	Email:	pwiescher@maulfoster.com

Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager		Alternate or Cultural Resource Contact	
Name:	Chris DeBoer, LHG	Name:	Donna Podger
Program:	Northwest Region Toxics Cleanup Program	Program:	Ecology Cultural Resource Specialist
Phone:	425-466-8732	Phone:	360-407-7016
Email:	chris.deboer@ecy.wa.gov	Email:	donna.podger@ecy.wa.gov

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

DAHP Contacts:

Name: Rob Whitlam, PhD
Title: State Archaeologist
Cell: 360-890-2615
Email: Rob.Whitlam@dahp.wa.gov
Main Office: 360-586-3065

Human Remains/Bones:

Name: Guy Tasa, PhD
Title: State Anthropologist
Cell: 360-790-1633 (24/7)
Email: Guy.Tasa@dahp.wa.gov

4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe:	Samish Indian Nation	Tribe:	Upper Skagit Indian Tribe
Name:	Jackie Ferry	Name:	Scott Schuyler
Title:	THPO	Title:	Cultural Resources
Phone:	360-293-6404 ext. 126	Phone:	360-854-7009
Email:	jferry@samishtribe.nsn.us	Email:	sschuyler@upperskagit.com
Tribe:	Tulalip Tribes of Washington	Tribe:	Swinomish Indian Tribal Community
Name:	Richard Young	Name:	Josephine Jefferson
Title:	Cultural Resources	Title:	THPO
Phone:	360-716-2652	Phone:	360-466-7352
Email:	ryoung@tulaliptribes-nsn.gov	Email:	jjefferson@swinomish.nsn.us

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:		State Agency:	
Agency:		Agency:	
Name:		Name:	
Title:		Title:	
Phone:		Phone:	
Email:		Email:	

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL MATERIAL

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify.*** For specific instructions on how to handle a human remains discovery, see: *RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions*.

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov
(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):
   - Local Medical Examiner or Coroner name and phone: Skagit County Coroner, 360-416-1996
   - Local Law Enforcement main name and phone: Sedro-Woolley Police Department, 360-855-0111
   - Local Non-Emergency phone number (911 if without a non-emergency number): Skagit County Sheriff's Office, 360-428-3211
2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, Cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. Organizations may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.53 and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessment are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

The archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below

surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the sites and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

Informational Resources

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003)
(https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

Potentially Interested Tribes

Interactive Map of Tribes by Area
(https://dahp.wa.gov/archaeology/tribal-consultation-information)

WSDOT Tribal Contact Website
(https://wsdot.wa.gov/tribal/TribalContacts.htm)

11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

Additional tribal contacts:

Stillaguamish Tribe of Indians
Kerry Lyste
THPO, Cultural Resources
360-652-7362 ext. 226
klyste@stillaguamish.com

Snoqualmie Indian Tribe
Adam Osbekoff
Cultural Resource Compliance Manager
adam@snoqualmietribe.us

Sauk-Suiattle Indian Tribe
Cultural Resources
thpo@sauk-suiattle.com

Lummi Nation
Lena Tso
THPO

Implement the IDP if you see…

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.

Stone artifacts from Oregon.

Stone artifacts from Washington.

Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

Implement the IDP if you see…

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.

Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.

Artifacts from unknown locations (left and right images).

Implement the IDP if you see…

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.

Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants. Right: Bone Pendants. Both from Oregon and Washington.*

Implement the IDP if you see…

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.

Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP).*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry*.

Implement the IDP if you see…

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- "Unusual" accumulations of rock (especially fire-cracked rock).
- "Unusual" shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a "layer cake" appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the "unusual" or out of place (for example, rock piles in areas with otherwise few rocks).

Shell Midden pocket in modern fill discovered in sewer trench.

Underground oven. Courtesy of DAHP.

Shell midden with fire cracked rock.

Hearth excavated near Hamilton, WA.

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.

Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*

Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.

Main Image: *Dishes, bottles, workboot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*

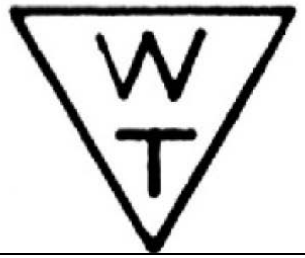
Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Implement the IDP if you see…

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.

Far Left: .303 British cartridge found by a WCC planting crew on Skagit River. Don't ever touch something like this!
Left: Maker's mark on bottom of old bottle.

Right: *Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.*



Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).

Can opening dates, courtesy of W.M. Schroeder.

Implement the IDP if you see…

You see historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.

Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

Implement the IDP if you see...

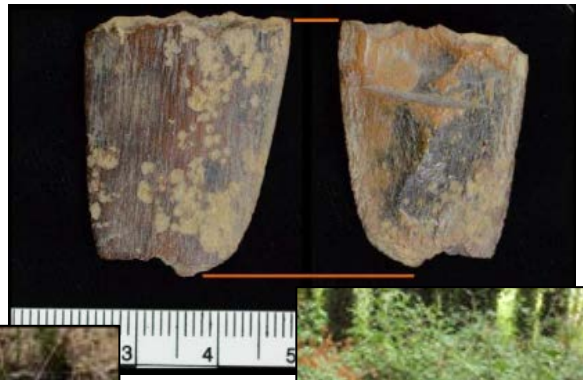
Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.

Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.



Directly Above: This is a real discovery at an Ecology sewer project site.

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: *Read the plan!*