FLOYD | SNIDER
strategy ▪ science ▪ engineering

Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

Memorandum

To: Tamara Welty and Sonia Fernández, Washington Department of Ecology
Copies: Geoff Lakman, Lakeshore Corporation
From: Nathan Schachtman, Kristin Anderson, and Gabe Cisneros, Floyd|Snider
Date: April 5, 2024
Project ID: Lakeshore-Panda
Re: **Site Characterization Work Plan**

INTRODUCTION AND SITE DESCRIPTION

This Site Characterization Work Plan (Work Plan) has been prepared in response to Washington State Department of Ecology's (Ecology's) First Periodic Review and subsequent January 10, 2024, Notice Letter for Panda Dry Cleaners (Site), requiring additional Site characterization to avoid rescission of the Site's 2006 No Further Action (NFA) determination (Ecology 2006, 2023, 2024). This Work Plan will be submitted along with an application to Ecology's Volunteer Cleanup Program (VCP) on or before May 9, 2024, which includes Ecology's 60-day extension from the original deadline that was granted via email on February 26, 2024 (Welty 2024).

As described in the following sections, the Site constitutes a small retail space (Unit 6 in Building B) that previously hosted a dry cleaner, located at 17408 Highway 9 in Snohomish County, Washington (Appendix A of Ecology 2023). The property that encompasses the Site (Snohomish County tax parcel 27051100409400) is located within Clearview Plaza and includes multiple adjacent retail spaces and a paved parking area. Currently, the Site retail space is occupied by Highway 9 Smokes, a tobacco product and accessories retailer. Adjacent retail spaces are occupied by a Subway sandwich shop and Safeway supermarket.

SITE AND REGULATORY BACKGROUND

A June 2005 Phase I Environmental Site Assessment (ESA) for Clearview Plaza identified Panda Dry Cleaners, a dry cleaner that operated at the Site between approximately 1996 and 2006, as a possible recognized environmental condition due to documented tetrachloroethene (PCE) usage in operations (LandAmerica 2005a). Based on this recommendation, a follow-up Phase II Limited Subsurface ESA was conducted in August 2005 that included two borings within the Panda Dry Cleaners space and two borings on the east and west sides of the building (LandAmerica 2005b). One soil sample was collected from each boring using either a direct-push

drill rig or a hand auger, and a groundwater sample was collected from a temporary monitoring well installed at the borings east of the building. The investigation locations and results are summarized as follows and shown in Attachment 1:

- At direct-push boring B-1, located approximately 10 feet east of the building, PCE was not detected at a concentration greater than the laboratory quantitation limit in the soil sample from 8.5 feet below ground surface (bgs). A grab groundwater sample was also collected at this location and PCE concentrations were also not detected. The primary toxic breakdowns product of PCE (trichloroethene, dichloroethene, and vinyl chloride) were also not detected in either sample.
- At direct-push boring B-2, located approximately 5 feet west of the building, PCE was not detected at a concentration greater than the laboratory quantitation limit in the soil sample from 1 foot bgs. The breakdown products of PCE were also not detected.
- At hand auger boring B-3, located on the western side of the building interior, PCE was detected at a concentration of 0.1 milligrams per kilogram (mg/kg) in the soil sample collected at 1 foot bgs, greater than the Model Toxics Control Act (MTCA) Method A cleanup level (CUL) of 0.05 mg/kg. The breakdown products of PCE were not detected.
- At hand auger boring B-4, located in the central portion of the building interior and closest to the former dry cleaning machine, PCE was detected at a concentration of 0.3 mg/kg in the soil sample collected at 2 feet bgs, exceeding the MTCA Method A CUL of 0.05 mg/kg. The breakdown products of PCE were not detected.

The top 4 feet of soil in the four borings was described as fine- to medium-grained sands, with engineered fill being encountered directly below the building. In the two direct-push borings (B-1 and B-2), a silt unit, consistent with a low permeability glacial till, was encountered starting at 4 feet bgs, and refusal was encountered in both borings at 10 feet bgs. Groundwater was encountered in both borings at approximately 9 feet bgs. Soil was field screened with a photoionization detector (PID), and measurements ranged from 0 to 710 parts per million. Because PCE has limited ionization potential (and, therefore, generally produces no or relatively low PID response), these field screening results are not consistent with the observed PCE results in soil.

Based on the results of the Phase II ESA, the Site was entered into the VCP in February 2006 (VCP number NW1588), and in July 2006, the property owners submitted an Assessment of Environmental Conditions that included a request for an NFA determination (URS 2006). In October 2006, the concrete floor around the dry cleaning and chemical storage areas was sealed with a product resistant to both liquid- and vapor-phase chlorinated solvents. On November 13, 2006, an NFA letter was issued for the Site requiring that a restrictive covenant be placed on the property to retain and maintain the building and integrity of concrete floor that overlies the PCE-impacted soil (Ecology 2006).

In December 2023, Ecology prepared their First Periodic Review for the Site to confirm that the restrictive covenant continued to protect human health and the environment (Ecology 2023). The periodic review found that the covenant continues to be protective of human health and the environment in regard to direct contact with PCE-contaminated soil under the building. However, Ecology also identified the following issues through the course of its periodic review related to incomplete Site characterization, reproduced as follows:

- "The horizontal and vertical extent of residual contaminated soil and potentially affected groundwater has not been fully delineated. The Covenant is only protective of soil beneath the subject property and does not apply to other potentially impacted media at the subject property, or any potential impacts to adjacent properties (such as the supermarket). In addition, it is unclear whether the Covenant includes the adjacent tenant spaces on the subject property, or includes only the former dry cleaner unit, due to inconsistencies in the Covenant. Therefore, the remedy may be ineffective long-term in protecting adjacent properties and/or adjacent units, if they are impacted."
- "A VI assessment has not been conducted at the Site. To ensure that the concentrations of PCE (and breakdown products) remaining at the Site are protective of human health, a VI assessment should be conducted per Ecology's 2022 Guidance for Evaluating Vapor Intrusion in Washington State: Investigation and Remedial Action. Soil gas and/or indoor air sampling (as appropriate) should be conducted in the Highway 9 Smokes space (former dry cleaner), as well as the adjacent tenant spaces and buildings, based on their close proximity to the remaining soil contamination (which has an unknown extent). Adjacent owners and occupants should be notified, and access requested."
- "Additional characterization work is needed to delineate the extent of chlorinated solvents in soil, soil vapor, and groundwater beneath adjacent properties and adjacent tenant spaces."

PROPOSED INVESTIGATION SCOPE

Soil, indoor air, and groundwater sample collection is proposed to meet the Site characterization objectives listed in the previous section and in the periodic review (Ecology 2023). Proposed investigation locations are shown in Figure 1. The proposed investigation scope focuses on media in the direct vicinity of the residual PCE-impacted soil below the Highway 9 Smokes tenant space. The proposed investigation will collect detailed field screening observations to support Site characterization. Additional sampling in adjacent retail spaces may be needed, pending results from this investigation.

All field investigations will be conducted according to Floyd|Snider Standard Guidelines provided in Attachment 2 and under a Site-specific Health and Safety Plan included as Attachment 3. Additional details for sampling each medium at the Site are provided in the following subsections.

Soil Sampling

To delineate the horizontal and vertical extent of residual contaminated soil, a total of seven soil borings (FS-01 through FS-07) will be advanced around the outside of the former dry cleaners using a direct-push drill rig or a direct-push and auger combination rig. The borings will be advanced by a Washington-licensed driller and will consist of one vertical and one angled boring at three locations directly outside of the Highway 9 Smokes tenant space as well as one downgradient vertical boring (Figure 1). The purpose of the vertical borings is to determine whether PCE-impacted soil extends out to the east and west of the tenant space, whereas the purpose of the angled borings is to help delineate the extent of soil PCE impacts underneath the tenant space as well as assess whether those PCE impacts extend onto the adjacent tenant spaces to the north and south.

Prior to soil boring activities, subsurface utilities will be cleared via public (811) and private locates according to the procedures outlined in the Floyd|Snider Standard Guideline for utility clearance (Attachment 2). The proposed soil sampling locations are presented on Figure 1, and a summary of sampling locations and methodologies is presented in the following sections.

Vertical Soil Borings (FS-01, FS-03, FS-05, and FS-07)

At each location outside of the Highway 9 Smokes tenant space, vertical borings will be advanced to a minimum of 10 feet bgs or until refusal. Soil from the borings will be field screened for presence of PCE impacts using a PID and logged per the Floyd|Snider Standard Guideline for soil logging (Attachment 2). If field observations indicate that PCE-impacted soil extends deeper than 10 feet bgs, the boring will be advanced an additional 5 feet bgs or until unimpacted soil is documented.[1] A minimum of two soil samples representing approximately 1-foot intervals of soil will be collected from each vertical boring per the Floyd|Snider Standard Guideline for soil sample collection (Attachment 2). If field indications of contamination are encountered (i.e., elevated PID measurements and odors), soil sampling will target intervals of soil with field indications of contamination in addition to the interval of underlying unimpacted soil. If there are no field indications of contamination, samples of unimpacted soil will be collected (1) from the 2- to 3-foot-bgs interval to horizontally constrain the soil PCE impacts previously observed underneath the building and (2) from the 4- to 8-foot-bgs interval to further characterize the interval of soil where elevated PID readings were previously observed. Additional soil samples may be collected and archived at the laboratory for analysis pending initial sample results.

If field indications of contamination are encountered in any of the vertical borings, step-out borings will be advanced farther east or west of the building to bound the horizontal extent of any soil impacts.

[1] The boring logs, field observations, and analytical results in the 2005 Phase II ESA (LandAmerica 2005b) indicate that impacted soil does not extend to greater than 10 feet bgs.

Angled Soil Borings (FS-02, FS-04, and FS-06):

Field screening information from the vertical soil borings will be used to inform the total depth and angle of the angled borings. A minimum of two soil samples representing approximately 1-foot intervals of soil will also be collected from each angled boring. Similar to the vertical borings, if field indications of contamination are encountered, soil sampling will target intervals of soil with field indications of contamination in addition to the interval of underlying unimpacted soil. If there are no field indications of contamination, samples of unimpacted soil will be collected from the 2- to 3- and 4- to 8-foot-bgs intervals consistent with the vertical borings.

Soil cuttings generated from the investigation will be managed according to the Floyd|Snider Standard Guideline for investigation-derived waste (Attachment 2). After sampling, each borehole will be abandoned with bentonite chips in accordance with WAC 173-160.

Groundwater Sampling

Previous investigations indicate that shallow groundwater at the Site occurs at approximately 9 feet bgs (LandAmerica 2005b). Shallow groundwater is presumed to flow to the southwest, based on shallow groundwater monitoring results from the nearby Texaco Star Mart 3706 Johnson Property (Cleanup Site ID 6971), approximately 0.3 miles south of the Site (GHD 2021). To characterize downgradient groundwater quality, a temporary 1-inch-diameter Schedule 40 polyvinyl chloride pipe well with a machine-slotted 5-foot-long, 10-slot well screen will be installed in soil borings FS-05 and FS-07 (Figure 1). Prior to sample collection, the temporary wells will be purged until the turbidity is less than 15 nephelometric turbidity units or at least three well volumes have been removed. A groundwater sample will be collected from each temporary well according to the Floyd|Snider Standard Guideline for groundwater sample collection with a direct-push drill rig (Attachment 2).

Purge and decontamination water generated from the investigation will be managed according to the Floyd|Snider Standard Guideline for investigation-derived waste (Attachment 2). After sampling, the temporary wells will be removed, and the boreholes will be abandoned with bentonite chips in accordance with WAC 173-160.

Vapor Intrusion Assessment

Indoor air samples will be collected to evaluate the potential threat to indoor air through the vapor intrusion pathway. The sampling approach for collecting indoor air samples was developed in accordance with the Tier II assessment outlined in Ecology's *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action* (Ecology 2022). Sampling will be performed per the Floyd|Snider Standard Guideline for Vapor Intrusion (Attachment 2), which includes performing a building survey and taking note of other potential vapor sources, such as cleaning products and air fresheners.

The proposed indoor air sample location is shown in Figure 1. The location of an outdoor air sample will be determined by the dominant wind direction on the day of sampling. A summary of sampling locations and methodologies is presented as follows:

- Indoor air sample IA-01 will be collected from inside the Highway 9 Smokes, on the western side of the tenant space and directly above the area where residual PCE-impacted soil remains in place below the building. IA-01 will be sampled on two separate sampling dates to evaluate the potential threat to indoor air via vapor intrusion during two temperature extreme seasons. Indoor air samples will be collected outside of normal business hours to reduce the risk of disturbance to the sample canisters.
- Outdoor air sample OA-01 will be collected from a location outside and upwind of the Site in a location protected from the elements (e.g., wind, precipitation) to measure ambient air concentrations. Indoor air results may be corrected for ambient contributions per Section 4.7 of Ecology's vapor intrusion guidance (Ecology 2022). OA-01 will be sampled once.

SAMPLE HANDLING, ANALYTICAL METHODS, AND SCREENING LEVELS

Soil, groundwater, and indoor air samples will be submitted for analysis of PCE and PCE degradation products per the laboratory methods specified for each medium in Table 1. Table 1 also provides a summary of sample handling procedures and applicable regulatory CULs for evaluation of the results.

SCHEDULE AND REPORTING

The field investigation schedule is contingent on the Site's acceptance to the VCP and the Ecology Site manager's review and concurrence with the Work Plan. After receiving the Ecology Site manager's concurrence, the field investigation will be scheduled and initiated pending staff and subcontractor availability.

After the field investigation is complete and all analytical data received and validated, a Data Summary Memorandum will be prepared and submitted to Ecology documenting all activities associated with the field investigation, including a comparison of analytical results to the CULs presented in Table 1. Validated analytical data will be uploaded to Ecology's Environmental Information Management system upon completion of the Data Summary Memorandum.

The Data Summary Memorandum will evaluate the sufficiency of the soil, groundwater, and indoor air data to address Ecology's requests for further site characterization. The data will be judged sufficient if soil contamination exceeding CULs is delineated by the proposed soil samples and if groundwater and indoor air at the proposed sample locations are not impacted at concentrations exceeding the CULs.

If the data are determined to be sufficient, the Data Summary Memorandum will serve as the basis of an updated restrictive covenant that clearly defines the maximum extent of residual contamination resulting from past dry cleaning operations at the Site. If data gaps remain after completion of the proposed site characterization, the Data Summary Memorandum will propose additional investigation to fill the data gaps.

REFERENCES

GHD. 2021. *Site Investigation Report, Jacksons Food Store No. 612.* 15 March.

LandAmerica Assessment Corporation (LandAmerica). 2005a. *Phase I Environmental Site Assessment, Clearview Plaza.* Prepared for Bank of America. 30 June.

_____. 2005b. *Phase II Limited Subsurface Investigation Report, Clearview Plaza.* Prepared for Commercial Real Estate Group. 8 August.

URS Corporation (URS). 2006. *Assessment of Environmental Conditions, Panda Dry Cleaners.* Letter report from David Raubvogel and Geoff Garrison, URS Corporation, to Mark Edens, Washington State Department of Ecology. 13 July.

Washington State Department of Ecology (Ecology). 2006. No Further Action Determination under WAC 173-340-515(5) for the Following Hazardous Waste Site: Panda Dry Cleaners. Letter from Mark H. Edens, Washington State Department of Ecology, to Michael LaMarche, Clearview Plaza LLC. 13 November.

_____. 2022. *Guidance for Evaluating Vapor Intrusion in Washington State: Investigation and Remedial Action.* Publication no. 09-09-047. Originally published October 2009. Revised February 2016, April 2018, November 2021, and March 2022.

_____. 2023. *First Periodic Review, Panda Dry Cleaners.* December.

_____. 2024. *Notice of Periodic Review Conducted at the Following Cleanup Site: Panda Dry Cleaners.* Letter from Tamara Welty, Washington State Department of Ecology, to Geoff Lakman, Lake Street Mall LLC. 10 January.

Welty, T. 2024. Email message “Re: Panda Dry Cleaners Site #4239” to Kristin Anderson, Floyd|Snider, and Sonia Fernandez, Washington State Department of Ecology. 26 February.

LIST OF ATTACHMENTS

Table

Table 1
Analytical Methods, Sample Handling, Practical Quantitation Limits, and Cleanup Levels

Analyte	Analytical Method	Preservative	Holding Time	Container Size and Type	Practical Quantitation Limit	MTCA CUL		
						MTCA Method A CUL (1)	Modified MTCA Method B Indoor Air CUL (2)	Non-Residential Short-Term Risk CUL (3)
Soil (mg/kg)								
Vinyl chloride	USEPA 8260D	MeOH and cool to <6 °C	14 days (with MeOH preservation)	Four pre-tared 40-mL VOAs	0.050	6.7	--	--
trans-1,2-Dichloroethene					0.050	1,600	--	--
cis-1,2-Dichloroethene					0.050	160	--	--
Trichloroethene					0.020	0.030	--	--
Tetrachloroethene					0.025	0.050	--	--
Groundwater (µg/L)								
Vinyl chloride	USEPA 8260D	MeOH and cool to <6 °C	14 days (with MeOH preservation)	Four 40-mL VOAs	0.020	0.20	--	--
trans-1,2-Dichloroethene					1.0	160	--	--
cis-1,2-Dichloroethene					1.0	16	--	--
Trichloroethene					0.50	5.0	--	--
Tetrachloroethene					1.0	5.0	--	--
Air (µg/m^3)								
Vinyl chloride	USEPA TO-15	None	30 days	6-liter silicone-coated stainless steel canister	0.26	--	1.1	--
trans-1,2-Dichloroethene					0.40	--	150	--
cis-1,2-Dichloroethene					0.40	--	150	--
Trichloroethene					0.11	--	2.3	7.5
Tetrachloroethene					6.8	--	37	--

Notes:

Methods and practical quantitation limits are from Friedman & Bruya, Inc.

CULs are presented with two significant figures.

-- Not available or not applicable to media for the purposes of this investigation.

1 MTCA Method A Soil Criteria for unrestricted land use are from WAC Table 740-1. When MTCA Method A criteria are not available for any analyte, the criterion in this table is the lowest of MTCA Method B soil criteria protective of cancer and noncancer endpoints for that chemical. MTCA Method B soil criteria are consistent with Ecology's February 2024 CLARC data tables.

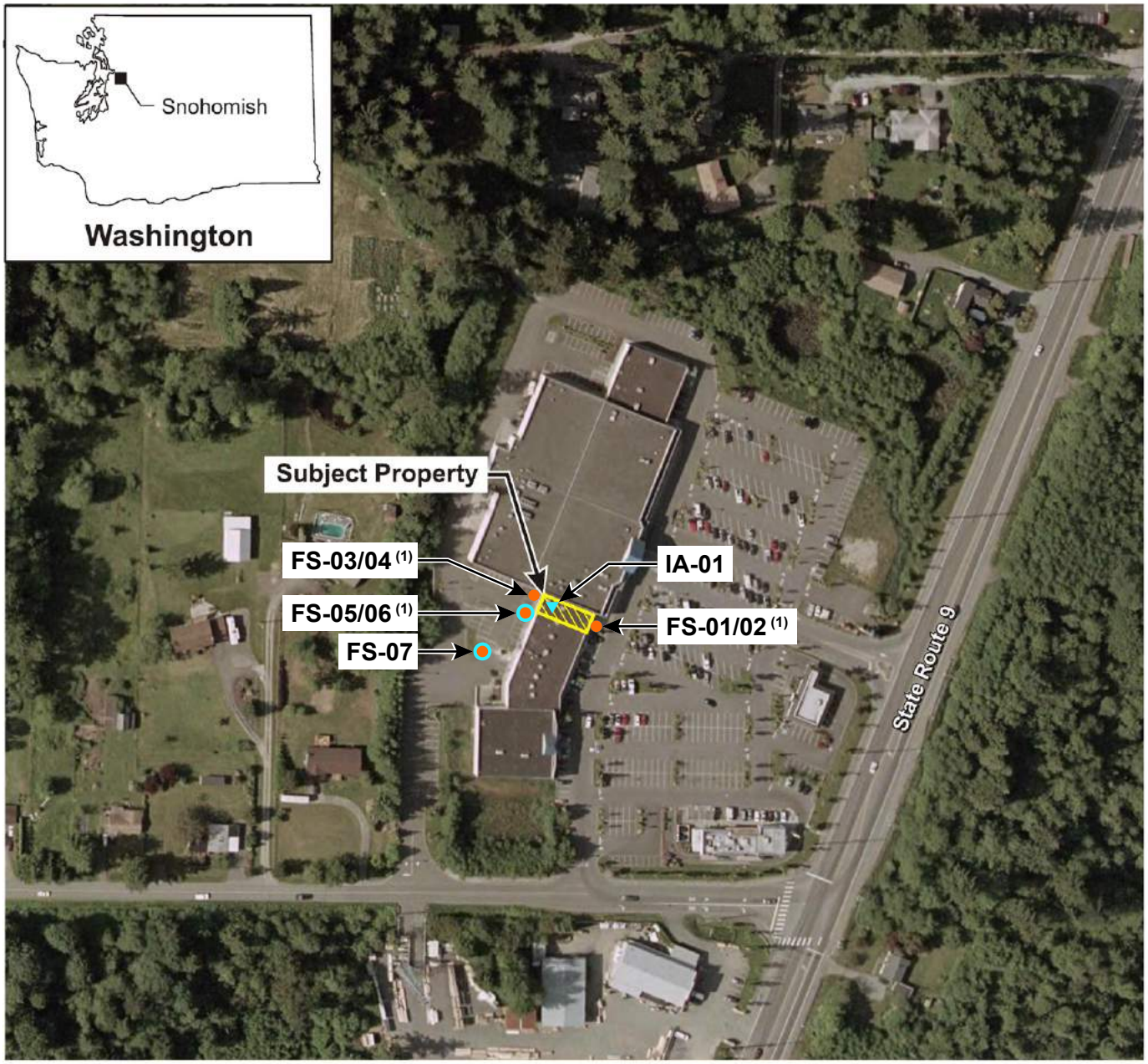
2 MTCA Method B CULs were modified for a commercial worker scenario per Ecology's vapor intrusion guidance (Ecology 2022).

3 The short-term risk CUL for tetrachloroethene was obtained from Ecology's vapor intrusion guidance (Ecology 2022).

Abbreviations:

°C	Degrees Celsius
CLARC	Cleanup Levels and Risk Calculation
CUL	Cleanup level
Ecology	Washington State Department of Ecology
MeOH	Methanol
µg/L	Micrograms per liter
µg/m^3	Micrograms per cubic meter
mg/kg	Milligrams per kilogram
mL	Milliliters
MTCA	Model Toxics Control Act
VOA	Volatile organic analysis
WAC	Washington Administrative Code

Figure



SOURCE: Google Earth Pro, 2005
Figure modified from Figure 1 URS 2006.

0' 100' 200'
Approximate Scale in Feet

N

Legend

- Former Panda Dry Cleaners Tenant Space
- Proposed Soil Boring
- Proposed Soil Boring and Grab Groundwater Sample
- Proposed Indoor Air Sample

Note:
1. Location includes vertical and angled borings.

FLOYD | SNIDER
strategy • science • engineering

Site Characterization Work Plan
Panda Dry Cleaners
Snohomish County, Washington

Figure 1
Site Vicinity Map and
Proposed Sample Locations

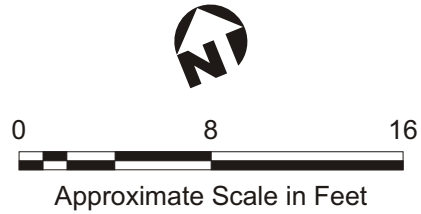
I:\GIS\Projects\Lakeshore-Panda\AI\Site Characterization Work Plan\Figure 1 Site Vicinity Map and Proposed Sample Locations.ai
2/28/2024

Attachment 1
Historical Boring Locations and Analytical Results

33758887_02.cdr

LEGEND

- Soil boring
- Soil boring and grab water sample
- Panda Cleaners (subject property)
- ND Not detected



Concentrations in parts per million

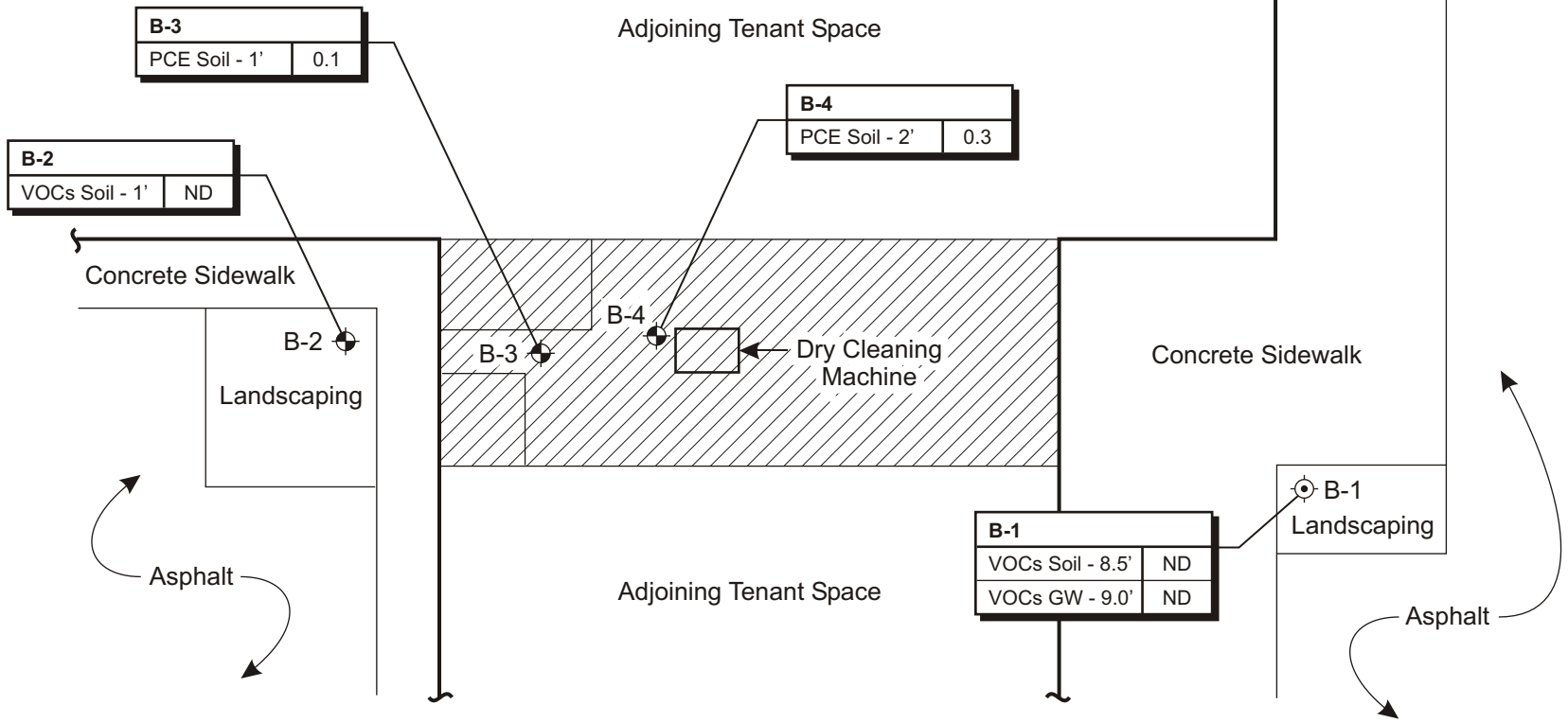


Figure 2

Boring Locations and Analytical Data

Job No. 33758887

URS

Panda Dry Cleaners
17424 State Route 9 SE, Suite G, Snohomish, Washington

Attachment 2
Floyd|Snider Field Standard Guidelines and Special Conditions

FLOYD | SNIDER
strategy • science • engineering

Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

F|S STANDARD GUIDELINE:
Special Condition

Utility Clearance

DATE/LAST UPDATE: October 17, 2018

This Special Condition applies to ground-disturbing work including drilling, excavation, and trenching. Standard Guideline(s) to which this Special Condition is appended include:

1. Soil Logging
2. Well Construction
3. Soil Sample Collection

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines and special procedures for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines and special conditions with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines and special conditions.

1.0 Special Condition Applicability

This Special Condition Standard Guideline should be used by the field staff prior to performing subsurface activities, such as collecting subsurface soil samples, monitoring well installation, excavation, or trenching activities. A public locate should always be conducted and scheduled at least 3 to 5 days prior to conducting the private locate and in compliance with the guidelines herein.

2.0 Equipment and Supplies

Logging Equipment and Tools:

- 100-foot tape measure or measuring wheel
- Handheld Global Positioning System (GPS)
- Spray paint:
  - White for proposed work area (boring locations or limits of work)
  - Optional colors for utilities:
    - Red for electrical
    - Green for sewers and drain lines
    - Blue for water
    - Orange for fiber optics, communications, or cable
    - Yellow for natural gas or fuel lines
- Flagging or wax lumber pencils if raining (preferably **white**; if white is not available choose **a color other than designated utility colors** above such as pink)
- Hammer and roofing nails to nail flagging if raining
- Pry bar or manhole lift for lifting heavy sewer or manhole lids
- Camera

Paperwork:

- Work Plan and/or Sampling and Analysis Plan (SAP) and/or Quality Assurance Project Plan (QAPP)
- Health and Safety Plan (HASP)
- Copies of figures showing proposed boring locations or work area and all known utilities
- Public locate ticket
- As-built drawings, if available

Personal Equipment:

- Steel-toed boots
- Safety vest
- Safety glasses
- Rain gear
- Work gloves

3.0 Special Condition Guidelines and Procedures

3.1 PUBLIC UTILITY LOCATE

A public utility locate notification must be completed in accordance with state law approximately 3 to 5 days prior to conducting the private locate and subsurface disturbance activities. Prior to contacting the public locate service, the outer limits of the work area or the proposed soil boring locations should be marked out in white spray paint. The public locate can then be submitted online (http://www.callbeforeyoudig.org/washington) or by calling 811. The ticket number should be submitted to the drilling and excavation subcontractors and logged on the attached utility clearance field checklist.

3.2 METHODOLOGIES FOR LOCATING UTILITIES

Surface and subsurface conditions can affect the accuracy of a specific locating technology, and no single method is universally fail proof. Review each project and its site-specific conditions to choose the proper technique(s). Below are the four most common techniques used for locating utilities; however, locating activities should not be limited to those described here.

1. **Pipe Tracing Transmitter and Receiver**

   This technique can be used to detect metal utilities, tracing wires, or warning tapes. The metal pipes or tracer wire must be exposed in order to transmit the signal to be traced. The limitations of this methodology are (1) that it is not useful for nonconductible utilities, and (2) that the metallic pipes or tracer wire must be exposed.

2. **Electromagnetic**

   This technique locates buried materials that have a high conductance, such as buried pipes, tanks, and drums, by inducing alternating electromagnetic waves at the surface into the ground. Any buried conducting body can be detected at the surface with a receiver. The limitations of this technique are that results are affected by nearby or adjacent power lines, metal fences, cars, and metal debris and it cannot detect utilities constructed of nonconductive material such as PVC or concrete sewer lines.

3. **Ground Penetrating Radar (GPR)**

   This technique is an extremely useful for locating shallow nonconductible features, such as concrete conduits, polyvinyl chloride (PVC) piping, underground storage tanks (USTs), former excavations, trenches, buried drums, other metallic objects, or hydrogeologic features. GPR can also be useful in locating voids beneath concrete or asphalt. The limitation of this technique is that penetration depth can be limited in soils with high electrical conductivity such as clayey or wet soil.

4. **Metal Taping or Radio Frequency Transmitter**

   This technique can be used to locate drain or sewer lines that extend from a building out to the main sewer line. Generally, sewer and drain lines are constructed of PVC and cannot be detected using electromagnetic or pipe tracing, as a result they are

sometimes missed during these surveys. Metallic fish tape or a radio frequency transmitter is inserted into the pipe from the building or a cleanout and then a radio frequency is sent along a wire. The signal is detected aboveground with a receiver that can determine the location of the centerline and approximate depth.

3.3 PRIVATE LOCATE

A private locate is also necessary since public locates generally are useful only up to the property line or to their own meters; rarely do public locates mark the utilities on the property if there is not a meter present on the property. Therefore, if the interior of the site is likely to have complex buried utilities or the alignments of utilities running through the site interior are unknown (i.e., accurate utility plans are not available), it is appropriate to conduct a private locate.

Upon arriving at the site, confirm that all entities, notified per the public locate ticket, have marked their respective utilities. Even if a utility does not exist on the property, the site should still be marked (e.g., “No Gas” or “No Fiber”) by all utilities listed on the public locate ticket. Take care to note the path of utilities marked at the street and directed toward the property. For example, a water line at the street may connect to a faucet or bathroom on property. The private locating subcontractor should use the public locating marks to help locate utilities on the property.

Mark all proposed boring locations or the limits of work in white spray paint so that the private utility locator can be thorough in these areas. Some projects may require additional soil borings beyond the initial scope of work. In this case, either mark a larger limit of work area prior to utility locate or have a private utility locate conducted throughout the property, including inside existing structures if needed.

Identify other subsurface features on the property such as, sewer/storm/roof drains and aboveground electrical lines that have not been identified by the public locate. During the private locate conduct all activities in the following list that apply to the subject property.

- Open all sewer lids and storm drains, and mark the direction of the visible pipes.
- Open any utility vaults (e.g., fiber optics, fire alarm, or electrical vaults) and mark the direction of lines, then extrapolate these lines to the building.
- Locate all roof drains and take care to note how these drains may connect to subsurface drainage lines.
- If multiple drains are visible, take care to notice possible subsurface connections (e.g., straight lines between drains).
- Look for subsidence features, such as former filled in trenches (which may contain subsurface lines), and including patched concrete/asphalt.
- Note the location of other relevant features, such as building water faucets, bathrooms, and water valve shut-offs at the street (attempt to extrapolate potential lines from these features).

- Identify aboveground utilities on the property (i.e., electrical lines along walls of buildings, lines on telephone poles). Confirm with subcontractor (driller or excavator) that overhead utilities will not obstruct subsurface work activities.
- Communicate with property owners or site managers to gain information on the location of subsurface utilities or other features. If possible, focus on utilities that may not have been located by standard techniques, such as plastic or PVC lines.
- Take care to locate irrigation lines and sprinklers in planters.
- Locate emergency stops for fuel lines if working on an active service station.

Plot all utilities, overhead and subsurface, on the site map so that investigations are not carried out in these areas.

3.4 ESTABLISHING A BUFFER

Establish a buffer around identified overhead and subsurface features where work should not be conducted. Maintain at least a 3-foot buffer on either side of a marked utility or in-line inference of a pipe or storm drain connections. Mark the buffer zone on the site map so that subsurface work is not completed in these locations. The buffer zone for overhead utilities may be greater than 3 feet, depending on the overhead line. For example, noninsulated electrical lines can arc over a certain distance. Confirm overhead buffer zones with the drillers or excavators.

Utilities such as electrical, fiber optics, or natural gas should have a 5-foot buffer, if possible. If subsurface activities need to be conducted within 5 feet of a fiber optics/communications line, notify the utility company. Generally, fiber optics/communication companies want to have their personnel on site to observe any subsurface activities within 5 feet as a safety precaution.

In the event of uncertainty on pipe location, determine if an air knife/vacuum truck is needed to safely clear the boring to a depth of 5 feet below ground surface or other appropriate depth to safely clear the utility line.

3.5 MARKING MAINTENANCE

Public locate marks expire after 45 days if the markings are not maintained. Best practices for maintaining locate marks include:

- Using stakes or nail flagging with roofing nails along the markings if markings are continuously destroyed by weather or traffic;
- Using wax lumber pencils if raining;
- Using white spray paint to maintain the original markings;
- Bookending the original marks with solid white painted squares;
- Painting dots between the original markings; and
- Requesting relocates, if needed.

3.6 EMERGENCY CONTACT NUMBERS

If any damage is caused to a utility, immediately notify the property owner and the respective utility company. Keep emergency contact numbers on hand in case of damage.

4.0 Field Documentation

The attached utility clearance checklist should be reviewed and completed at the beginning of each project, prior to conducting subsurface activities, or before establishing sample locations. If appropriate, the checklist should be reviewed and completed for each proposed sampling location or subsurface disturbance area.

Enclosure: Utility Clearance Field Checklist

UTILITY CLEARANCE FIELD CHECKLIST

FLOYD | SNIDER

Project: _____

Completed by: _____

Date Completed: _____

Public Ticket No: _____

This checklist is intended for use prior to field activities associated with subsurface site investigations. The field manager should complete this checklist in its entirety before beginning work or establishing sample locations. There may be site-specific features that are not included on this form so be sure to complete a thorough review of all available information and complete a pre-field inspection prior to the work.

SUBSURFACE UTILITIES

- ☐ **PUBLIC UTILITY LOCATE** completed for the property.
  Mark limits of work in white paint. Call the appropriate Call Before You Dig hotline (dial 811 in Washington) or complete online utility locate request; provide public locate service with location info including cross streets and/or other geographic features to locate work area. If not present for the utility locate, make sure to verify all marked utilities. Plot marked utilities on the site map and record location (by GPS survey or licensed surveyor if feasible, or by measurement from existing features). Take care to note the path of utilities marked at the street and directed toward the private property (i.e., water line at street may connect to faucet or bathroom on property).
- ☐ **PRIVATE UTILITY LOCATE** completed inside and outside existing structures on the property.
  If not present for the utility locate, make sure to verify all marked utilities. Plot marked utilities on the site map and record location (by GPS survey or licensed surveyor if feasible, or by measurement from existing features).
  - ☐ Is the method of utility locate appropriate for the site conditions (i.e., metal taping may be necessary for undetected PVC drain lines where the outlet is visible in a storm drain)?
- ☐ **FACILITY PLAN REVIEW** completed.
  If not readily available, request utility or as-built plans from the client that may include subsurface utilities or other features (i.e., tanks or vaults).

UTILITY COMPANIES

- ☐ Natural Gas Marked (YELLOW)
  Natural gas emergency contact number(s): _____
- ☐ Electrical Marked (RED)
  Electrical emergency contact number(s): _____
- ☐ Water Marked (BLUE)
  Water emergency contact number(s): _____
- ☐ Sewer/Drain Lines Marked (GREEN)
  Sewer emergency contact number(s): _____
- ☐ Communications/Fiber Optics/Cable Marked (ORANGE)
  Communications emergency contact number(s): _____

PRIVATE SUBSURFACE FEATURES

IDENTIFY OTHER SUBSURFACE FEATURES on the property, such as storm/sewer drains or aboveground electrical lines that have not already been discovered by the public or private locate.

- ☐ Open sewer lids and storm drains and mark the direction of visible pipes.
- ☐ Open any utility vaults (e.g., fiber optics, fire alarm, or electrical vaults), mark the direction of lines, and extrapolate these lines to the building.
- ☐ Locate all roof drains and take care to note how these drains may connect to subsurface drainage lines.
- ☐ If multiple drains are visible, take care to notice possible subsurface connections (straight lines between drains).
- ☐ Look for subsidence features (former filled in trenches) that may contain subsurface lines; including patched concrete/asphalt.
- ☐ Note location of other relevant features, such as building water faucets, bathrooms, and water shut-offs at the street (attempt to extrapolate potential lines from these features).
- ☐ Identify aboveground utilities on the property (electrical lines along walls of buildings, lines on telephone poles). Confirm with drillers that overhead utilities will not obstruct drill rig activities.
- ☐ Locate yard or parking lot lights and confirm electrical connections.
- ☐ Communicate with property owners or site managers to gain information on the location of subsurface utilities or other features, such as nonconductible plastic or PVC lines.
- ☐ Locate emergency stops for fuel lines if working on an active service station.
- ☐ Locate any irrigation or sprinklers that may be present in planters.

ESTABLISH A BUFFER around identified subsurface features (or aboveground lines) where investigations should not be conducted. Maintain at least a 3-foot buffer on either side of a marked utility or in-line inference of a pipe. Utilities such as electrical, fiber optics, or natural gas should have a 5-foot buffer. Mark the buffer zone on the site map clearly so that investigations are not carried out in these locations.

- ☐ Is an air knife/vacuum truck needed to safely clear the boring to a depth of 5 feet below ground surface?

FLOYD | SNIDER
strategy ▪ science ▪ engineering

Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

F|S STANDARD GUIDELINE

Soil Logging

DATE/LAST UPDATE: October 2019

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step by step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines and should review and understand these procedures prior to going in the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

These soil logging standard guidelines should be used by the field staff performing subsurface investigations, such as a direct push or roto-sonic soil boring, installation of a monitoring well via hollow stem auger, or roto-sonic or mud rotary drilling. While many projects will not necessarily have a Licensed Geologist (LG) or Hydrogeologist (LHG) who reviews and stamps every boring log, it is important that the field staff discusses the soil logging needs for a particular investigation with the project geologist, the project manager, or whoever will ultimately be responsible for interpreting the findings of the field investigation. This discussion is in addition to field training and general knowledge about soil logging, and should happen prior to entering the field, with additional follow-up before drafting a final set of electronic logs, after the investigation is complete.

2.0 Equipment and Supplies

Logging Equipment and Tools:

- 100-foot tape measure or measuring wheel
- Handheld Global Positioning System (GPS; optional)
- Unified Soil Classification System (USCS) Soil Classification Field Guide
- Soil logging kit containing:

  - Stainless steel spoons
  - Paint scraper or trowel
  - Small Ziploc bags
  - Small stainless steel bowls or black mining pans for sheen testing
  - Spray bottle filled with water
  - Paper towels (preferably white)
  - Engineers tape
  - Note cards
  - Optional items include:
    - Empty VOA vials or small glass jars
    - Munsell color chart
    - Sieves
    - White and grayscale color cards for photographs
- Plastic sheeting and duct tape or clamps to cover the sampling table
- Camera
- Trash bags
- Coolers
- Jars
- Labels
- Ice

Paperwork:

- Work Plan and/or Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP)
- Health and Safety Plan (HASP)
- Copies of figures showing previous boring locations and boring logs from previous investigations, if available
- Boring log forms (enclosed) appropriate for drilling method, printed in Rite in the Rain paper and/or bound field notebook
- Permanent markers and pencils

Personal Equipment:

- Steel-toed boots
- Hard hat
- Safety vest

- Safety glasses
- Nitrile gloves
- Ear plugs
- Rain gear
- Work gloves

3.0 Standard Procedures

3.1 OFFICE PREPARATION

First, meet with the project manager or field manager to identify the key information and goals of the soil boring investigation. These may include fill history, known or suspected sources of contamination and potential field indications of these contaminants, identification of specific units, or important geotechnical measurements. If possible, select a boring log template that is appropriate for the project needs.

Next, review the work plan and all available existing materials such as cross-sections or boring logs from previous investigations to familiarize yourself with the site geology. In addition (or alternatively if other information is not available), you may also review a geologic map of the area from a reputable source such as United States Geological Survey (USGS).

Finally, check the area of the site where drilling will occur for underground objects. At minimum, a OneCall locate request should be made at least one week in advance of drilling in order to give public utility locators time to mark known buried utility lines. All planned boring locations should be marked on the ground with white spray paint prior to making a locate request. In almost all cases, a private utility locator should also clear the area of drilling any underground objects using electromagnetic techniques. If drilling is to occur in close proximity to buried utilities, the work plan may specify use of an air knife or vacuum to clear the borehole to a depth below the utility lines.

3.2 COLLECTING SOIL SAMPLES FOR CLASSIFICATION

1. Before beginning drilling, record the following information on each log:
    a. Operator's name and company, equipment make/model, equipment measurements (i.e., sampler length and diameter, hammer weight and stroke if using hollow stem auger, boring diameter)
    b. Your name, date, project, boring name and approximate descriptive location (i.e., where is the soil boring relative to known site features). Include a description of the ground surface and whether or not coring was necessary, if coring was necessary, include core diameter, concrete thickness, and subcontractor information.

c. A small hand drawn map showing your location with measurements to a stationary reference point, or GPS coordinates (ideally, both). This is also a good place to note if you have had to move a boring location because of underground utilities, access issues, etc. It is important to note the reason for relocation and the direction and distance moved (i.e., moved 10 feet to the north due to presence of subsurface water line).

2. If you are using a hollow stem auger drilling method, it is important to communicate to the driller how often you would like a split spoon sample collected. Typically this would be continuous or every 5 feet but may be different depending on the project needs.
3. Note any feedback from the driller about the drilling conditions. This may include difficult drilling or rig chatter (usually caused by hard materials), heaving sands (usually caused by hydrostatic pressure on the borehole), caving, or hole instability.
4. For split spoon samples, record the number of hammer blows (blow counts) necessary to drive the sampler each 6-inch increment, as reported by the driller. If more than 50 blows are needed, record the distance that the sampler was driven in 50 blows (i.e., 2-inches in 50 blows). This is referred to as the standard penetration test.
5. Cover the sampling table with plastic sheeting. Lay an engineer's tape lengthwise across the sampling table. Once a sample has been collected, orient it on the table so that the top is aligned with the 0-foot mark on the tape.
6. Split open the sampler, core barrel liner, or sample collection bag. Record the depth interval that the sampler was driven and the depth interval of soil that was recovered. For split spoons or single-cased core barrels, such as Geoprobe direct-push rods, determine whether any loose 'slough' soil has been dislodged by the drilling equipment and deposited at the top of your core (AMS direct push rods are double cased and do not create slough). Do not include slough in the measurement of the soil recovered. Often the core will be filled with an uninterrupted column of soil that is shorter in length than the total drive interval. In such cases, record the recovery interval as it is situated in the core unless you are able to determine the actual depth where the soil sample originated. For the purposes of recording soil observations and collecting samples for analysis, assume that the recovered column of soil has been evenly compressed unless you are able to determine the interval(s) in which compression has occurred. Decompress the recovered soil when making further observations (e.g., if the recovered soil column is 80 percent of the length of the drive interval, assume 0.8 feet of recovered soil represent 1 foot of soil in situ).
7. Before further disturbing the soil, take volatile organic compound (VOC) measurements with a photoionization detector (PID), if using. Take measurements by making crevices in the soil with a spoon or scraper and inserting the PID probe into these openings. Alternatively, collect small spoonfuls of soil into Ziploc bag(s), seal the bag(s), gently shake the bag(s), and insert the PID probe through the top of the bag(s) and into the headspace once the soil vapor has been allowed to equilibrate with the

surrounding air (headspace method). The bag headspace screening method is typically more accurate and is useful at sites with low concentrations of VOCs, whereas the in-situ method is a faster and more qualitative method, best used at sites with higher VOC concentrations. If sampling for VOCs by the U.S. Environmental Protection Agency (USEPA) Method 5035, these soil samples should also be collected prior to disturbing the core. Soil sampling procedures using USEPA Method 5035 are described in detail in the Soil Sample Collection Standard Guideline.

8. Use a straight edge to scrape the soil level and expose the center of the core. Photograph the core alongside the measuring tape and an index card displaying the soil boring location/ID and depth interval.

3.3 SOIL CLASSIFICATION

Soils are described using the following characteristics: Color, consistency, MAJOR CONSTITUENT, minor constituent, geotechnical properties, moisture content, other observations (e.g. visual or olfactory indications of contamination). The USCS field guide is included in this guidance for reference. The steps below should help guide the logger in classifying soils according to the USCS.

1. Record the color of the soil. A descriptive color (i.e., light brown) or a color identified using the Munsell color chart are both valid.
2. Determine whether organic matter influences the properties of the material. If so, record as an organic soil.
3. If the soil is predominantly inorganic, identify whether the major constituent is coarse- or fine-grained. Coarse-grained soils include sands and gravels; fine-grained soils include silts and clays.
    a. For coarse grained soils, determine:
        i. Grain size(s) present including fine, medium, or coarse, and grain size distribution including well-graded (a mixture of fine to coarse grains) or poorly-graded (uniform in size). The USCS guide is helpful for determining grain sizes. If the major constituent is gravel, note its angularity using “rounded,” “sub-angular” or “angular.”
        ii. Minor constituent(s). If a minor constituent represents less than approximately 15% of the sample, note this as “with [minor constituent]” and optionally, whether it is “trace” (<5%) or “few” (5-15%). If a minor constituent represents more than 15% of the sample, use “[minor constituent]-y.” For example, a sand with 5% silt would be classified as a “SAND with trace silt” and sand with 30% silt would be classified as a “SILTY SAND.” For coarse-grained soils with fines between 5% and 15%, the USCS includes several dashed classifications, such as SW-SM. It is often helpful to record an estimated percentage for soil constituents to aid in classification according to the USCS.

b. For fine-grained soils, determine:

   i. Major constituent. To determine whether a material is silt or clay, a simple settling test may be performed in a glass vial or gloved hand by spraying a small amount of the sample with water. Silt particles will settle out of suspension in water within a few minutes, whereas clay particles will remain suspended for a longer period of time.

   ii. Minor constituent(s). As described above, determine the approximate percentage and record as "with [minor constituent]" or "[minor constituent]-y" as appropriate. It is often helpful to record an estimated percentage to aid in classification according to the USCS.

   iii. Geotechnical properties. Depending on project data needs, geotechnical properties may be optional but often provide helpful information. Geotechnical properties include plasticity (ranging from "non-plastic" to "highly plastic" as determined by a thread test) and consistency (ranging from "loose" to "very dense" for coarse-grained soils and "soft" to "hard" for fine-grained soils). When using split spoon samplers, blow counts recorded during the standard penetration test (also referred to as N-values) are used to determine consistency; when using direct-push or sonic drilling, consistency is described qualitatively.

4. Using the USCS guide and the description of the soil, determine the appropriate USCS symbol and record it on the log. If it is difficult to distinguish the major constituent of a soil, a borderline "/" symbol may be used to denote the two potential major constituents present. This is not the same as the USCS classifications that utilize a dash, such as SW-SM.

5. Determine whether contacts between stratigraphic units are abrupt, or gradational. Note abrupt contacts using a solid line and gradational contacts using a dotted line. If the contact between units is not visible and was missed between sample depths, a dashed line is used.

6. If the site or area geology is known, and you are confident in your identification of a specific stratum, note the geologic unit. At a site where the geology is uncertain, you may make some more general notes about the depositional environment, such as identifying probable estuarine deposits, colluvium, glacial till, etc.

7. Note the moisture content of the soil, using "dry," "moist," "wet," or "saturated." Mark the water table at the time of drilling on the log at the depth where saturated soil is first observed.

3.4 OTHER OBSERVATIONS

1. Record other materials observed in the sample. These may include minor amounts of rootlets or other plant matter, evidence of organisms such as shell fragments, and/or anthropogenic debris such as brick fragments, plastic, or metal debris.
2. Record potential indications of contamination. These may include odors, colored or black staining on soils, colored crystals, hydrocarbon sheens, or non-aqueous phase liquid (NAPL) product.
    a. To test for hydrocarbon sheen, put a small amount of soil in a bowl, saturate with water and swirl, noting whether a rainbow sheen appears on the surface of the water. Alternatively, place a small amount of water in the bottom of the bowl and a small amount of soil along the side, then tilt the bowl so that the water slowly touches the soil. If observed, note the color of the sheen and describe as slight (discontinuous on the water surface), moderate (continuous but spreading slowly) or high (rainbow sheen covering entire surface water).
    b. To test for the presence of NAPL, use a clean paper towel to blot the surface of the core and note the proportion of the towel that is saturated with oil (be sure to allow the towel to dry when blotting moist to wet soils to distinguish between saturation due to NAPL and due to water).
3. Note the final depth of the boring and any reasons for early termination of the boring (i.e., refusal).
4. If monitoring wells will be installed, follow the Standard Guidelines for monitoring well construction and well development.

4.0 Decontamination

All reusable equipment that comes into contact with soil should be decontaminated as follows prior to moving to the next sampling location.

Split spoons, stainless steel bowls and spoons, and any other tools used for soil classification must be decontaminated between boring locations. If collecting soil samples for chemical analysis, split spoons and any tools used for sample processing must be decontaminated between each sample; alternatively, disposable bowls and spoons may be used. Equipment decontamination will consist of a tap water rinse to remove soil particles, followed by scrubbing with brushes and an alconox (or similar)/clean water solution and a final rinse with distilled or deionized water.

5.0 Investigation-Derived Waste

Unless otherwise specified in the project work plan, waste soils and other drilling materials generated during soil boring activities will be contained, transported, disposed of in accordance with applicable laws, and stored in a designated area until transported off-site for disposal.

The approach to handling and disposal of these materials is as follows. For investigation-derived waste (IDW) that is contained, such as waste soils, 55-gallon drums approved by the Washington State Department of Transportation (WSDOT) will be supplied by the driller and used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “soil cuttings”), the dates on which the wastes were placed in the container, the owner’s name, contact information for the field person who generated the waste, and the site name.

Whenever possible, IDW contained within drums will be characterized relative to applicable waste criteria using data from the sampling locations. Material that is designated for off-site disposal will be transported to an off-site facility that is permitted to accept the waste. Manifests will be used as appropriate for disposal.

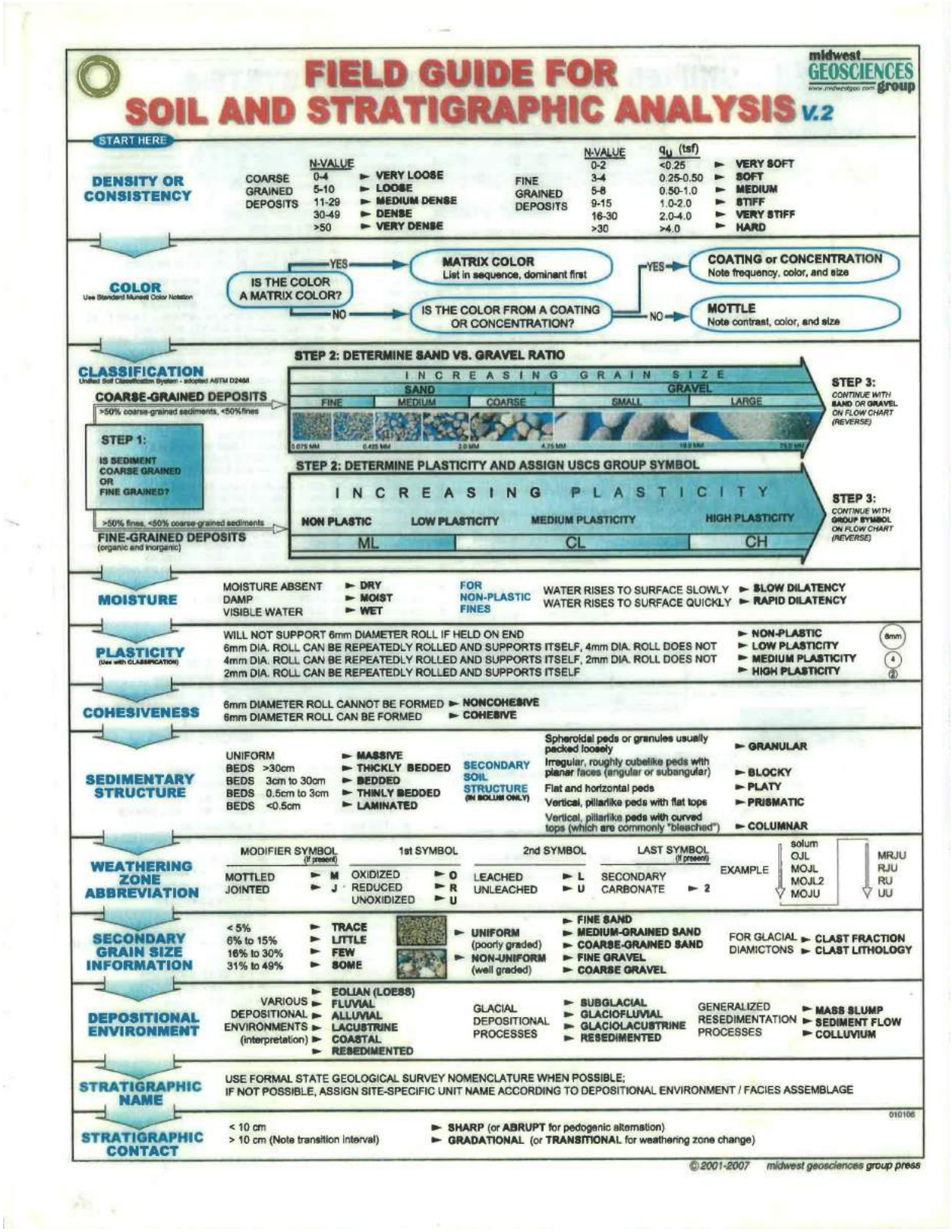
Disposable sampling materials and incidental trash such as paper towels and personal protective equipment (PPE) used in sample processing will be placed in heavy duty garbage bags or other appropriate containers and disposed of as solid waste in the municipal collection system (i.e., site dumpster).

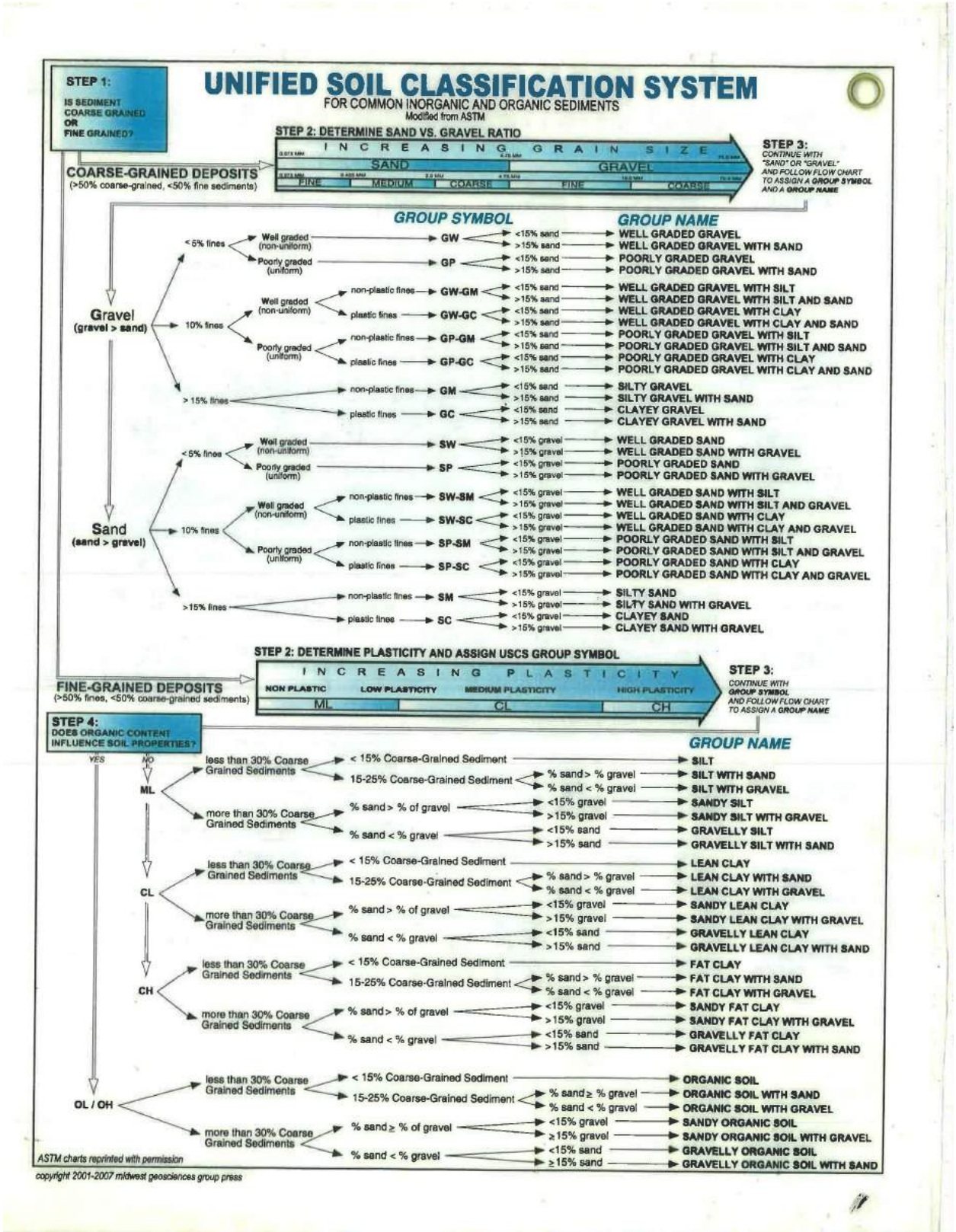
6.0 Field Documentation

All observations should be recorded on a soil boring form appropriate for the drilling method or in a bound field notebook. Field staff should make an effort to record as much detail as possible in the field log. After the field work is complete, a set of final logs (usually electronic) that serve as the record for the project will be completed in consultation with the project manager or field manager.

Enclosure: USCS Soil Classification Field Guide
Boring Log

USCS SOIL CLASSIFICATION FIELD GUIDE




UNIFIED SOIL CLASSIFICATION SYSTEM
FOR COMMON INORGANIC AND ORGANIC SEDIMENTS
Modified from ASTM
STEP 1: IS SEDIMENT COARSE GRAINED OR FINE GRAINED?
COARSE-GRAINED DEPOSITS (>50% coarse-grained, <50% fine sediments)
STEP 2: DETERMINE SAND VS. GRAVEL RATIO
INCREASING GRAIN SIZE
SAND
GRAVEL
FINE
MEDIUM
COARSE
FINE
COARSE
STEP 3: CONTINUE WITH "SAND" OR "GRAVEL" AND FOLLOW FLOW CHART TO ASSIGN A GROUP SYMBOL AND A GROUP NAME
GROUP SYMBOL
GROUP NAME
Gravel (gravel > sand)
<5% fines
Well graded (non-uniform)
GW
<15% sand
WELL GRADED GRAVEL
>15% sand
WELL GRADED GRAVEL WITH SAND
Poorly graded (uniform)
GP
<15% sand
POORLY GRADED GRAVEL
>15% sand
POORLY GRADED GRAVEL WITH SAND
10% fines
Well graded (non-uniform)
non-plastic fines
GW-GM
<15% sand
WELL GRADED GRAVEL WITH SILT
>15% sand
WELL GRADED GRAVEL WITH SILT AND SAND
plastic fines
GW-GC
<15% sand
WELL GRADED GRAVEL WITH CLAY
>15% sand
WELL GRADED GRAVEL WITH CLAY AND SAND
Poorly graded (uniform)
non-plastic fines
GP-GM
<15% sand
POORLY GRADED GRAVEL WITH SILT
>15% sand
POORLY GRADED GRAVEL WITH SILT AND SAND
plastic fines
GP-GC
<15% sand
POORLY GRADED GRAVEL WITH CLAY
>15% sand
POORLY GRADED GRAVEL WITH CLAY AND SAND
>15% fines
non-plastic fines
GM
<15% sand
SILTY GRAVEL
>15% sand
SILTY GRAVEL WITH SAND
plastic fines
GC
<15% sand
CLAYEY GRAVEL
>15% sand
CLAYEY GRAVEL WITH SAND
Sand (sand > gravel)
<5% fines
Well graded (non-uniform)
SW
<15% gravel
WELL GRADED SAND
>15% gravel
WELL GRADED SAND WITH GRAVEL
Poorly graded (uniform)
SP
<15% gravel
POORLY GRADED SAND
>15% gravel
POORLY GRADED SAND WITH GRAVEL
10% fines
Well graded (non-uniform)
non-plastic fines
SW-SM
<15% gravel
WELL GRADED SAND WITH SILT
>15% gravel
WELL GRADED SAND WITH SILT AND GRAVEL
plastic fines
SW-SC
<15% gravel
WELL GRADED SAND WITH CLAY
>15% gravel
WELL GRADED SAND WITH CLAY AND GRAVEL
Poorly graded (uniform)
non-plastic fines
SP-SM
<15% gravel
POORLY GRADED SAND WITH SILT
>15% gravel
POORLY GRADED SAND WITH SILT AND GRAVEL
plastic fines
SP-SC
<15% gravel
POORLY GRADED SAND WITH CLAY
>15% gravel
POORLY GRADED SAND WITH CLAY AND GRAVEL
>15% fines
non-plastic fines
SM
<15% gravel
SILTY SAND
>15% gravel
SILTY SAND WITH GRAVEL
plastic fines
SC
<15% gravel
CLAYEY SAND
>15% gravel
CLAYEY SAND WITH GRAVEL
STEP 2: DETERMINE PLASTICITY AND ASSIGN USCS GROUP SYMBOL
INCREASING PLASTICITY
NON PLASTIC
LOW PLASTICITY
MEDIUM PLASTICITY
HIGH PLASTICITY
ML
CL
CH
FINE-GRAINED DEPOSITS (>50% fines, <50% coarse-grained sediments)
STEP 3: CONTINUE WITH GROUP SYMBOL AND FOLLOW FLOW CHART TO ASSIGN A GROUP NAME
STEP 4: DOES ORGANIC CONTENT INFLUENCE SOIL PROPERTIES?
YES
NO
GROUP NAME
ML
less than 30% Coarse Grained Sediments
< 15% Coarse-Grained Sediment
SILT
15-25% Coarse-Grained Sediment
% sand > % gravel
SILT WITH SAND
% sand < % gravel
SILT WITH GRAVEL
more than 30% Coarse Grained Sediments
% sand > % of gravel
<15% gravel
SANDY SILT
>15% gravel
SANDY SILT WITH GRAVEL
% sand < % gravel
<15% sand
GRAVELLY SILT
>15% sand
GRAVELLY SILT WITH SAND
CL
less than 30% Coarse Grained Sediments
< 15% Coarse-Grained Sediment
LEAN CLAY
15-25% Coarse-Grained Sediment
% sand > % gravel
LEAN CLAY WITH SAND
% sand < % gravel
LEAN CLAY WITH GRAVEL
more than 30% Coarse Grained Sediments
% sand > % of gravel
<15% gravel
SANDY LEAN CLAY
>15% gravel
SANDY LEAN CLAY WITH GRAVEL
% sand < % gravel
<15% sand
GRAVELLY LEAN CLAY
>15% sand
GRAVELLY LEAN CLAY WITH SAND
CH
less than 30% Coarse Grained Sediments
< 15% Coarse-Grained Sediment
FAT CLAY
15-25% Coarse-Grained Sediment
% sand > % gravel
FAT CLAY WITH SAND
% sand < % gravel
FAT CLAY WITH GRAVEL
more than 30% Coarse Grained Sediments
% sand > % of gravel
<15% gravel
SANDY FAT CLAY
>15% gravel
SANDY FAT CLAY WITH GRAVEL
% sand < % gravel
<15% sand
GRAVELLY FAT CLAY
>15% sand
GRAVELLY FAT CLAY WITH SAND
OL / OH
less than 30% Coarse Grained Sediments
< 15% Coarse-Grained Sediment
ORGANIC SOIL
15-25% Coarse-Grained Sediment
% sand ≥ % gravel
ORGANIC SOIL WITH SAND
% sand < % gravel
ORGANIC SOIL WITH GRAVEL
more than 30% Coarse Grained Sediments
% sand ≥ % of gravel
<15% gravel
SANDY ORGANIC SOIL
≥15% gravel
SANDY ORGANIC SOIL WITH GRAVEL
% sand < % gravel
<15% sand
GRAVELLY ORGANIC SOIL
≥15% sand
GRAVELLY ORGANIC SOIL WITH SAND
ASTM charts reprinted with permission
copyright 2001-2007 midwest geosciences group press

FLOYD | SNIDER
strategy • science • engineering

PROJECT:		LOCATION:	BORING ID:
LOGGED BY:		COORDINATE SYSTEM:	
DRILLED BY:		NORTHING:	EASTING:
DRILLING EQUIPMENT:		GROUND SURFACE ELEVATION:	
DRILLING METHOD:		TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):
SAMPLING METHOD:		BORING DIAMETER:	DRILL DATE:

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID
0							

ABBREVIATIONS:
ft bgs = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

NOTES:

FLOYD | SNIDER
strategy • science • engineering

PROJECT:		LOCATION:	BORING ID:
LOGGED BY:		COORDINATE SYSTEM:	
DRILLED BY:		NORTHING:	EASTING:
DRILLING EQUIPMENT:		GROUND SURFACE ELEVATION:	
DRILLING METHOD:		TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):
SAMPLING METHOD:		BORING DIAMETER:	DRILL DATE:

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID

ABBREVIATIONS:
ft bgs = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

NOTES:

FLOYD | SNIDER
strategy ▪ science ▪ engineering

Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

F|S STANDARD GUIDELINE

Soil Sample Collection

DATE/LAST UPDATE: December 2022

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field but are not intended to be step by step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline presents commonly used procedures for collection of soil samples for characterization and laboratory analysis. The methods presented in this guideline apply to the collection of soil samples during the following characterization activities: soil borings via drilling, manual collection of shallow soil samples, test pit excavation, excavation confirmation, and stockpile characterization. Specific details regarding the collection of discrete and composite samples, and special sampling techniques for volatile organic compounds (VOCs) are also included. The guideline is intended to be used by staff who collect soil samples in the field.

It is important that the field staff completing the soil sample collection discusses the specific needs for a particular investigation with the project geologist, the project manager, or whoever will ultimately be responsible for interpreting the findings of the field investigation. This discussion is in addition to field training and general knowledge about soil sampling, and should happen prior to entering the field, with additional follow-up before finalizing the field forms, after the investigation is complete.

2.0 Equipment and Supplies

Soil Sampling Equipment and Tools:

- Tape measure or measuring wheel
- Stainless steel bowls and spoons
- Trowel, hand auger, or shovel (if needed)
- Table and disposable sheeting, tape or clamps to hold down sheeting (if needed).
- White board and dry erase pen
- Graduated plunger and collection tubes for VOC samples (if needed)
- Photoionization detector (PID) (if needed)
- Ziploc bags (sandwich and gallon sizes)
- Trash bags
- Decontamination tools including:
  - Paper towels or shop towels
  - Spray bottles of Alconox (or similar) solution
  - Deionized or distilled water
  - Scrubbing brush and bucket
- Adhesive drum labels, and paint or grease pen
- Washington State Department of Transportation- (WSDOT) approved drums for investigation-derived waste (IDW) disposal, if needed (if drilling, to be provided by driller)
- Camera
- Hand-held global position system (GPS; if needed)
- Coolers, sample jars, labels, ice

Paperwork:

- Work Plan and/or Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP)
- Field map printed on Rite in the Rain paper
- Site-specific Health and Safety Plan (HASP)
  - Tailgate meeting form (for each day you expect to be on Site)
  - Safety Data Sheets
- Floyd|Snider's Accident Prevention Plan (APP)

- Sample collection forms printed in Rite in the Rain paper
- Boring Logs
- Rite in the Rain field notebook
- Chain of custody forms
- Emergency contact numbers for utilities, property owner/manager, etc. (as needed)

Safety Equipment:

- Steel-toed boots
- Safety vest
- Safety glasses
- Nitrile gloves
- Rain gear
- Work gloves
- Hard hat
- Ear protection
- Traffic barricades or cones
- Vehicle emergency kit (road flares, fire extinguisher, first aid kit, etc.)
- Sunscreen if needed
- Hand and foot warmers, if needed
- Mosquito repellent, Hornet Spray, if needed
- Drinking water
- Rain or sun shelter, if needed
- Cell phone and charger cables

3.0 Standard Procedures

3.1 OFFICE PREPARATION

Prior to going into the field, review the SAP and QAPP to become familiar with the sampling goals, data quality objectives, desired sample intervals and nomenclature, field Quality Assurance (QA) samples (i.e., frequency of field duplicates, MS/MSDs) to be collected, analytes, sample containers, and holding times for each analytical method.

At least one week prior to sampling, coordinate with the laboratory specified in the SAP/QAPP to receive coolers and appropriate sample containers (including additional containers for

QA samples). Familiarize yourself with the volume requirements and container types, preservation methods, and holding times for each class of analytes.

If drilling or digging test pits, mark the sample area and sample locations with white spray paint prior to sampling, then submit an 811 public utility locate request at least 3 business days prior to work. Hire a private utility locator and schedule to locate utilities on private property and ensure proposed boring and/or excavation locations are free of utilities (Note: not all locators are equipped to mark non-conductible utilities).

3.2 TAILGATE SAFETY MEETING

Conduct a tailgate safety meeting prior to beginning work at the Site. Include any subcontractors working with you at the Site in this meeting. The safety meeting should cover the hazards specific to soil sampling. Typical hazards include:

- Heavy machinery/drill rig awareness (overhead hazards, pinch points, noise, uncontrolled release of energy). Always make eye contact before approaching an operator.
- Physical hazards (heavy lifting, uneven ground/trip hazards)
- Chemical hazards (dust, site-specific contaminants of concern, lab preservatives)
    - Refer to HASP for specific air monitoring requirements, permissible exposure limits (PELs), and actions if PELs are exceeded.

Additional hazards that may be present at any job site include traffic, adverse weather, slips, trips, falls, biological hazards (such as insects, plants, animals), and worksite distractions (such as pedestrians or other onsite activities).

Record the meeting attendees and topics discussed on the front page of the tailgate safety meeting form. All attendees should sign the form.

3.3 OTHER HEALTH AND SAFETY GUIDELINES

The following are additional health and safety guidelines that should be followed in the field. These guidelines are intended to supplement the guidelines and requirements identified in the HASP and are not intended to replace the HASP.

- Review and sign the HASP prior to going out into the field.
- Conduct a tailgate safety meeting prior to beginning work at the site as discussed in Section 3.2.
- If conditions change (e.g., weather or personnel) or when moving between sampling locations/switching to different sampling tasks, assess any additional hazards that may be associated with the new condition or location/task. Record additional hazards noted and corrective actions to address those hazards on the second page of tailgate safety meeting form.

Record near misses and incidents on the Near Miss and Incident Reporting Form (included as an attachment to the HASP) and conduct management/client notifications according to the protocols detailed in the HASP.

3.4 GENERAL SOIL SAMPLE COLLECTION PROCEDURES

1. Locate the desired sample location and depth interval using a handheld GPS or by taking field measurements from known site features. Record the soil type and any other observations or indications of contamination on a soil boring log (enclosed), soil sample collection form, or field notebook, as described in the Soil Logging Standard Guideline. Note the location and depth of the sample on the whiteboard or notecard and take a photograph with a scale (e.g., tape measure), if possible.
2. Refer to Sections 3.4.1 through 3.4.4 for the appropriate soil collection procedures for drilling, shallow soil, test pit excavation, excavation confirmation, and stockpiles. If collecting samples for VOC analysis by the U.S. Environmental Protection Agency (USEPA) Method 5035, refer to Section 3.5 for specific sample collection procedures for this method. If composite soil sampling is recommended, refer to Section 3.6 for details.
3. Once soil has been collected from the desired depth or interval, mix thoroughly in a disposable or decontaminated stainless-steel bowl until the sample is homogenous in color, texture, and moisture.
4. Fill the required laboratory-provided jars, taking care not to overfill. If large gravels (diameter greater than ~ 1 inch) are encountered, these should be discarded to ensure that an adequate soil volume is collected for analysis. If necessary, use a clean paper towel to remove soil particles from the threaded mouth of the jar before securing lids to ensure a good seal. Remove any soil or dirt from the outside of the jar with a clean paper or shop towel.
5. Label each jar with the sample name, date, time, field staff initials and required analyses. If collecting a field duplicate, use the sample nomenclature specified in the SAP\QAPP and note the field duplicate name and sample time in the sample log and/or field notebook. If extra volume for matrix spike/matrix spike duplicate (MS/MSD) analysis is required, use the same name on all jars. Soil samples should be protected from moisture by placing the filled sample jars into separate sealed Ziploc bags before placing them into a cooler.
6. Upon completion of each day of sampling, complete a chain-of-custody form for all samples, including sample names, date and time of collection, number of containers, and required analyses and methods. Write neatly and make sure information on the chain is legible. If you need to correct an entry, strike the incorrect entry out once, and add your initials next to the strike out. Samples collected for waste characterization purposes should be recorded on a separate chain-of-custody. Keep samples on ice (unless otherwise specified in the SAP/QAPP) to maintain

temperatures of 4-6 degrees Celsius (°C) and transport to the laboratory under chain-of-custody procedures.

3.4.1 Soil Sample Collection via Drilling

These procedures should be used for drilling via direct-push, hollow stem auger, or roto-sonic methods where a pre-designated sample interval (i.e., 0 to 5 feet below ground surface [bgs]) is retrieved from the subsurface using a split spoon sampling device, lined core, or bag sampler.

1. Ensure that reusable sampling equipment has been thoroughly decontaminated prior to sampling.
2. Collect PID measurements and other field tests, if necessary. PID measurements should be collected using the head-space method: put a small amount of soil from the selected interval into a sandwich bag and seal the bag. Label the bag with the soil interval. After at least 10 seconds, insert the tip of the PID into the bag and record the PID reading on the boring log or field collection form. If a sheen test is necessary, place a small amount of soil into a disposable or decontaminated stainless steel bowl, spray it with tap water or deionized water and observe whether a sheen appears on the water. Record results on the boring log or sample collection form.
3. Prior to sample collection, log soil on the boring log or sample collection form following the Soil Logging Standard Guideline.
4. Use a stainless-steel spoon or trowel, or disposable scoop to remove an equal volume of soil across the targeted depth interval from the sampler.
    a. If using a split spoon sampler or other reusable sampler, avoid collecting the soil that is touching the sides of the sampler to the extent practical.
    b. If the soil touching a reusable sampler must be collected to obtain adequate volume for analysis, notify the PM and record in the field logbook.

3.4.2 Manual Collection of Shallow Soil Samples

These procedures should be used for shallow soil sampling via scoop, trowel, shovel, or hand auger.

1. Dig or auger to the bottom depth of the shallowest sample to be collected, using a tool that has been thoroughly decontaminated. Verify that the target depth has been reached using a measuring tape.
2. If using a scoop or trowel, collect the soil directly into a decontaminated stainless-steel bowl.
3. If using a shovel, the soil may either be collected in bowls or set as aside on plastic sheeting in favor of collecting the sample from the sidewall of the hole. If sampling the sidewall, use a decontaminated or disposable scoop or trowel to collect soil from the target depth, or scrape along the sidewall to collect soil across a target depth

interval. Transfer soil to a disposable or decontaminated stainless-steel bowl, repeating until a sufficient volume has been collected.

4. If using a hand auger, empty the cylinder of the auger directly into a disposable or decontaminated stainless-steel bowl. It may be necessary to empty the hand auger onto plastic sheeting or into a bowl to reach the target depth without overflowing the sampler.
5. Any soil from depth intervals that are not targeted for sampling should be set aside on plastic sheeting and returned to the hole after sampling.
6. Collect PID measurements and other field tests as described in Section 3.4.1.

3.4.3 Sample Collection from Test Pits or Limited Soil Excavations

These procedures should be used for collecting samples from test pit explorations excavated using a backhoe or excavator. These same general procedures should also be followed for post-excavation soil samples used to confirm that an excavation has removed contaminated material or to document post-excavation conditions after target excavation limits have been reached.

1. Measure the length, width, and depth of the test pit or excavation area to verify that the target extents have been reached. The lateral spacing of the test pit or excavation confirmation samples, or exact location of samples should be specified in the work plan and typically depend on the size of the excavation area but can vary significantly by project.
2. If not specified in the work plan, sidewall samples may be collected either midway between the ground surface and base of the excavation, or incrementally along the entire height of the sidewall. Both sidewall and base (bottom) samples should penetrate a minimum of 6 inches into the excavated surface.
3. If the test pit or excavation is less than 4 feet deep, or has been benched to accommodate safe entry, a sample may be collected directly from the sidewall(s). Do not enter an excavation before reviewing and verifying the necessary safety requirements. Most excavations can be sampled without entering, which is preferred. If entering is safe, based on the depth or accommodations to support entry, to collect soil from a sidewall, use a decontaminated or disposable scoop, trowel, or shovel to obtain soil from the desired depth or depth interval directly into a decontaminated stainless-steel bowl.
4. If a test pit or excavation cannot be safely entered, instruct the excavator operator to scoop sidewall material from the target depth or depth interval. Collect the soil sample from the excavator bucket using a decontaminated stainless-steel spoon, trowel, or disposal scoop, avoiding material that has come into contact with the teeth or sides of the bucket. Place an adequate volume of soil into a decontaminated stainless-steel bowl. If necessary, follow the compositing procedures in Section 3.6.

3.4.4 Stockpile Sampling

These procedures should be used for classifying stockpiled soil, including excavated soil and imported backfill material.

1. Where potentially contaminated soils have been previously excavated and stockpiled on site, Washington State Department of Ecology (Ecology) guidance recommends using a decontaminated or disposable scoop or trowel, penetrating 6 to 12 inches beneath the surface of the pile at several locations until sufficient volume for analysis is achieved. A decontaminated shovel may also be used to facilitate collection of soil from large piles. The locations for soil collection should be where contamination is most likely to be present based on field screening (i.e., staining, odor, sheen, or elevated photoionization detector [PID] readings). If there are not field indications of contamination, the locations should be distributed evenly around the stockpile.
2. The stockpile may need to be broken up into sections for sample collection depending on the size of the pile (i.e., segregate the pile in half or quarters). If this is necessary, it is important to document where each set of samples were collected from (i.e., north quadrant) and create a field sketch in the project notebook of the pile for reference and mark sample locations with flags.
3. If a sampling frequency is not specified in the work plan, the general rule of thumb for contaminated soil stockpile profiling is to collect and submit 3 analytical samples (these samples can be multi-point composites or grabs) for stockpiles less than 100 cubic yards (CY), 5 samples for stockpiles between 100 and 500 CY, 7 samples for stockpiles 500 to 1,000 CY, 10 samples for stockpiles 1,000 to 2,000 CY, and 10 samples for stockpiles larger than 2,000 CY with an additional sample collected for every 500 CY of material. This rule of thumb is consistent with the Washington State Guidance for Remediation of Petroleum Contaminated Site (Ecology 2016).
4. Samples for characterization of stockpiles of imported backfill or other presumed clean material should also be collected as described under 3. If not described in the work plan, the typical sample frequency for imported or clean material characterization is one sample per 500 CY.

3.5 SOIL SAMPLE COLLECTION FOR VOC ANALYSIS

If collecting soil samples for VOC analysis by USEPA Method 5035, collect these samples first before disturbing the soil. This method uses a soil volume gauge fitted with a disposable soil sampling plunger tube to collect a soil plug that can be discharged directly to a VOA vial, limiting the loss of volatiles during sampling. The collection of VOC samples using the 5035 method specifies use of an airtight VOA vial with a septum lid. Ecology's interpretation of the USEPA 5035 method allows for field preservation of the sample with methanol or sodium bisulfate, or laboratory preservation (i.e., field collection into an un-preserved vial). It is important to note that if laboratory preservation is the selected method, samples must be received at the laboratory within 48-hours of sample collection. The method of sample preservation for the 5035 method will vary for each site and is dependent on site-specific conditions. Preservation

method selection should be coordinated with the laboratory and specified in the sampling plan. Note that not all labs use the soil volume gauge as described below (some use syringes or Terra Core samplers) and that it is important to verify the sampling process with the lab.

1. Note the volume of soil needed for analysis as specified by the laboratory (commonly 5 or 10 grams). Raise the handle of the soil volume gauge to the slot in the gauge body corresponding to the desired volume and turn clockwise until the tabs in the handle lock into the slot.
2. Insert a sample tube at the open end of the gauge body and turn clockwise until the tabs on the tube lock into the "0 gram" slot. Remove the cap from the sample tube and press directly (where possible) into the shallow soil, soil core/sampler, excavation base or sidewall, or stockpile.
3. Continue pressing the sample tube until the plunger is stopped by the sample volume gauge. If a depth interval (for example 9 to10 feet) is targeted for VOC sampling, collect small volumes of soil across this interval until the sample tube is filled
4. Twist counterclockwise to disengage the sample tube, then depress the plunger to eject the soil plug directly into a laboratory-provided VOA vial. Wipe off any soil particles on the VOA vial threads before tightening the lid. Grit on the VOA vial threads can cause a poor seal and interfere with the laboratory analyses. If multiple vials per sample are required, the same plunger may be re-used to fill the remaining vials.

3.6 COMPOSITE SAMPLE COLLECTION

For this guideline, composites are considered samples that are collected across more than one location, or multiple depth intervals at a single location. Samples collected over continuous depth intervals within a sampling device (i.e., split spoon) are addressed for each sampling method in Section 3.4 above.

Compositing of sample material may be performed in the field or by the analytical laboratory. To collect a field composite sample, identify the locations and depth(s) that will comprise the composite. Collect soil from the first target sub-sample depth or depth interval and hold in a decontaminated stainless-steel bowl, covered with aluminum foil to prevent cross contamination and label with the location and depth. Continue to collect and hold individual sub-samples until all components of the composite have been collected, then transfer an equal amount of each sub-sample to a clean bowl and homogenize. Fill necessary sample jars from homogenized composite. In some cases, project plans may require that each individual sample that comprised the composite be collected in jars and submitted to the laboratory if individual sample analysis is desired, or if laboratory compositing is requested in addition to field compositing as a field quality control measure. In this case, label each individual jar, but indicate HOLD on the chain-of-custody, and note that the sample is part of composite XYZ.

To collect a laboratory composite sample, collect, and label each sub-sample using the procedures described above in Section 3.4. Record each sub-sample on the chain-of-custody form, and indicate on this form which samples should be composited by the laboratory and the

desired name of the composite sample. It is important to communicate to the laboratory if discrete samples will also require analysis (in some cases) or only the composite sample. It is helpful to send a follow up email to the laboratory PM with laboratory compositing details.

4.0 Decontamination

All reusable equipment that contacts soil or dust should be decontaminated prior to moving to the next sampling location.

Stainless-steel bowls and spoons, and any tools used for sample processing will be decontaminated between each sample; alternatively, disposable bowls and spoons may be used. Equipment decontamination will consist of a tap water rinse to remove soil particles, followed by scrubbing with brushes and an Alconox (or other soap)/tap water solution, and a final rinse with distilled or deionized water.

5.0 Investigation-Derived Waste

Unless otherwise specified in the project work plan, waste soils accumulated as investigation derived waste (IDW) will be contained, transported, disposed of in accordance with applicable laws, and stored in designated drums in a designated area until transported off-site for disposal.

The approach to handling and disposal of these materials is as follows. For IDW that is containerized, such as waste soils, 55-gallon drums approved by WSDOT (or the applicable stage agency) will be used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “soil”), the dates on which the soil was accumulated, the site owner’s name (i.e., the generator), Floyd|Snider name, and the Floyd|Snider field person contact information or front desk telephone number.

Refer to the IDW Special Conditions SOP for further information on IDW storage, sampling, profiling, and handling.

Disposable sampling materials and incidental trash such as paper towels and personal protective equipment (PPE) used in sample processing will be placed in heavy duty garbage bags or other appropriate containers and disposed of as solid waste in the municipal collection system (i.e., site dumpster).

6.0 Field Documentation

All observations including sample collection locations, soil descriptions, sample depths, collection times, analyses, and field QC samples should be recorded on a boring log, soil sample collection form, and/or bound field notebook. Information recorded should additionally include personnel present (including subcontractors), purpose of field event, weather conditions, sample collection date and times, sample analytes, and any deviations from the SAP.

At the end of the day, complete and review the second page of the tailgate safety meeting form detailing additional hazards, corrective actions, near-misses or incidents. Any incidents that result in field staff injuries or have the potential to result in staff injuries (such as hitting buried utility lines when drilling) should be reported immediately to the PM.

7.0 Demobilization

Upon returning to the office, ensure that all equipment is property cleaned and put away in the field room. Equipment with rechargeable batteries should be plugged in as appropriate so it is ready for use by the next person. It is preferable to dispose of trash at the project site, but any trash left in the field vehicle should be brought upstairs, labeled, and placed in the front production room for building staff to dispose of.

If equipment or sample coolers will be placed at the front desk for pickup, clearly label each item with the company picking it up, anticipated pickup time frame, and your contact information so front desk staff can contact you if there are any questions. Notify front desk staff if any items require a signature at pickup.

Within one week of returning from the field, the field lead for the event should review field notes, sampling forms and tailgate safety meeting forms with the PM. Following PM review and approval, field notes will be scanned and saved to the project folder. Hard copies should be filed. The PM will provide copies of near miss and incident reports to the Health and Safety Administrator.

Enclosures: Boring Log
Test Pit Log and Sample Collection Form

Record of Revisions:

Revisions	**Date**
Added H&S information and line edits for clarity.	7/22/2022
Reviewed with minor updates	SD 12/9/2022

FLOYD | SNIDER
strategy ▪ science ▪ engineering

	PROJECT:	LOCATION:	BORING ID:
	LOGGED BY:	COORDINATE SYSTEM:	
DRILLED BY:		NORTHING:	EASTING:
DRILLING EQUIPMENT:		GROUND SURFACE ELEVATION:	
DRILLING METHOD:		TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):
SAMPLING METHOD:		BORING DIAMETER:	DRILL DATE:

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID
0							
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

ABBREVIATIONS:
ft bgs = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

NOTES:

FLOYD | SNIDER
strategy ▪ science ▪ engineering

	PROJECT:	LOCATION:	BORING ID:
	LOGGED BY:	COORDINATE SYSTEM:	
DRILLED BY:		NORTHING:	EASTING:
DRILLING EQUIPMENT:		GROUND SURFACE ELEVATION:	
DRILLING METHOD:		TOTAL DEPTH (ft bgs):	DEPTH TO WATER (ft bgs):
SAMPLING METHOD:		BORING DIAMETER:	DRILL DATE:

Depth (feet)	USCS	Description	Drive	Recovery	# of Blows	PID (ppm)	Sample ID
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

ABBREVIATIONS:
ft bgs = feet below ground surface
ppm = parts per million
USCS = Unified Soil Classification System
▼ = denotes groundwater table

NOTES:

Test Pit Log and Sample Collection Form

Project:	Date:
Field Personnel:	
Test Pit #	
Pit Dimensions	Depth:_____ Length:_____ Width:_____ Units:_____
Soil Description: (note depth to native, presence of debris, odor, sheen)	
Sketch	
GPS coordinates	
Other Notes or Observations:	

Samples Details	Sample ID	Depth	Time	Analysis

FLOYD | SNIDER
strategy ▪ science ▪ engineering

Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

F|S STANDARD GUIDELINE: *Special Condition*

Investigation-Derived Waste

DATE/LAST UPDATE: October 2, 2020

Standard Guideline(s) to which this Special Condition is appended:

1. Groundwater Sample Collection with a Submersible Pump
2. Groundwater Sample Collection with a Direct-Push (i.e., Geoprobe) Drill Rig
3. Low-Flow Groundwater Sample Collection
4. Sediment Coring
5. Sediment Grab Sample Collection
6. Shallow Soil Sample Collection
7. Soil Sample Collection
8. Well Development

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field, but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines and special procedures for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines and special conditions with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines and special conditions.

1.0 Special Condition Applicability

This special condition applies to any sampling method that may produce investigation-derived waste (IDW) solids or liquids that will be containerized for characterization and offsite disposal. These wastes may include excess sample material; drill cuttings; or well development, purge, or

equipment decontamination water. Field staff should always consult their work plan to determine whether IDW must be containerized; some sampling methods such as sediment grab sampling and shallow soil sampling may allow for returning excess sample material to the sample station. Additionally, some facilities may have existing permits or regulatory agreements governing waste disposal that should be followed in addition to this special condition. It is also important to note that additional precautions must be taken when handling pure non-aqueous phase liquid (NAPL) product as detailed in the special condition for light non-aqueous phase liquid in groundwater.

2.0 Equipment and Supplies

Management of IDW may require the equipment outlined in the standard guidelines to which this special condition is attached, and also may require the following items:

- U.S. Department of Transportation (USDOT)-approved drums
- Adhesive labels identifying nonhazardous waste, waste pending characterization, and/or hazardous waste as appropriate for the site and waste stream (refer to Section 3.4 for details regarding preliminary waste designation)
- Broad-tip indelible marker
- Grease pen or paint marker
- Photoionization detector (PID)
- 1-gallon ziplock bags or large jars
- Bung wrench and socket or speed wrench with 15/16-inch socket
- Screw auger or push tube (for solids)
- Composite Liquid Waste Sampler (COLIWASA), drum thief or bailer (for liquids)
- Stainless steel spoon and bowl
- Sufficient laboratory-provided jars or bottles for required analyses
- Cooler with ice
- Site-specific Health and Safety Plan (HASP)

3.0 Special Condition Guidelines and/or Procedures

This section details protocols for IDW storage, waste sampling methods, sample frequency and waste characterization.

3.1 IDW STORAGE

Before arriving at the field site, ensure that there will be adequate drums on site for the scope of work. For drilling projects, drums are typically supplied by the drilling company, but for well

development or groundwater sampling, field staff may need to purchase a drum from a local vendor (these companies are usually referred to as barrel companies). Reconditioned drums are acceptable if they are inspected and found to be in good condition (free of large dents, rust, debris, and residues). For drums that will be used to store liquids, a lid with a bung (i.e., a small opening with a threaded cap) is recommended. When planning for drummed storage of IDW, the following quantities of material represent an approximate volume of 55 gallons, or one standard-sized drum:

- 20 feet of soil boring or sediment coring by hollow-stem auger or rotosonic methods (generally 6 to 8 inches in diameter); larger diameter borings will require additional drum volume
- 100 to 200 feet of direct push soil samples
- Development water from a 2-inch well with a screened interval of 5 to 10 feet (some sites may require additional volume for well development if fines in the formation necessitate additional pumping)
- Development water from four to five prepacked wells with ¾-inch or 1-inch casing
- Decontamination water from steam cleaning rods/casing for 1 day of drilling
- Purge water from 10 to 20 wells sampled using low-flow sampling methodology

First determine the location of the temporary drum staging area at the site. This area should be secured from the public when possible and out of the way of any active site operations or traffic. When staging IDW at an active facility, always coordinate the location of the drum staging with your facility manager or contact. The drum staging area should ideally be accessible by truck, or easily accessible via a level and solid surface for moving drums with a drum dolly or other equipment (i.e., forklift) to a truck for offsite transport.

During field activities, label each drum with its contents as it is filled. Use a grease or paint pen to write on sides and lid of the drum. Include contact info (Floyd|Snider main phone line) on at least one drum. Affix appropriate labels with generator information and Floyd|Snider contact information; note, however, that these labels fade quickly outdoors so should always be backed up with grease/paint pen. If there are existing site data, the drums may be labeled as hazardous or nonhazardous as appropriate (refer to Section 3.4 for waste categorization). When in doubt, label the drums as IDW pending characterization.

Before leaving the site each day, make sure the drum lids are closed securely and that the storage area is secured, if applicable.

3.2 IDW SAMPLE COLLECTION

IDW samples of the same medium and from the same investigation at a site can generally be composited for characterization. A frequency of one sample per three 55-gallon drums is typically required for waste disposal characterization, but always check with your preferred disposal

vendor to verify the number of samples needed. If sampling drums with unknown contents, compositing may be guided by field observations or screening, and the presence of irregular material or NAPL may necessitate individual drum samples for proper characterization.

The most efficient way to characterize IDW solids (i.e., soil or sediment) is to collect samples during your field event. Collect representative material from each location and place immediately into a large ziplock bag or unpreserved jar stored on ice in your sample cooler. Alternately, if the scope of field sampling includes all required IDW analyses, discrete field samples collected for the investigation may also be used for IDW characterization. Liquid samples may be collected at the end of the field event by sampling directly from the drums, or in the case of purged groundwater, representative samples collected during groundwater sampling may be sufficient for characterization.

In some instances, field staff may need to characterize drums that were not generated by Floyd|Snider but were left on a site. If existing drums will be sampled, it is important to determine their likely contents. This information may be obtained by reviewing labels or markings on the drum(s) if legible, reviewing prior site reports that describe field sampling and IDW management, communicating with facility operators or generators, or communicating with prior consultants who performed work at the site. If a remediation system is or was in place (such as NAPL recovery), it is especially important to verify whether drums left on site contain environmental media (i.e., soil, sediment, or groundwater) or remediation system waste that may have specific handling and disposal requirements.

The procedure for drum sampling varies slightly depending on whether the contents are known or unknown. For drums with known contents:

- Assess the condition of the drums. Look for indications of pressurization (bulging), crystals around opening, rust, and holes/weeping/leaking. Do not open drums exhibiting pressurization or crystal formation; these drums should be handled by a professional hazardous waste contractor. Ground any drums not in contact with the earth using grounding wires, alligator clips, and a grounding rod or metal structure.
- Record the contents of the drums. Group drums of like material for compositing and record composite groups in the field notebook.
- For solids: Open the lid. If volatile contaminants are known or suspected at the site, measure the headspace volatile organic compound (VOC) concentration above the drum with a PID to determine whether it is safe to proceed with sampling in accordance with the air monitoring action levels provided in the site-specific HASP. Use a screw auger or push tube to collect a core sample. Discharge the sample to a decontaminated stainless steel bowl. Repeat as needed to generate the representative sample amount of the composite needed for analysis. Once all representative samples of the composite have been collected, fill volatile organic analysis (VOA) vials (refer to Soil Sample Collection standard guideline) prior to homogenizing.

- For water: Open the bung (if present) or lid. If volatile contaminants are known or suspected at the site, measure the headspace VOC concentration above the drum with a PID to determine whether it is safe to proceed with sampling in accordance with the air monitoring action levels provided in the site-specific HASP. Collect a sample with a COLIWASA, drum thief, or bailer by lowering the sampler to bottom of the drum and closing the inner tube of the COLIWASA, plugging the upper end of the drum thief with a gloved fingertip, or pulling up on the bailer to engage the ball plug. Fill each container with a representative amount of the needed composite volume, collecting additional volume from each drum as needed to fill the sample containers.
- For all media: Record field observations such as overlying water (in drums containing solids) sheen, odor, and the presence of NAPL in the field notebook. If overlying water is present in solids drums, estimate the percentage of the drum volume occupied by water. If NAPL is encountered in water drums, estimate the percentage of drum volume that is occupied by NAPL. Contact the intended disposal company to determine whether additional NAPL samples are needed for characterization and report field observations to the disposal company to ensure an accurate disposal profile.

For drums with unknown contents:

- Assess the condition of the drums. Look for indications of pressurization (bulging), crystals around opening, rust, and holes/weeping/leaking. Do not open drums suspected to contain hazardous materials or drums exhibiting pressurization or crystal formation; these drums should be handled by a professional hazardous waste contractor. Ground any drums not in contact with the earth using grounding wires, alligator clips, and a grounding rod or metal structure.
- Record the contents of the drums. Check for a label indicating drum contents. Designate drums with media type and number if the label listing the contents is missing or illegible (i.e., “Solids-01”). The contents (solid or liquid) of an IDW drum with a missing or illegible label can be determined by knocking on the outside of the drum with a steel-toe boot or rubber mallet and listening for reverberation indicating that the drum is filled with liquid. The drum type may also indicate the contents; drums containing water are often fitted with a lid that has a bung, whereas drums containing solids are often fitted with a lid that does not have a bung. Group drums of like material for compositing and record composite groups in the field notebook.
- For solids: Open the lid. If volatile contaminants are known or suspected at the site, measure the headspace VOC concentration above the drum with a PID to determine whether it is safe to proceed with sampling in accordance with the air monitoring action levels provided in the site-specific HASP. Use a screw auger or push tube to collect a core sample. Discharge the sample to a decontaminated stainless steel bowl. Repeat as needed to generate the representative sample amount of the composite needed for analysis. Once all representative samples of the composite have been

collected, fill VOA vials (refer to Soil Sample Collection standard guideline) prior to homogenizing.

- For water: Open the bung (if present) or lid. If volatile contaminants are known or suspected at the site, measure the headspace VOC concentration above the drum with a PID to determine whether it is safe to proceed with sampling in accordance with the air monitoring action levels provided in the site-specific HASP. Collect a sample with a COLIWASA, drum thief, or bailer by lowering the sampler to bottom of the drum and closing the inner tube of the COLIWASA, plugging the upper end of the drum thief with a gloved fingertip, or pulling up on the bailer to engage the ball plug. Fill each container with a representative amount of the needed composite volume, collecting additional volume from each drum as needed to fill the sample containers.
- For all media: Record field observations such as overlying water (in drums containing solids) sheen, odor, and the presence of NAPL in the field notebook. If overlying water is present in solids drums, estimate the percentage of the drum volume occupied by water. If NAPL is encountered in water drums, estimate the percentage of drum volume that is occupied by NAPL. Contact the intended disposal company to determine whether additional NAPL samples are needed for characterization and report field observations to the disposal company to ensure an accurate disposal profile.

3.3 LABORATORY ANALYSIS

IDW samples should be analyzed for the Resource Conservation and Recovery Act (RCRA) list of contaminants that define hazardous waste on the basis of toxicity, other wastes with disposal restricted by federal statutes, and contaminants that are defined as Washington State dangerous wastes. These contaminants may include the following:

- Metals: arsenic, cadmium, chromium, lead, mercury, selenium, and silver
- VOCs: benzene, carbon tetrachloride, chlorobenzene, chloroform, 1,4-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethene, methyl ethyl ketone, tetrachloroethene, trichloroethene, vinyl chloride, and other halogenated VOCs
- Semivolatile organic compounds (SVOCs): cresol (m-, o-, and p- isomers), 2,4-dinitrotoluene, hexachlorobenzene, hexachlorobutadiene, hexachloroethane, nitrobenzene, pentachlorophenol, pyridine, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,4,5-TP (Silvex), and polycyclic aromatic hydrocarbons (PAHs)
- Pesticides: chlordane, 2,4-D, endrin, heptachlor (and epoxide), lindane, methoxychlor, and toxaphene
- Polychlorinated biphenyls (PCBs)

If a contaminant was known to never have been used on a site, or existing analytical data from likely contaminated areas of a site demonstrate that a contaminant is not present, this generator

knowledge may be used to eliminate some analyses. However, at a minimum, waste characterization generally requires analysis for metals, VOCs, SVOCs, and PCBs, which are common industrial contaminants. Specific analytical requirements should be provided by the disposal vendor to ensure that adequate characterization is performed.

3.4 WASTE CATEGORIZATION

Wastes generated by environmental investigations are often suitable for disposal as unregulated materials at a Subtitle D landfill. However, there are some instances where wastes are regulated under RCRA, the Toxic Substances Control Act (TSCA), or Washington States dangerous waste regulations and may require specialized disposal at a Subtitle C/hazardous waste landfill. Situations where wastes may require specialized handling and disposal are described in the following sections.

It is important to note that the information in this section should be used as a guideline for waste characterization only. Staff should always verify the proper waste designation with the waste disposal company in accordance with the appropriate rules and regulations, noting that there are some exemptions to certain rules.

3.4.1 Resource Conservation and Recovery Act

Wastes are categorized by RCRA according to the processes by which they are generated and their characteristics including ignitability, corrosivity, reactivity, and toxicity. Toxicity is the most common characteristic that may cause IDW to be regulated under RCRA; however, other wastes (for example, water with very high or low pH) may also require specialized handling and disposal. Wastes that may require specialized handling and disposal on the basis of toxicity are discussed in further detail below.

Toxicity is determined by contaminant concentrations in liquid or leachate. For solids, a rule of thumb can be applied to predict a solid concentration that will produce a leachate concentration equivalent to the RCRA Regulatory Level. The rule of thumb conservatively assumes that the leachate concentration in milligrams per liter (mg/L) will be one-twentieth of the solid concentration in milligrams per kilogram (mg/kg).

Contaminant	**RCRA Regulatory Level (mg/L)**
Arsenic	5.0
Barium	100
Benzene	0.5
Cadmium	1.0
Carbon tetrachloride	0.5
Chlordane	0.03
Chlorobenzene	100

Contaminant	RCRA Regulatory Level (mg/L)
Chloroform	6.0
Chromium	5.0
o-Cresol	200
m-Cresol	200
p-Cresol	200
2,4-D	10
1,4-Dichlorobenzene	7.5
1,2-Dichloroethane	0.5
1,1-Dichloroethylene	0.7
2,4-Dinitrotoluene	0.13
Endrin	0.02
Heptachlor (and its epoxide)	0.008
Hexachlorobenzene	0.13
Hexachlorobutadiene	0.5
Hexachloroethane	3.0
Lead	5.0
Lindane	0.4
Mercury	0.2
Methoxychlor	10
Methyl ethyl ketone	200
Nitrobenzene	2.0
Pentachlorophenol	100
Pyridine	5.0
Selenium	1.0
Silver	5.0
Tetrachloroethene	0.7
Toxaphene	0.5
Trichloroethene	0.5
2,4,5-Trichlorophenol	400
2,4,6-Trichlorophenol	2.0
2,4,5-TP (Silvex)	1.0
Vinyl chloride	0.2

If a contaminant concentration is greater than 20 times the RCRA Regulatory Level, follow-up analysis using the Toxicity Characteristic Leaching Procedure (TCLP) to determine the leachability

of the contaminant should be completed. TCLP results may demonstrate that the contaminant does not produce leachate concentrations exceeding its RCRA Regulatory Level. Waste requires specialized handling and disposal under RCRA if the liquid or leachate concentration of any contaminant exceeds its RCRA Regulatory Level.

3.4.2 Toxic Substances Control Act

TSCA regulates wastes containing PCBs. Wastes require specialized handling and disposal if they contain total PCBs greater than 5 mg/L in liquids or 50 mg/kg in solids.

3.4.3 Washington State Dangerous Waste

Wastes may also be categorized as Washington State dangerous waste or extremely hazardous waste requiring specialized handling and disposal on the basis of total halogenated VOC or PAH concentrations. Washington State categorization includes the following:

- Dangerous waste: total halogenated VOCs 0.01% to 1.0%
- Extremely hazardous waste: total halogenated VOCs or PAHs greater than 1.0%

3.5 DISPOSAL PROFILE PREPARATION

A disposal profile is typically created by the selected waste disposal company using laboratory analytical data and drum inventories supplied by Floyd|Snider. In some instances, additional information regarding site history may be needed to complete portions of a disposal profile based on generator knowledge.

Sites and vendors may vary; however, the property owner or operator is usually listed as the generator of a waste. Floyd|Snider personnel may sign a disposal profile, when allowed and approved by the property owner or operator, as the authorized representative of the generator.

4.0 Field Documentation

The number of drums filled during the field investigation, contents of each drum, and location of the drum staging area should be documented in the field notebook. IDW sample logs should also be recorded in the field notebook and include the date and time, sample collection method, and drums represented by each composite sample as well as any field observations.

Disposal records are mailed by the disposal company. These records should be retained in the project files and provided to the property owner/generator.

FLOYD | SNIDER
strategy ▪ science ▪ engineering

Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

F|S STANDARD GUIDELINE

Groundwater Sample Collection with a Direct-Push (i.e., Geoprobe) Drill Rig

DATE/LAST UPDATE: December 2022

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline provides details necessary for collecting representative groundwater samples using a direct-push drill rig. These guidelines are designed to meet or exceed guidelines set forth by the Washington State Department of Ecology (Ecology).

2.0 Equipment and Supplies

Groundwater Sampling Equipment and Tools

- For wells with head less than 25 feet:
  - Peristaltic pump with fully charged internal battery or standalone battery and appropriate connectors (typically provided by driller; confirm prior to mobilization)
- For wells with head greater than 25 feet:
  - Submersible pump (and controller if low-flow; with extension cord if near an electrical outlet; with battery and appropriate connectors or generator if not near an outlet)

- Peristaltic pump and internal battery or standalone battery with appropriate connectors (typically provided by driller; confirm prior to mobilization)
- Water level meter
- Multi-parameter water quality meter (if applicable)
- Polyethylene tubing, Teflon tubing, or similar (assume polyethylene unless otherwise specified in SAP) and tubing weights (for wells deeper than approximately 10 feet)
- Silicone tubing
- Filters (if field filtering)
- Tools for opening drums (15/16-inch socket, ratchet, screwdriver, hammer/mallet, bung wrench)
- Tube cutters, razor blade, or scissors
- 55-gallon drum and clamp (or 5-gallon drum) and labels
- 5-gallon bucket and lid
- Decontamination supplies: Alconox (or similar), distilled or deionized water, spray bottles, and paper towels
- Trash bags

Lab Equipment

- Sample jars/bottles
- Coolers
- Chain-of-Custody Forms
- Labels
- Ice
- Ziploc bags

Paperwork

- Field notebook with site maps and previous boring logs, if available
- Sampling forms (enclosed)
- Purge water plan
- Rite-in-the-Rain pens, paper, and permanent markers
- Site-Specific Health and Safety Plan (HASP), Tailgate Safety Meeting Forms (for each day you expect to be on site), and F|S Accident Prevention Plan (APP)
- Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP), or other similar work plan

- List of emergency contacts for the Site or facility
- Safety Data Sheets (SDS) binder

Safety Equipment

- PPE:
  - Safety-toed boots
  - Safety vest
  - Hard hat
  - Nitrile gloves
  - Safety glasses
  - Hearing protection
  - Rain gear
  - Work gloves
- Traffic barricades or cones
- Vehicle emergency kit (road flares, fire extinguisher, etc.)
- First Aid Kit

3.0 Standard Procedures

The following sections describe the procedure for sampling groundwater using direct-push methods. Before entering the field, project considerations including the target aquifer or depth for sampling and screen placement (i.e., across or within the water table) should be discussed with the Project Manager. Any deviations from these procedures should be approved by the Project Manager and fully documented. Groundwater sampling from a direct-push boring consists of purging and sampling water within the borehole with a peristaltic pump. Direct-push drilling activities will typically follow Floyd|Snider Standard Guidelines for Soil Sampling.

3.1 TAILGATE SAFETY MEETING

Conduct a tailgate safety meeting prior to beginning work at the Site. Emergency evacuation procedures, rally points, and onsite communication protocols should be discussed at the first tailgate meeting and repeated if new personnel join the field team onsite.

The safety meeting should cover the hazards specific to direct-push groundwater sampling. Typical hazards of this type of sampling include:

- Drilling with a direct-push rig
  - Buried utilities
  - Pinch points

  - Hot exhaust and fire hazards
  - Overhead equipment
  - Moving heavy equipment such as direct-push rods
  - Loud noise
- Well point purging and sampling
  - Lifting heavy buckets and coolers
  - Splash hazards from water/mud
  - Sharp blades
  - Electrical hazards when working with exposed battery contacts
- Site Hazards
  - Traffic
  - Slips, trips and falls (uneven terrain, wet ground, equipment on site, etc.)
  - Biological (insects, animals, plants)
- Chemical hazards (refer to HASP for Site COCs)

Record the meeting attendees and topics discussed on the front page of the tailgate safety meeting form. All attendees should sign the form. The drilling crew may have an additional safety meeting template and meeting form to cover more specific hazards related to operation of and working around the drill rig.

3.2 OTHER HEALTH AND SAFETY GUIDELINES

The following are additional health and safety guidelines that should be followed in the field. These guidelines are intended to supplement the guidelines and requirements identified in the HASP and are not intended to replace the HASP.

- Review and sign the HASP prior to going into the field.
- Conduct a tailgate safety meeting prior to beginning work at the site as discussed in Section 3.1
- When moving between well points or switching to different tasks (e.g., transitioning from sampling to cooler QC prior to lab pickup), assess any additional hazards that may be associated with the new location or task. Record additional hazards noted and corrective actions to address those hazards on the Daily Tailgate Safety Meeting and Debrief Form (included as an attachment to the HASP).
- Record near misses and incidents on the Near Miss and Incident Reporting Form (included as an attachment to the HASP) and conduct management/client notifications according to the protocols detailed in the HASP.

3.3 CALIBRATION OF WATER QUALITY METERS

Water quality meters used during groundwater sampling (if applicable) will be calibrated prior to each sampling event. Calibration procedures are outlined in each instrument's specific user manual.

3.4 PURGING AND SAMPLING PROCEDURES

Once the direct-push drilling activities have reached the desired depth, a new polyvinyl chloride (PVC) or decontaminated stainless-steel casing and screen is temporarily installed in the borehole by the driller. Record the depth-to-water and total depth of the well to calculate the volume (this is calculated by multiplying the area inside the casing by the height of water in the casing).

- The maximum depth to water that can be sampled in a temporary well point using a peristaltic pump is approximately 20 to 25 feet bgs. For wells with 25 feet or less of head, slowly lower new polyethylene or Teflon tubing down the temporary casing and use a peristaltic pump to purge and collect groundwater samples. When sampling temporary well points with a bottom screen depth greater than approximately 10 feet, it is important to measure the length of tubing prior to placement as longer lengths of tubing are more likely to get caught or otherwise obstructed and feel like it has reached the bottom; this issue can be mitigated by using decontaminated stainless steel tubing weights.
- For temporary well points with more than 25 feet of head, connect a submersible pump to a discharge line of appropriate length to situate the pump within the lower half of the water column. Slowly lower the decontaminated submersible pump with a discharge line into the monitoring well and note any restrictions. If the connection of the polyethylene tubing to the pump outlet does not feel secure, use a small hose clamp to reinforce the connection. A small piece of silicone tubing maybe used to connect a pump outlet and polyethylene tubing of different diameters.
- The discharge line should be directed to a 55-gallon drum (or 5-gallon drum or bucket), provided by the drilling subcontractor to contain the purge water generated. Purging will continue until the groundwater is visually clear (if achievable) or at least 3 well volumes have been removed. Collect water quality parameters, if applicable, either by lowering the quality instrument into the well or placing the instrument into a container filled with purge water. The following water-quality parameters may be collected prior to sampling:
    - pH
    - Specific conductivity
    - Dissolved oxygen
    - Temperature
    - Turbidity
    - Oxidation Reduction Potential (ORP)

After the well has been purged and the sample bottles have been labeled, the groundwater sample will be collected by directly filling the laboratory-provided bottles from the pump discharge line. All sample containers should be filled with minimum disturbance by allowing the water to flow down the inside of the bottle or vial. When collecting a volatile organic compound (VOC) sample, fill to the top to form a meniscus over the mouth of the vial prior to placing the cap in order to eliminate air bubbles. Do not overfill preserved sample jars or pre-cleaned Volatile Organic Analyte (VOA) sampling vials.

If sampling for dissolved analytes (such as metals), collect these samples last and with attention to the flow direction arrow, fit an in-line filter at the end of the discharge line, invert filter to minimize air bubbles and allow a minimum of 0.5 to 1 liter of groundwater to pass through the filter prior to collecting the sample.

Sample labels will clearly identify the project name, sampler's initials, sample location and unique sample ID, analysis to be performed, date, and time. Upon collection, place samples in a cooler maintained at a temperature of approximately 4 to 6 degrees Celsius (°C) using ice (if required). Complete the chain-of-Custody forms. Upon transfer of the samples to the laboratory, the Chain-of-Custody Form will be signed by the persons transferring custody of the sample containers to document change in possession.

When sample collection is completed at a designated location, remove and properly dispose of the tubing and temporary well screen and casing or decontaminate reusable tubing and well screens. In most cases, this waste is considered solid waste and can be disposed of as refuse.

4.0 Decontamination

Prior to moving to the next sampling location, all reusable equipment that has come into contact with groundwater should be decontaminated using the processes described in this section.

Water Level Meter: The water level indicator and tape will be decontaminated between direct-push sampling locations and at the end the day by spraying the entire length of tape that came in contact with groundwater with an Alconox (or similar)/water mixture followed by a thorough rinse with distilled or deionized water.

Water quality sensors and flow-through cell (if used): Use distilled or deionized water to rinse the water quality sensors and flow-through cell. No other decontamination procedures are recommended since the equipment is sensitive. After the sampling event, the water quality meters will be cleaned and maintained according to the specific manual.

Submersible Pump: Decontaminating the pump requires running the pump in three progressively cleaner grades of water.

1. Fill a bucket with approximately 4 gallons of an Alconox (or similar)/clean water solution to sufficiently cover the pump. Place the pump and the length of the power cord (and reusable tubing, if applicable) that was in contact with water into the bucket

and run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted.

2. Fill a second bucket containing approximately 4 gallons of clean water to sufficiently cover the pump. Place the pump and cord (and reusable tubing, if applicable) into this bucket and run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted.
3. Fill a third bucket with approximately 4 gallons of distilled or deionized water to sufficiently cover the pump. Place the pump and cord (and reusable tubing, if applicable) into this bucket and run the pump for approximately two minutes or until the volume of water in the bucket has been exhausted.

The Alconox/water solution may be re-used; however, rinse water should be collected for disposal as described in Section 5.0 below. When done for the day, dry the exterior of the pump and cord with clean towels to the extent practical prior to storage: all decontaminated water (including Alconox solution) should be managed in accordance with Section 5.0 below.

All reusable equipment on the drill rig (such as casings and rods) that comes into contact with soil or groundwater will be decontaminated by the driller between locations. The drilling subcontractor will store all decontaminated water in labeled 55-gallon drums on-site for proper disposal unless otherwise specified.

5.0 Investigation-Derived Waste (IDW)

Unless otherwise specified in the project-specific work plan, water generated during groundwater sampling activities will be contained and stored in a designated area until it can be transported and disposed of off-site in accordance with applicable laws. This includes purge water and decontamination wash water.

The approach to handling and disposal of these materials for a typical cleanup site is as follows.

For IDW that is containerized, (such as purge water), 55-gallon drums (or other smaller sized drums) approved by the Washington State Department of Transportation will be used for temporary storage pending profiling and disposal. Each container holding IDW will be sealed and labeled as to its contents (e.g., “purge water”), the dates on which the wastes were placed in the container, the owner’s name, contact information for the field person who generated the waste, and the site name.

IDW containerized within drums will be characterized relative to applicable waste criteria using data from the sampling locations whenever possible. Material that is designated for off-site disposal will be transported to an off-site facility permitted to accept the waste. Manifests will be used, as appropriate, for disposal. Refer to the FS Special Condition Standard Guideline for Investigation Derived Waste for additional information regarding proper profiling and disposal of wastewater generated by groundwater sampling

Disposable sampling materials and incidental trash such as paper towels and gloves/other disposable PPE used in sample processing will be placed in heavy-duty garbage bags or other appropriate containers and disposed of as trash in the municipal collection system, unless otherwise specified in the SAP.

6.0 Field Documentation

Drilling and groundwater sampling activities will be documented in field sampling forms and/or notebooks and Chain-of-Custody Forms. Information recorded will at a minimum include personnel present (including subcontractors), purpose of field event, weather conditions, sample collection date and times, sample analytes, depths to water, water quality field measurements (if collected), amount of purged water generated, and any deviations from the SAP.

At the end of the day, complete and review the second page of the tailgate safety meeting form detailing additional hazards, corrective actions, near-misses or incidents. Any incidents that result to field staff injuries or have the potential to result in staff injuries should be reported immediately to the PM.

7.0 Demobilization

Upon returning to the office, ensure that all equipment is property cleaned and put away in the field room. Equipment with rechargeable batteries should be plugged in as appropriate. It is preferable to dispose of trash on-site, but any trash left in the field vehicle should be brought upstairs, labeled and placed in the front production room.

If equipment or sample coolers will be placed at the front desk for pickup, clearly label each item with the company picking it up and anticipated pickup time frame. Notify front desk staff if any items require a signature at pickup.

Within one week of returning from the field, the field lead for the event should review field notes, sampling forms and tailgate safety meeting forms with the PM. Following PM review and approval, field notes will be scanned and saved to the project folder. Hard copies should be filed. The PM will provide copies of near miss and incident reports to the Safety Program Manager.

Enclosures: Groundwater or Surface Water Sample Collection Form

Record of revisions:

Revisions	Date
Added health and safety information, reviewed EPA guidance, and added revisions table.	12/9/2022

GROUNDWATER OR SURFACE WATER SAMPLE COLLECTION FORM

Project:_____ Date of Collection: _____

Task:_____ Field Personnel: _____

Purge Data

Well ID: _____ Secure: ☐ Yes ☐ No Ecology Tag #: _____ Casing Type/Diameter/Screened Interval _____

Replacement Required: ☐ Monument ☐ Lid ☐ Lock ☐ Bolts: Missing (#) _____ Stripped (#) _____ Other Damage: _____

Depth Sounder decontaminated Prior to Placement in Well: ☐ Yes ☐ No One Casing Volume (gal): _____

Depth of water (from TOC):_____Time: _____

Total Depth (from log or field measurement): _____

After 5 minutes of purging (from top of casing): _____

Begin purge (time): _____End purge (time): _____

Volume purged:_____ Purge water disposal method_____

Volume of Schedule 40 PVC Pipe

Diameter	O.D.	I.D.	Volume (Gal/Linear Ft.)	Weight of Water (Lbs/Lineal Ft.)
1 ¼"	1.660"	1.380"	0.08	0.64
2"	2.375"	2.067"	0.17	1.45
3"	3.500"	3.068"	0.38	3.2
4"	4.500"	4.026"	0.66	5.51
6"	6.625"	6.065"	1.5	12.5

Time	Depth to Water (ft)	Vol. Purged (_____)	pH (s.u.)	DO (mg/L)	Specific Conductivity (µs/cm)	Turbidity (NTU)	Temp (°C)	ORP (mV)	Comments

Sampling Data

Sample No: _____ Location and Depth: _____

Date Collected (mo/dy/yr):_____ Time Collected: _____ Weather:_____

Type: ☐ Ground Water ☐ Surface Water Other: _____ Sample: ☐ Filtered ☐ Unfiltered Filter Type:_____

Sample Collected with: ☐ Bailer ☐ Pump Other: _____ Type: ☐ Peristaltic ☐ Bladder ☐ Submersible Other: _____

Water Quality Instrument Data Collected with: Type: ☐ YSI ProDSS ☐ Tudbidity Meter ☐ Other: _____

Sample Decon Procedure: Sample collected with: ☐ decontaminated <u>all</u> tubing; ☐ disposable tubing ☐ dedicated silicon and poly tubing; ☐ dedicated tubing replaced

Sample Description (Color, Turbidity, Odor, Other): _____

Sample Analyses

Analyte	Analysis Method	Sample Container	Quantity	Preservative	Notes

QC samples

Duplicate Sample No: _____ Duplicate Time: _____ MS/MSD: ☐ Yes ☐ No

Signature: _____ **Date:** _____

FLOYD | SNIDER
strategy ▪ science ▪ engineering

Two Union Square
601 Union Street, Suite 600
Seattle, WA 98101
tel: 206.292.2078 fax: 206.682.7867

F|S STANDARD GUIDELINE

Vapor Intrusion

DATE/LAST UPDATE: December 2022

These procedures should be considered standard guidelines and are intended to provide useful guidance when in the field but are not intended to be step-by-step procedures, as some steps may not be applicable to all projects.

All field staff should be sufficiently trained in the standard guidelines for the sampling method they intend to use and should review and understand these procedures prior to going into the field. It is the responsibility of the field staff to review the standard guidelines with the field manager or project manager and identify any deviations from these guidelines prior to field work. When possible, the project-specific Sampling and Analysis Plan should contain any expected deviations and should be referenced in conjunction with these standard guidelines.

1.0 Scope and Purpose

This standard guideline provides details necessary to complete vapor intrusion monitoring, which may include soil vapor point and sub-slab installation, soil vapor point monitoring and/or sampling, indoor air sampling, and remediation system compliance monitoring. Field screening for volatile organic compounds (VOCs) is most often conducted with a photoionization detector (PID) and confirmed via analytical sample collection. The most common sampling methods are included herein. These guidelines are designed to meet or exceed guidelines set forth by the Washington State Department of Ecology's (Ecology's), *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action* (Ecology 2022). In addition, refer to Ecology's *Updated Process for Initially Assessing the Potential for Petroleum Vapor Intrusion: Implementation Memorandum No. 14* (Ecology 2016), Ecology's *Petroleum Vapor Intrusion (PVI): Updated Screening Levels, Cleanup Levels, and Assessing PVI Threats to Future Buildings: Implementation Memorandum No. 18* (Ecology 2018b), and the U.S. Environmental Protection Agency's (USEPA's) *Technical Guide For Addressing Petroleum Vapor Intrusion At Leaking Underground Storage Tank Sites* and *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air* (USEPA 2015a and 2015b). Defining the lateral and vertical inclusion zones will determine if soil vapor sampling is required. The Interstate Technology and Regulatory Council (ITRC) online guidance for soil vapor intrusion (ITRC 2014) is another good source of information.

2.0 Equipment and Supplies

The following is a list of typical equipment and supplies that may be necessary to complete vapor intrusion monitoring. It is important to note that this list is for a typical project; site-specific conditions may warrant additional or different equipment for completion of the work.

Soil Vapor Sample Point Installation:

- Rotary hammer drill (aka rotohammer)
- Drill bit
- Shop vac
- Paper towels and trash bags
- For vapor point (AMS Gas Vapor Dedicated Points or similar) installation
  - Vapor points (1 per location)
  - Stainless steel dummy tip (optional; 1 per location)
  - Teflon™, nylon, or stainless steel tubing with 0.25-inch outer diameter (OD) and 0.15-inch inner diameter (ID)
  - Swagelok® or similar on/off valves (optional), or compression fitting (such as Swagelok® [SS-400-7-4] 0.25-inch OD female thread NPT connectors or similar) and cap (1 setup per location)
  - Sand pack
  - Bentonite chips
  - Protective cover for permanent point
  - Quick set (concrete) or hydraulic cement, or putty (VOC free)
  - Nylon ferrules
- For Vapor Pin® Kits (Cox-Colvin & Associates), which include the following:
  - Brass or stainless steel Vapor Pins®
  - Vapor Pin® sleeves
  - Vapor Pin® caps
  - Plastic or stainless steel flush mount covers
  - Spanner screwdriver
  - Stainless steel drilling guide
  - Installation and extraction tool
  - Bottle brush
  - Water dam materials for leak testing (modeling clay or Play-Doh)
  - Potable water

Soil Vapor Point or Remediation System Screening and/or Sampling:

- PID
- Teflon™, nylon, or stainless steel tubing with 0.25-inch OD and 0.15-inch ID
- Air sampling pump or peristaltic pump
- Tedlar® bag or SUMMA® canisters
- Two adjustable wrenches (to tighten SUMMA® canister connections)
- Soil gas sampling manifolds (often provided by the laboratory)
  - One manifold per sample location
  - Duplicate sampling tees (as necessary if duplicate sample collection is required)
- Appropriate ferrules/fittings to connect the sampling train to the sample point:
  - Silicone tubing (for Vapor Pin® sampling)
  - Compression fittings (for connecting to capped compression fittings on sample point tubing, such as Swagelok® [SS-400-1-4] 0.25-inch OD male thread NPT)
- Laboratory Grade Helium (or other detection gas, such as isopropyl alcohol, if leak detection is necessary)
- Helium detector (if leak detection is necessary with helium)
- Helium shroud for leak detection
  - Airtight, transparent plastic bag and length of thin chain to weigh down the bag edges; or
  - Airtight, transparent rigid chamber designed to create a seal with the ground or floor surface

Indoor Air Sampling:

- PID
- Flow regulator
- SUMMA® canisters (6 liter, laboratory certified)
- Sampling cane (optional)
- At least two adjustable wrenches

Paperwork:

- Field notebook with site maps and previous boring logs, if available
- Sampling forms and building survey form (enclosed)
- Vapor Pin® Standard Operating Procedures (SOP; if using Vapor Pin®)

- Rite-in-the-Rain pens, paper, and permanent markers
- Site-Specific Health and Safety Plan (HASP), Tailgate Safety Meeting Forms (for each day you expect to be on site), and F|S Accident Prevention Plan
- Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan, or other similar work plan
- List of emergency contacts for the site or facility
- Safety Data Sheets binder

Safety Equipment:

- Personal protective equipment:
  - Safety-toed boots
  - Safety vest
  - Hard hat
  - Nitrile gloves
  - Safety glasses
  - Hearing protection
  - Rain gear
  - Work gloves
  - Dust mask/filtering facepiece respirator (if using rotohammer)
- Traffic barricades or cones
- Vehicle emergency kit (road flares, fire extinguisher, etc.)
- First Aid Kit

3.0 Standard Procedures

Soil vapor samples and/or indoor air samples should be collected from a sufficient number of locations to assess the presence of VOCs and potential exposure to workers or occupants of potentially impacted buildings or future building locations.

3.1 TAILGATE SAFETY MEETING

Conduct a tailgate safety meeting prior to beginning work at the site. Emergency evacuation procedures, rally points, and on-site communication protocols should be discussed at the first tailgate meeting and repeated if new personnel join the field team onsite.

The safety meeting should cover the hazards specific to vapor intrusion. Typical hazards of this type of field work include the following:

- Drilling with a rotohammer or direct-push rig
  - Buried utilities
  - Loud noise
  - Silica dust
  - Lifting heavy equipment
- Working around drill rigs
  - Pinch points
  - Hot exhaust and fire hazards
  - Overhead equipment
- Soil gas sampling
  - Lifting heavy equipment and bending
  - Cuts or abrasions when using blades or tools
  - Electrical hazards when working with exposed battery contacts
- Site Hazards
  - Traffic
  - Slips, trips, and falls (uneven terrain, wet ground, equipment onsite, etc.)
  - Biological (insects, animals, plants)
- Chemical hazards (refer to HASP for site contaminants of concern)

Record the meeting attendees and topics discussed on the front page of the tailgate safety meeting form. All attendees should sign the form. The drilling crew may have an additional safety meeting template and meeting form to cover more specific hazards related to operation of, and working around, the drill rig.

3.2 OTHER HEALTH AND SAFETY GUIDELINES

The following are additional health and safety guidelines that should be followed in the field. These guidelines are intended to supplement the guidelines and requirements identified in the HASP and are not intended to replace the HASP.

- Review and sign the HASP prior to going into the field.
- Conduct a tailgate safety meeting prior to beginning work at the site as discussed in Section 3.1.
- When moving between sample points or switching to different tasks (e.g., transitioning from installation to sampling), assess any additional hazards that may be associated with the new location or task. Record additional hazards noted and corrective actions to address those hazards on the Daily Tailgate Safety Meeting and Debrief Form (included as an attachment to the HASP).

- Record near misses and incidents on the Near Miss and Incident Reporting Form (included as an attachment to the HASP) and conduct management/client notifications according to the protocols detailed in the HASP.

3.3 PRE-SCREENING ASSESSMENT

When completing a vapor intrusion survey or indoor air sampling, it is important to complete a pre-sampling survey to document potential activities or storage items that may cause interference with sample results. Some important things to note (list is not comprehensive):

- If smoking has occurred in the building
- Storage of potential contaminants (cleaners, fuels, paints, paint thinners, etc.)
- Heating, ventilation, and air conditioning system operation (on or off)
- Temperature and weather (wind direction, barometric pressure, etc.)
- Vehicle maintenance or industrial activities on the property or in the immediate vicinity (especially upwind)
- If new carpet or furniture is present

A pre-sampling soil vapor building survey form can be found at the end of this document. Be mindful of your surroundings and make a comprehensive list of potential factors that may influence sample results.

3.4 SOIL VAPOR SAMPLE POINT INSTALLATION

Soil vapor sampling points can be installed along the outside perimeter of a building or in the lowest level of a building directly through the slab (or beneath the floor into the subsurface if there is not a slab). It is important to perform a utility locate and visual survey to evaluate the presence of utilities prior to drilling into the subsurface or through a concrete slab.

If the sampling point is for one-time use, tubing inserted into a hole drilled in the subsurface is sufficient. However, if the sampling is to be part of a long-term monitoring program, use of a dedicated vapor sampling implant or sample point (such as those manufactured by Geoprobe, AMS, or Cox-Colvin, as described below) to establish a permanent soil gas point is recommended. Five different methods for installing soil vapor installation points are described here. Note that these are general procedures and site-specific conditions may warrant additional or different equipment for completion of the work. A typical soil gas sampling probe schematic is presented below.

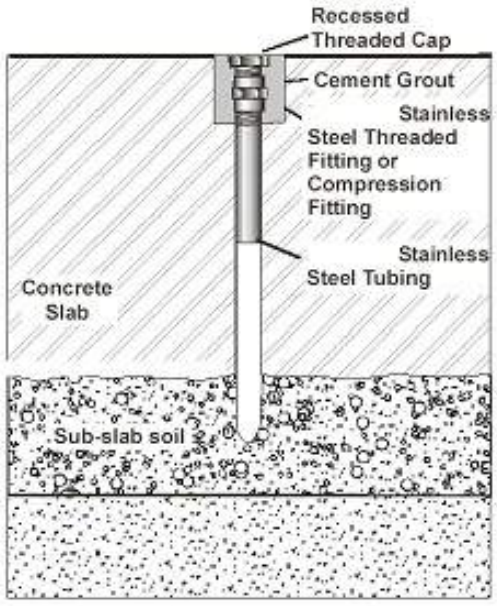


Figure 1: Sub-slab soil gas probe schematic (Source: Ecology 2016)

Occasionally, the work plan requires an equipment blank to be collected. The purpose of the equipment blank is to collect information on the cleanliness of dedicated sampling equipment, before it is used to construct a sample point (refer to Section 3.5.2.4).

3.4.1 Shallow Outdoor Soil Gas Sample Point Installation

Shallow outdoor soil gas points may be installed where a continuous concrete slab is present in the desired sampling location. Shallow soil gas points are installed using a rotohammer according to the following procedures.

1. Check for buried obstacles and utilities. Set up wet/dry vacuum to collect drill cuttings. Also, look for nearby cracks or other holes in the slab that may cause short circuiting and influence from indoor air.
2. Drill a 2-inch diameter hole into the subsurface to a depth of approximately 1 foot below the bottom of the slab. Note the type of sub-slab material (if able to be observed).
3. Prepare the vapor sampling point. The sampling point is composed of a 6-inch long by 0.75-inch diameter stainless steel screen that is capped on the bottom end (such as those manufactured by Geoprobe or AMS) and attached to a length of 0.25-inch OD/0.15-inch ID vacuum rated nylon, Teflon™, or stainless-steel tubing using an appropriate diameter Swagelok® or other compression fitting. Refer to the manufacturer's or driller's instructions for specific details regarding assembly and deployment. Use Teflon™ tape on threaded joints to ensure a good seal.
4. Deploy the probe screen down the borehole. Center the screen in the void space below the slab.

5. Place clean sand pack down in hole to surround the implant up to the slab, resulting in 3 inches of sand above and below the screen. Seal with VOC-free hydraulic cement to the top of the slab. Placement of a cap or other protective monument is recommended if the sampling point will remain in place for multiple rounds of soil gas sampling. To install a flush-mounted protective cap, place cement to a depth just above the base of the cap, set the cap, then place additional cement surrounding the cap up to the ground surface. Allow concrete to cure for 15 to 30 minutes. Note the depth of the sample point below ground surface and construction of the sample point seal materials.
6. Cut the tubing above the surface seal. Fit the above-grade end of the tubing with a stainless steel Swagelok® on/off control valve or similar valve, which is used to prevent short-circuiting of ambient air into the probes and to conduct closed-valve tests. Alternately, fit the end of the tubing with a protective compression fitting and cap.

3.4.2 Deep Outdoor Soil Gas Sample Point Installation

Deep soil gas points are installed where the surrounding ground surface is permeable, and a localized seal is needed above the soil gas sampling point to prevent short circuiting of the sample by ambient air. Deep soil gas points are installed with a direct push rig or hand auger according to the following procedure:

1. Check for buried obstacles and utilities.
2. Advance a 2-inch diameter boring approximately 3 inches beyond the sample depth interval specified in the SAP. Note observed soil types.
3. Prepare the vapor sampling point. The sampling point is composed of a 6-inch long by 0.75-inch diameter stainless steel screen that is capped on the bottom end (such as those manufactured by Geoprobe or AMS) and attached to a length of 0.25-inch OD/0.15-inch ID vacuum rated nylon, Teflon™, or stainless steel tubing using an appropriate diameter Swagelok® or other compression fitting. Refer to the manufacturer or driller's instructions for specific details regarding assembly and deployment. Use Teflon™ tape on threaded joints to ensure a good seal.
4. Deploy the probe screen down the borehole. Vertically center the probe screen at the sample depth interval specified in the SAP.
5. Place at least 1 foot of clean pack to surround the implant, resulting in 3 inches of sand above and below the screen. Cover the sand pack with a 1-foot interval of dry granular bentonite, followed by at least 2 feet of pre-hydrated granular bentonite. The dry granular bentonite is emplaced immediately above the sand pack to ensure that pre-hydrated granular bentonite slurry does not flow down to the probe screen and seal it. Fill the remainder of the borehole with pre-hydrated granular bentonite slurry (mixed at the surface and poured in) to approximately 1 foot below ground surface (bgs). Seal with VOC-free hydraulic cement up to a depth a few inches above the base of flush-mounted well box or other suitable protective cover, set the monument, and add cement surrounding the monument to reach the ground surface. Allow cement to cure

for 15 to 30 minutes. Note the depth of the sample point below ground surface and construction of the sample point seal materials.

6. Cut the tubing above the surface seal. Fit the above grade end of the tubing with a stainless steel Swagelok® on/off control valve or similar valve, which is used to prevent short-circuiting of ambient air into the probes and to conduct closed-valve tests. Alternately, fit the end of the tubing with a protective compression fitting and cap.

3.4.3 Temporary Indoor Sub-Slab Sample Point Installation

Temporary indoor sub-slab points are installed when vapor sampling is a one-time or short-term event. Temporary sub-slab sample points are installed using a rotohammer according to the following procedures:

1. Check for buried obstacles and utilities. Set up wet/dry vacuum to collect drill cuttings. Also, look for nearby cracks or other holes in the slab that may cause short circuiting and influence from indoor air.
2. Drill a hole at least 0.375 inches in diameter into the subsurface to a depth of approximately 3 inches below the bottom of the slab. Note the type of sub-slab material (if able to be observed).
3. Extend a length of 0.25-inch OD/0.15-inch ID vacuum rated nylon, Teflon™, or stainless steel tubing into the hole, ensuring that the probe tubing does not reach the bottom of the hole order to avoid obstructing the tubing with sub-slab material. Note the depth of the end of the tubing below the surface of the slab.
4. Seal around the tubing with VOC-free hydraulic cement, hydrated bentonite, or with VOC-free putty. Allow cement to cure for 15 to 30 minutes.
5. Fit the end of the tubing with a protective compression cap or temporary protective cap.

3.4.4. Permanent Sub-Slab Vapor Point Installation

A permanent vapor sub-slab point is installed when multiple rounds of sample collection are anticipated. Permanent sub-slab vapor points are installed using a rotohammer according to the following procedures:

1. Check for buried obstacles and utilities. Set up wet/dry vacuum to collect drill cuttings. Also, look for nearby cracks or other holes in the slab that may cause short circuiting and influence from indoor air.
2. Drill a shallow hole approximately to partially penetrate the slab (do not completely penetrate the slab). The shallow hole should be of appropriate depth and diameter to accommodate a tamper-resistant cap or other small protective monument. Use a portable vacuum to remove the drill cuttings. Next, drill a smaller diameter inner hole approximately 0.3125 inch in diameter through the remainder of the slab and into the

sub-slab material to a depth about 3 inches below the bottom of the slab. Note the type of sub-slab material (if able to be observed).

3. Extend a length of 0.25-inch OD/0.15-inch ID vacuum rated nylon, Teflon™, or stainless steel tubing into the hole, ensuring that the probe tubing does not reach the bottom of the hole order to avoid obstructing the tubing with sub-slab material.
4. Seal with VOC-free hydraulic cement around the tubing to a depth just above the base of the cap, set the cap, then place additional cement surrounding the cap up to the ground surface. Allow concrete to cure for 15 to 30 minutes. Note the depth of the end of the tubing below the surface of the slab and construction of sample point sealing materials.
5. Cut the tubing above the surface seal. Fit the above grade end of the tubing with a stainless steel Swagelok® on/off control valve or similar valve, which is used to prevent short-circuiting of ambient air into the probes and to conduct closed-valve tests. Alternately, fit the end of the tubing with a protective compression fitting and cap.

3.4.5 Vapor Pin® Temporary or Permanent Sub-Slab Sample Point Installation

Figure 2: Assembled Vapor Pin®

A Vapor Pin® may be used as a temporary vapor sampling point or a longer-term point suitable for multiple rounds of sample collection. Vapor Pins® are installed using a rotohammer and specialized tools provided by the manufacturer according to the following procedures:

1. Check for buried obstacles and utilities. Set up wet/dry vacuum to collect drill cuttings. Also, look for nearby cracks or other holes in the slab that may cause short circuiting and influence from indoor air.
2. Drill a 1.5-inch diameter hole at least 1.75 inches into the slab, then drill a 0.625-inch hole through the slab and approximately 1 inch into the underlying soil to form a void. The hole must be 0.625 inches in diameter to ensure proper seal. The Cox-Colvin SOP recommends using the drill guide provided in the kit. Remove the drill bit, brush the hole with the bottle brush provided in the kit, and remove the loose cuttings with the vacuum. Note the type of sub-slab material (if able to be observed).
3. Place the lower end of Vapor Pin® assembly into the drilled hole. Place the small hole located in the handle of the installation/extraction tool provided in the kit over the

Vapor Pin® to protect the barb fitting and tap the Vapor Pin® into place using a dead blow hammer or rubber mallet. Make sure the installation/extraction tool is aligned parallel to the Vapor Pin® to avoid damaging the barb fitting. Place the provided silicone cap over the barbed open end of the sampler.

4. For flush mount installations, cover the Vapor Pin® with a flush mount cover, using either the plastic cover or the optional stainless-steel Secure Cover provided by Vapor Pin®.

3.5 SOIL VAPOR POINT SAMPLING

The objective of the vapor sampling procedures is to collect representative samples of the targeted media and analyze the gas for the presence of VOCs. Once the sub-slab or soil vapor probes are installed and the concrete well seal at each vapor point has fully cured, vapor sampling activities may commence after allowing 48 hours for sub-slab conditions to equilibrate unless otherwise specified in your work plan. If feasible, vapor sampling should not be conducted during or immediately after a significant rain event (i.e., greater than an inch of rainfall) due to the reduced effective diffusion coefficient and decrease in relative vapor saturation in the unsaturated zone.

If indoor air samples will be collected, they may be collected simultaneously during the sub-slab sampling activities (details found in Section 3.7) if required by the work plan. Depending on the work plan, it might also be necessary to collect an air equipment blank sample through the vapor probe components prior to installation.

3.5.1 Sampling Using Tedlar® Bags

Typically, a low volume air pump or peristaltic pump is used to pull a sample through the sampling train when collecting vapor samples using a Tedlar bag. The procedures are as follows:

1. Remove the cap from the sample point. Connect a length or 0.25-inch OD/0.15-inch ID vacuum rated nylon, Teflon™ or stainless steel tubing to your sampling point from your low volume air pump to the sample point using the appropriate compression fitting (or silicone tubing for vapor points).
2. Purge for 3 to 5 minutes at the intended sample collection rate to ensure that you are collecting a representative sample. Record the purge time and rate on the enclosed soil vapor sample collection sheet.
3. After purging, connect your Tedlar® bag to your air pump and collect your sample (note: Tedlar® bags should be filled at a rate of approximately 5 liters per minute). Note that it is easier to fill out the label on the Tedlar® bag prior to sample collection.
4. Screen for VOCs in the sample collected in a Tedlar® bag using a PID, as follows:
    a. Connect the PID probe to the sample container using a section of tubing.
    b. Use the PID to read the organic vapor level present in the sample and record on the soil vapor sample collection sheet.

Soil Vapor samples are typically collected into 1-liter Tedlar® bags and have a short (typically less than 72 hours) holding time. Samples collected into Tedlar® bags should be transported to the laboratory immediately under chain-of-custody protocol and stored in a dark container at ambient temperature during transport out of direct ultraviolet-light. Do not ship Tedlar® bags to the laboratory using an air transportation method as the pressure could compromise the sample or the bag. If air transport is necessary, do not completely fill the Tedlar® to avoid bursting.

3.5.2 Sampling using SUMMA® Canisters

For sub-slab or soil vapor probe sampling, 1-liter laboratory certified and pre-evacuated SUMMA® canisters should be used in order to minimize the volume of soil vapor collected.

Prior to soil vapor sampling, check all soil vapor sampling supplies to ensure the right sampling equipment arrived from the laboratory including duplicate tees, if duplicate sample collection is necessary, and purging canisters. Conduct the following:

- Confirm that all SUMMA® canisters have at least 27 to 30 inches of mercury (in. Hg) prior to going out in the field to sample.
- Confirm that each SUMMA® canister is supplied with an analytical test report certifying that the canister is “clean” to concentrations less than the respective method detection limits.
- Check and record all manifold and SUMMA® canister tags and numbers.
- Make sure all connections on the SUMMA® canisters and manifolds are tight.

A closed-valve test should be conducted prior to soil vapor sample collection to check for leaks in the sampling train. A closed-valve test is conducted by capping the ends with proper Swagelok® or other compression caps and/or closing any valves at the sampling point and purge canister. Once all ends are closed tight, turn the sampling canister valve on for 5 minutes. If the sampling train maintains its original vacuum for 5 minutes, the equipment will be assumed to be functional and without leaks. If the vacuum reading starts to drop, turn off the valves right away, check all connections, tighten if necessary, and re-test. If this passes, the only location that a leak can occur is from the soil ground seal around the vapor probe, which will be tested using helium or another tracer gas during sampling.

After the close-valve test is complete, remove the protective cap from your sample point. Connect a length or 0.25-inch OD/0.15-inch ID vacuum rated nylon, Teflon™, or stainless steel tubing to your sampling point from your purging device using the appropriate compression fitting (or silicone tubing for vapor points). Purging can be completed using a non-certified 6-liter SUMMA® canister or a low volume air pump. Purge a minimum of three tubing volumes at a flow rate that will not exceed the flow rate limit used for subsequent sampling. A table to calculate tubing volume and purging time is enclosed in this standard guideline. Record the purge time and rate on the enclosed soil vapor collection sheet.

Prior to collecting the samples, record the SUMMA® canister ID numbers and flow control regulator ID numbers in the field notebook along with the initial canister vacuums. Each canister will be equipped by the laboratory with a pre-calibrated flow controller sampling train to allow collection of the sample at a flow rate of less than 167 milliliters per minute (mL/min).

Collect soil vapor samples per the following steps:

1. Disconnect the purging device and connect the sampling train to the sampling point using appropriate connectors.
2. Open the valve on the top of the SUMMA® canister and record the time and initial vacuum reading in the logbook. Open any additional check valve connections in the sampling train.
3. Observe the vacuum gauge on the sampling train to ensure that the vacuum in the canister is decreasing over time.
4. Shut off the valve once the vacuum gauge reads between 4.0 and 5.0 in. Hg. Sample collection will typically take 5 to 10 minutes depending on the grain size of the soil formation. Record the final vacuum reading.

3.5.2.1 Leak Testing

In addition to soil gas sampling activities, leak testing may be required at sampling locations and should be conducted using the following soil gas sampling set-up procedures:

When helium is being used as a tracer gas:

- Place a large plastic bag (or other acceptable shroud) around the SUMMA® canister, sampling apparatus, and vapor probe. Weigh down the bag using a thin chain or other weights to retain the tracer gas.
- Cut a small hole in the bag to allow tubing to be inserted to introduce tracer gas such as helium, and to subsequently fill the plastic bag.
- Keep the tracer gas (i.e., helium) concentration in the bag at 10% by volume or higher. Record helium volumes inside the shroud periodically during sampling.

When isopropyl alcohol is being used as a tracer gas:

- Soak towels in isopropyl alcohol.
- Place soaked towels over the sampling probe at the connection to the manifold and at the ground surface.

Detections of the tracer gas in the soil gas samples would indicate that the canister, valves, or ground surface seal to the sample probe have potentially leaked ambient air into the sample. Small amounts of sample train leakage is permissible; however, the leak percentage should not exceed 10% of the soil gas results. If the leak percentage exceeds 10%, the sampling point may

have to be resampled. The integrity of the soil vapor samples can be assessed by estimating the percent leakage as shown here in micrograms per square meter (µg/m^3):

$$\% \text{ leakage} = 100 \times \frac{\text{helium concentration in soil vapor sample } [\mu g/m^3]}{\text{average helium concentration measured inside the shroud } [\mu g/m^3]}$$

The above equation for helium can be used because the known average helium concentration can be determined via field screening with a helium detector. Tracer gas leaks should not occur if the sampling train passes a properly performed closed-valve test and given the low flow rate of 167 mL/min.

When a water dam is used for conducting a leak test for a Vapor Pin®:

- Clean the slab within a 2-inch radius of the Vapor Pin® sampling device to remove dust. Avoid wetting the concrete or wait until the concrete is dry before proceeding and avoid cleaning with substances containing VOC.
- Roll a 1-inch diameter ball of Play-Doh or modeling clay between your palms to form a "snake" approximately 7 inches long and press it against the end of the water dam. Push the water dam gently against the slab to form a seal with the concrete.
- Attach the sample tubing to the top of the Vapor Pin® sampling device and pour enough distilled water into the water dam to immerse base of the Vapor Pin®.
- Purge the sample point per the table provided in this guideline. Concrete will absorb some of the water, which is normal; however, if water is lost to the sub-slab, stop, remove the water from the water dam, and reposition the Vapor Pin® sampling device to stop the leakage. Reseat the leak test equipment, if needed.

Figure 3 Example Water Dam Construction

3.5.2.2 Final Readings

Once the sampling is completed and the final vacuum is recorded, remove the sampling train from the canister and fit a Swagelok® or appropriate compression cap tightly fitted to the inlet port of the canister (the cap is usually provided by the laboratory). Use a PID probe inserted into the open end of the sample point to collect a VOC reading and record on the sampling sheet.

Transfer the required information—such as initial canister vacuums, vacuum testing times, sampling starts and times, final vacuum readings—from the sampling sheet to the chain-of-custody form.

3.5.2.3 Field duplicates

Field duplicates are collected by placing a 3-way T in the sampling train to fill two SUMMA® canisters simultaneously, after purging the sample point as described above. Manifolds equipped with 3-way tees may be requested from the laboratory in most instances. When collecting a field duplicate, monitor the vacuum in both canisters and close each shutoff valve when the appropriate final vacuum is reached.

3.5.2.4 Equipment Blank

An equipment blank is collected by drawing a sample of clean air or nitrogen through the probe materials before installation in the ground. To collect an equipment blank, connect the canister containing the air supply to the assembled vapor point using vacuum rated nylon, Teflon™, or stainless steel tubing and appropriate connectors. The procedures for equipment blank sampling are the same as vapor sample collection.

3.6 USE OF MONITORING WELLS FOR SOIL GAS SAMPLING

While dedicated soil gas probes are typically used to collect soil gas samples, existing monitoring wells that are appropriately located and screened can also be used for this purpose, with limitations. This is an advantage when evaluating the risk of vapor intrusion solely from contaminated aquifers (as compared to contaminated vadose zone soil) because the soil gas that will be sampled can reflect a soil gas sample that lies close to the zone of saturation and represents a worse-case condition for equilibrium partitioning of contamination in groundwater to the gas phase. Also, monitoring wells are typically constructed at a depth greater than soil vapor probes and are less influenced by changes in barometric pressure. They are also inherently constructed to be sealed against breakthrough from atmospheric air (while purging and sampling). For an existing well to be used for soil gas sampling, it must have at least 2 to 3 feet of unsaturated screen above the water table during sample collection.

The main disadvantage of using existing monitoring wells is that the required purge volume would be much greater because of the significantly larger diameter of the well screen as compared to probes. This requires the use of a larger air pump or small blower instead of the low volume air pump. While purging, care must be taken to minimize the vacuum in the well casing, which may be large enough to raise the water column high enough to cover the exposed well screen and invalidate the use of the well for sampling soil gas. Appropriate temporary fittings additionally need to be installed to allow the reduction of the well casing sufficient to allow connection to the collection tubing.

3.7 INDOOR AIR AND OUTDOOR AMBIENT AIR SAMPLE COLLECTION

Indoor air sampling should be conducted in an environment that is representative of normal building use. Indoor air and outdoor ambient air samples are typically collected into 6-liter SUMMA® canisters and can either be grab (not often recommended) or time-weighted samples. For time weighted samples, the laboratory will provide preprogrammed flow controllers for the samples for your desired sample duration. An 8-hour flow controller is the most common to assess typical working conditions or to provide a time-weighted average to assess residential risk (a 24-hour flow controller may also be used for residential assessments). SUMMA® canisters should be placed in an area that is close to the breathing zone (i.e., 3 to 5 feet above the floor level), or a sampling cane can be connected to the SUMMA® canister to sample indoor air at breathing-zone height. Before placing the SUMMA® canisters, other site-specific factors may require evaluation in accordance with the SAP, such as proximity to subsurface source area(s) or penetrations through the slab or foundation.

Ambient air samples should be collected from a location protected from the elements (wind, rain, snow, or ice) and vehicle traffic on the upwind side of the building (5 to 15 feet away) during the same sampling event when the indoor air samples are collected in order to provide information about the outside influences on indoor air quality (i.e., vapors from automotive fuels and exhaust). USEPA recommends that ambient air sampling begin at least 1 hour prior to indoor air sampling and should continue at least 30 minutes before indoor monitoring is complete (USEPA 2015b).

To collect the sample, refer to specific guidelines provided by the laboratory for operating the Summa® canister, as equipment can be slightly different from laboratory to laboratory. Generally, the steps include the following:

1. Note the initial vacuum reading on the gauge. For reference, initial vacuum should be between 27 and 30 in. Hg.
2. Connect the flow controller, open the canister, and record the sample collection start time
3. After the specified sample collection time has elapsed, shut the SUMMA® canister valve and disconnect the flow controller. Record the sample collection end time post-sample vacuum (this should be between 4 and 5 in. Hg).

Transfer information from the sample form—such as initial and final vacuum, sample start and end times, and controller and the canister ID (unique laboratory tracking ID)—to the chain-of-custody form and package securely for delivery to the laboratory following chain-of-custody protocol.

3.8 REMEDIATION SYSTEM VAPOR SAMPLE COLLECTION

Remediation systems that have a soil vapor extraction (SVE) component often require compliance monitoring to evaluate mass removal and effluent discharge limits. Both screening (with a PID) and sampling are routinely conducted during active operation. Tedlar® bags are often

used to simplify SVE system screening but SUMMA® canisters may also be used. Procedures for using Tedlar® bags are presented in this guideline.

If the sample port is under vacuum (i.e., SVE manifold or wellhead), it is often necessary to reduce the flow somewhat and to use a hand or mechanical pump to extract the vapor from the line. If the sample port is under a high vacuum, it may be necessary to step down the flow (i.e., close the flow valve) in order to collect a sample.

If the sample port is under pressure (i.e., SVE system discharge), the sample can be collected without the use of a pump. Simply attach a clean piece of tubing securely to the sample port, connect the Tedlar® bag to the tubing, open the Tedlar® bag, slowly open the sample port valve, and be careful not to overfill the bag. Remove the Tedlar® bag when full, close the Tedlar® bag (do not over-tighten), and close the sample port valve.

Use a PID to measure the VOCs in the sample, as described in Section 3.5.1, and record the maximum observed concentration. Follow steps in Section 3.5.1 for sample collection and delivery.

4.0 Field Documentation

Soil vapor probe and monitoring point installation field activities should be documented in field notebooks and completion diagrams, or boring logs should be completed to document construction. Information recorded will include personnel present, total depth, type and length of implant or screen, screen and filter pack intervals, bentonite seal intervals and surface completion details. Photographs of construction activities should be taken. After probe and monitoring point installation is complete, location coordinates should be recorded with a global positioning system (GPS). If GPS cannot be used (i.e., for location within a building), it is important to document the location by recording representative measurements to fixed points.

All sampling activities must be documented in a field notebook and/or on field forms appropriate for the sampling activity. Information recorded will include at a minimum personnel present, date, and time of sample collection, length of sample purge time, and any deviations from the project's work plan or sampling and analysis plan.

Weather conditions should also be recorded and should include temperature, barometric pressure, wind direction and speed, humidity, and degree of cloud cover. Additional site-specific details such as surface soil conditions, presence of standing water, wet soil, irrigation activities, and if possible, groundwater elevations, should also be noted.

5.0 Demobilization

Upon returning to the office, ensure that all equipment is property cleaned and put away in the field room. Equipment with rechargeable batteries should be plugged in as appropriate. It is preferable to dispose of trash onsite, but any trash left in the field vehicle should be disposed as regular trash at Two Union Square.

If rented equipment or samples will be placed at the front desk for pickup, clearly label each item with the company picking it up, anticipated pickup time frame, and your contact information so front desk staff can contact you if there are any questions. Notify front desk staff if any items require a signature at pickup.

Within one week of returning from the field, the field lead for the event should review field notes, sampling forms, and tailgate safety meeting forms with the project manager (PM). Following PM review and approval, field notes will be scanned and saved to the project folder. Hard copies should be filed. The PM will provide copies of near miss and incident reports to the Safety Program Manager.

6.0 References

Interstate Technology Regulatory Council (ITRC). 2014. Petroleum Vapor Intrusion: Fundamentals of Screening, Investigation, and Management. <http://www.itrcweb.org/PetroleumVI-Guidance/>. October.

Washington State Department of Ecology (Ecology). 2015. Vapor Intrusion Table Update. (Replaces Table B-1 of Ecology's Guidance for Evaluating Soil Vapor Intrusion in Washington State). <https://ecology.wa.gov/Asset-Collections/Doc-Assets/Regulations-Permits/Guidance-technicalassistance/Vapor-Intrusion/2015VaporIntrusionUpdates>. 6 April.

_____. 2022. *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*. Review Draft. Prepared by the Toxics Cleanup Program. Publication No. 09-09-047. Originally published October 2009; revised February 2016, April 2018, and November 2021.

U.S. Environmental Protection Agency (USEPA). 2015a. *Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites*. Prepared by the Office of Underground Storage Tanks. EPA 510-R-15-001. June.

_____. 2015b. *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*. Prepared by the Office of Solid Waste and Emergency Response. OSWER Publication 9200.2-154. June.

Enclosures: Indoor Air Building Survey Form
Purge Volume Calculations during Soil Vapor Sampling
Soil Vapor Sampling Sheet

Record of Revisions:

Revisions	Date
Streamlined VI SOG developed, superseding previous version.	12/9/2022

INDOOR AIR BUILDING SURVEY FORM

Date:

Site Name:

Title:

Building Use:

Occupants: _____

Building Address: _____

Property Owner: _____

Contact's Phone: _____

Number of Occupants: _____

Business or Residential: _____

Building Characteristics

Building Type: ☐ Residential ☐ Multifamily ☐ Office

☐ Commercial ☐ Industrial ☐ Mall

Describe Building:_____

_____

Number of Floors Below Grade: _____ ☐ Basement ☐ Slab-On-Grade ☐ Crawl Space

Bldg Dimensions: Width:_____ Length: _____ Height: _____

Basement Floor: Dirt / Concrete / Painted? Foundation Walls: Concrete / Cinder Blocks / Stone

VENTILATION SYSTEM

☐ Central Air Conditioning ☐ Mechanical Fans ☐ Bathroom Vans

☐ Conditioning Units ☐ Kitchen Range Hood ☐ Outside Air Intake

Other:_____

HEATING SYSTEM

☐ Hot Air Circulation ☐ Hot Air Radiation ☐ Wood

☐ Steam Radiation ☐ Heat Pump ☐ Hot Water Radiation

☐ Kerosene Heater ☐ Electric Baseboard Other:_____

Outside Contaminant Sources

Nearby surrounding property sources: Gas Stations / Emission Stacks

Soil Contamination: Petroleum Hydrocarbons / Solvents

Heavy Vehicle Traffic: Yes / No

Indoor Contaminant Sources

Identify all potential sources found in the building (including attached garages), the location of the source (floor and room), and whether the item was removed from the building 48 hours prior to indoor sampling event. Any ventilation implemented after removal of the items should be completed at least 24 hours prior to the commencement of the indoor air sampling event.

Potential Sources	Location(s)	Removed (Yes / No / NA)
Gasoline storage cans		
Gas powered equipment		
Kerosene storage cans		
Paints / Thinners / Strippers		
Cleaning solvents / Dry cleaners		
Oven cleaners		
Carpet / upholstery cleaners		

Other house cleaning products		
Moth Balls		
Potential Sources	**Location(s)**	**Removed (Yes / No / NA)**
Polishes / waxes		
Insecticides		
Furniture / floor polish		
Nail polish / polish remover		
Hairspray		
Cologne / perfume		
Air fresheners		
Fuel tank (inside building)		
Wood stove or fireplace		
New furniture		
New carpeting / New flooring		
Hobbies – glues, paints		
Other: _____		
Other: _____		
Other: _____		

SAMPLING INFORMATION

Sampler(s) _____

☐ Indoor Air / Outdoor Air ☐ Sub-slab ☐ Soil Vapor Point ☐ Exterior Soil Gas

☐ Tedlar® Bag ☐ Sorbent ☐ SUMMA® ☐ Other _____

Analytical Method: TO-15 / TO-17 / Other: _____

WEATHER CONDITIONS

Was there a significant rain event in the last 24 hours? Yes / No

Temperature: _____ Atmospheric Pressure: _____ Pressure: Rising or Falling?

Describe the general weather conditions: _____

Wind Speed and Direction: _____

PURGE VOLUME CALCULATIONS DURING SOIL VAPOR SAMPLING

Sample Tubing Purge												
Tubing Length (feet)	**Pi**	**Casing Radius (inches)**	**Area of Casing Radius ($Pi(R^2)$) (inches)**	**Length of casing (feet)**	**Conversion of feet to inches**	**Number of Casing Volumes to Purge**	**Conversion of Cubic Inches to mL**	**Purge Volume (mL)**	**Purge Volume (L)**	**Purge Rate (mL/min)**	**Purge Time (min)**	
5	3.141593	0.125	0.049087	5	60	1	16.387064	48.263888	0.048264	167	0.29	
5	3.141593	0.125	0.049087	5	60	3	16.387064	144.79166	0.144792	167	0.87	
5	3.141593	0.125	0.049087	5	60	7	16.387064	337.84721	0.337847	167	2.02	

Annular Space Purge											
Annular Space Length (inches)	**Pi**	**Boring Radius (inches)**	**Area of Boring Radius ($radius^2$)**	**Volume of Annular Space (inches)**	**Assumed Porosity of Sand Pack**	**Air Filled Volume of Annular Space (cubic inches)**	**Number of Casing Volumes to Purge**	**Conversion of Cubic Inches to mL**	**Purge Volume (mL)**	**Purge Volume (L)**	**Purge Rate (mL/min)**	**Purge Time (min)**
12	3.141593	2	12.56637	150.7964	0.3	45.23893	1	16.387064	741.3333	0.741333	167	4.44
12	3.141593	2	12.56637	150.7964	0.3	45.23893	3	16.387064	2224	2.224	167	13.32
12	3.141593	2	12.56637	150.7964	0.3	45.23893	7	16.387064	5189.333	5.189333	167	31.07

Summary of Purge Durations	
One Purge Volume	4.73
Three Purge Volumes	14.18
Seven Volumes	33.10

SOIL VAPOR SAMPLING SHEET

Site Reference:
_____ Date: _____

Address:
_____ Personnel: _____

	Vacuum Test		Purging				Helium		Sampling				PID		
Soil Vapor Sampling Point ID	Time Start Vacuum Testing	Time Stop Vacuum Testing	Time Start Purging	Time Stop Purging	Purging Rate (mL/min)	Total Volume Purged (mL)	Time of Helium Reading	Helium Reading (%)	Time Start Sampling	Time Stop Sampling	Canister Vacuum Before Sampling (in. Hg)	Canister Vacuum After Sampling (in. Hg)	Time of PID Reading	PID Reading	Notes
					167										
					167										

Notes:

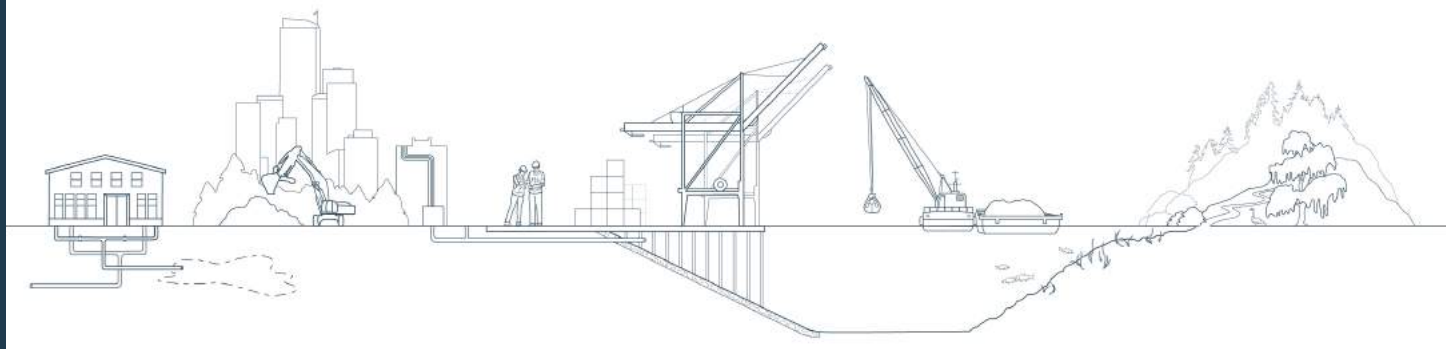
Attachment 3
Health and Safety Plan

Health and Safety Plan

Panda Dry Cleaners

Prepared for
Lakeshore Corporation

April 2024



FLOYD | SNIDER
strategy ▪ science ▪ engineering

Certified B Corporation

LIMITATIONS

This report has been prepared for the exclusive use of Lakeshore Corporation, their authorized agents, and regulatory agencies. It has been prepared following the described methods and information available at the time of the work. No other party should use this report for any purpose other than that originally intended, unless Floyd|Snider agrees in advance to such reliance in writing. The information contained herein should not be utilized for any purpose or project except the one originally intended. Under no circumstances shall this document be altered, updated, or revised without written authorization of Floyd|Snider.

Table of Contents

List of Figures

List of Appendices

List of Abbreviations

Abbreviation	Definition
APP	Accident Prevention Plan
cis-1,2-DCE	*cis*-1,2-dichloroethene
COC	Contaminant of concern
ESA	Environmental Site Assessment
HASP	Health and Safety Plan
HSO/SS	Health and Safety Officer/Site Supervisor
OSHA	Occupational Safety and Health Act
PCE	Tetrachloroethene
PID	Photoionization detector
PM	Project Manager
PPE	Personal protective equipment
Site	Panda Dry Cleaners
SSO	Site Safety Officer
TCE	Trichloroethene
VC	Vinyl chloride
VOC	Volatile organic compound

1.0 Plan Objectives and Applicability

This Health and Safety Plan (HASP) has been written to comply with the standards prescribed by the Occupational Safety and Health Act (OSHA) and the Washington Industrial Safety and Health Act.

The purpose of this HASP is to establish site-specific protection standards and mandatory safe practices and procedures for all personnel involved with post-cleanup site characterization and monitoring at the former Panda Dry Cleaners (Site), in Snohomish, Washington. It has been prepared as a supplement to Floyd|Snider's Accident Prevention Plan (APP; Appendix A).

This HASP establishes standard operating procedures and provides for contingencies that may be implemented during field work activities. This HASP consists of Site and facility descriptions, a summary of work activities, an identification and evaluation of chemical and physical hazards, monitoring procedures, a description of Site zones, decontamination and disposal practices, and emergency procedures.

The provisions and procedures outlined in this HASP apply to all Floyd|Snider personnel on-site. Contractors, subcontractors, other oversight personnel, and all other persons involved in the field work activities described herein are required to develop and comply with their own HASP or Job Safety Analysis but must also comply with the requirements of this HASP on job sites managed by Floyd|Snider. All Floyd|Snider staff conducting field activities are required to read this HASP and indicate that they understand its contents by signing the Health and Safety Officer/Site Supervisor's (HSO/SS's) copy of this plan prior to conducting field work activities. A copy of this plan must be maintained on-site at all times by the HSO/SS.

This HASP is based on information that was available as of the date indicated on the title page. Additional hazards not specifically addressed by this HASP may exist at the work site or may be created as a result of site activities. Should project personnel identify a site condition that is not addressed by this HASP and have any questions or concerns about site conditions, they should immediately notify the HSO/SS, and work shall be paused to assess any new hazards. If any new hazards identified can be mitigated or controlled, work can proceed and the HASP will be revised, if appropriate.

The HSO/SS has field responsibility for ensuring that the HASP adequately protects worker health and safety and is properly implemented. In this capacity, the HSO/SS will conduct regular site inspections and has the authority to make health and safety decisions that may not be specifically outlined in this HASP based on site conditions. If the HSO/SS leaves the Site while work is in progress, an alternate Site Safety Officer (SSO) will be designated. Personnel responsibilities are further described in the APP.

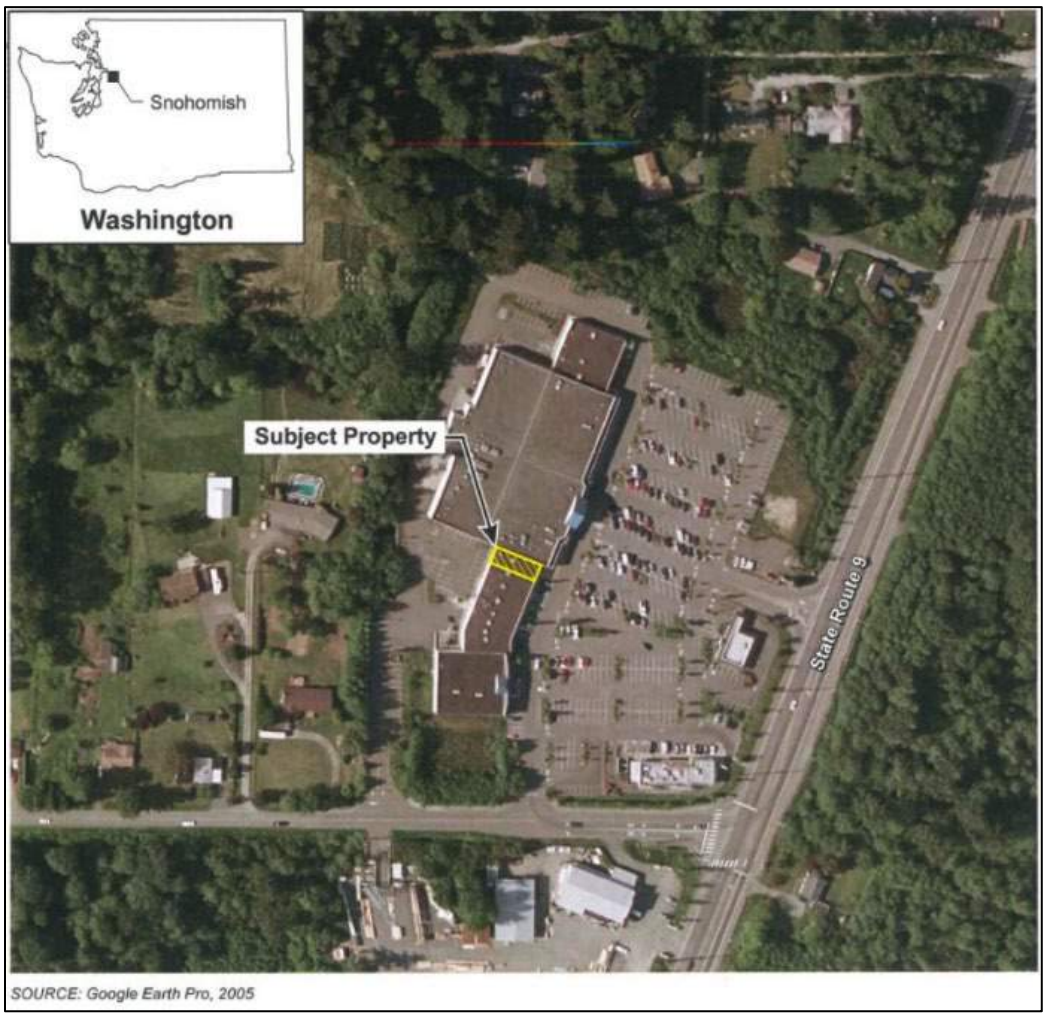
This HASP was reviewed by the Project Manager (PM) and the HSO/SS prior to commencement of work activities.

2.0 Background Information

2.1 SITE BACKGROUND

The Site is located at 17408 Highway 9, Building B, Unit 6 in Clearview Plaza in Snohomish, Washington. It is composed of a subset of Snohomish country parcel 27051100409400, which includes a retail space in a commercial center, as shown in Figure 2.1 and Figure 2.2. The Site is currently occupied by Highway 9 Smokes a tobacco product and accessories retailer. The ground surface at the Site is paved with minimal landscaping. It is accessed by entering the shopping center from Highway 9 or 176th Street SE.

Figure 2.1
Site Vicinity Location (from URS 2006)



SOURCE: Google Earth Pro, 2005

Figure 2.2
Snohomish County Parcel Map

A June 2005 Phase I Environmental Site Assessment (ESA) for Clearview Plaza identified Panda Dry Cleaners, an on-site dry cleaner that operated at the Site between approximately 1996 and 2006, as a possible recognized environmental condition due to documented tetrachloroethene (PCE) usage in operations. Based on this recommendation, a follow-up Phase II Limited Subsurface ESA was conducted in August 2005. Based on the results of the Phase II ESA, the Site entered a Voluntary Cleanup Program (NW1588) in February 2006. On November 13, 2006, a No Further Action letter was issued for the Site requiring that a restrictive covenant be placed on the property to retain and maintain the building and integrity of concrete floor that overlies the PCE-impacted soil. In December 2023, Ecology prepared its First Periodic Review for the Site and identified the need for additional characterization.

To the west of the Site are residential properties separated by trees; south of the Site are adjacent retail tenants, including restaurants, an automobile parts store, and a veterinary clinic; east of the Site is the shopping center parking lot and Highway 9; and north of the Site is an adjacent supermarket. Roadways in the vicinity of the Site are private parking lots, Highway 9, and 176th Street SE.

The contaminants of concern (COCs) at the Site include PCE, trichloroethene (TCE), *cis*-1,2-dichloroethene (*cis*-1,2-DCE), and vinyl chloride (VC) from previous dry cleaning operations.

Floyd|Snider will be conducting investigation activities in the immediate perimeter of the subject property (Figure 2.1) and the interior of the property. Additional activities may occur in areas of the identified county parcel.

2.2 SCOPE OF WORK

The purpose of the investigation is to collect soil, indoor air, and groundwater samples to meet the Site characterization objectives of the work plan. The investigation will consist of the following:

- Soil sampling including vertical and angled soil borings
- Groundwater sample collection from temporary wells using a direct-push drill
- Vapor intrusion assessment with indoor and outdoor air samples

3.0 Emergency Contacts and Information

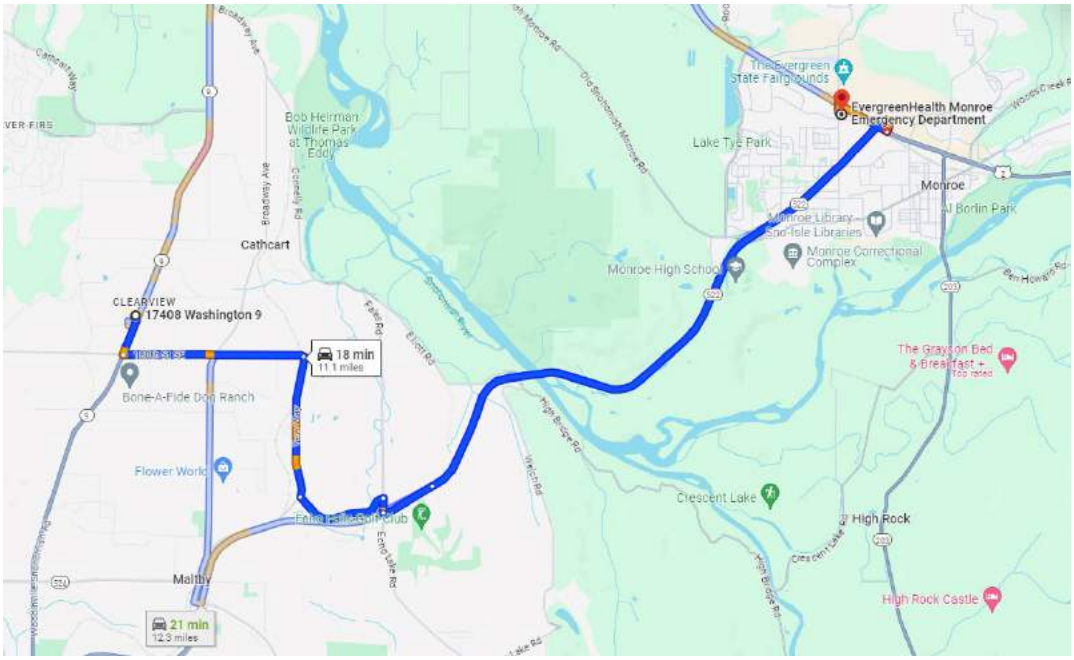
3.1 DIAL 911

In the event of an emergency, dial 911 to reach fire, police, and first aid.

3.2 HOSPITAL AND POISON CONTROL

Nearest Hospital Location and Telephone: (Refer to Figure 3.1 for directions and map to the hospital.)	EvergreenHealth Monroe Emergency Department 14701 179th Avenue SE Monroe, WA (360) 794-1402
Washington Poison Control Center:	(800) 222-1222

Figure 3.1
Hospital Directions



1. Head south on Woodinville Snohomish Rd.
2. Use the left 2 lanes to turn left onto 180th St SE.
3. Continue onto 103rd Ave SE/Yew Way.
4. Turn left onto Downes Rd.
5. Turn right onto Fales Rd.
6. Turn left to merge onto WA-522 E toward Monroe.
7. Merge onto WA-522 E.
8. Turn right onto US-2 W.
9. Turn left onto 179th Ave SE.
10. Turn left and the destination will be on the right.

3.3 PROVIDE INFORMATION TO EMERGENCY PERSONNEL

All Floyd|Snider project personnel should be prepared to give the following information:

Information to give to Emergency Personnel	
Site Location: (Refer to Figure 3.1)	Highway 9 Smokes, Clearview Plaza 17416 WA-9 Snohomish, WA 98296
Number You Are Calling From:	This information can be found on the phone you are calling from.
Type of Accident or Type(s) of Injuries:	Describe accident and/or incident and number of individuals needing assistance.

3.4 UTILITY EMERGENCY CONTACTS

Additional entities that may need to be contacted in the event of an emergency involving damage to a utility include the following:

Snohomish PUD #1 – Electric Emergency Line:	(425) 783-1000
Puget Sound Energy – Natural Gas Emergency Line:	(888) 225-5773
Snohomish County PUD – Water & Sewer Emergency Line:	(425) 397-3000
Frontier Communications Emergency Line:	(877) 462-8188

3.5 PROJECT CONTACTS

After contacting emergency response crews as necessary, contact the Floyd|Snider PM, or a Principal, to report the emergency. The Floyd|Snider PM may then contact the Lakeshore Corporation or direct the field staff to do so.

Floyd|Snider Emergency Contacts:

Contact	Office Phone Number	Cell Phone Number
Nathan Schachtman, PM	(206) 292-2078	(314) 456-8058
Gabe Cisneros, Associate Principal		(206) 582-8223
Gillian Sweeney, HSO/SS		(510) 316-6679
Cheronne Oreiro, SSO		(206) 334-4992

Client Emergency Contacts:

Contact	Association	Phone Number
Geoff Lakman	Lakeshore Corporation	(425) 417-3863
Highway 9 Smokes	Current Occupant	(360) 668-4070

4.0 Hazard Evaluation and Risk Analysis

The typical fire, explosion, and physical hazards likely to be present on the job site, and procedures to control the mitigation of these hazards, are presented in the APP. This HASP presents additional information regarding site-specific hazards, including chemical exposure hazards associated with site COCs or the scope of field activities and analysis of the hazards associated with each site investigation task.

4.1 CHEMICAL EXPOSURE HAZARDS

This section describes potential chemical hazards associated with the field activities being conducted. Based on previous site data, elevated concentrations of the following chemicals may be encountered at the Site:

- PCE
- TCE
- *cis*-1,2-DCE
- VC

Human health hazards associated with these chemicals are presented in the following table. This information covers potential toxic effects that might occur in the event of relatively significant acute and/or chronic exposure. Potential routes of exposure include dermal contact, inhalation, and ingestion. The primary exposure route of concern during site work is through exposure to contaminated dust from soil during drilling and groundwater during sampling.

Chemical exposure is considered unlikely and highly preventable. In general, the chemicals that may be encountered at this Site are not expected to be present at concentrations that could result in significant exposures. The types of planned work activities and use of monitoring procedures and protective measures will limit potential exposures at this Site. The use of appropriate personal protective equipment (PPE) and decontamination practices will assist in controlling exposure by means of all pathways to the COCs listed in the following table.

Chemical Hazard	Cal/OSHA Permissible Exposure Limits (8-hour TWA/STEL)	Routes of Exposure	Potential Toxic Effects	Maximum Historical Concentration
PCE	25 ppm/ 100 ppm	Inhalation, skin absorption, ingestion, skin/eye contact	Eye irritation; allergic dermatitis; chloracne; gastrointestinal distress; liver, kidney damage; breast and other cancers	0.3 mg/kg (soil) highest photoionization detector reading of 536 ppm
TCE	25 ppm/ 100 ppm	Inhalation	Dermatitis; bronchitis; lung, skin, and stomach cancer	Unknown
cis-1,2-DCE	200 ppm/ 250 ppm	Inhalation, skin absorption, ingestion, skin/eye contact	Ulceration of nasal septum; dermatitis; gastrointestinal disturbance; respiratory irritation; hyperpigmentation of skin; skin and lung cancer	Unknown
VC	1 ppm/ 5 ppm	Inhalation, Dermal, Ingestion	Inhalation, skin absorption, ingestion, skin/eye contact	Unknown

Abbreviations:

Cal/OSHA	California Division of Occupational Safety and Health
mg/kg	Milligrams per kilogram
ppm	Parts per million
STEL	Short-term exposure limit
TWA	Time-weighted average

4.2 JOB HAZARD ANALYSIS

This section identifies potential hazards associated with each task listed in Section 2.2 of this HASP. Tasks have been grouped according to the types of potential hazards associated with them.

Work Task	Potential Hazards	Actions to Control Hazards
Load and transport equipment on vehicles	Damage or injury from unsecured cargo	Ensure that all cargo is secured when packing equipment in or out. Prevent movement of equipment while vehicle is in operation.
	Injuries during the removal of work zone delineators	Verify that traffic is clear before removing work zone delineators and/or traffic control devices.
Lifting and manual transport of equipment	Improper lifting techniques, overreaching/ overextending, lifting overly heavy objects	Use proper lifting techniques and mechanical devices where appropriate. Test the weight of the load prior to lifting. Do not attempt to lift a heavy load alone. Never try to lift more than you are accustomed to lifting. Avoid quick, jerky movements and twisting motions.
Traffic hazards	Vehicle traffic and hazards when working near active operations.	Use of signs, signals, and barricades is required. Spotters will be used to monitor traffic during work activities. Personnel working are required to wear American National Standards Institute (ANSI) Class 2 vests or garments within any right-of-way. Avoid working with your back to traffic whenever possible.
Populous urban environment	Third-party impacts from noise, COCs	Activities that require air monitoring and loud noise will be scheduled outside retail operating hours when possible.
	Encroachment on work area by third parties	Refer to Section 5.4 for details on setting up the work zone.

Work Task	Potential Hazards	Actions to Control Hazards
General site hazards, Air monitoring	Heat and cold exposure hazards	Refer to Section 5.3 in the APP.
	Inadequate lighting	Work will only proceed during daylight hours or under sufficient artificial light.
	Slip, trip, or fall hazards	Keep work areas organized and free from unmarked trip hazards.
Ground-impacting tasks	Underground utility damage	Utilities are to be surveyed with a public and private utility locate and marked prior to work. Drilling locations will be cleared using a vacuum truck to 5 feet prior to drilling.
Direct push drilling, temporary well installation, and groundwater sampling from temporary wells	Heavy equipment (drill rigs)	Ensure the use of competent operators, backup alarms, regular maintenance, daily mechanical checks, and proper guards. All project personnel will make eye contact with the operator and obtain a clear "OK" before approaching or working near heavy equipment.
	Exposure to loud noise	Wear earplugs or protective ear covers when heavy equipment is operating and when a conversational level of speech is difficult to hear at a distance of 3 feet.
	Overhead hazards, falling and/or sharp objects, bumping hazards, construction equipment	All personnel will wear hard hats at all times when overhead hazards exist, such as during drilling activities and around heavy or large equipment. Workers will never work under overhead loads.
	Lifting hazards, potential dermal or eye exposure to site contaminants in groundwater and soil	See lifting and manual transport of equipment. Wear all the required Level D PPE including eye protection. Avoid splashing or dropping equipment into decontamination water.

5.0 Site Controls and Monitoring

The following sections describe site controls and monitoring that will be implemented during site field activities. The HSO/SS, or a designated alternate (SSO), is responsible for inspecting the work area daily and identifying additional hazards. Personnel responsibilities are further described in the APP.

5.1 DAILY SAFETY MEETINGS

A safety meeting will be conducted by the HSO/SS or designated SSO daily prior to the start of work. Additional safety briefings or safety checks should also be performed when switching tasks or whenever new hazards are identified. Safety meetings topics and attendance will be recorded on the Daily Tailgate Safety Meeting and Debrief Form provided in Appendix B.

Any near misses or incidents that occur on the job site will be recorded on the Near Miss and Incident Reporting Form provided in Appendix C.

5.2 EMERGENCY MUSTER POINT

The muster point for the Site is the south entrance from 176th Street SE to Clearview Plaza near the dance studio.

The APP describes required emergency equipment and procedures to be followed in the case of medical emergency; release of a hazardous substance; or other emergencies such as a thunderstorm, vehicle collision, fire, or earthquake.

5.3 PERSONAL PROTECTIVE EQUIPMENT

Work will proceed in standard Level D as described in the APP. PPE should be inspected for defects before each use. Field staff will use clean, disposable nitrile gloves when handling sample material.

Site-specific PPE includes hard hats and hearing protection during drilling activities and high-visibility outerwear while working near active roadways.

5.4 WORK AREAS

An exclusion zone will be established when working with contaminated materials. The exclusion zone will be set up around each soil boring and temporary well location.

A contaminant reduction zone will be set up at the entry/exit point of the exclusion zone. The contaminant reduction zone will contain the necessary elements to perform personnel and equipment decontamination as described in Section 5.5. This will include the closure of the immediate area surrounding the drilling location with barricades to through traffic.

The support zone will consist of vehicles and public facilities located outside the immediate work area.

The work zone will be delineated with cones and caution tape or another suitable barrier to prevent members of the public from approaching the work area. When possible, activities are to be scheduled outside business hours of the adjacent properties to minimize pedestrians in the area.

5.5 DECONTAMINATION AND WASTE DISPOSAL

Field staff should always follow the best practices for prevention of contamination detailed in the APP.

Sampling equipment will be decontaminated in accordance with the work plan. Personnel decontamination will include of disposal gloves and handwashing with soap and water.

Floyd|Snider and its subcontractors will use safe and prudent waste collection and housekeeping practices to minimize the spread of contamination beyond the work zone and the amount of investigation-derived waste (IDW). The Floyd|Snider HSO/SS will work with site personnel to ensure the proper collection, packaging, and identification of waste materials so that waste materials will be properly disposed of.

Disposable PPE and sampling equipment will be disposed of as municipal solid waste. Excess sample material will be containerized in U.S Department of Transportation-approved drums. Equipment wash water will be containerized with IDW.

5.6 AIR MONITORING

Air monitoring using a photoionization detector (PID) will be performed if personnel are likely to be exposed to volatile contaminants. Contaminant concentrations in soil and groundwater at the Site are present at concentrations that are not expected to result in vapor concentrations that exceed allowable OSHA levels. Potential volatile COCs include chlorinated solvents including PCE, TCE, and VC in soil or groundwater.

Action levels for air monitoring are presented in the following table with PID calibrated to isobutylene with the correction factor for TCE:

Monitoring Equipment	VOC Concentration	Action
PID	Less than 13.5 ppm; less than 54 ppm for no longer than 15 minutes	Continue operations in Level D PPE. Work upwind of drilling area when possible.
	Greater than 13.5 ppm and less than 54 ppm intermittent	Leave work area and allow vapor to dissipate; use engineering controls if necessary. Monitor VOC concentration every 5 minutes; resume work once concentrations are less than 13.5 ppm for 15 minutes.
	Greater than 54 ppm	Stop operations and evacuate the area. Do not resume work until engineering controls are in place that can maintain VOC concentrations less than 13.5 ppm in breathing spaces.

Abbreviations:

ACGIH American Conference of Governmental Hygienists
ppm Parts per million
STEL Short-term exposure limit
TWA Time-weighted average
VOC Volatile organic compound

6.0 Approvals

Project Manager	Date
Project Health & Safety Officer	Date

7.0 Signature Page

I have read this Health and Safety Plan and understand its contents. I agree to abide by its provisions and will immediately notify the HSO/SS if site conditions or hazards not specifically designated herein are encountered.

Name (Print)	Signature	Date	Company/Affiliation

Health and Safety Plan

Panda Dry Cleaners

Appendix A
Accident Prevention Plan

Accident Prevention Plan

June 2022

FLOYD | SNIDER
strategy ▪ science ▪ engineering
Two Union Square ▪ 601 Union Street ▪ Suite 600
Seattle, Washington 98101 ▪ tel: 206.292.2078

Table of Contents

List of Tables

List of Abbreviations

Acronym/ Abbreviation	Definition
AED	Automated external defibrillator
APP	Accident Prevention Plan
AQI	Air quality index
COPD	Chronic obstructive pulmonary disease
CPR	Cardiopulmonary resuscitation
°F	Degrees Fahrenheit
FFR	Filtering facepiece respirator
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSO/SS	Health and Safety Officer/Site Supervisor
JHA	Job Hazard Analysis
JSA	Job Safety Analysis
L&I	Washington State Department of Labor & Industries
MTCA	Model Toxics Control Act
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Act
PEL	Permissible exposure limit
PM	Project Manager

Acronym/ Abbreviation	Definition
PPE	Personal protective equipment
RPP	Respiratory Protection Program
SDS	Safety Data Sheet
SSO	Site Safety Officer
USEPA	U.S. Environmental Protection Agency
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act

1.0 Plan Objectives and Applicability

This Accident Prevention Plan (APP) describes the policies and best practices established by Floyd|Snider to ensure the safety of employees to the maximum extent possible when performing their work duties. Employee safety is Floyd|Snider's highest priority. Employees are encouraged to use the Health and Safety Department as a resource in identifying potential hazards and the appropriate precautions to address them. While additional safety precautions may impact project schedules and costs, Floyd|Snider will ultimately benefit as accidents are avoided.

This APP has been written to comply with the standards of the Occupational Safety and Health Act (OSHA) and Washington Industrial Safety and Health Act (WISHA) as they pertain to work activities performed by Floyd|Snider.

This APP applies to all employees of Floyd|Snider. It consists of the following components:

- A description of the roles and responsibilities of all Floyd|Snider personnel in ensuring worker safety,
- General safety policies for the office and the field job site,
- Procedures to follow in an emergency,
- Information on common hazards and steps that should be taken to mitigate these hazards,
- A description of the basic safety controls that should be implemented on all field job sites,
- Training requirements for field staff, and
- Safety record keeping and reporting requirements and procedures.

2.0 Roles and Responsibilities

All staff members share responsibility for safety. The roles and responsibilities for Floyd|Snider staff in ensuring company safety are described in the following sections.

2.1 BOARD OF DIRECTORS

The Floyd|Snider board of directors consists of the elected senior officers of Floyd|Snider who establish the company's culture of safety. These individuals set policy for the company, including safety policy. The Management Committee, which consists of the Board of Directors and additional shareholder representatives, is also responsible for enforcement of this APP.

2.2 HEALTH AND SAFETY COMMITTEE

The Health and Safety Committee is composed of field and management staff, who meet on a quarterly basis or more frequently if needed to review and update the Floyd|Snider Health and Safety Program. The Health and Safety Committee is responsible for making updates to this APP as approved by the Management Committee. Health and Safety Committee meeting minutes are recorded and made accessible on Floyd|Snider's Health and Safety department page on SharePoint.

2.3 HEALTH AND SAFETY ADMINISTRATOR

The Health and Safety Administrator receives, organizes, and reviews reports of near misses and incidents in the workplace. The Health and Safety Administrator is responsible for the administration of benefits, working with managers to identify OSHA-reportable incidents, and managing the OSHA reporting process. The Health and Safety Administrator is also responsible for documentation of Health and Safety Committee meeting minutes and employee training record keeping. The Health and Safety Administrator is supported by the Board of Directors and the Health and Safety Committee, who are responsible for taking corrective actions when near misses, incidents, and other safety issues identified in this plan occur.

2.4 PROJECT MANAGERS

Project Managers (PMs) reinforce the Floyd|Snider safety culture. During all phases of projects, PMs review health and safety issues and will have authority to allocate resources and personnel to safely accomplish project work.

PMs direct the field personnel at a job site. PMs coordinate with the project Health and Safety Officer/Site Supervisor (HSO/SS) to ensure that the scope of the project and site conditions are accurately documented in all project safety materials and that all Floyd|Snider personnel on site have received the required safety training and understand the procedures to follow should an incident occur on site. PMs review safety documentation materials with the HSO/SS at intervals

determined prior to the start of field events and report near misses and incidents to the Health and Safety Administrator.

2.5 FIELD HEALTH AND SAFETY OFFICER AND SITE SUPERVISOR

The HSO/SS prepares and/or approves the site Health and Safety Plan (HASP) and any amendments thereof and is responsible for full implementation of all elements of the HASP.

The HSO/SS will advise the PM and project personnel on all potential health and safety issues of the field investigation activities to be conducted at a site. The HSO/SS will specify required exposure monitoring to assess site health and safety conditions, modify the site HASP based on field assessment of health and safety accidents and/or incidents, and recommend corrective action if needed. The HSO/SS will report all accidents and/or incidents to the PM. If the HSO/SS observes unsafe working conditions by Floyd|Snider personnel or any contractor personnel, the HSO/SS will suspend all work until the hazard has been addressed.

The HSO/SS is responsible for conducting tailgate safety meetings daily before the start of field work. Tailgate safety meetings should identify the work to be completed, safety hazards likely to be encountered, and the appropriate work practices needed to minimize exposure to these hazards. Tailgate safety meeting forms are included in the HASP documents.

2.6 FIELD SITE SAFETY OFFICER

The field Site Safety Officer (SSO) may be a person dedicated to this task, to assist the HSO/SS during field work activities. The SSO will ensure that all personnel have appropriate personal protective equipment (PPE) on site and that PPE is properly used. The SSO will assist the HSO/SS in field observation of Floyd|Snider personnel safety. If a health or safety hazard is observed, the SSO shall suspend all work activity. The SSO will conduct onsite safety meetings daily before work commences. All health and safety equipment will be calibrated daily and records kept in the daily field logbook. The SSO may perform exposure monitoring if needed and will ensure that equipment is properly maintained.

2.7 FLOOR WARDENS

Floor Wardens are Floyd|Snider staff members who have volunteered to coordinate Floyd|Snider's response in case of an emergency at Union Square. Floor Wardens are responsible for ensuring that all staff have evacuated the building if an evacuation order is issued by building management and accounting for staff at the emergency muster point. Floor Wardens also post and update emergency evacuation routes and maintain maintenance records for fire extinguishers located at the office. The names of current Floor Wardens are posted in the office above fire extinguishers and on the Floyd|Snider SharePoint home page.

2.8 EQUIPMENT MANAGER

The Equipment Manager is responsible for ensuring that all field equipment, including the company vehicle, is in safe working order and for keeping records of equipment maintenance. Employees must report any issues with the company vehicle or field equipment to the Equipment Manager. The Equipment Manager will designate an alternate for days when the manager will not be available to assist field staff with urgent equipment or vehicle issues.

2.9 FLOYD|SNIDER PERSONNEL

All Floyd|Snider project personnel will take precautions to prevent accidents and/or incidents from occurring to themselves and others. Employees must read, understand, and sign this APP. Employees will report all incidents and near misses to their PM, HSO/SS, or SSO and inform of any physical conditions that could impact their ability to perform their work.

2.10 EMERGENCY CONTACTS

All Floyd|Snider staff must designate a person outside of the company who may be contacted in case of an emergency in which a staff member requires medical care. Emergency contacts are responsible for making decisions regarding medical treatment in the event that the staff member is incapacitated, or for contacting the individual who has been designated authority by the staff person to make such decisions if they do not have that authority.

Emergency contact information will be provided to the Health and Safety Administrator and updated as needed, at a minimum frequency of once per year. The Health and Safety Administrator is responsible for maintaining emergency contact information in the Floyd|Snider firm contact database and making this information available on the Floyd|Snider SharePoint home page.

3.0 Safety Policies

The safety policies presented in this section have been developed to ensure the safety of all staff. They should be considered the minimum requirements to maintain a safe workplace; staff should be vigilant at all times and take the needed actions to identify and correct unsafe situations.

3.1 GENERAL OFFICE SAFETY

This section describes the policies that have been developed to keep staff safe in all work scenarios, including at the office and on the job site.

3.1.1 Injury Prevention

In office areas, trips and falls are the primary cause of acute injury, and they can be easily prevented. There are many different ways to prevent injury, including, but not limited to:

- Keep all work areas, aisles, and hallways clear at all times.
- Make sure all exits are accessible, clearly marked, and properly illuminated.
- Keep all work and storage areas in a sanitary condition; floors shall be clean and, as much as possible, kept in a dry condition. If floors are wet, they should be marked with signage to notify others.
- Pile or store materials in a stable manner, so that they will not be subject to falling.
- Keep walkways and work areas free of electrical cords.
- Never make repairs to light fixtures unless authorized to do so by a supervisor.
- Use a stepstool when reaching overhead objects.
- Do not lift equipment and materials weighing more than 20 pounds by yourself; ask for help and/or use a handtruck.
- When carrying loads, exercise care to avoid overexertion and strain. Use proper lifting and reaching techniques.
- Use adjustable desk chairs to reduce musculoskeletal injuries; ask for assistance if you are unfamiliar with proper ergonomic adjusts for your desk, computer, and chair.
- Report all unsafe conditions and symptoms of injury to the Health and Safety Administrator.
- Exercise caution in moving about the office.

3.1.2 Administration of First Aid and Cardiopulmonary Resuscitation

First aid and cardiopulmonary resuscitation (CPR) should only be administered by individuals with the appropriate training. Floyd|Snider makes First Aid and CPR/automated external defibrillator (AED) training to available to all staff members and requires this training for all field staff members. At least one person on a field site must be trained and have current certification in

First Aid and CPR. First aid kits compliant with the ANSI Z308.1-2015 Class B standard will be available at the Floyd|Snider office and at all field sites. First aid kits for field sites additionally include basic medications (aspirin and diphenhydramine), tweezers, a clotting sponge, potable water, outdoor skin cleanser, super glue, adhesive moleskin pads, safety pins, sunblock, insect repellant, medical masks and a printed field staff emergency contact list.

3.1.3 New Employee Orientation

All new employees receive an orientation to the Floyd|Snider Health and Safety Program from a member of the Health and Safety Committee. This orientation is arranged by the assigned mentor for the new employee and includes a review of the materials available on the Health and Safety department home page (APP, HASP templates, near miss and incident forms, training resources, etc.) as appropriate to the employee's role at Floyd|Snider, office and field safety policies, and training and documentation requirements for field and office safety.

3.1.4 Workplace Hostility

Floyd|Snider intends to provide a work environment that is free from intimidation, hostility, or other offenses that are inappropriate. Harassment of any sort—verbal, physical, or visual—will not be tolerated.

Harassment can take many forms. It may be, but is not limited to, words, signs, jokes, pranks, physical or verbal intimidation, physical contact, or violence. Harassment is not necessarily sexual in nature, although these prohibitions against harassment specifically include all forms of sexual harassment.

It is the company's policy to regard sexual harassment and other forms of harassment, as well as the threat of such harassment, as very serious matters and to prohibit them in the workplace by any person and in any form. All staff are required to complete harassment training. Floyd|Snider also makes bystander intervention training available to all staff.

3.2 FIELD SAFETY

This section describes the additional policies developed to keep field staff safe on the job site.

3.2.1 Stop Work Authority

All staff members have Stop Work Authority. Stop Work could be a temporary pause in work for a few minutes or a full shutdown of work until unsafe work conditions can be addressed. If unsafe work conditions are encountered and cannot be immediately addressed by the staff on-site, the HSO/SS should report immediately to the PM. Safety hazards may include physical site conditions or dangerous work practices by subcontractors or other workers. The PM will help the field staff to make modifications to the work practices to mitigate the hazard if possible. If the unsafe conditions cannot be mitigated, field staff have the authority to stop all work until the conditions can be properly addressed.

3.2.2 Health and Safety Plan

A site-specific HASP must be prepared and made available to field staff at job sites. A site-specific HASP is required for any activities where field staff may contact contaminated material; activities such as a site visit or oversight where no contact with contaminated material or physical hazards may occur can be completed without a HASP, if approved by the PM. The HASP should address both potential physical and chemical hazards on-site and steps taken to mitigate those hazards.

3.2.3 Tailgate Safety Meetings

The HSO/SS is responsible for conducting tailgate safety meetings daily before the start of field work. Tailgate safety meetings should identify the work to be completed, safety hazards likely to be encountered, and the appropriate work practices needed to minimize exposure to these hazards. Tailgate safety meetings must always cover the site-specific procedures to follow in case of an emergency.

When performing field work, staff should maintain awareness of new or changing hazards at the job site. Staff should always assess then reassess the hazards when changing between tasks or changing the manner in which a task is performed and document meetings and assessments on the tailgate safety meeting form.

3.2.4 Buddy System

Floyd|Snider employs the buddy system for work at job sites meaning employees are never alone in the field. The buddy system ensures that employees can get help in case of an emergency. Working in the field without another Floyd|Snider employee present may be permissible in the following scenarios:

- When the site is occupied, you are not performing an activity with high risk of injury (e.g., not working in traffic, not entering small spaces or lifting heavy objects), and you are in close proximity of other people capable of responding if you call for help.
- If you are accompanied by a teaming partner or subconsultant who may act as your buddy.
- IF FOR ANY REASON YOU ARE NOT COMFORTABLE WITH THE ASSIGNMENT OR THE CONDITIONS, DISCUSS IT WITH YOUR PM AND ASK FOR A BUDDY.

3.2.5 Check-in Procedure

All employees in the field, whether in groups or alone, will follow the check-in procedure detailed below:

- Notify front desk or your PM when you are leaving for field work. Notification can be by email, phone, or in person.
- Provide an estimated completion time of when you think you will return to the office or head home.

- At the end of the field day, before leaving the site, call the office and let the front desk or your PM (the same person you notified at the beginning of the day) know you are returning to the office or heading home. Ask to be transferred to the PM to discuss how things went.
- If you will not be finished with field work by 5:00 p.m., call the office and let the front desk know you are still in the field and that you will check in with the PM when fieldwork is finished.
- Communicate with the PM when you are finished with work and leaving the site (after 5:00 p.m.).
- If you are in a group of Floyd|Snider employees doing this field work, one person can do this check-in process on behalf of the group.
- If you fail to check in and cannot be reached by cell phone, someone from the office may be sent to locate you, or local authorities may be notified.

3.2.6 Personal Protective Equipment

Field staff must wear the appropriate PPE required in the site-specific HASP. Floyd|Snider provides employees with all required PPE such as steel-toed boots, reflective vest/jacket, hardhat, safety glasses, gloves, ear protection, and first aid kits. Field staff are responsible for wearing the appropriate PPE in accordance with the HASP, keeping their PPE in good condition, and replacing it as needed.

All work will proceed in Level D PPE, which shall include hard hat, protective footwear, hearing protection, eye protection, gloves, and sturdy outer work clothing. Protective footwear must be compliant with ASTM F2413 or the former ANSI Z41 (repealed) standard, with oil- and chemical-resistant soles, and must be securely laced without signs of excessive tread wear. For all work involving potential exposure to soil and groundwater, workers will wear nitrile gloves and Level D PPE. Personal floatation devices will be worn at all times during work in the vicinity of surface water. When working in a remote location, all teams must carry a field first aid kit. The contents of a field first aid kit include basic medications (aspirin and diphenhydramine), sterile dressings, adhesive bandages and tape, wound-cleansing towelettes, sting-relief wipes, antibiotic ointment, butterfly bandages, tweezers, safety pins, and a printed field staff emergency contact list.

All field personnel will be properly fitted for PPE and trained in the use of PPE during initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training (refer to Section 7.0 for additional training information). The level of protection will be upgraded by the HSO/SS whenever warranted by conditions present in the work area. The HSO/SS will ensure that field staff know how to properly use PPE and periodically inspect equipment such as gloves and hard hats for defects.

3.2.7 Confined Spaces

Floyd|Snider field staff are not trained in confined space entry and may not enter permit-required confined spaces. It is considered entry if your head/face breaks the plane of the confined space opening.

Confined spaces are defined as a spaces that have limited or restricted means for entry or exit and are not designed for continuous occupancy. Confined spaces commonly encountered at field sites may include vaults, manholes, pits, and tanks. OSHA designates confined spaces as "permit-required confined spaces" if they exhibit one or more of the following characteristics:

- Contains or has the potential to contain a hazardous atmosphere
- Contains material that has the potential to engulf an entrant
- Has walls that converge inward or floors that slope downward and taper into a smaller area that could trap or asphyxiate an entrant
- Contains any other recognized safety or health hazard (e.g., unguarded machinery, exposed wires, extreme heat)

In accordance with OSHA regulations, only personnel with specialized confined space training may enter a permit-required confined space under a confined space entry plan.

3.3 RESPIRATORY PROTECTION PROGRAM

The goals of the Respiratory Protection Program (RPP) are to protect employees from potential exposure to respiratory hazards and to ensure compliance with applicable occupational safety and health standards regarding respiratory hazards. Additionally, the RPP provides requirements for the proper selection and use of respiratory protection equipment.

On July 16, 2021, the Washington State Department of Labor & Industries (L&I) adopted an emergency rule to protect workers who are exposed to harmful levels of wildfire smoke (WAC 296-62-085). This RPP conforms to the Washington Administrative Code (WAC) standards for WAC 296-841 Airborne Contaminants and WAC 296-842 Respirators, as well as draft rule WAC 296-65-085 Wildfire Smoke.

3.3.1 Applicability

This RPP applies to respiratory protection used in the field due to impaired ambient air quality when respirator use is not required but may be preferred for comfort. This applies to impaired ambient air quality due to chemical hazards or wildfire smoke. Employees will not be required to perform site work when airborne substances (i.e., site contaminants) are present at concentrations exceeding their OSHA permissible exposure limits (PELs) or if air quality due to wildfire smoke exceeds the Stop Work action threshold and respiratory protection would be

required to safely complete the work. Employees may additionally elect to use respirators for comfort purposes to control non-hazardous substances such as nuisance odors.

If there is the potential to exceed a PEL or wildfire smoke action threshold at a site, engineering and administrative controls will be implemented to mitigate the hazard. Project work that cannot be altered by using engineering or administrative controls must be approved by the Management Committee in advance of the scheduled fieldwork.

The RPP is intended to help employees identify conditions that may warrant the voluntary use of a respirator and to support the selection and maintenance (if applicable) of an appropriate respirator. The RPP should be implemented when employees are working in conditions where respiratory hazards may be encountered, such as when working in conditions with wildfire smoke.

3.3.2 Administrator and Employee Responsibility

The RPP administrator is the Health and Safety Committee chair. The RPP administrator oversees the development, execution, and evaluation of the RPP and will ensure procedures are followed, respirator use is monitored, and respirators provide adequate protection when job conditions change. The RPP administrator will ensure appropriate respirators and the associated supplies are provided to employees for voluntary use at no cost to the employee.

Employees voluntarily using respirators have the following responsibilities:

1. Participate in the Floyd|Snider medical monitoring program in accordance with Section 7.1.
2. Use the respirator only for the specific tasks that it was issued for.
3. Seek medical help if wearing a respirator creates negative health effects such as difficulty breathing, dizziness, or anxiety.
4. Care for and maintain respirators as instructed, including following the manufacturer's specific cartridge change-out or respirator replacement schedule.
5. Notify the supervisor of any problems associated with using a respirator. This includes a respiratory hazard that needs further evaluation, if the respirator is not providing adequate protection, and any concerns with the RPP.
6. Monitor air quality while wearing a respirator and calling Stop Work if PELs are exceeded or if the Stop Work action level for wildfire smoke is exceeded.

3.3.3 Use of Respirators

Respirator use by Floyd|Snider employees is done on a voluntary basis and may be done at any time when the use of an approved respirator may increase comfort or provide additional

protection when air quality conditions are still within a level considered to be safe for work. Voluntary use of respirators applies only when it has been determined that:

- Such respirator use will not in itself create a hazard.
- Airborne occupational exposures to hazardous chemicals will not exceed applicable PELs.
- Exposure to fine particles called PM2.5 in wildfire smoke does not exceed the Stop Work action level (refer to Table 3.1).
- No airborne biological hazard is present.
- No specification standards require the mandatory use of respirators.

3.3.4 Wildfire Smoke Exposure Control Plan

The Wildfire Smoke Exposure Control Plan is intended to address risks to employees working outside from potential exposure to wildfire smoke. This plan will be in effect whenever wildfires are present in the region (in Washington State, surrounding states, or British Columbia, Canada) and will continue to be implemented until such a time that wildfire smoke is no longer a health risk as determined by the air quality index (AQI). The greatest risk of wildfire coincides with the dry season from approximately mid-May through mid-October; however, fires can also occur outside of the typical dry season.

Smoke from wildfires contains chemicals, gases, and fine particles that can be harmful to human health. Breathing in smoke can cause immediate health effects such as coughing, trouble breathing, stinging eyes, a scratchy throat, runny nose, irritated sinuses, wheezing and shortness of breath, chest pain, headaches, an asthma attack, tiredness, and fast heartbeat (CDC 2013). The smallest and most harmful particulate matter in wildfire smoke and other air pollutants are PM2.5. PM2.5 are particles that are 2.5 micrometers or less in width. Increases in daily PM2.5 exposure has been linked to premature death in people with heart or lung disease and nonfatal heart attacks (USEPA 2020). Long-term exposure to PM2.5 is associated with increased rates of lung cancer and heart disease.

Those at increased risk for adverse health effects from wildfire smoke include the following:

- People with lung diseases such as asthma or chronic obstructive pulmonary disease (COPD), including bronchitis and emphysema, and those who smoke
- People with respiratory infections, such as pneumonia, acute bronchitis, bronchiolitis, colds, or flu, or those with or recovering from COVID-19
- People with existing heart or circulatory problems, such as irregular heartbeat, congestive heart failure, coronary artery disease, or angina, and those who have had a heart attack or stroke
- Adults over age 65 and pregnant women

- People with diabetes
- People with other medical or health conditions that can be exacerbated by exposure to wildfire smoke as determined by a physician

Program elements and protocols for wildfire smoke have been developed in accordance with emergency rule WAC 196-62-085 and additionally consider Cal/OSHA Title 8 California Code of Regulations Section 5141.1 regarding Wildfire Smoke.

The Wildfire Smoke Program includes the following elements:

1. Identification of Harmful Exposures (WAC 296-62-08530):

   When wildfire smoke is present, the site-specific HSO will monitor the AQI before each shift and periodically thereafter using U.S. Environmental Protection Agency's (USEPA's) AirNow,[1] available at www.airnow.gov, or a similar state or federal AQI modeling service. The HSO can also monitor real-time air quality using an air quality detector capable of measuring $PM_{2.5}$. The HSO will take actions consistent with the action levels presented in Table 3.1.

2. Hazard Communication (WAC 296-62-08540):

   The HSO will communicate wildfire smoke hazards to employees during the tailgate safety meeting and will record the AQI or $PM_{2.5}$ concentration on the tailgate meeting form when wildfire smoke is present in the air. The HSO will communicate available measures for employees to mitigate wildfire smoke exposure and the symptoms of smoke exposure.

3. Information and Training (WAC 296-62-08550):

   Employees will be trained in the information presented in this RPP (refer to Section 3.3.9), consistent with mandatory information presented in WAC 296-62-08590, prior to conducting work in the presence of wildfire smoke.

4. Exposure Symptom Response (WAC 296-62-08560):

   Employees displaying adverse symptoms of wildfire smoke exposure must be monitored to determine whether medical attention is necessary and may not be penalized for seeking medical treatment. Symptoms of wildfire smoke exposure most often include persistent coughing, difficulty breathing, and aggravation of existing respiratory conditions such as asthma. Provisions for prompt medical treatment will be established for each job site and reviewed during the tailgate safety meetings.

[1] AirNow reports air quality using the official U.S. AQI, a color-coded index designed to communicate whether air quality is healthy or unhealthy. AirNow is a partnership of the USEPA; National Oceanic and Atmospheric Administration; National Park Service; National Aeronautics and Space Administration; Centers for Disease Control and Prevention; and tribal, state, and local air quality agencies.

5. Exposure Controls (WAC 296-62-08560):

   Floyd|Snider will reduce workers' exposure to wildfire smoke by using the hierarchy of controls. Controls are encouraged whenever the ambient air concentration of PM2.5 is greater than 20.5 micrograms per cubic meter (µg/m^3; AQI 69) and required when the concentration of PM2.5 is greater than 55.5 µg/m^3 (AQI 151).

   A. Engineering controls will be implemented where feasible. Such controls include providing enclosed buildings, structures, or vehicles where the air is adequately filtered.

   B. If engineering controls are not sufficient to reduce exposure, Floyd|Snider will implement administrative controls. Such controls include relocating work to a location with a lower ambient air concentration of PM 2.5, changing work schedules to a time where the ambient air concentration of PM 2.5 is less, reducing work intensity, and providing additional rest periods.

   C. In addition to the standards provided in the emergency regulation (WAC 296-62-085), Floyd|Snider has developed action levels for wildfire smoke exposure to be followed at job sites. Table 3.1 shows the AQI categories, equivalent $PM_{2.5}$ measurement in micrograms per cubic meter, the level of health concern, and the action required. The HSO will stop work if the AQI for $PM_{2.5}$ is greater than 301 or if it is not possible to conduct field activities safely due to discomfort or decreased visibility.

   D. Where overnight stays are required in areas that do not have filtered indoor air, additional Floyd|Snider policies apply. If the AQI is forecasted to be greater than 301 overnight, or if the AQI exceeds 500 for several hours, the HSO, Floyd|Snider PM, and client PM will coordinate and decide whether demobilization to an off-site location is necessary.

6. Respiratory Protection (WAC 296-62-08570):

   Floyd|Snider will provide respirators at no cost to all employees for voluntary use in accordance with WAC 296-842 Safety Standards for Respirators. Employees are encouraged to use respirators any time the PM2.5 concentration is greater than 20.2 µg/m^3 (AQI 69), and especially when the PM2.5 concentration is 55.5 µg/m^3 (AQI 151) or greater.

Table 3.1
Action Levels for Wildfire Smoke

AQI Categories for PM2.5	PM2.5 (µg/m³)	Levels of Health Concern	Action [1]
0 to 50	0 to 12.0	Good	• Monitor air quality if wildfire smoke is present. • Stop work if employees have symptoms of smoke exposure.[2] All employees have Stop Work authority.
51 to 68	12.1 to 20.1	Moderate	• Monitor air quality. • Stop work if employees have symptoms of smoke exposure.[2] All employees have Stop Work authority. • Implement administrative and engineering controls.
69 to 150	20.2 to 55.4	Unhealthy for Sensitive Groups	• Monitor air quality. • Stop work if employees have symptoms of smoke exposure.[2] All employees have Stop Work authority. • Implement administrative and engineering controls. • Respirator provided for voluntary use; respirator use is strongly encouraged. • Take frequent breaks in an indoor space with filtered air.
151 to 200	55.5 to 150.4	Unhealthy	• Monitor air quality. • Stop work if employees have symptoms of smoke exposure.[2] All employees have Stop Work authority. • Implement administrative and engineering controls. • Respirator provided for voluntary use; respirator use is strongly encouraged. • Provide for frequent breaks—at least once per hour—in an indoor space with filtered air; stop work if an indoor space with filtered air is not available. • Accommodations must have filtered air for multi-day and overnight field events.
201 to 300	150.5 to 250.4	Very Unhealthy	• Monitor air quality. • Stop work if employees have symptoms of smoke exposure.[2] All employees have Stop Work authority. • Implement administrative and engineering controls. • Respirator provided for voluntary use; respirator use is strongly encouraged. • Take breaks at least once per hour in an indoor space with filtered air; stop work if an indoor space with filtered air is not available. • Accommodations must have filtered air for multi-day and overnight field events. • Reduce work hours; limit workday to no more than 8 hours on-site.
301 to 500	250.5 to 500.4	Hazardous	• **Stop work.** • Demobilize to an off-site work location if necessary.

Notes:
(1) Respirators can be worn at lower AQI levels based on personal preference. Respirators are provided at no cost to employees for use during any air quality conditions.
(2) Symptoms of wildfire smoke exposure most often include persistent coughing, difficulty breathing, and aggravation of existing respiratory conditions such as asthma.

3.3.5 Selection of Respirators

Employees can voluntarily use a respirator based on personal preference. Floyd|Snider will provide respirators at no cost to all employees for voluntary use in accordance with WAC 296-842 Safety Standards for Respirators. PPE is the last line of defense and should be considered after engineering and administrative controls are implemented.

The only approved respirator types to be used without fit testing are filtering facepiece respirators (FFRs), also known as N95 dust masks. Per WAC 296-842-10200, FFRs are any tight-fitting, half-facepiece, negative-pressure, particulate air purifying respirator with the facepiece composed mainly of filter material. These respirators do not use cartridges or canisters and may have sealing surfaces composed of rubber, silicone, or other plastic-like materials. Employees may elect to use respirators for other voluntary uses such as to control nuisance odors and may additionally elect to use respirators other than FFRs for protection from wildfire smoke if the respirator provides protection from PM2.5 equivalent to or greater than an FFR. Use of respirators other than FFRs is subject to fit testing requirements in accordance with the manufacturer specifications. Fit testing, if required for the selected respirator, is provided by Floyd|Snider at no cost to employees.

The National Institute for Occupational Safety and Health (NIOSH) of the Centers for Disease Control and Prevention certifies N95 respirators including FFRs. A label or statement of certification by NIOSH should appear on the respirator or respirator packaging. KN95 respirators, which are filtering facepiece respirators manufactured to the Chinese particulate filtration standard equivalent to N95, are approved for respiratory protection by the U.S. Food and Drug Administration and may also be used if an adequate supply of NIOSH-approved respirators is not available.

Any employee who experiences any difficulties while wearing a respirator must immediately inform their supervisor. If an employee requests to wear a respirator other than an FFR, they must contact their supervisor to ensure the respirator is appropriate and properly fitted for the user.

3.3.6 Medical Evaluations

All Floyd|Snider field staff participate in a medical monitoring program and are evaluated biennially. This evaluation includes respiratory clearance and accomplishes the goal of medical clearance for this program on a voluntary use basis per WAC 296-842-11005. Workers with breathing problems such as asthma, COPD, or chronic heart and lung disease should communicate these conditions to their doctor to determine whether it is safe for them to voluntarily wear an FFR or other type of protection at work. Respirators restrict breathing and can put stress on the heart and lungs, which may worsen health symptoms.

3.3.7 Respirator Fit and Seal Check

Proper fit is necessary to get the most protection from a respirator. Fit testing is not required for FFRs, so employees are not required to participate in fit testing; however, fit testing can be provided at employee request. Note that facial hair, piercings, or facial abnormalities may disqualify an employee from using certain types of tight-fitting respirators. Shaving facial hair is recommended, but not required, for voluntary FFR or use. Employees who choose to use a tight-fitting elastomeric respirator (half- or full-face respirators) will require fit testing and additional training, which Floyd|Snider will provide at no cost to employees.

FFRs should fit according to the manufacturer's instructions. Elastic straps, a moldable nosepiece, or adhesive may be used to aid in sealing. A seal check should be performed after fitting the respirator to the face, using the following procedure:

1. Cover the respirator with both hands and exhale. If air leaks where the respirator seals against the face, readjust the respirator and nosepiece and try again. When a proper fit is achieved, the respirator should bulge from the face and not leak around the seal.
2. Cover the respirator with both hands and inhale. If air leaks where the respirator seals against the face, readjust the respirator and nosepiece and try again. When a proper fit is achieved, the respirator should collapse slightly and not leak around the seal.

The following video provides additional demonstration of fitting the respirator to the face and performing a seal check: https://www.youtube.com/watch?v=GmJxzGXeIvo

3.3.8 Respirator Replacement, Maintenance, and Storage

FFRs are disposable and generally designed for single use (i.e., one 8-hour day); however, the total hours of use may vary by manufacturer. Employees will replace respirators according to the manufacturer-recommended schedule, or a minimum of once per work day if not specified. Disposable respirators should also be immediately discarded if, at any time during use, they become damaged, deformed, dirty, or difficult to breathe through. The number of times an FFR is doffed and donned should be limited whenever possible. Respirators other than FFRs will be maintained or replaced (in full or in part, such as in the case of respirators with detachable cartridges) according to the manufacturer specification. Respirators will be given to a specific employee and may not be shared among employees.

Before donning, respirators will be inspected by the user for damage, deterioration, or improper functioning before use. FFRs will also be checked for proper sealing using the seal check procedures described in Section 3.3.7.

Respirators will be stored in a clean, dry, and sealed area in the field room, field vehicle, or a designated clean area on the job site.

3.3.9 Training

Training will be provided to all employees who voluntarily wear respirators. At a minimum, the training will cover the following information:

- Identification of the hazard (i.e., wildfire smoke)
- Floyd|Snider's policy on hazard communication and how to obtain current information regarding the AQI
- Potential health affects as a result of exposure to the hazard
- Employee rights regarding medical treatment for exposures
- Mitigation measures for smoke exposure
- Employer requirements to provide respirators under the L&I emergency rule
- The respirator's capabilities and limitations
- Proper fit, use, and maintenance of respirators

3.3.10 Record Keeping

As per WAC 296-842-11010, voluntary use of respirators does not require record keeping; however, all employees are required to read and sign this APP, and Floyd|Snider will retain a copy of the signature page and any additional relevant training materials.

3.4 BUILDING SECURITY

For security purposes, Union Square is equipped with an access card system. Computerized proximity cards let you enter the building on your own, any time, but prevent unauthorized access to the building.

To help maintain the integrity of this system:

- Do not let others follow you into the building when exiting and entering when entrances to the building are locked.
- Notify Tenant Services of lost access cards.
- Notify the company when transferring ownership of access cards.

General regular building hours are defined as the time between 6:00 a.m. and 6:30 p.m. After-hours are defined as the time between 6:30 p.m. and 6:00 a.m. During this time period, One and Two Union Square are in after-hours mode and will require an after-hours access card for entry into the buildings.

There is a security guard desk in the main lobby where any security-related incidents should be reported. The security guards are also available to escort employees to their vehicles if they are

feeling unsafe for any reason or can provide access to the office (after verifying your employment status by calling a Principal) if you do not have your access card or keys with you.

3.5 VEHICLE SAFETY

Floyd|Snider maintains a company vehicle for use during field work and to attend meetings. Personal vehicles and/or rental vehicles may be used if additional transportation is needed for a specific task. General vehicle safety and Floyd|Snider vehicle-specific procedures when driving for business purposes are described in the following sections.

3.5.1 General Vehicle Safety

Before driving a vehicle, always perform a safety check:

- Walk around and look for damage such as broken reflectors, damaged mirrors, windshield cracks, missing wiper blades, obviously low tire pressure or damage to tires, new dents, or scratches. Report new damage to the Equipment Manager. Do not drive a vehicle with obvious tire damage or an unrepaired windshield crack. Also note collision hazards in the immediate area.
- Check the vehicle emergency kit for the following items: first aid kit, potable water, eye wash, fire extinguisher, Mylar blanket, road flares, and collapsible traffic cones.
- Ensure that all items stored inside the vehicle are secure and will not slide or tumble during transport. Do not drive with unsecured loads.
- Start the vehicle and check that safety systems are working: headlights, turn signals, emergency flashers, headlights, brake lights, and windshield wipers. Check for dashboard warning lights and address any critical safety warnings (low tire pressure, low oil pressure, high engine temperature, antilock brake system, battery) immediately.

When driving a vehicle for business purposes, all traffic laws must be obeyed. Obey speed limits and all posted signs. Minimize distractions and stay aware of your surroundings. In addition to your safety, you are also a representative of the company behind the wheel and should not conduct any behaviors that would put you or Floyd|Snider in a negative light.

The following safety violations will not be tolerated by Floyd|Snider and will cause revocation of your driving privileges for company business purposes (even if they occur after business hours):

- Texting/cell phone use while driving (hands-free device permitted)
- Citations for reckless driving
- Use of alcohol or drugs before or while driving
- Carrying more passengers than available seatbelts

In the event of an accident, call 911 and follow the procedures in Section 4.3. In the event of a breakdown, call roadside assistance if possible in the area where you are located. If roadside assistance is not available, staff may perform basic tasks (such as addressing a flat tire) in order to be able to return to the office safely only if they are trained and feel comfortable to do so. If you are stuck, call your PM to arrange for emergency assistance.

In the event of a multi-day field effort or a late-night finish, all field equipment (high-dollar-value items) must be stored in a locked garage or other locked storage area for the night and should not be left in the vehicle.

3.5.2 Floyd|Snider Vehicle Safety

The Floyd|Snider vehicle is not equipped with 4-wheel drive, so no off-road driving should be attempted. If the project site is especially muddy or has limited access, an appropriate vehicle should be rented. No one other than Floyd|Snider employees (except for emergency personnel in case of emergency or qualified repair personnel) should be allowed to drive the company vehicle. Do not smoke in the company vehicle.

A first aid kit and fire extinguisher will be kept in the vehicle at all times. A checklist of supplies is kept in the vehicle bulkhead vertical file area and inside the door to the field room for reference. Additional safety supplies that are stocked in the vehicle include nitrile and work gloves, hearing protection, safety glasses, and basic decontamination equipment including Alconox solution, distilled water, disinfectant spray/wipes, and paper towels. If you have used these items, please notify the Health and Safety Committee so they can be replenished. The vehicle is also equipped with basic maintenance supplies including a jack, air pump, and spare tire. The gas tank should always be left at least half full before returning the company vehicle to the garage. The vehicle engine has a minimum octane rating and should be filled with premium gasoline.

Report vehicle warning lights immediately to the Equipment Manager or a designated alternate in the event that the Equipment Manager is not available. The Equipment Manager will work with you to determine a plan to safely address the warning light. If you cannot use the field vehicle safely, notify your PM to assist you with arranging an alternate vehicle. Tire pressure warning lights should be addressed immediately using the pump stored in the van or at a service station if a station is readily available—never drive a vehicle with insufficient tire pressure.

The Equipment Manager will be responsible for making sure the following routine maintenance is performed (but please notify them immediately if you notice any other problems):

- Oil changes and periodic routine maintenance per dealer schedule
- Monthly walk-around check (tires, lights, damage, etc.)
- Detailing when needed

3.6 CONTROLLED SUBSTANCE ABUSE

Floyd|Snider has a strong commitment to provide a safe and drug-free workplace for its employees.

Drug or alcohol testing of current employees may be performed where (a) there are reasonable grounds to believe an employee is under the influence of or suspected of consuming alcohol or using marijuana during work hours or using illegal drugs at any time; (b) as a follow-up to a rehabilitative program; or (c) on a random basis when health and safety requirements for clients or projects necessitate testing.

If the alcohol or drug test reveals positive results, the employee may be suspended pending evaluation of the situation by management.

An employee who voluntarily seeks assistance on a timely basis for an alcohol- or drug-related problem, prior to the company identifying the problem, may do so without jeopardizing their employment status, provided the prescribed treatment is followed and work performance is acceptable. In some cases, temporary reassignment may be necessary.

If an employee is undergoing a prescribed medical treatment with a substance that may alter physical or mental capacity, the employee must report this to the Health and Safety Administrator, particularly if they will be conducting field work. The Health and Safety Administrator will coordinate with the Board of Directors, who will determine how to manage the affected employee's work load.

Any manager who observes or receives a report of alcohol or drug use must promptly investigate the allegations in a confidential manner. The Board of Directors should also be notified immediately. Any other employee who observes or has knowledge of a violation, whether by an employee or others, has an obligation to promptly report this to their immediate supervisor. If an employee's immediate supervisor is suspected of violating the company's drug and alcohol policy, the report should be made directly to the Board of Directors.

In any instance where there exists an imminent threat to the safety of persons or property, an employee shall immediately contact a Principal.

4.0 Emergency Procedures

This section defines the emergency procedures for Floyd|Snider. Reasonably foreseeable emergency situations include medical emergencies; accidental release of hazardous materials or hazardous waste; and general emergencies such as vehicle accident, fire, thunderstorm, and earthquake.

A muster point should be designated for all personnel. The Floyd|Snider office emergency muster point is at the Paramount Theatre, on the corner of Pine Street and 9th Avenue. A map of the office evacuation route and a map of the locations of first aid kits, fire extinguishers, and AEDs is posted in all communal office spaces including kitchens and conference rooms, is available on the Floyd|Snider SharePoint home page. On a job site, the SSO should designate a muster point that is clear of adjacent hazards and not located downwind of site activities and communicate this location to the field team each day. In an emergency, all personnel and visitors will evacuate to the muster point for roll call.

It is important that each person understand their role in an emergency and that they remain calm and act efficiently to ensure everyone's safety. Expected actions for potential emergency situations are outlined in the following sections.

4.1 MEDICAL EMERGENCIES

In the event of a medical emergency, the following procedures should be used:

- Stop any imminent hazard if you can safely do so.
- Remove ill, injured, or exposed persons from immediate danger if moving them will clearly not cause them harm and no hazards exist to the rescuers.
- Evacuate other personnel from the immediate vicinity until the ill, injured, or exposed persons have been evacuated and it is safe for work to resume.
- If serious injury or a life-threatening condition exists, call 911 for paramedics, fire department, and police. When in doubt, contact emergency services; do not drive a seriously ill or injured person to the hospital unless emergency services cannot be summoned (for example, if phone service is out or there is not an ambulance that can reach the location).
- Clearly describe the location, injury, and conditions to the dispatcher. Designate a person to go to the site entrance and direct emergency equipment to the injured persons. Provide the responders with information about any chemical hazards that might be present on a job site.
- Trained personnel may provide first aid/CPR if it is necessary and safe to do so. Remove contaminated clothing and PPE only if this can be done without endangering the injured person.

- Once more highly trained personnel (i.e., emergency services) have taken over care of the person experiencing the medical emergency, immediately contact the staff member's designated emergency contact person.
- If you are in the field, notify your PM and HSO/SS.
- If a person experiencing a medical emergency is taken to the hospital, another staff member should accompany whenever possible and remain at the hospital until a designated emergency contact person arrives.
- Immediately implement steps to prevent recurrence of the accident.

4.2 ACCIDENTAL RELEASE OF HAZARDOUS MATERIALS OR WASTES

In the event of a release of a hazardous material or waste:

1. Evacuate all personnel to the designated emergency muster point until it is safe for work to resume.
2. If you are in the field, instruct a designated person to contact the PM or HSO/SS and confirm a response. If a release occurs in the office, the Floor Wardens will contact building security.
3. Contain the spill, if it is a known material, is possible, and can be done safely.
4. If the release is not stopped, contact 911 to alert the fire department.
5. Contact the Washington State Emergency Response Commission at 1 (800) 258-5990 to report the release.
6. Initiate the cleanup process. Cleanup must be performed by professionals trained in cleanup response for the type of material released.
7. Submit a written report to the Washington State Department of Ecology in the event of a reportable release of hazardous materials or wastes.

4.3 OTHER EMERGENCIES AND NATURAL DISASTERS

Vehicle Accident

In the event of an accident:

- Check yourself and your passengers and, if safe to do so, any other persons involved in the accident for serious injuries. If anyone is seriously injured, call 911 and wait for emergency personnel.
- If the vehicle can be moved, move to the shoulder or side of the road out of the way of traffic before calling 911. Do not leave the scene of the accident, and avoid engaging in conversation with other persons involved, aside from confirming injury status.
- If the vehicle cannot be moved, get yourself and your passengers to safety if possible. If the vehicle is disabled in a place with fast moving traffic (such as a multi-lane freeway), it may be safest to wait in the vehicle. Use your best judgment.

- If you are able to move the vehicle to the shoulder, use road flares (located in the vehicle emergency kit) to warn oncoming drivers.
- Wait for police to arrive and fill out an accident report.
- Call your PM or HSO/SS to report the accident. In the case of a minor accident, the PM or HSO/SS will consult with the Equipment Manager to determine whether the vehicle should be driven back to the office or towed to a repair facility. Contact roadside assistance if towing is needed.

Fire

During the incipient phase of a fire, the available fire extinguisher may be used by persons trained in putting out fires, if it is safe for them to do so.

If a fire is identified in the office building (either by smell or by the fire alarm), walk to the nearest emergency exit and walk down the stairs (do not use the elevator). Walk to the emergency muster point. Use common sense during a fire to avoid injury if areas are inaccessible.

In the case of a fire in a job site, work shall be halted and all onsite personnel will be immediately evacuated to the emergency muster point, if the fire cannot be extinguished. The local police/fire department shall be notified if the emergency poses a continuing hazard by calling 911.

Thunderstorm

A thunderstorm may present danger of lightning strike any time that visible lightning or audible thunder are present.

In the event of a thunderstorm, seek shelter inside a building if possible. Avoid concrete walls and floors, corded phones, and puddles. When a thunderstorm is accompanied by high winds, also avoid windows. If sheltering in a building is not possible, shelter inside your vehicle, and avoid direct contact with any metal objects in contact with the frame of the vehicle.

Do not resume work activities outdoors until at least 30 minutes have elapsed since the last thunder or lightning was observed.

Earthquake

If you are inside a building during an earthquake, the area near the exterior wall of a building is the most dangerous place to be. Windows, facades, and architectural details are often the first parts of the building to collapse. To stay away from this danger zone, stay inside if you are inside and outside if you are outside. In a high-rise: drop, cover, and hold on. Face away from windows and other hazards. Do not use elevators. Do not be surprised if sprinkler systems or fire alarms activate. Once the earthquake is over, be alert for aftershocks that might occur, follow instructions of your Floor Warden or building security, take your emergency kit or emergency supplies, proceed to the emergency exit, and walk down the stairs. Walk to the emergency

muster point. The above are general guidelines and are not meant to apply to every situation, so please use common sense during an earthquake to avoid injury. Additional office safety precautions for earthquakes are posted in the Production Room of the Floyd|Snider office and posted to the Health and Safety department page on SharePoint.

If you are on a jobsite when an earthquake occurs, move away from buildings, overhead power lines, and any other structures that may collapse. Get down low and stay down until the shaking stops to avoid injury. If you are in a moving vehicle, stop as quickly and safely as possible. Move to the shoulder or curb, away from utility poles, overhead wires, and under- or overpasses. Stay in the car and set the parking brake. Turn on the radio for emergency broadcast information. A vehicle may jiggle violently on its springs, but it is a good place to stay until the shaking stops. If a power line falls on the vehicle, stay inside until a trained person removes the wire. After the shaking stops, take your emergency supplies and proceed to the emergency muster point if it is safe to do so. Call your PM or HSO/SS when it is safe to do so.

4.4 EMERGENCY COMMUNICATIONS

Emergencies at Union Square will be communicated by building security using the public address system. If an emergency announcement is made, pause what you are doing and listen to the entire message. Emergencies involving the Floyd|Snider office only may be communicated over the office telephone system.

In the case of a job site emergency, signals may vary by site and should be discussed at daily tailgate meetings so all personnel on-site are aware of the site-specific signals and alarms. In general, horns (vehicle or airhorns) are used as needed to signal the emergency. One long (5-second) blast will be given as the emergency/stop work signal. If horns are not working, waving of arms is typically used to signal an emergency. In any emergency, all personnel will evacuate to the designated muster point and await further instruction.

After an emergency is resolved, the involved personnel or management will meet and debrief on the incident—the purpose is not to fix blame, but to improve the planning and response to future emergencies. The debriefing will review the sequence of events, what was done well, and what can be improved. The debriefing will be documented in a written format and filed by the Health and Safety Administrator.

4.5 EMERGENCY EQUIPMENT

The following minimum emergency equipment will be readily available in the office and at all job sites and functional at all times:

- First Aid Kit: Contents approved by the HSO/SS, including two blood-borne pathogen barriers. First aid kits are located in the company vehicle; a personal vehicle kit is located in the field room and should be used when field staff drive personal or rental vehicles; and in the office, first aid kits are located at each fire extinguisher location in the north hall, west hall, main kitchen, and large conference room. The location of

first aid kits and fire extinguishers will also be posted on maps kept in communal office spaces (kitchens and conference rooms).

- Portable fire extinguishers are included in the field first aid/safety kits and are also located in the office in the north hall, west hall, main kitchen south entrance, and Cedar Conference room.
- A copy of the HASP if on a job site.
- A binder of Safety Data Sheets (SDSs) for commonly encountered chemicals and all potential contaminants of concern that may be present on a job site. This binder is kept in the document organizer compartment of the company vehicle and an additional copy is kept in the field room.

4.6 INCLEMENT WEATHER

Occasionally, there are weather conditions, like snow, that make travel difficult. If the Seattle Public Schools are closed for the day due to hazardous road conditions, then the office will also be closed out of concern for your safety. Any field work scheduled during an office closure due to inclement weather should also be postponed.

4.7 CATASTROPHIC EVENTS

Floyd|Snider has formed an Emergency Planning Committee to develop preparation, communication, and safety plans to implement if a catastrophic event occurs. A catastrophic event is an event that disrupts or destroys critical infrastructure, such as a large-scale earthquake or other natural disaster.

Emergency Kits

Each staff member is provided one emergency kit backpack in case of emergencies that disrupt transportation or utilities. These backpacks include a map with critical structures, contact list and work plan, 32-ounce water bottle (to be filled and replaced every 6 months by the employee), additional 14-ounce water bottle and Platypus water container, water purification tablets, food bars, magnesium firestarter and matches, a multi-purpose tool, an LED flashlight and extra batteries, an emergency radio, an emergency (heat reflective) blanket, rags, nylon rope, a tarp and trash bags, duct tape, hand cleanser, Super Glue, and a hiker's first aid kit. Employees should provide their own raingear, extra socks, walking/hiking shoes, family plan, sunscreen, and 3-day supply of critical medicines. Not all packs are exactly the same, but all should include the items listed above. The Emergency Planning Committee will send regular reminders to check emergency kits and replace expired items.

Staff members should keep their emergency contact card up to date, listing phone numbers for whom to contact if they are unable to make calls themselves. Emergency contact cards should be kept in the front pocket of the backpack, where they can be easily located by others.

Staff should familiarize themselves with the contents of the emergency backpack to make sure all necessary items are included and that they are operational. The Emergency Planning Committee will remind staff every 6 months to check and update backpack contents (replace water in water containers, check the expiration date on the nutrient bars, update contact list if it is not current, etc.). Staff are responsible for keeping the employee contact list updated and having a sensible pair of shoes available in the office.

WhatsApp Emergency Contact Group

The purpose of our WhatsApp group is for group coordination needs during periods of emergency. It will be an easy way for management to communicate next steps back to the entire group, such as the status of the office/IT and expected timelines for returning to work. It also serves as an additional way to check in and communicate that staff and family are safe. Remember, immediately after an emergency, the initial call to check in with Jessi should still be made. Join the Floyd|Snider group on WhatsApp:

1. Download the WhatsApp app on to your phone and setup your account
2. Join the "F|S Emergency Contact" group by following the instructions on the Health & Safety Department site: https://floydsnider.sharepoint.com/Dept/Safety/SitePages/Emergencies.aspx#emergency-coordination-whatsapp

At the 6-month check-in time for backpack contents, employees should also confirm that they are still connected and included in the WhatsApp group. If an employee has been removed from the group (which can occur during software updates, etc.), the employee should notify the Emergency Planning Committee to have the group invitation resent so they can rejoin the group.

What to Do if You Are in the Office When a Disaster Occurs

If you are in the office when an emergency occurs, first and foremost is to remain safe. Wait until the building gives instructions over the PA system, then take your emergency kit and exit the building safely and quickly to meet at the Floyd|Snider muster point at the Paramount Theatre, on the corner of Pine Street and 9th Avenue. Once you have checked in with other Floyd|Snider staff there, you should find your way home safely to check on family and property. Jessi Massingale has been identified as the Disaster Contact. One person from the muster point will contact Jessi once all employees have been safely evacuated. Floyd|Snider will use the WhatsApp group to communicate next steps, as well as email (if available). WhatsApp is described in more detail above.

What to Do if You Are Not in the Office When a Disaster Occurs

If you are not in the office when an emergency occurs, the first thing to do after ensuring your safety and the safety of your family and property, is to text Jessi or Matt Massingale in Bend, Oregon. Report that you are okay and await further instructions. Other management team

members can also be contacted if needed. Floyd|Snider will use the WhatsApp group to communicate next steps, as well as email (if available).

In Emergency, Text Jessi/Matt in Bend		
Jessi	206.683.4307 (cell)	
Matt	206.255.2799 (cell)	541.241.6255 (work)
Management Team Numbers		
Allison	206.722.2460 (cell)	206.842.4484 (home)
Kate	206.375.0762 (cell)	206.781.7682 (home)
Tiffany	206.779.2806 (cell)	

Building Access

Depending on the severity of the disaster, Union Square may be closed for inspection, bus routes may be disrupted, and cell phone service may be limited. The nature and likely duration of the emergency aftermath will affect decision-making around working at the office during this time. Floyd|Snider will send out communications via WhatsApp and/or email with information on when to resume work and when it is safe to return to the office.

5.0 Hazard Awareness and Mitigation

In general, there are three broad hazard categories that may be encountered on the job: chemical exposure hazards, fire and explosion hazards, and physical hazards. Sections 5.1 through 5.3 discuss the specific hazards that fall within each of these broad categories and ways to mitigate these hazards.

Additional hazard analysis for specific chemicals present or tasks to be performed at a job site should be detailed in the HASP for the site.

5.1 CHEMICAL EXPOSURE HAZARDS

Potential toxic effects can occur from significant acute or chronic exposure to hazardous chemicals.

Hazardous products used in the office or on the job site should be sealed and stored in places where they cannot be easily spilled. Always follow manufacturer instructions for storage and use of hazardous chemicals. Discard chemicals no longer in use in accordance with manufacturer's instructions, and discard chemicals if containers are damaged, corroded, or otherwise leaking. Consider nontoxic alternatives to cleaning and other products when possible. Consider use of gloves or eye protection when handling or using chemicals with the potential to irritate eyes or skin if contacted.

On contaminated sites and on work sites where hazardous chemicals are used, chemical exposure hazards, monitoring procedures, and decontamination procedures should be detailed in the site HASP.

5.2 FIRE AND EXPLOSION HAZARDS

When storage of material posing a fire and explosion hazards is necessary, such material will be stored in containers approved by the Washington State Department of Transportation in a location not exposed to strike hazards and provided with secondary containment. A minimum 2A:20B fire extinguisher will be located within 25 feet of the storage location and where refueling occurs. Any subcontractors bringing flammable and combustible liquid hazards to a job site are responsible for providing appropriate material for containment and spill response, which should be addressed in their respective HASP, Job Hazard Analysis (JHA), or Job Safety Analysis (JSA). Transferring of flammable liquids (e.g., gasoline) will occur in areas with containment to capture any spillage, and only after making positive metal-to-metal connection between the containers, which may be achieved by using a bonding strap. Storage of ignition and combustible materials will be kept away from fueling operations.

5.3 PHYSICAL HAZARDS

When working in or around any hazardous or potentially hazardous substances or situations, all personnel should plan all activities before starting any task. Personnel shall identify health and

safety hazards involved with the work planned. If you have concerns or uncertainty about the safety of a given task, always consult with your PM or, if in the field, with your HSO/SS to determine how the task can be performed in the safest manner.

All field personnel will adhere to general safety rules including wearing appropriate PPE—hard hats, steel-toed boots, high-visibility vests, safety glasses, gloves, and hearing protection, as appropriate. Eating, drinking, and/or use of tobacco or cosmetics will be restricted in all work areas. Personnel will prevent splashing of liquids containing chemicals and minimize dust emissions.

The following table summarizes a variety of physical hazards that may be encountered during work activities. For convenience, these hazards have been categorized into several general groupings with recommended preventative measures.

Hazard	Cause	Prevention
Head strike	Falling and/or sharp objects, bumping hazards	Hard hats will be worn by all personnel at all times when overhead hazards exist.
Foot/ankle twist, crush, slip/trip/fall	Sharp objects, dropped objects, uneven and/or slippery surfaces	Steel-toed boots must be worn at all times on site while heavy equipment is present. Pay attention to footing on uneven or wet terrain and do not run. Keep work areas organized and free from unmarked trip hazards.
Hand cuts, splinters, and chemical contact	Hands or fingers pinched or crushed; chemical hazards; cut or splinters from handling sharp/rough objects and tools	Nitrile safety gloves will be worn to protect the hands from dust and chemicals. Leather or cotton outer gloves will be used when handling sharp-edged rough materials or equipment. Refer to preventive measures for mechanical hazards below.
Eye damage from flying materials, or splash hazards	Sharp objects, poor lighting, exposure due to flying debris or splashes	Safety glasses will be worn at all times on a job site. If a pressure washer is used to decontaminate heavy equipment, a face shield will be worn over safety glasses or goggles. Care will be taken during decontamination procedures to avoid splashing or dropping equipment into decontamination water.

Hazard	Cause	Prevention
Electrical hazards	Electrical cord hazards	Make sure that no damage to extension cords occurs. If an extension cord is used, make sure it is the proper size for the load that is being served and rated SJOW or STOW (an "-A" extension is acceptable for either) and inspected prior to use for defects. The plug connection on each end should be of good integrity. Insulation must be intact and extend to the plugs at either end of the cord. All portable power tools will be inspected for defects before use and must be either double-insulated or grounded with a ground-fault circuit interrupter.
Mechanical hazards	Heavy equipment such as drilling machine	Ensure the use of competent operators, backup alarms, "kill" switches, regular maintenance, daily mechanical checks on all hoses and cables, and proper guards. Verify that "whip checks" or similar securing devices are installed on "quick-connections," where the failure of high-pressure connections could lead to the whipping of hoses. Discuss the need for plastic sheeting or other methods to contain drips (hydraulic oil, motor oil, etc.) to determine if measures are needed to prevent releases to the ground. Subcontractors will supply their own JHA, HASP, or JSA. All personnel will make eye contact with operator and obtain a clear OK before approaching or working within a hazardous radius of the heavy equipment.
Noise damage to hearing	Machinery creating more than 85 decibels time-weighted average, less than 115 decibels continuous noise, or peak at less than 140 decibels	Wear earplugs or protective ear covers when a conversational level of speech is difficult to hear at a distance of 3 feet or if an employee must shout to be heard by nearby coworkers; when in doubt, a sound level meter may be used on site to document noise exposure.

Hazard	Cause	Prevention
Strains from improper lifting	Injury due to improper lifting techniques, overreaching/ overextending, lifting overly heavy objects	Use proper lifting techniques and mechanical devices where appropriate. The proper lifting procedure first involves testing the weight of the load by tipping it. If in doubt, ask for help. Do not attempt to lift a heavy load alone. Take a good stance and plant your feet firmly with legs apart, one foot farther back than the other. Make sure you stand on a level area with no slick spots or loose gravel. Use as much of your hands as possible, not just your fingers. Keep your back straight, almost vertical. Bend at the hips, holding load close to your body. Keep the weight of your body over your feet for good balance. Use large leg muscles to lift. Push up with one foot positioned in the rear as you start to lift. Avoid quick, jerky movements and twisting motions. Turn the forward foot and point it in the direction of the eventual movement. Never try to lift more than you are accustomed to lifting.
Traffic hazards	Vehicle traffic and hazards when working near active operations	When working in or near the right-of-way, orange cones and/or flagging will be placed around the work area. Safety vests will be worn at all times while conducting work in or near the right-of-way. Multiple staff will work together (buddy system) and spot traffic for each other. Avoid working with your back to traffic whenever possible.
Cold stress	Cold temperatures and related exposure	Workers will ensure appropriate clothing, stay dry, and take breaks in a heated environment when working in cold temperatures. Further detail on cold stress is provided in Section 5.3.1.
Heat exposure	High temperatures exacerbated by PPE, dehydration	Workers will ensure adequate hydration, shade, and breaks when temperatures are elevated. Further detail on heat stress is provided in Section 5.3.2.
Accidents due to inadequate lighting	Improper illumination	Work will proceed during daylight hours only or under sufficient artificial light.
Drowning hazards	Work in or near water	Wear a personal flotation device at all times when working in or near water. Be aware of surroundings including head strike and trip hazards that could cause a fall into water.

Hazard	Cause	Prevention
Slip, trip, and fall hazards	Working in vegetated areas, areas with uneven ground surface, or areas with obstructions	Watch your step when walking and minimize distractions. Establish a path free of obstructions before mobilizing equipment.

5.3.1 Cold Stress

Exposure to moderate levels of cold can cause the body's internal temperature to drop to a dangerously low level, causing hypothermia. Symptoms of hypothermia include slow, slurred speech, mental confusion, forgetfulness, memory lapses, lack of coordination, and drowsiness.

To prevent hypothermia, stay dry and avoid exposure. On a job site, personnel will have access to a warm, dry area, such as a vehicle, to take breaks from the cold weather and warm up. Site personnel will be encouraged to wear sufficient clothing in layers such that outer clothing is wind- and waterproof and inner layers retain warmth (wool or polypropylene), if applicable. Site personnel will keep hands and feet well protected at all times. The signs and symptoms and treatment for hypothermia are summarized below.

Signs and Symptoms

- Mild hypothermia (body temperature of 98–90 degrees Fahrenheit [°F])
  - Shivering
  - Lack of coordination, stumbling, fumbling hands
  - Slurred speech
  - Memory loss
  - Pale, purplish gray, or dusky and cold skin
- Moderate hypothermia (body temperature of 90–86 °F)
  - Shivering stops
  - Unable to walk or stand
  - Confused and irrational
- Severe hypothermia (body temperature of 86–78 °F)
  - Severe muscle stiffness
  - Very sleepy or unconscious
  - Ice cold skin
  - Death

Treatment of Hypothermia—Proper Treatment Depends on the Severity of the Hypothermia

- Mild hypothermia
  - Move to warm area.
  - Stay active.
  - Remove wet clothes, replace with dry clothes or blankets, and cover the head.
  - Drink warm (not hot) sugary drinks.
- Moderate hypothermia
  - All of the above, plus:
    - Call 911 for an ambulance.
    - Cover all extremities completely.
    - Place very warm objects such as hot packs or water bottles on the victim's head, neck, chest, and groin.
- Severe hypothermia
  - Call 911 for an ambulance.
  - Treat the victim very gently.
  - Do not attempt to re-warm—the victim should receive treatment in a hospital.

Frostbite

Frostbite occurs when the skin actually freezes and loses water. In severe cases, amputation of the frostbitten area may be required. Although frostbite usually occurs when the temperatures are 30 °F or lower, wind chill factors can allow frostbite to occur in above-freezing temperatures. Frostbite typically affects the extremities, particularly the feet and hands. Frostbite symptoms include cold, tingling, stinging, or aching feeling in the frostbitten area followed by numbness and skin discoloration: Paler skin may change from red to purple, then to white or very pale, and darker skin may become more pale, dusky, or purplish. Frostbitten skin will be waxy and firm while still frozen and may redden, swell, or blister when thawed. Should any of these symptoms be observed, wrap the area in soft cloth, do not rub the affected area, and seek medical assistance. Call 911 if the condition is severe.

Protective Clothing

Wearing the right clothing is the most important way to avoid cold stress. The type of fabric also makes a difference. Cotton loses its insulation value when it becomes wet. Wool, on the other hand, retains its insulation even when wet. The following are recommendations for working in cold environments:

- Wear at least three layers of clothing.
  - An outer layer to break the wind and allow some ventilation (like Gortex or nylon)

  - A middle layer of down or wool to absorb sweat and provide insulation even when wet
  - An inner layer of cotton or synthetic weave to allow ventilation
- Wear a hat—up to 40 percent of body heat can be lost when the head is left exposed.
- Wear insulated boots or other footwear.
- Keep a change of dry clothing available in case work clothes become wet.
- Do not wear tight clothing—loose clothing allows better ventilation.

Work Practices

- Drinking—Drink plenty of liquids, avoiding caffeine and alcohol. It is easy to become dehydrated in cold weather.
- Work Schedule—If possible, heavy work should be scheduled during the warmer parts of the day. Take breaks out of the cold in heated vehicles.
- Buddy System—Work in pairs to keep an eye on each other and watch for signs of cold stress.

5.3.2 Heat Stress

To avoid heat-related illness, current regulations in WAC 296-62-095 through 296-62-09570 will be followed during all outdoor work activities. These regulations apply to any outdoor work environment from May 1 through September 30 when workers are exposed to temperatures greater than 89 °F when wearing breathable clothing, greater than 77 °F when wearing double-layered woven clothing (such as jackets or coveralls), or greater than 52 °F when wearing non-breathing clothing such as chemical resistant suits or Tyvek. Floyd|Snider will identify and evaluate temperature, humidity, and other environmental factors associated with heat-related illness including, but not limited to, the provision of rest breaks that are adjusted for environmental factors and encourage frequent consumption of drinking water. Drinking water will be provided and made readily accessible in sufficient quantity to provide at least 1 quart per employee per hour. All Floyd|Snider personnel performing outdoor work will be informed and trained for responding to signs or symptoms of possible heat-related illness and accessing medical aid.

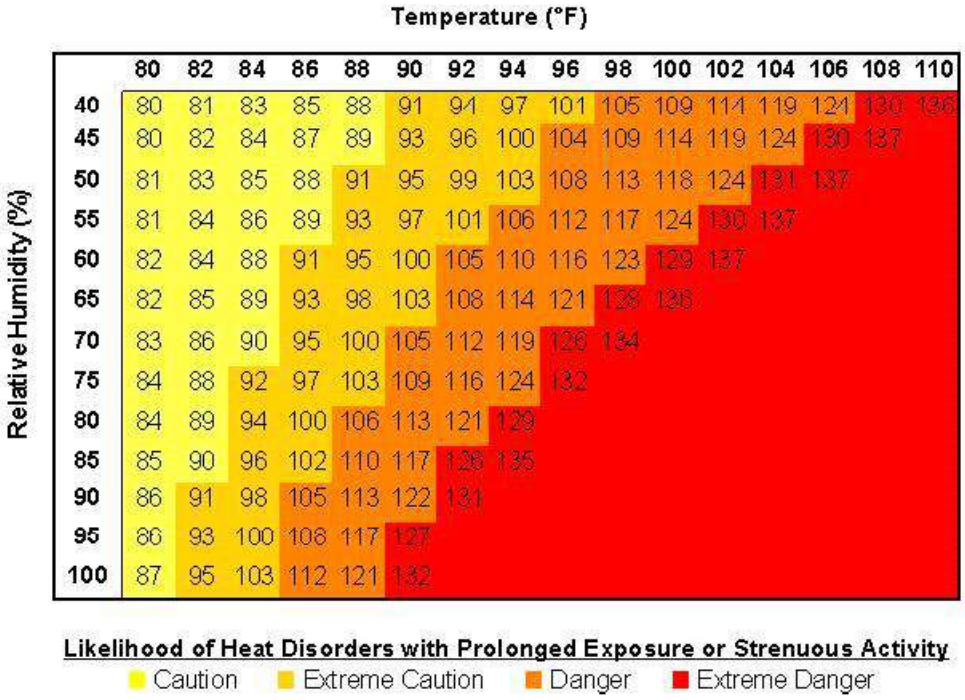
Employees showing signs or demonstrating symptoms of heat-related illness must be relieved from duty and provided with a sufficient means to reduce body temperature, including rest areas or temperature-controlled environments (i.e., air conditioned vehicle). Any employee showing signs or demonstrating symptoms of heat-related illness must be carefully evaluated to determine whether it is appropriate to return to work or whether medical attention is necessary.

Any incidence of heat-related illness must be immediately reported to the employer directly through the HSO/SS.

The signs, symptoms, and treatment of heat stress include the following:

Condition	Signs/Symptoms	Treatment
Heat cramps	Painful muscle spasms and heavy sweating	Increase water intake, rest in shade/cool environment.
Heat syncope	Brief fainting and blurred vision	Increase water intake, rest in shade/cool environment.
Dehydration	Fatigue, reduced movement, headaches	Increase water intake, rest in shade/cool environment.
Heat exhaustion	Pale and/or clammy skin, possible fainting, weakness, fatigue, nausea, dizziness, heaving sweating, blurred vision, body temperature slightly elevated	Lie down in cool environment, water intake, loosen clothing, and call 911 for ambulance transport if symptoms continue once in cool environment.
Heat stroke	Cessation of sweating, skin hot and dry, red or flushed face, high body temp, unconsciousness, collapse, convulsions, confusion or erratic behavior; life-threatening condition	**Medical Emergency!! Call 911** for ambulance transport. Move victim to shade and immerse in water.

If site temperatures are forecast to exceed 85 °F and physically demanding site work will occur in impermeable clothing, the HSO/SS will promptly consult with a certified industrial hygienist and a radial pulse monitoring method will be implemented to ensure that heat stress is properly managed among the affected workers. The following heat index chart indicates the relative risk of heat stress.



5.3.3 Allergies and Biohazards

Allergens capable of triggering a severe reaction may be present in the office environment or the job site. Outdoor work presents additional biohazards such as bees and other insects and wildlife.

Staff with severe allergies should make these allergies known to Floyd|Snider and maintain appropriate preventative medications (EpiPen, Benadryl, etc.) as directed by their physician in a location that can be easily accessed in case of emergency. The locations of these medications should be shared with the Floor Wardens, along with instructions for delivery if needed.

In the field, persons with allergies to bees or other insects will make the HSO/SS aware of their allergies and will avoid areas where bees/insects are identified. Controls such as repellents, hoods, nettings, masks, or other personal protection may be used. Report any insect bites or stings to the HSO/SS and seek first aid, if necessary. Especially when working during the summer months, staff should monitor the work area for evidence of insect nests of stinging insects. A nest may be nearby if multiple flying insects are observed in the area, or if flying insects appear to be entering and leaving the same locations. Nests may be buried underground, located in vegetated areas, or in structures such as well monuments, vaults, and buildings.

Inspect the work area for hazardous plants, medical waste (syringes and similar items), and indications of hazardous organisms, and avoid such areas if possible. On job sites, personnel will maintain a safe distance from any urban wildlife encountered, including stray dogs, raccoons, and rodents, to preclude a bite from a sick or injured animal.

A severe allergic reaction, or anaphylaxis, is a rapid immune response that may be fatal if untreated. Persons experiencing anaphylaxis require medical care beyond preventative medication or first aid. The signs of anaphylaxis may include the following:

- Extensive skin rashes, itching, or hives
- Swelling of the lips, tongue, or throat
- Shortness of breath, trouble breathing, or wheezing
- Dizziness and/or fainting
- Stomach pain, bloating, vomiting, or diarrhea
- Uterine cramps
- Feelings of panic or dread

5.3.4 Fatigue

Worker fatigue can impair judgment and increase the risk of injuries on the job site. Fatigue may be caused by physical exertion from difficult tasks, extended working hours, and environmental challenges, including exposure and extreme weather. Fatigue can be caused by working extended hours for a duration of 1 week or more (including overtime work, consecutive long shifts, and extended work weeks) or by extremely physically and mentally demanding work of any duration. Tasks should be assessed individually for risk of fatigue. Variable weather conditions (high and

low temperatures, sustained strong winds) can place additional physical and mental strain on field personnel.

5.3.4.1 Fatigue Symptoms and Self-Monitoring

Signs and symptoms of fatigue may present similarly to inebriation and can include:

- Reduced fine motor skills and coordination (e.g., tripping or dropping items)
- Impaired concentration
- Poor communication
- Poor judgment
- Mood swings or irritation

The above are typical symptoms of fatigue, but individuals can also experience or present fatigue in other ways that may be less obvious to an observer. The HSO/SS should additionally check in with staff members to ensure they are not experiencing any symptoms of fatigue that may impair their judgment or coordination in the field.

5.3.4.2 Managing Fatigue

Fatigue should be managed by limiting working hours and implementing rest days. Signs and symptoms of fatigue and fatigue management should be discussed, when applicable, at the daily tailgate and debrief meetings.

Potential actions to minimize fatigue include the following:

- Plan to get 7 to 9 hours of sleep each night
- Take a lunch break inside, or out of the weather
- Take snack and hydration breaks throughout the day
- Take a late start, half-day, or rest day during the field event

5.3.4.3 Fatigue Response Actions

In job situations where fatigue is likely, the HSO/SS should monitor employee fatigue using the following guide.

If the answer is yes to any of the following questions, the HSO/SS should consider implementing a shortened work day, light duty, or a day off for the affected employee.

- Do environmental factors pose an additional fatigue load (e.g., exposure to extreme hot/cold weather or wind)?
- Has the team member exhibited signs of fatigue?
- Has the team member worked on a physically intense task?

- Has the team member worked through the day without taking regular breaks to eat, stay hydrated, and rest?
- Has the team member had less than 6 hours of sleep in the past 24 hours?
- Did the team member work more than 12.5 hours in the past day?

If the answer is yes to either of the following questions, the HSO/SS will implement a day off for the affected employee.

- Did the team member work more than 75-80 hours in the past week?
- By the end of the shift, has the team member been awake for more than 17 hours?

Employees should also self-monitor for signs of fatigue and immediately report to the HSO/SS if fatigue becomes a concern.

If fatigue becomes a team-wide safety issue on the job site, the HSO/SS should coordinate with the PM to determine the actions that will be taken at the project level to manage fatigue. Actions may include adding team members, changing work practices, and/or adjusting the work schedule.

6.0 Job Site Controls

This section describes the best practices to be implement on a field job site to protect personnel and the environment. These best practices are considered the minimum controls for any job site, and additional site-specific protocols should be detailed in the site-specific HASP.

- All site work should be completed in teams when possible. Teams should establish a primary means of communication on-site and with offsite contacts (generally via cell phones or radios on-site). An agreed-upon system of alerting via air horns and/or vehicle horns may be used around heavy equipment to signal an emergency if shouting is ineffective.
- Work area perimeter controls should be established to ensure that members of the public do not enter the work area and limit the potential for chemical exposure associated with site activities when hazardous materials may be present. These work areas include a support zone, a contaminant reduction zone (decontamination area), and an exclusion zone.
- Staff will take precautions to prevent contamination:
    - Inspect all PPE prior to entering the exclusion zone.
    - Avoid walking through puddles or areas of known or obvious surface soil contamination.
    - Do not carry unnecessary items into the exclusion zone.
    - Take care to limit contact with heavy equipment and vehicles.
    - Protect the ground surface when processing samples and wipe down or sweep surfaces frequently to minimize the amount of potential contaminated material that may be spread during site work.
- Staff will decontaminate all equipment and gear as necessary during field events. Decontamination procedures will be strictly followed to prevent offsite spread of contaminated materials. Decontamination procedures should be detailed in the site-specific HASP but at a minimum will include cleaning equipment to a visually debris-free surface. The HSO/SS will assess the effectiveness of decontamination procedures by visual inspection.
- Hands must be thoroughly washed before leaving the Site to eat, drink, or use tobacco or cosmetics.
- Visual monitoring for fugitive dust and soil track-out by vehicles leaving the job site should be conducted by the HSO/SS or a dedicated member of the field staff. If visible dust leaving the work area or track-out are observed, immediate action should be taken to correct the issue.
- The HSO/SS will ensure the proper collection, packaging, and identification of waste materials so that waste materials will be properly disposed of.

7.0 Training Requirements

All Floyd|Snider field personnel must comply with applicable regulations specified in WAC Chapter 296-843, Hazardous Waste Operations, and WISHA (WAC Chapter 296-800). WISHA states that personnel who may come into contact with hazardous materials must have current HAZWOPER certification and participate in an employer-sponsored medical monitoring program. Therefore, these sections apply to any employee at Floyd|Snider who performs work where they have the potential to come in to contact with hazardous or dangerous substances. Additionally, when doing site work, at least one person on-site must be trained in CPR/First Aid. In order to maintain compliance with the regulation, **employees whose medical clearance or HAZWOPER certification are expired may not conduct field work unless their medical examination or refresher course is scheduled to occur within 30 days of their previous certification expiration date.**

7.1 MEDICAL MONITORING

In accordance with state medical surveillance regulations, field staff employees must participate in the medical monitoring program, which benefits both the employees and Floyd|Snider by evaluating the overall health of each individual in connection with the work to be performed, as well as monitoring workplace health and safety initiatives. Employees who will be working on-site are required to participate in a baseline examination and biennial examinations, as well as completion of an exit exam should an employee no longer conduct onsite work requiring medical monitoring.

The purpose of the Floyd|Snider examination program is to:

- Provide a baseline of health information for an employee, which can be used for comparison in related future examinations;
- Detect any adverse health effect that might be a result of workplace exposures;
- Detect any underlying medical condition that may place an employee at higher risk for medical problems related to workplace activities; and
- Ensure that an employee is able to function safely while performing their essential job functions at Floyd|Snider.

When an employee is no longer participating in fieldwork and wishes to unenroll from the Floyd|Snider medical monitoring program, the employee should contact the Health and Safety Administrator for approval and to begin the medical monitoring program exit process described in Section 7.5.

7.2 HAZWOPER TRAINING

HAZWOPER training and certification are required for all staff on-site at sites regulated by the Model Toxics Control Act (MTCA) or the USEPA more than 30 days per year. This training typically

includes an initial 40-hour HAZWOPER certification and annual 8-hour refresher courses. Field staff who have the potential to contact contaminated materials must have 40-hour HAZWOPER certification and attend annual 8-hour refresher courses. HAZWOPER certification may also be necessary on a project-specific basis for PMs who are not active in the field safety training and medical monitoring program. Field staff who do not have the potential to contact contaminated material, and are not in a supervisory field role, may require fewer hours of HAZWOPER training, to be determined on a case-by-case basis. These employees will also be required to attend annual 8-hour refresher courses.

7.3 JOB-SPECIFIC TRAINING

In addition to the 40-hour classroom training required by HAZWOPER, all field staff must complete 24 hours of job-specific training. This training is conducted on-site in the field under direct supervision of a skilled supervisor who is another Floyd|Snider employee. These training hours can occur on one or multiple field events and can cover an array of standard field activities. Once the 24-hours of training is complete, job-specific training forms (available on Floyd|Snider's Health and Safety department page on SharePoint) must be completed and signed by the trainer and submitted to the Health and Safety Administrator.

Additional site-specific training should be conducted to cover onsite hazards; PPE requirements, use, and limitations; decontamination procedures; and emergency response information as outlined in the HASP for the site.

7.4 CPR/FIRST AID

When conducting field work, at least one person on-site must be trained in CPR/First Aid, with a current certification. All employees who are on-site at MTCA- or USEPA-regulated sites more than 30 days per year are required to have current CPR/First Aid certification. This training is also provided by the company to any interested employees, including those who do not do field work.

7.5 EXITING THE FIELD STAFF SAFETY TRAINING AND MEDICAL MONITORING PROGRAM

This section presents the protocols to be followed in the event that an employee must exit the field staff safety training and medical monitoring program due to termination of their employment or transition to a different role at Floyd|Snider.

7.5.1 Termination of Employment

Washington's medical surveillance regulations require Floyd|Snider to schedule an exit exam for an employee upon termination of employment. Upon termination, employees will be notified of the appointment date and time and will be given information to reschedule the appointment if needed. The exit exam will be provided at Floyd|Snider's sole expense, and it is strongly recommended, in the best interest of your health, that you attend the appointment.

Floyd|Snider reserves the right to withhold payment of any severance package offered until confirmation of the exam is received.

7.5.2 Transition of Role

Floyd|Snider is a company of versatile employees with technical expertise who collaborate effectively to meet client and project needs; because of this collaborative approach, we do not employ full-time field technicians who exclusively fill a sampling role. Therefore, to ensure that client needs are met even during our busiest times and spread workload equitably across the firm, it is essential that all staff involved in field data collection, including in a supervisory capacity, maintain current field safety certification and medical clearance.

However, under certain limited circumstances, an employee may transition roles at the company such that field certifications are no longer needed. An employee who wishes to exit the field staff safety training and medical monitoring program must:

- Document that employee has performed fewer than 30 partial or full days of field work for each of the past 2 calendar years; and
- Obtain approval from the Management Committee, by coordinating with the Health and Safety Administrator.

If an employee's exit from the program is approved, the employee is required by WISHA to complete a medical monitoring exit exam. Failure to complete an exit exam may result in withholding any bonus pay and a delay in annual pay increases.

A letter to document the date and reason for an employee's rationale for terminating participation in the field staff safety training and medical monitoring program, signed by the employee and a Principal, must be maintained in the employee's personnel file.

8.0 Record Keeping and Reporting

Prompt and accurate recording and reporting is essential for continuing to improve the Floyd|Snider health and safety program and comply with the safety regulations.

8.1 RECORD KEEPING

Records should be kept of all employee training, safety meetings including Health and Safety Committee meetings and daily tailgate safety meetings conducted in the field, and near misses and incidents. Forms for on-the-job employee training, daily tailgate safety meetings, and near misses and incidents are available on the company's Health and Safety department page on SharePoint.

The minutes of Health and Safety Committee meetings are recorded by the Health and Safety Administrator and maintained on Floyd|Snider's Health and Safety department page on SharePoint.

The HSO/SS, or a designated alternate, will be responsible for conducting daily tailgate safety meetings and recording the meeting on a daily tailgate safety meeting form. The form, which must be appended to all HASPs, lists the hazards discussed and is signed by all personnel present at the meeting. The HSO/SS will manage the administration of job-specific training. Job-specific training forms must be completed and signed by the trainer.

Daily tailgate safety meeting and job-specific training forms must be reviewed with the PM after completion of the field event. After PM review, scans of the forms should be saved to the appropriate project folder, and the original copies of the forms will be submitted to the Health and Safety Administrator. The PM and the Health and Safety Administrator will determine whether any issues identified on tailgate safety meeting forms require further review or follow-up actions.

8.2 REPORTING

Near misses and incidents should be recorded on a Near Miss and Incident Reporting Form. The form gathers information regarding the circumstances of the near miss or incident, consequences, and corrective actions implemented. Near misses and incident report forms may be filled out by any Floyd|Snider staff. If a near miss or incident occurs in the field, the form must be reviewed and signed by the HSO/SS and the PM. This form must be appended to all site-specific HASPs.

Near Miss and Incident Reporting Forms will be maintained by the Health and Safety Administrator and made accessible to all staff for review after information that may identify specific individuals is redacted. In the event that an injury occurs in the workplace, the Health and Safety Administrator will coordinate with the PM or Management Committee to determine whether the injury is OSHA-reportable and implement follow-up reporting.

9.0 Signature Page

I have read this Accident Prevention Plan and understand its contents. I agree to abide by its provisions and will immediately notify the Health and Safety Administrator or Board of Directors if conditions or hazards not specifically designated herein are encountered.

Name (Print)	Signature	Date

Health and Safety Plan

Panda Dry Cleaners

Appendix B
Daily Tailgate Safety Meeting Form

DAILY TAILGATE SAFETY MEETING FORM

Instructions: To be completed by the Field Lead or Site Safety Officer (SSO) prior to beginning of work each day, when changes in work procedures occur, or when additional hazards are present. Review with your Project Manager (PM) at the conclusion of your event and file with your field notes.

PROJECT NAME AND SCOPE OF WORK:	SITE ADDRESS FOR EMERGENCY RESPONDERS:

EMERGENCY RESPONSE:

Muster Point:
Emergency Contacts & Resources:
Allergies/ Medical Alerts:

GENERAL TOPICS/HAZARDS: (Discuss all)

☐ Emergency Response Information	☐ Weather/Heat or Cold Stress
☐ HASP Review and Location	☐ Required PPE: Overview and Verification
☐ Near Miss & Incident Reporting	☐ Slip, Trip, Fall Hazards
☐ Safety Equipment Location: AED, First Aid Kit & Fire Extinguisher	☐ Buddy System and Communication
☐ Chemicals of Concern & SDS locations	☐ Vehicle Safety, Road Conditions

DETAILS OF DISCUSSION

SITE SPECIFIC CONSIDERATIONS: (Discuss as applicable)

☐ Lessons Learned	☐ Construction	☐ Forested/Brush Environment
☐ Fatigue	☐ Heavy Equipment	☐ Insects/Animals
☐ Site Access & Security	☐ Overhead Hazards	☐ Water Hazards & Vessel Safety
☐ Establishing Work Zones	☐ Excavation/Trenching	☐ Decontamination
☐ Urban Environment	☐ Flammables/Sparks	☐ Mob/Demob
	☐ Tool Usage	☐ Other (Describe)

DETAILS OF DISCUSSION

ATTENDEE NAME/AFFILIATION/SIGNATURE:

SSO/Field Lead Signature & Date: _____

Health and Safety Plan

Panda Dry Cleaners

Appendix C
Near Miss and Incident Reporting Form

NEAR MISS AND INCIDENT REPORTING FORM

Date & Time:	**Project:**
Incident Type: □ **Near Miss** □**Incident**	**Site/Location:**
Check all that apply: □ **Injury/illness** □ **Vehicle/Equipment** □ **Workplace Violence** □ **Evacuation/Emergency** □ **Other Stop Work Hazard (describe: _____)**	

Employee(s) Involved (include witnesses, teaming partners, and subcontractors):

Description of Incident (include precise location, injuries, the task performed, equipment/materials involved, 3rd party involvement, structure, or property damage):

Describe Any First Aid or Medical Treatment:

What Was the Root Cause of the Incident Based on the 5 Whys Approach?

What were the Contributing Factors or Conditions during the incident? (weather, fatigue, low visibility, lighting, etc.):

What actions can be taken to prevent the incident from reoccurring? (Include any preliminary actions taken):

Preparer's Signature:_____ Date:_____

SSO or Field Lead Signature:_____ Date:_____

Instructions:

- A Near Miss is a potential hazard or incident in which no property was damaged, and no personal injury was sustained, but where, given a slight shift in time or position, damage or injury could have easily occurred. An incident is when injuries or damage do occur and can range in severity.
- If there are multiple employees involved in an incident or near miss, select one to be the primary reporter.
- Complete the form as soon as practical after the incident with any witnesses or involved employees. A witness may complete the form on behalf of an injured employee if they cannot complete the form themselves.
- Fill out the forms completely. If a section does not apply mark the section as "N/A".

Field Near Miss/Incident

1. All Near Misses/Incidents in the field shall be reported to the Site Safety Officer or Field Lead.
   A. Serious field incidents (Injury, equipment damage, stop work etc.) are to be reported to the Project Manager (PM) as soon as it is safe to do so.
2. Complete the Near Miss and Incident Reporting form with the SSO/Field lead as soon as practical after the near miss/incident.
   A. The SSO/Field Lead will ensure any required reporting is made to the Client on the site.
3. Review the completed form with the PM at the end of the field work for the day.
4. Submit the final form to the Safety Program Manager after the PM review.

For incidents that result in injury, the SSO or PM will complete the Injury Reporting Follow-up Form within 24 hours and submit it to the Safety Program Manager.

Non-Field Near Misses/Incidents

1. Report the Near Miss or Incident to the Safety Program Manager or a Safety Committee Member.
2. Complete the Near Miss and Incident Reporting form as soon as practical after the incident with any witnesses or involved employees.
3. Review the completed form with the Safety Program Manager or a Safety Committee Member
4. For incidents that result in injury, the Safety Committee Member or Safety Program Manager will complete the Injury Reporting Follow-up Form within 24 hours.
5. Final versions of all forms should be submitted to the Safety Program Manager.

Follow-Up From an Incident

- For all near misses/incidents additional information (i.e., corrective action or medical updates) should be reported to the Safety Program Manager within 1 week.
- Notification of the event to the firm will be shared in a timely manner in the format most appropriate for the severity/complexity of the incident.
- Corrective action completion will be tracked and verified by the Safety Program Manager as applicable.
- Additional notifications to third parties (agencies, teaming partners, or clients) may be required by the PM or Principal-in-charge as appropriate.
- For vehicle incidents, notify Tiffany of the accident as insurance reporting may be required.
- Notify the Field Equipment Manager of any damage to equipment or vehicles.

INJURY REPORTING FOLLOW-UP FORM

Instructions for the Site Safety Officer or Project Manager:

- Complete this form following an incident with an injury within 24 hours of the incident.
- Submit this form with a copy of the completed Near Miss and Incident Reporting Form to the Safety Program Manager with copies to the Principal-in-Charge for the project if applicable. [1]
- Any additional information (i.e., corrective action or medical updates) should be reported to the Safety Program Manager within 1 week of the incident.

Was this an OSHA-Recordable Injury/Illness? Why?

□**Yes**	□ Loss of consciousness □ Days away from work □ Restricted work/Job transfer □ Medical Treatment Beyond First Aid[1] □ Other _____
□**No**	□First Aid treatment only □ Recordkeeping exemption □ No treatment □ Other _____

Describe Any Follow-Up First Aid or Medical Treatment:

Did the Injury/Illness involve Inpatient Hospitalization, Amputation or Loss of an Eye?
□No □Yes – Contact the Principal-in-Charge

What Was the Root Cause of the Incident Based on the 5 Why's Approach?

Follow-Up Actions Taken (include owners & dates)**:**

SSO or Field Lead Signature:_____ Date:_____

Project Manager's Signature: _____ Date:_____

[1] First Aid is defined as: using non-prescription medication at non-prescription strength, cleaning wounds on the skin surface, applying wound coverings (not sutures/staples), removing foreign bodies from the eye using irrigation or a swab, removing foreign bodies from elsewhere (not the eye) using tweezers, hot/cold therapy, drinking fluids to relieve heat stress, using finger guards or eye patches, using non-rigid means of support (such as bandages), using temporary immobilizing devices while transporting an injured person, administering tetanus immunizations. Guidelines for determining what incidents are OSHA Recordable are available here: *https://www.osha.gov/recordkeeping/*. The principal in charge is to be notified of any Recordable Incidents.