



SUB-SLAB DEPRESSURIZATION SYSTEM INSTALLATION



Irwin Hodson Property

2808 and 2838 SE 9th Avenue
Portland, Oregon 97202
Multnomah County Parcel R251319

Agency Information

ODEQ LUST File Number 26-97-0130
ODEQ ECSI File No. 6399

Prepared for:

The Irwin Hodson Company

2838 SE 9th Avenue
Portland, Oregon 97202
Attn: Heather Brown

Issued on:

March 28, 2024
EVREN NORTHWEST, INC.
Project No. 186-19002-07

Offices in Portland and Bend, OR / San Rafael, CA
P.O. Box 14488, Portland, Oregon 97293
T. 503-452-5561 / E. ENW@EVREN-NW.com

This

Sub-Slab Depressurization System Installation

Report for the:

Irwin Hodson Property

2808 and 2838 SE 9th Avenue
Portland, Oregon 97202

Has been prepared for the sole benefit and use of our Client:

The Irwin Hodson Company

2838 SE 9th Avenue
Portland, Oregon 97202
Attn: Heather Brown

and its assignees

Issued March 28, 2024 by:



EVRENNORTHWEST INC.
environmental / natural resource consultants



Exp 14-25

Paul M. Trone

Paul M. Trone, P.G.
Principal Geologist

1022

EXP. 2/1/2025

Lynn D. Green, C.E.G.
Principal Engineering Geologist

Table of Contents

1.0	Introduction	1
2.0	Relevant Site Characteristics	1
3.0	SSD System Design Criteria and Components	2
4.0	SSD System Installation	3
5.0	SSD System Start-up	3
6.0	Negative Pressure Field Extension	4
7.0	Limitations	4

List of Figures and Appendices

Figures

- 1 Site Vicinity Map
- 2 Site Plan
- 3 Sub-Slab Depressurization System – Detail Plan View
- 4 Active SSD Equipment
- 5 Sub-Slab Negative Pressure Field Extension Diagram

Appendices

- A Site Photographs

List of Acronyms and Abbreviations

client	The Irwin Hodson Company
ECSI	Environmental Cleanup Site Information
ENW	EVREN Northwest, Inc.
GRO	gasoline-range organics
Qfch	Channel Facies of Missoula Flood deposits
RAOs	remedial action objectives
RAWP	Remedial Action Work Plan
SSD	sub-slab depressurization
SSV	sub-slab venting
TCE	trichloroethene

1.0 Introduction

EVREN Northwest, Inc. (ENW) on behalf of The Irwin Hodson Company (Irwin Hodson, client) installed a sub-slab venting (SSV) system and vapor barrier at 2808 and 2838 SE 9th Avenue in Portland, Oregon (subject site; see Figures 1 and 2) as part of a soil removal action at the subject site.¹ The purpose of the SSV system and vapor barrier were to help mitigate intrusion of residual concentrations of trichloroethene (TCE) and gasoline-range organics (GRO) vapors into indoor air. The passive SSV system was designed in such a way that it could be converted to an active sub-slab depressurization (SSD) system if necessary to meet the Remedial Action Objectives (RAOs) for TCE in indoor air. The RAOs for TCE in indoor air were consistently met; however, given the elevated TCE concentrations in sub-slab vapor, ODEQ recommended converting the existing SSV system to an active SSD system as an interim measure during the development and implementation of an active remedy.² This Technical Memorandum summarizes the installation and start-up of the SSD system.

2.0 Relevant Site Characteristics

Site and Vicinity General Description. The subject property is in a commercial/industrial section of southeast Portland, Oregon, on the north side of SE Powell Boulevard (see Figure 1). The site consists of one tax lot encompassing a total of 0.85 acres, with an industrial warehouse building covering the entire building footprint. The site is bordered by a mix of commercial and industrial land uses east to SE 11th Avenue, south to SE Powell Boulevard, west to the banks of the Willamette River, and north to NE Broadway Street. Site features and nearby properties are shown on Figure 2.

Historical Land Use. Industrial land use of the site and surrounding area dates to the early 1900s. Previous occupants of the subject site included Northwest Planing Mills Company, a former coal gas facility, and the Iron Fireman Manufacturing Company. Irwin Hodson has occupied the site since the mid-1960s, operating a metal sign and printing company out of four warehouse buildings on the property. Irwin Hodson currently shares the buildings with one small, light industrial business. A complete account of the site's operational history is described in more detail in ENW's *July 2021 Data Gap Investigation*³ and ENW's Remedial Action Work Plan (RAWP).⁴

¹ ENW, January 13, 2022. *Sub-Slab Venting System Installation* (DRAFT), Irwin Hodson Property, 2808 and 2838 SE 9th Avenue, Portland, Oregon 97202, Multnomah County Parcel R251319, Agency Information ODEQ LUST File Number 26-97-0130, ODEQ ECSI File No. 6399: Prepared for The Irwin Hodson Company, 2838 SE 9th Avenue, Portland, Oregon 97202.

² ODEQ, October 24, 2023. *Post RD/RA Action Implementation Performance Monitoring Reports and Scott Jerger December 28, 2022 Letter*, from Jim Orr, ODEQ, to Heather Brown, The Irwin Hodson Company.

³ ENW, July 22, 2021. *Data Gap Investigation*, Irwin Hodson Property, 2808 and 2838 SE 9th Avenue, Portland, Oregon 97202, Multnomah County Parcel R251319, ODEQ LUST File Number 26-97-0130; prepared for The Irwin Hodson Company.

⁴ ENW, July 22, 2021. *Sub-slab Venting/Depressurization Installation and Focused Soil Removal Action Work Plan*, Irwin Hodson Property, 2808 and 2838 SE 9th Avenue, Portland, Oregon 97202, Multnomah County Parcel R251319, Agency Information ODEQ LUST File Number 26-97-0130: Prepared for The Irwin Hodson Company, 2838 SE 9th Avenue, Portland, Oregon 97202.

Soils and Geology. Soil borings completed at the site generally encountered fine sediments consisting of silt grading to sand down to a depth of approximately 18 feet below ground surface (bgs). These fine-grained sediments are underlain by dense, coarser-grained materials consisting of sands, gravels and cobbles that extended to the maximum depth drilled of 50 feet bgs. Geologic mapping of this portion of Portland maps these materials as Channel Facies of Missoula Flood deposits (Qfch).⁵ Boring locations are shown on the Sample Location Diagram on Figure 3. Boring logs were presented in ENW's *Data Gap Investigation*.³

Ground Water. Depth to static water measured from temporary exploratory borings during subject site investigations ranged from approximately 27 to 33 feet bgs. An out-of-service industrial well (MULT 2778) was abandoned at the subject site in June 2019. This 4-inch diameter well was deepened from 113 feet to 153 feet bgs in March 1967, at which time a static water level of 24 feet was recorded. The driller's log indicates that the well terminated in large, water-bearing gravel.

3.0 SSD System Design Criteria and Components

An SSD system is designed to exert a measurable negative pressure differential which allows residual sub-slab TCE vapors to migrate from sub-slab regions of higher pressure to lower pressure around the SSD collection trench perforated pipes exerted by the in-line fans. From there, the captured sub-slab vapors are manifolded through a header to risers leading to granular activated carbon (GAC) absorbers positioned on the first-story roof, prior to the vapors being vented to a safe discharge location above the second-story roof of the Irwin Hodson building.

The SSD System design includes all components of the SSV system¹ (see Figure 3) plus these additional SSD components.

- One 6-inch explosion-proof in-line fan⁶ each for the north and south SSD collection trench perforated pipes.
- 4-inch schedule 40 polyvinyl chloride (PVC) pipe and fittings to manifold the existing 4-inch north SSD riser to the in-line fan, the existing 4-inch south SSD riser to the in-line fan and extend a vent riser from each fan to the 2nd floor roof deck. Brackets to secure each vent riser to the outside wall of the building, and a critter guard placed over the top of each vent riser.
- A 30-gal moisture knock-out drum each for the north SSD leg and south SSD leg.
- Two in-series 30-gal GAC units each for the north SSD leg south SSD leg.
 - Installed with flexible Fernco fittings to easily change out spent GAC units or to bypass GAC units once TCE emissions are less than the site-specific TCE emission limit of 1,750 µg/m³ at the stack.
- A manometer for each vent riser for ongoing system monitoring.
- Pre-, mid-, and vent sample ports for each SSD leg.

⁵ Madin, I.P., 1990, Earthquake Hazard Geology Maps of the Portland Metropolitan Area, Oregon: Oregon Department of Geology and Mineral Industries Open File Report 0-90-2.

⁶ Radon-Away RP265 in-line fan capable of 70 cubic feet per minute (CFM) under 2.0 inches of water (IOW).

4.0 SSD System Installation

The active SSD system components were installed during the week of December 7, 2023, by ENW and its subcontractors. After removing the portion of the existing passive vent riser above the first floor roof deck and wind-driven turbine fan for each SSV leg, ENW's technicians installed the active SSD system components on the first-story roof deck above the SSD header and risers located at the west end of the NE warehouse in accordance with the Active SSD Equipment plan in Figure 4. The north and south SSD legs were each manifolded to a moisture knock-out drum, primary GAC unit, secondary GAC unit, in-line fan, and vent riser extending from the fan to the second floor roof deck. An electrician installed a dedicated electrical circuit consisting of an electrical breaker and conduit for each in-line fan. Photographs taken during installation of the system are included in Appendix A.

5.0 SSD System Start-up

The two in-line fans of the SSD system were activated on December 13, 2023. ENW immediately conducted start-up monitoring, including:

- **Sub-Slab Pressure and Vapor Screening:**⁷ upon startup and following one hour of operation from select communication test (CT) points, sub-slab (SUB) sampling points, and soil gas (SG) sampling points.
- **Differential Pressure:** deployed TEC model DG-1000 Digital Pressure Gauges to continuously monitor differential pressures (ΔP) at three locations in the NE warehouse:
 - indoor air and outdoor air,
 - indoor air and sub-slab vapor (SUB18) within the soil removal action (SRA) area, and
 - indoor air and sub-slab vapor (SUB22) within the SRA area.
- **Effluent Screening:**⁷ SSD01-Pre, SSD01-Mid, and SSD01-Vent, SSD02-Pre, SSD02-Mid, and SSD02-Vent on an hourly basis during the first six (6) hours of operation.
- **Exhaust Vent Sampling:** within one hour of startup, collected vent samples from pre-GAC, mid-GAC and post-GAC sample ports (SSD01-Pre, SSD01-Mid, and SSD01-Vent, SSD02-Pre, SSD02-Mid, and SSD02-Vent) using a 30-minute flow controller, and analyzed the samples for TCE.

First quarter 2024 SSD system monitoring results will be reported under separate cover.

⁷ Using a photoionization detector (PID)

6.0 Negative Pressure Field Extension

A negative pressure field extension diagram (Figure 5) shows that negative pressures are exerted by the SSD system in those sub-slab areas where residual concentrations of TCE are suspected to be present in sub-slab soil.

7.0 Limitations

The scope of this report is limited to observations made during on-site work; interviews with knowledgeable sources; and review of readily available published and unpublished reports and literature. As a result, these conclusions are based on information supplied by others as well as interpretations by qualified parties.

The focus of the work does not extend to the presence of the following conditions:

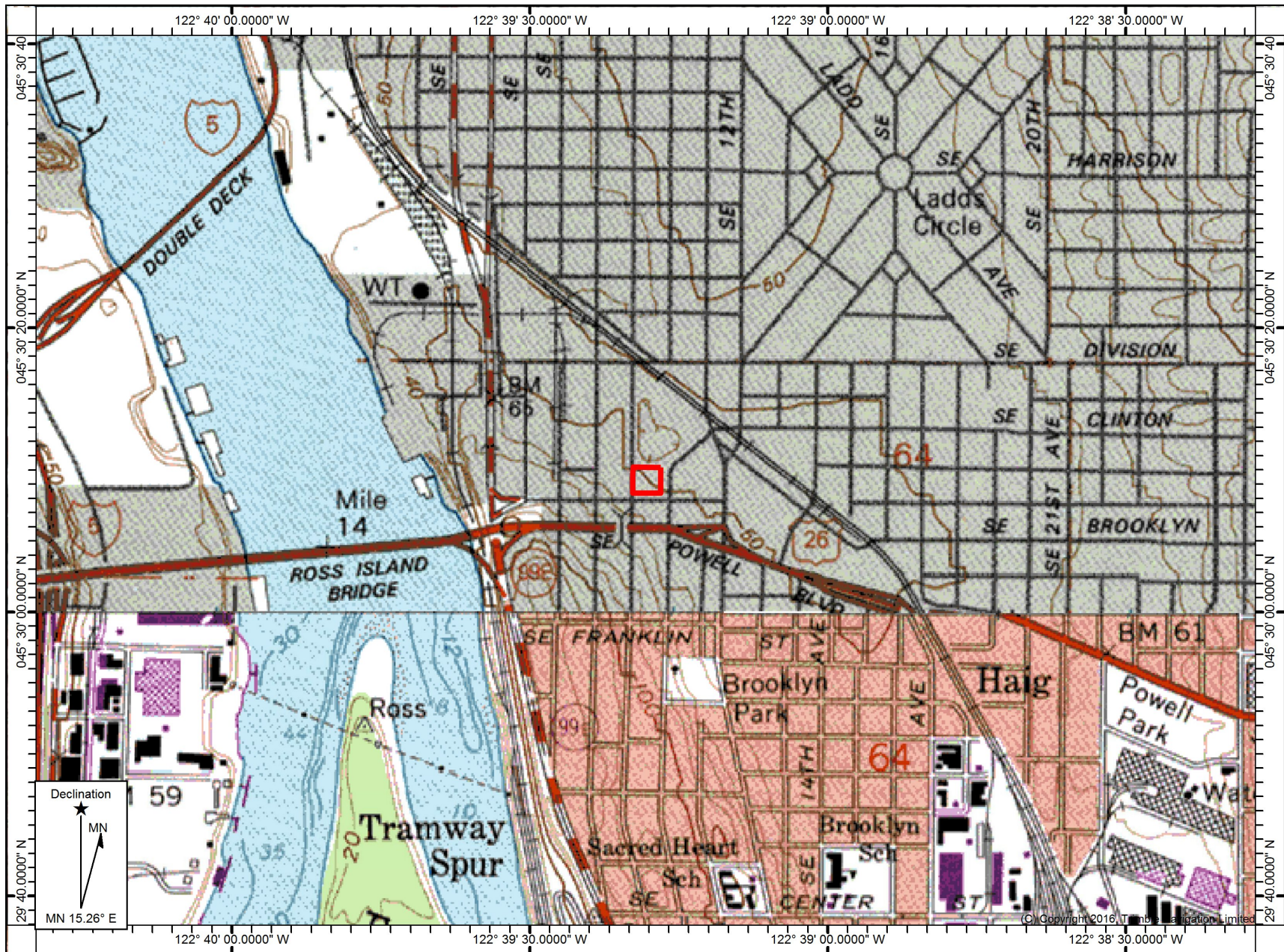
1. Naturally occurring toxic or hazardous substances in the subsurface soils, geology, and water,
2. Toxicity of substances common in current habitable environments, such as stored chemicals, products, building materials and consumables,
3. Contaminants or contaminant concentrations that are not a concern now but may be under future regulatory standards,
4. Unpredictable events that may occur after ENW's site work, such as illegal dumping or accidental spillage.

There is no practice that is thorough enough to absolutely identify the presence of all hazardous substances that may be present at a given site. ENW's investigation has been focused only on the potential for contamination that was specifically identified in the Scope of Work. Therefore, if contamination other than that specifically mentioned is present and not identified as part of a limited Scope of Work, ENW's environmental investigation shall not be construed as a guaranteed absence of such materials. ENW has endeavored to collect representative analytical samples for the locations and depths indicated in this report. However, no sampling program can thoroughly identify all variations in contaminant distribution.

We have performed our services for this project in accordance with our agreement and understanding with the client. This document and the information contained herein have been prepared solely for the use of the client.

ENW performed this study under a limited scope of services per our agreement. ENW assumes no responsibility for conditions that we did not specifically evaluate or conditions that were not generally recognized as environmentally unacceptable at the time this report was prepared.

Figures



Name: PORTLAND
Date: Jan 1, 1990

0 1000 2000
Feet

Location: 45° 30' 09.2914" N, 122° 39' 18.3519" W
Contour Interval: 10 ft



Date Drawn: 8/12/2019
CAD File Name: 186-19002-fig1sv_map(v01)
Drawn By: JOB
Approved By: LDG

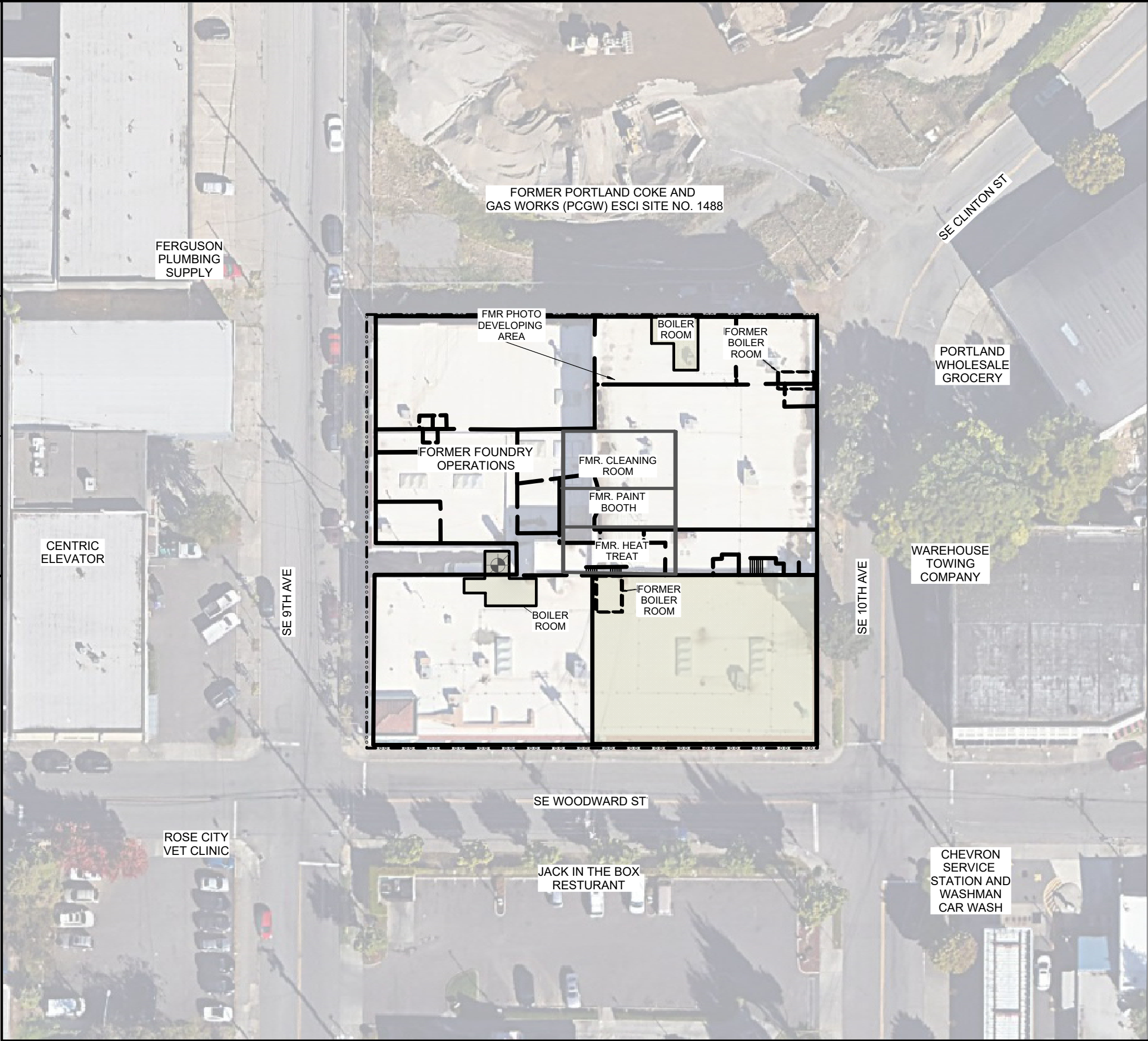
Irwin Hodson Property
2808 and 2838 SE 9th Avenue
Portland, Oregon

Site Vicinity Map

Project No.
186-19002

Figure No.

1



LEGEND:

- SUBJECT PROPERTY BOUNDARIES
- SUBJECT BUILDINGS
- BASEMENT AREA
- DECOMMISSIONED WATER WELL

- NOTES:
1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2018 AND ENW FIELD NOTES.
 2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.
 3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT SHAPE, SIZE, OR ORIENTATION.

APPROXIMATE SCALE

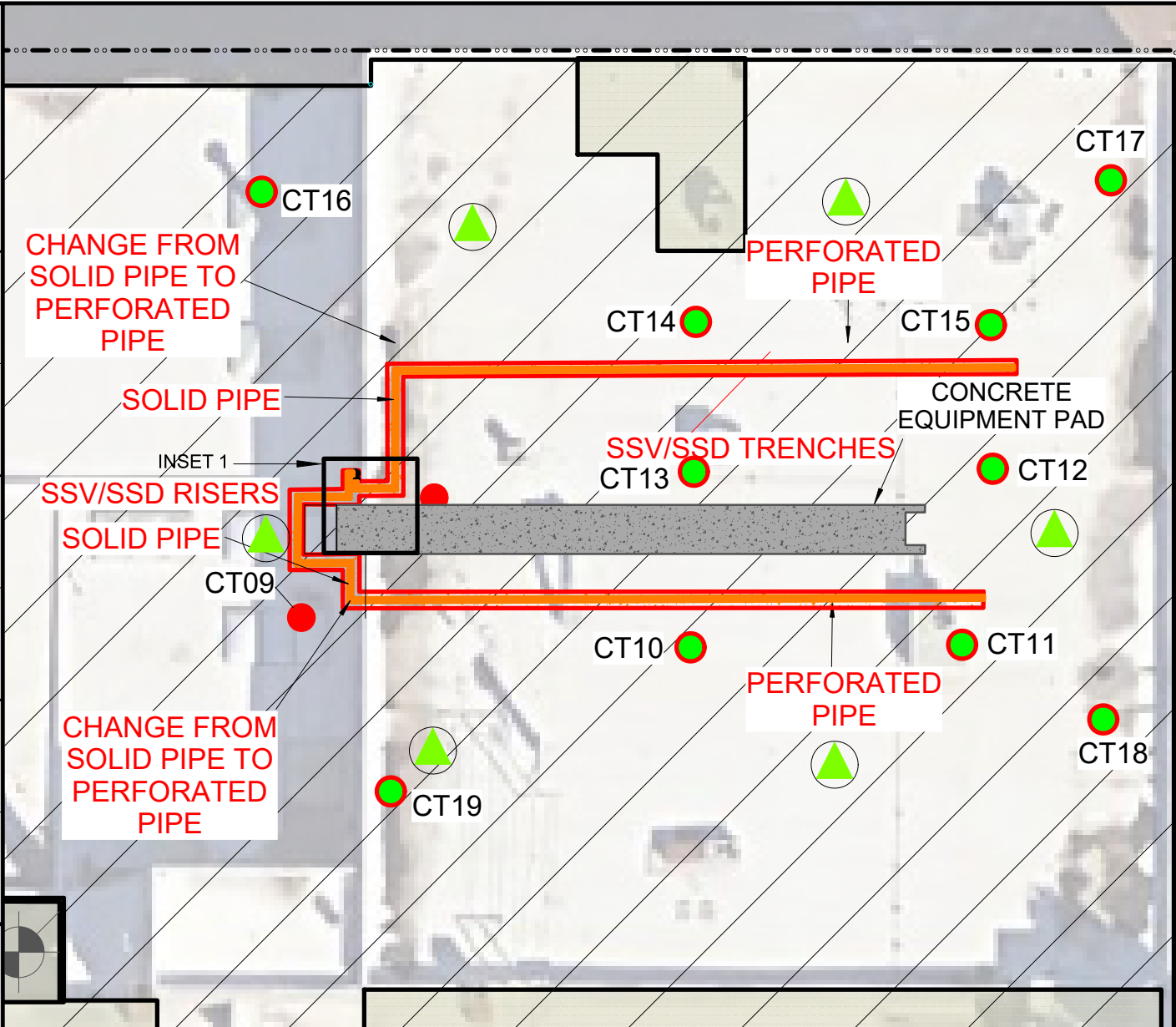
0 45 90 FEET

environmental natural resource consultants
PO BOX 14488, PORTLAND, OREGON 97293
P: (503)452-5561, E: ENW@EVREN-NW.COM

FIGURE 2
SITE PLAN

IRWIN HODSON PROPERTY
2808 AND 2838 SE 9TH AVENUE
PORTLAND, OREGON

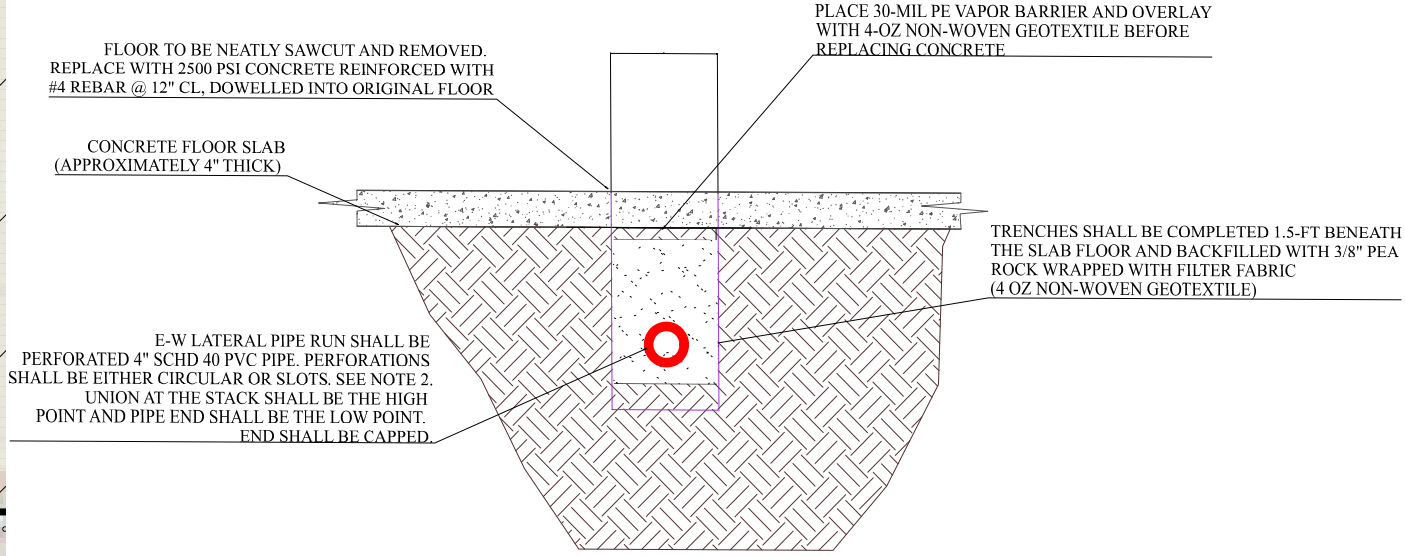
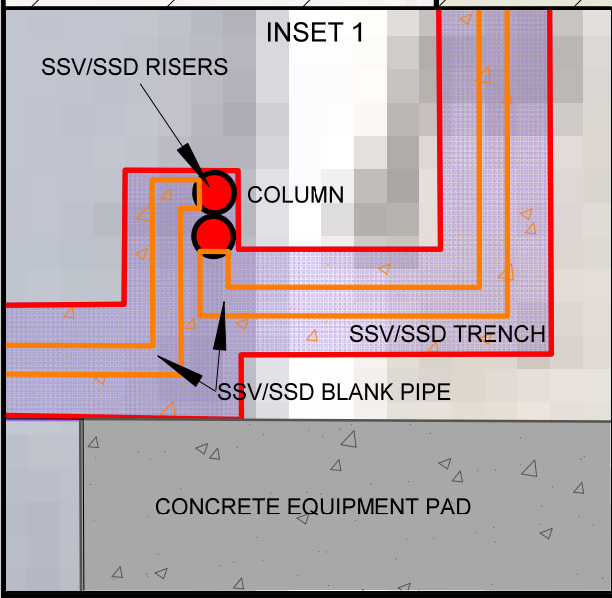
DRAWING NUMBER 186-19002(v01)
APPROVED BY L. GREEN 03/28/2024
CHECKED BY P. TRONE 03/28/2024
DRAWN BY C. ROSEBROOK 01/18/2021



INSTALLATION NOTES:

1. Above-ground Sub-Slab Depressurization (SSD) (solid, not perforated) piping shall have a continuous downward slope towards the perforated pipe point of not less than 1/8 inch (3.2 mm) per foot (30 cm). Configurations that result in obstructed airflow by allowing water to collect within SSD piping are prohibited. This requirement is intended to allow rainwater or condensation within the pipes to drain downward into the ground beneath the slab floor.
2. Perforations shall be either circular or slots.
 - A. Circular perforations shall be $1/4 \pm 1/16$ -inch diameter holes arranged in rows parallel to the axis of the pipe and evenly spaced along each row such that the center-to-center distance between perforations is not less than eight times the perforation diameter. Rows shall be arranged in two equal groups at equal distance from the bottom on each side of the vertical centerline of the pipe. The lowermost rows of perforations shall be separated by an arc of not less than 60 degrees or more than 125 degrees. The uppermost rows of perforations shall be separated by an arc not to exceed 166 degrees. The spacing of rows between these limits shall be uniform.
 - B. Slot perforations shall be located within the lower quadrants of the pipe with slots no wider than 1/8 inch and spaced not to exceed 11 times the perforation width. Slot perforations shall be symmetrically located in two rows, one on each side of the pipe centerline.
 - C. Perforations may appear at the ends of short and random lengths.
 - D. The minimum number of rows perforations (circular or slots) shall be two for a 4-inch ID pipe, which correlates to a minimum opening of 0.22 sq inches per lineal foot.
3. Supports for SSD plastic piping shall be installed at least every 10 feet (3m) on vertical runs and at least every 6 feet (1.8m) on horizontal runs. Support adequate to ensure structural integrity of the piping should also be provided directly below the discharge location.
4. Seal all penetrations through slab floor with polyurethane sealant.
5. Riser vent: For Diffuse Vertical Discharges: Not less than 15 feet (4.6 m) above grade nearest the point of discharge and 4 feet (120 cm) above, or not less than 15 feet (4.6 m) away from operable windows, doors or other passive ventilation openings into the occupiable portion of the structure or an adjacent structure. Install mesh critter guard at vent end.

SSV/SSD SYSTEM CROSS SECTION IN FLOOR

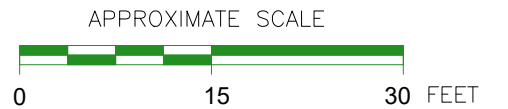


LEGEND:

- SUBJECT PROPERTY BOUNDARIES
- SUBJECT BUILDINGS
- BASEMENT AREA
- SSD TRENCH AND PERF PIPE
- SSD RISER
- PRE/POST COMMUNICATION TEST POINTS
- POST COMMUNICATION TEST POINTS (ACTIVE SSD ONLY)
- SEMI-PERMANENT SUB-SLAB MONITORING POINTS (ACTIVE SSD ONLY)

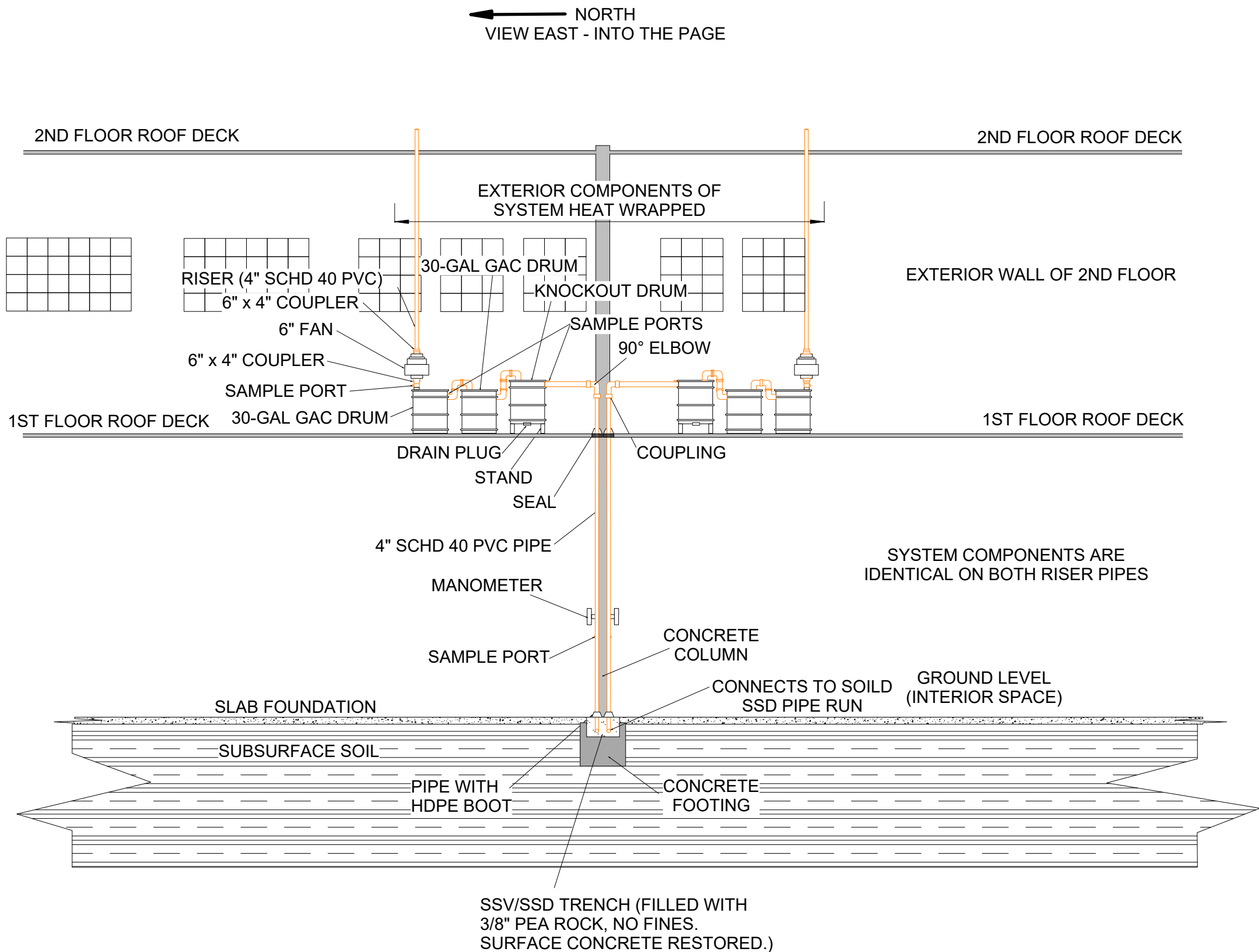
NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2018 AND ENW FIELD NOTES.
2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.
3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT SHAPE, SIZE, OR ORIENTATION.



PO BOX 14488, PORTLAND, OREGON 97293
P: (503)452-5561, E: ENW@EVREN-NW.COM

FIGURE 3
SUB-SLAB DEPRESSURIZATION SYSTEM/
DETAIL PLAN VIEW
IRWIN HODSON PROPERTY
2808 AND 2838 SE 9TH AVENUE
PORTLAND, OREGON



INSTALLATION NOTES:

- Above-ground Sub-Slab Ventilation (SSV) / Depressurization (SSD) (solid, not perforated) piping shall have a continuous downward slope towards the perforated pipe point of not less than 1/8 inch (3.2 mm) per foot (30 cm). Configurations that result in obstructed airflow by allowing water to collect within SSV/SSD piping are prohibited. This requirement is intended to allow rainwater or condensation within the pipes to drain downward into the ground beneath the slab floor.
- All SSV/SSD duct piping, shall be rigid, non-perforated, schedule 40. PVC SSV/SSD piping shall be perforated 4" ID PVC drain pipe
- Perforations shall be either circular or slots.
 - Circular perforations shall be 1/4 ± 1/16-inch diameter holes arranged in rows parallel to the axis of the pipe and evenly spaced along each row such that the center-to-center distance between perforations is not less than eight times the perforation diameter. Rows shall be arranged in two equal groups at equal distance from the bottom on each side of the vertical centerline of the pipe. The lowermost rows of perforations shall be separated by an arc of not less than 60 degrees or more than 125 degrees. The uppermost rows of perforations shall be separated by an arc not to exceed 166 degrees. The spacing of rows between these limits shall be uniform.
 - Slot perforations shall be located within the lower quadrants of the pipe with slots no wider than 1/8 inch and spaced not to exceed 11 times the perforation width. Slot perforations shall be symmetrically located in two rows, one on each side of the pipe centerline.
 - Perforations may appear at the ends of short and random lengths.
 - The minimum number of rows perforations (circular or slots) shall be two for a 4-inch ID pipe, which correlates to a minimum opening of 0.22 sq inches per lineal foot.
- Supports for SSD plastic piping shall be installed at least every 10 feet (3m) on vertical runs and at least every 6 feet (1.8m) on horizontal runs. Support adequate to ensure structural integrity of the piping should also be provided directly below the discharge location and at fan location.
- Flexible Coupling Disconnects: Where disassembly may be required in the future for maintenance purposes (fan), the disconnect shall consist of two unconnected portions of the SSD pipe joined with a flexible coupling.
- Seal all penetrations through slab floor with polyurethane sealant.
- Fan:
 - Since SSD, high flow, high negative pressure fan is required.
 - Fan will plug into outlet installed by Electrician located within 6 feet of fan.
 - Connect fan to solid duct piping from SSD using 90° elbows and flexible couplers on both inlet and outlet ends.
 - Extend riser vent from fan using 4-inch PVC to roof, or similar (maintaining drainage towards fan, with drains to SSV/SSD perf. piping.
- Riser: For Diffused Horizontal Discharges (e.g., rain caps): Not less than 15 feet (4.6 m) above grade nearest the point of discharge and 4 feet (120 cm) above, or not less than 15 feet (4.6 m) away from operable windows, doors or other passive ventilation openings into the occupiable portion of the structure or an adjacent structure.
- Labeling:
 - Label solid piping from SSV/SSD system with "Sub-Slab Vapor Reduction" label.
 - A system description label shall be placed on a primary component of system (e.g. on duct piping near SSD fan), or within 12 inches (30 cm) of the electric service panel or other prominent location.
 - The label title shall state, "Sub-Slab Vapor Reduction System" or similar wording and include:
 - the date of installation;
 - an advisory stating that the building should be tested for sub-slab vapor at least every 2 years
 - an advisory stating that the system should be evaluated for mechanical performance quarterly
 - the installer's name, phone number and applicable certification identification;
 - Interior SSD duct piping shall be marked with not less than one label at each floor level with label titles stating "Sub-Slab Vapor Reduction System" or similar wording. For SSD systems, such labels should be affixed at intervals not greater than 10 feet (3 m) along the developed length of piping.
- Disconnects such as switches or the receptacles providing power to plugged connections for mitigation system fans shall be marked to indicate their purpose. The label title shall identify that the disconnect is a component of a mitigation system such as with the text "Sub-Slab Vapor Fan", and can include instructions such as "Caution – Sub-Slab Vapor Fan", "Sub-Slab Vapor Fan – Leave Switch On" or "Sub-Slab Vapor Fan – Leave Plugged In."
- The circuit breaker(s) protecting the mitigation system fan circuit(s) should also be labeled with the text "Sub-Slab Vapor" or "Sub-Slab Vapor Fan."
- Clearly mark the manometer/vent to indicate the initial pressure reading.



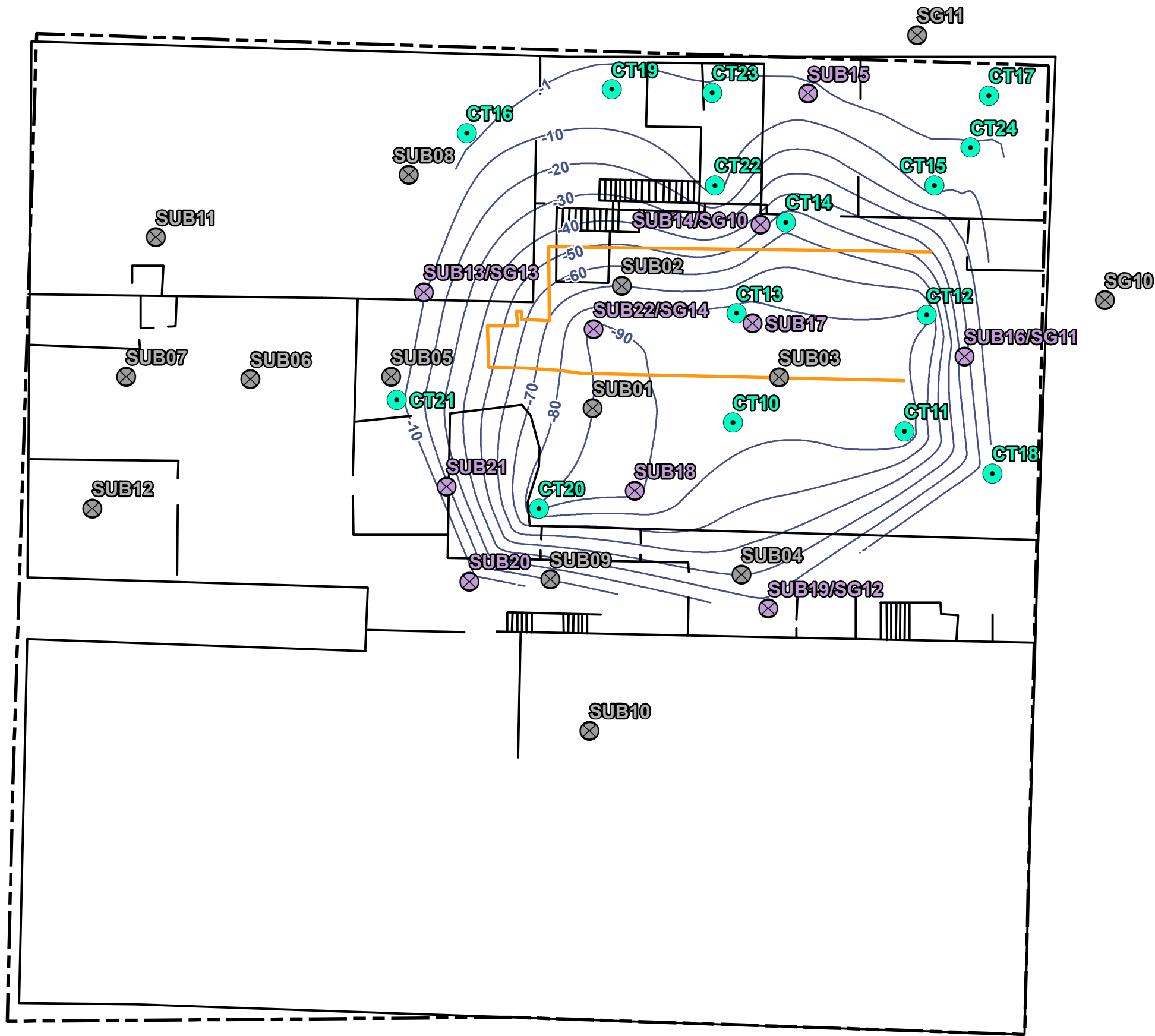
PO BOX 14488, PORTLAND, OREGON 97293
P: (503)452-5561, E: ENW@EVREN-NW.COM

FIGURE 4
ACTIVE SSD EQUIPMENT

IRWIN HODSON PROPERTY
2808 AND 2838 SE 9TH AVENUE
PORTLAND, OREGON

NOT TO SCALE

DRAWN BY	H. ROMER	1/5/2024	CHECKED BY	E. BRUGGEMAN	1/5/2024	APPROVED BY	L. GREEN	1/5/2024	DRAWING NUMBER	186-19002(V01)



- LEGEND:**
- SUBJECT PROPERTY BOUNDARY
 - SUBJECT BUILDING
 - SUB-SLAB DIFFERENTIAL PRESSURE CONTOUR (PASCAL)
 - SSV/SSD VAPOR COLLECTION PIPING
 - COMMUNICATION TEST LOCATION
 - SUB-SLAB VAPOR SAMPLE LOCATION
 - FORMER SOIL GAS VAPOR SAMPLE LOCATION

- NOTES:**
1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2023 AND ENW FIELD NOTES.
 2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.
 3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT SHAPE, SIZE, OR ORIENTATION

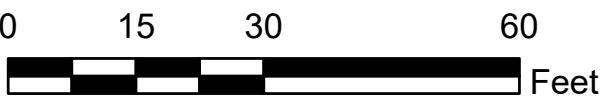


FIGURE 5

**SUB-SLAB NAGATIVE PRESSURE
FIELD EXTENSION DIAGRAM**

**IRWIN HODSON PROPERTY
2808 AND 2838 SE 9TH AVENUE
PORTALND, OREGON**

Appendix A

Site Photographs



Positioning the granular activated carbon (GAC) units in preparation for activating the sub-slab depressurization (SSD) system.



SSD system with one inline fan and three GAC units per vent.



Pre-GAC sample ports.



Mid-GAC and vent sample ports.



Irwin Hodson Property
2808 and 2838 SE 9th Avenue
Portland, Oregon

SSD Activation Site Photographs

Project No.
186-19002-07
Appendix
A



Critter-guards on vent risers.



Interior portion of vent risers, note U-tube manometers on each vent riser to provide visual confirmation of system operation.



Communication testing was performed at all communication test ports to confirm negative pressure-field extension beneath the slab.



Irwin Hodson Property
2808 and 2838 SE 9th Avenue
Portland, Oregon

SSD Activation Site Photographs

Project No.
186-19002-07

Appendix
A