April 12, 2018

Mr. Ed Jones
Washington State Department of Ecology
Northwest Regional Office
3190 160th Avenue Southeast
Bellevue, Washington 98008

BY MAIL AND EMAIL

RE: RESPONSE TO ECOLOGY VAPOR INTRUSION ACTION REQUIREMENT
5815 4TH AVENUE SOUTH, SEATTLE, WASHINGTON
AGREED ORDER NO. DE 5348
FARALLON PN: 457-007

Dear Mr. Jones:

Farallon Consulting, L.L.C. (Farallon) has prepared this letter on behalf of Capital Industries, Inc. (Capital) in response to a requirement by the Washington State Department of Ecology (Ecology) to conduct a third-party evaluation of ongoing Tier 4 vapor intrusion (VI) mitigation measures at the Pacific Food Systems, Inc. North Building at 5815 4th Avenue South in Seattle, Washington (herein referred to as the North Building) (Figure 1). Ecology requested VI mitigation measures in response to historical performance indoor air sampling results that indicated tetrachloroethene (PCE) and/or trichloroethene (TCE) concentrations continue to exceed health-based mitigation goals in indoor air at the North Building regardless of adjustments to operation of the subslab depressurization system (SSDS). The purpose of the third-party evaluation was to evaluate the SSDS design and operations and collaborate to identify additional measures that could be implemented to meet VI mitigation goals established in the technical memorandum regarding Revised Vapor Intrusion Assessment, Monitoring, and Mitigation Plan, W4 Joint Deliverable, Seattle, Washington dated February 2, 2015, from Farallon to Mr. Jones of Ecology. This letter presents pertinent background information, a description of the work conducted, and planned work.

BACKGROUND

The results from the assessment of indoor and outdoor ambient air conducted between 2012 and 2014 indicated that a source of PCE and/or TCE in the subsurface was resulting in a VI condition for the North Building that required mitigation measures. An SSDS was designed to mitigate vapor intrusion in the North Building in accordance with ASTM International ASTM Standard 2121-13 and specifications defined in the *Vapor Intrusion Mitigation Design Plan, 5815 4th Avenue South – North Building, Seattle, Washington* dated November 10, 2014, prepared by Farallon. Installation of the SSDS in the North Building was completed in March 2015. The design of the SSDS in the North Building is shown on Figure 2. The VI mitigation objective is to eliminate the vapor intrusion pathway for the volatile constituents of concern, PCE and TCE, that have the potential to migrate from soil and/or Water Table Interval groundwater at and proximate to the North Building to indoor air.

Depressurization beneath the concrete building slab has previously been confirmed by pressure field monitoring data from subslab monitoring ports in the North Building. North Building inspections conducted prior to each air quality monitoring event have not identified products containing PCE or TCE in the North Building. Cracks and penetrations in the building slab were identified and sealed before the SSDS was installed. However, results of indoor air sampling conducted between 2015 and 2017 have indicated that TCE concentrations continue to exceed cancer and non-cancer Inhalation Pathway Interim Measures Action Levels.

In addition, water accumulated in the exhaust piping from the SSDS blower that extended to the rooftop exhaust stack and lowered performance of the SSDS during with 2017 winter season. Accumulated water in the SSDS exhaust piping was drained and collected when observed. Performance of the SSDS has not been affected by water since the 2017 winter season.

The persistence of TCE concentrations that exceed cancer and non-cancer Inhalation Pathway Interim Measures Action Levels regardless of optimization of the SSDS has been an obstacle to meeting the VI mitigation objective for the North Building. Ecology recommended contracting an outside party with expertise in VI mitigation to provide a third-party evaluation of the SSDS design and performance and the historical VI investigation work at the North Building to determine what further actions may be necessary to meet the VI mitigation objective. In the interim, the SSDS has been operated continuously to reduce concentrations of PCE and TCE in indoor air.

SUBSLAB DEPRESSURIZATION SYSTEM EVUALATION

Farallon contracted with Advanced Radon Technologies of Spokane, Washington (ART), a VI mitigation contractor with experience designing, installing, and operating VI mitigation systems in the area. ART, Ecology, and Farallon conducted an evaluation of the SSDS at the North Building on December 6, 2017. Based on the evaluation, ART provided the VI mitigation system opinion letter dated December 27, 2017, from Mr. David Gerard of ART to Mr. Jeffrey Kaspar of Farallon (Attachment A).

ART comments and recommendations for additional work that could improve SSDS performance included:

- Install three temporary subslab monitoring ports within 18 to 24 inches of the northern wall in the north-central, northwestern, and northeastern corners of the North Building to confirm that the SSDS is depressurizing the entire building slab area and to determine whether additional extraction sumps are necessary to improve SSDS performance.
- Enlarge the existing 5-gallon extraction sumps and potentially extend the depth to minimize water condensation into the SSDS and mitigate water accumulation.
- Insulate the 4-inch-diameter riser piping from the SSDS blower to the discharge point to minimize moisture condensation that may be resulting in the accumulation of water.
- Change the existing 4-inch-diameter SSDS piping to 3-inch-diameter piping with insulation to increase airflow velocity and minimize opportunities for condensation to form. The existing SSDS was designed to ASTM Standard 2121-13 but has resulting low airflow, allowing water to condense in the discharge pipe.

- Conduct additional air sampling under rapidly falling barometer scenarios to evaluate whether equipment and/or building materials are a contributing source of PCE and/or TCE.
- If all other measures do not result in the SSDS meeting the VI mitigation objective, install an additional SSDS in the northern portion of the North Building. This likely would be a smaller residential-type system that could improve negative field pressure beneath the building slab in northern portion of the North Building.

PLANNED WORK

The results of the third-party evaluation of the SSDS by ART confirmed that the SSDS was designed in accordance with ASTM Standard 2121-13 as required by Ecology. However, additional evaluation of the SSDS performance and the potential for contributing sources in the North Building is necessary to determine what further action(s) are required to meet the VI mitigation objective. The planned work herein considers ART recommendations and includes the initial tasks that will evaluate whether the SSDS is depressurizing the entire building slab area and will mitigate accumulation of water in the SSDS piping.

Three temporary subslab monitoring ports will be installed within 18 to 24 inches of the northern wall in the north-central, northwestern, and northeastern corners of the North Building to measure the pressure differential across the building slab. The subslab monitoring ports will be installed in the northeastern, north-central, and northwestern portions of the North Building (Figure 2). Each subslab monitoring port will be placed approximately 24 inches from the northern wall, with one 24 inches from the eastern wall, one in the approximate center of the North Building along the northern wall, and one 24 inches from the western wall. The subslab monitoring ports will each consist of a standard Cox-Colvin and Associates, Inc. VAPOR PIN with a secured cover (Attachment B). Subslab conditions will be allowed a minimum of 20 minutes to equilibrate before obtaining pressure field measurements. The negative pressure field will be evaluated at each location. After completion of testing, the security caps will be installed and the ports will remain in-place until the SSDS optimization work confirms that monitoring at these locations is no longer necessary.

A negative pressure of 0.005 inch of water or greater is considered to demonstrate depressurization. If the pressure field extension monitoring has a negative pressure less than 0.005 inch of water, additional measures will be necessary to depressurize the entire building slab. These measures may include installation of supplemental extraction sumps or installation of a supplemental SSDS in the northern portion of the North Building. The results of the pressure field monitoring will be reported to Ecology upon completion in April 2018.

If the pressure field monitoring indicates that the building slab is sufficiently depressurized to eliminate the vapor intrusion pathway, evaluation of potential off-gassing of PCE and/or TCE from existing equipment and/or building materials will be conducted. This may include use of a real-time monitoring device to evaluate conditions throughout the North Building and identify locations of elevated PCE and/or TCE. Alternatively, isotopic forensics may be used to compare isotopic characteristics of soil gas and indoor air samples. Isotopic forensics has the capability to distinguish sources of PCE and TCE that are detected in soil gas versus indoor air.

Water accumulation did not occur in the SSDS during fall and winter 2017. Continued monitoring for water buildup will occur in 2018. If water becomes an issue affecting SSDS performance, the exhaust piping from the SSDS blower will be decreased from 4-inch-diameter to 2-inch-diameter piping (Figure 2). The decreased piping diameter will increase the soil gas exhaust velocity by at least three times the current velocity, decreasing the potential for condensate generation or rain water accumulation in the exhaust piping, but also has the potential to decrease the blower's capacity to apply the vacuum to the building slab. The exhaust piping will be insulated with an exterior-rated insulation to reduce exhaust vapor cooling, which also will decrease the potential for condensate generation in the exhaust piping. Water collection sumps will be installed in the SSDS piping network if water continues to accumulate after the piping modifications. These measures are expected to be sufficient to eliminate future water accumulation issues, eliminating the need to extend the extraction sump depth or replace other SSDS piping with smaller diameter piping.

Farallon will include Ecology in discussions regarding alternatives to evaluate the potential contribution of internal sources of PCE and TCE, and/or implement supplemental mitigation measures following evaluation of the pressure field extension beneath the building slab. Upon concurrence with Ecology, Farallon will implement the work necessary to meet the VI mitigation objective.

CLOSING

Farallon trusts that the information presented herein is sufficient for your needs. Please contact either of the undersigned at (425) 295-0800 if you have questions or need additional information.

Sincerely,

Farallon Consulting, L.L.C.

Russell Luiten, P.E.
Project Engineer

Jeffrey Kaspar, L.G., L.H.G.
Principal Geologist

Attachments: Figure 1, *Site Vicinity Plan*
Figure 2, *Pacific Food Systems North Building, Proposed Subslab Depressurization System Modifications*
Attachment A, Advanced Radon Technologies Opinion Letter
Attachment B, Cox-Colvin Associates, Inc. VAPOR PIN Details

cc: Mr. Ronald Taylor; Capital Industries, Inc. (by email)
Mr. Donald Verfurth, Gordon & Rees LLP (by email)
Janet Knox, Pacific Groundwater Group
Dana Cannon, Aspect Consulting
Bill Carroll, Arrow Environmental

ROL/JK:mm

FIGURES

RESPONSE TO ECOLOGY VAPOR INTRUSION ACTION REQUIREMENT
5815 4th Avenue South
Seattle, Washington

Farallon PN: 457-007

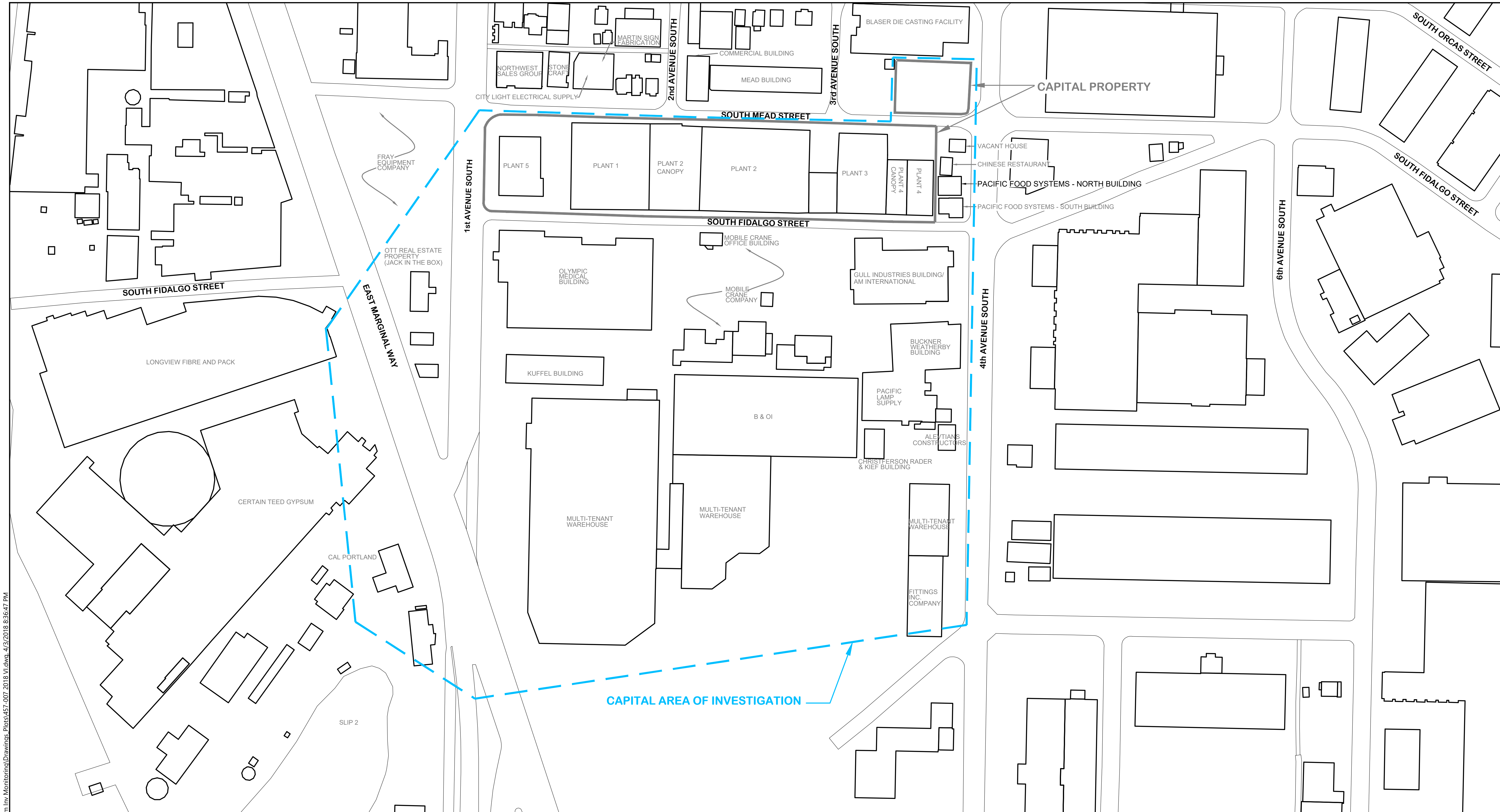

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FIGURE 1

SITE VICINITY PLAN
5815 4TH AVENUE SOUTH
SEATTLE, WASHINGTON

FARALLON PN: 457-007

Drawn By: ROL | Checked By: JM | Date: 04/03/2018 | Disk Reference: 457-007 2018 VI

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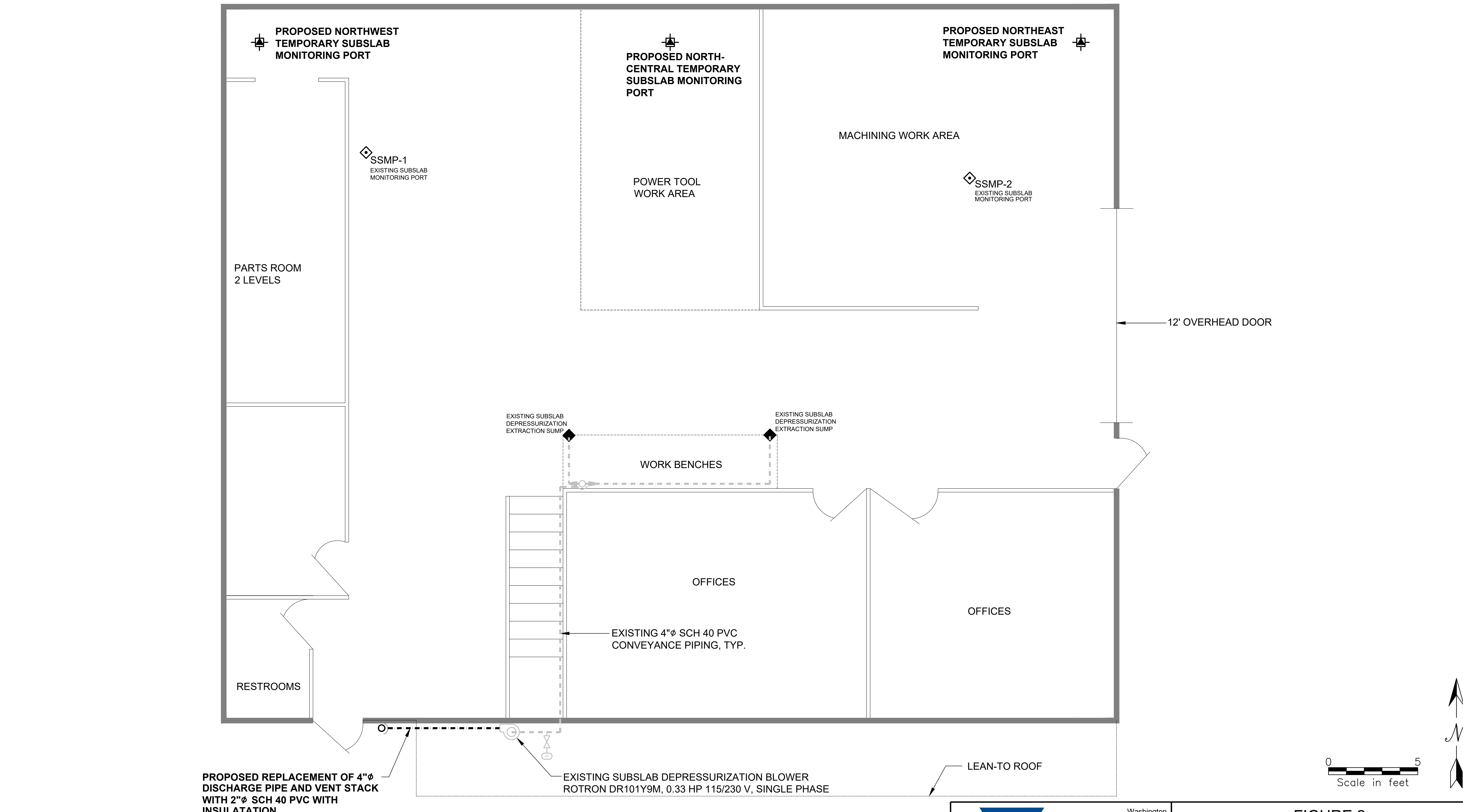

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FIGURE 2

PACIFIC FOOD SYSTEMS NORTH BUILDING
PROPOSED SUBSLAB DEPRESSURIZATION SYSTEM MODIFICATIONS
5815 4th AVENUE SOUTH
SEATTLE, WASHINGTON

FARALLON PN: 457-007

Drawn By: ROL | Checked By: JM | Date: 04/03/2018 | Disk Reference: 457-007 2018 VI

ATTACHMENT A
ADVANCED RADON TECHNOLOGIES OPINION LETTER

RESPONSE TO ECOLOGY VAPOR INTRUSION ACTION REQUIREMENT
5815 4th Avenue South
Seattle, Washington

Farallon PN: 457-007

Advanced Radon Technologies
Radon Testing / Radon & VOC Mitigation
Servicing the Northwest Since 1991
Washington State Contractor's License #:ADVANRT06402 Idaho License # PWC-C-11174-C-4

Web Site: Advancedradontech.net
E-Mail:advancedradontech@yahoo.com

631 N Hogan St • Spokane, WA 99202 • Telephone No: (509) 326-5127 • Fax No: (509) 328-2927

December 27, 2017

Jeff Kaspar
Farallon Consulting

Dear Jeff:

After the review of the VI mitigation system on December 6, 2017 at 5801 Third Avenue S, Seattle, Advanced Radon Technologies has noted that the current system appears to be installed adequately and meeting existing standards. No defects or inappropriate design were noted.

Suggested recommendations for the Building:

1) Install 3 Temporary negative field pressure extension test holes within 18-24" at the North Wall in the North Central, Northwest and Northeast corners.

2) Enlarge the 5 gallon suction pits with the possibility of going substantially deeper, to minimize water condensate into the system. A.R.T. has put in 50+ suction pits in this neighborhood, removing approximately 15 gallons of soil per suction pit.

3) At minimum, insulate the 4" riser from the fan to the discharge point to minimize moisture condensation.

4) Consider changing the 4" pipe to 3" and insulating, to increase the velocity of air flow, and gives the system less opportunity to condense, if water condensing problem continues. Current system has low air flow allowing water to condense inside the discharge pipe.

5) Take additional rounds of air samples under rapidly falling barometer scenarios to determine any off gassing of equipment, materials or secondary sources.

6) As a last resort, install an additional system on the North side of the Building. only if there is continuing insufficient reduction of TCE readings, or negative field pressure and limited suction is still present. This could likely be a smaller residential radon style system to improve negative field pressure to the north side of the structure.

Please contact me if you have any questions or concerns.

Respectfully,

David M Gerard

David M Gerard, President
Advanced Radon Technologies, Inc

ATTACHMENT B
COX-COLVIN ASSOCIATES, INC. VAPOR PIN DETAILS

RESPONSE TO ECOLOGY VAPOR INTRUSION ACTION REQUIREMENT
5815 4th Avenue South
Seattle, Washington

Farallon PN: 457-007

Standard Operating Procedure
Use of the VAPOR PIN® Drilling Guide and Secure Cover

Updated March 16, 2018

Scope:

This standard operating procedure (SOP) describes the methodology to use the VAPOR PIN® Drilling Guide and Secure Cover to install and secure a VAPOR PIN® in a flush mount configuration.

Purpose:

The purpose of this SOP is to detail the methodology for installing a VAPOR PIN® and Secure Cover in a flush mount configuration. The flush mount configuration reduces the risk of damage to the VAPOR PIN® by foot and vehicular traffic, keeps dust and debris from falling into the flush mount hole, and reduces the opportunity for tampering. This SOP is an optional process performed in conjunction with the SOP entitled “Installation and Extraction of the VAPOR PIN®”. However, portions of this SOP should be performed prior to installing the VAPOR PIN®.

Equipment Needed:

- VAPOR PIN® Secure Cover (Figure 1);
- VAPOR PIN® Drilling Guide (Figure 2);
- Hammer drill;
- 1½-inch diameter hammer bit (Hilti™ TE-YX 1½” x 23” #00293032 or equivalent);
- 5/8-inch diameter hammer bit (Hilti™ TE-YX 5/8” x 22” #00226514 or equivalent);
- assembled VAPOR PIN®;
- #14 spanner wrench;
- Wet/Dry vacuum with HEPA filter (optional); and
- personal protective equipment (PPE).

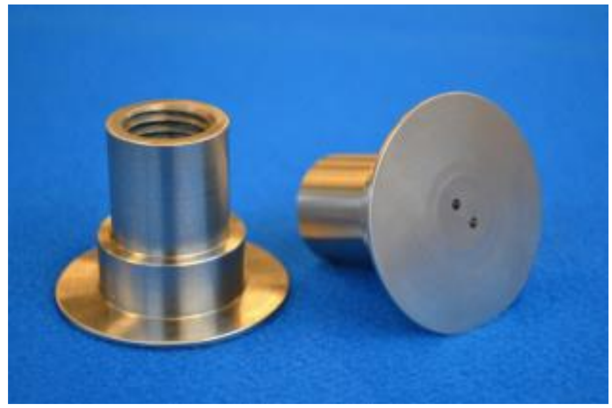

Figure 1. VAPOR PIN® Secure Cover

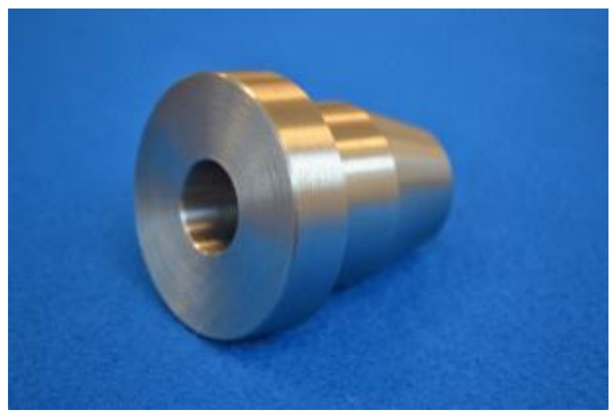

Figure 2. VAPOR PIN® Drilling Guide

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) While wearing PPE, drill a 1½-inch diameter hole into the concrete slab to a depth of approximately 1 3/4 inches. Pre-marking the desired depth on the drill

bit with tape will assist in this process.

4) Remove cuttings from the hole and place the Drilling Guide in the hole with the conical end down (Figure 3). The hole is sufficiently deep if the flange of the Drilling Guide lies flush with the surface of the slab. Deepen the hole as necessary, but avoid drilling more than 2 inches into the slab, as the threads on the Secure Cover may not engage properly with the threads on the VAPOR PIN®.

Figure 3. Testing Depth with the Drilling Guide

5) When the 1½-inch diameter hole is drilled to the proper depth, replace the drill bit with a 5/8-inch diameter bit, insert the bit through the Drilling Guide (Figure 4), and drill through the slab. The Drilling Guide will help to center the hole for the VAPOR PIN®, and keep the hole perpendicular to the slab.

6) Remove the bit and drilling guide, clean the hole, and install the VAPOR PIN® in accordance with the SOP "Installation and Extraction of the VAPOR PIN®.

Figure 4. Using the Drilling Guide

7) Screw the Secure Cover onto the VAPOR PIN® and tighten using a #14 spanner wrench by rotating it clockwise (Figure 5). Rotate the cover counter clockwise to remove it for subsequent access.

Figure 5. Tightening the Secured Cover

Limitations:

On slabs less than 3 inches thick, it may be difficult to obtain a good seal in a flush mount configuration with the VAPOR PIN.®

Standard Operating Procedure Installation and Extraction of the Vapor Pin®

Updated March 16, 2018

Scope:

This standard operating procedure describes the installation and extraction of the VAPOR PIN® for use in sub-slab soil-gas sampling.

Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the VAPOR PIN® for the collection of sub-slab soil-gas samples or pressure readings.

Equipment Needed:

- Assembled VAPOR PIN® [VAPOR PIN® and silicone sleeve(Figure 1)]; Because of sharp edges, gloves are recommended for sleeve installation;
- Hammer drill;
- 5/8-inch (16mm) diameter hammer bit (hole **must** be 5/8-inch (16mm) diameter to ensure seal. It is recommended that you use the drill guide). (Hilti™ TE-YX 5/8" x 22" (400 mm) #00206514 or equivalent);
- 1½-inch (38mm) diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch (19mm) diameter bottle brush;
- Wet/Dry vacuum with HEPA filter (optional);
- VAPOR PIN® installation/extraction tool;
- Dead blow hammer;
- VAPOR PIN® flush mount cover, if desired;
- VAPOR PIN® drilling guide, if desired;
- VAPOR PIN® protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel for repairing the hole following the extraction of the VAPOR PIN®.

Figure 1. Assembled VAPOR PIN®

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) If a flush mount installation is required, drill a 1½-inch (38mm) diameter hole at least 1¾-inches (45mm) into the slab. Use of a VAPOR PIN® drilling guide is recommended.

4) Drill a 5/8-inch (16mm) diameter hole through the slab and approximately 1-inch (25mm) into the underlying soil to form a void. Hole **must** be 5/8-inch (16mm) in diameter to ensure seal. It is recommended that you use the drill guide.

VAPOR PIN® protected under US Patent # 8,220,347 B2, US 9,291,531 B2 and other patents pending

5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.

6) 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 over the vapor pin to protect the barb fitting, and tap the vapor pin into place using a dead blow hammer (Figure 2). Make sure the installation/extraction tool is aligned parallel to the vapor pin to avoid damaging the barb fitting.

Figure 2. Installing the VAPOR PIN®

During installation, the silicone sleeve will form a slight bulge between the slab and the VAPOR PIN® shoulder. Place the protective cap on VAPOR PIN® to prevent vapor loss prior to sampling (Figure 3).

Figure 3. Installed VAPOR PIN®

7) 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 (Figure 4).

Figure 4. Secure Cover Installed

8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to re-equilibrate prior to sampling.

9) Remove protective cap and connect sample tubing to the barb fitting of the VAPOR PIN®. This connection can be made using a short piece of Tygon™ tubing to join the VAPOR PIN® with the

Nylaflow tubing (Figure 5). Put the Nylaflow tubing as close to the VAPOR PIN® as possible to minimize contact between soil gas and Tygon™ tubing.

Figure 5. VAPOR PIN® sample connection

10) Conduct leak tests in accordance with applicable guidance. If the method of leak testing is not specified, an alternative can be the use of a water dam and vacuum pump, as described in SOP Leak Testing the VAPOR PIN® via Mechanical Means (Figure 6). For flush-mount installations, distilled water can be poured directly into the 1 1/2 inch (38mm) hole.

Figure 6. Water dam used for leak detection

11) Collect sub-slab soil gas sample or pressure reading. When finished, replace the protective cap and flush mount cover until the next event. If the sampling is complete, extract the VAPOR PIN®.

Extraction Procedure:

1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the VAPOR PIN® (Figure 7). Turn the tool clockwise continuously, don't stop turning, the VAPOR PIN® will feed into the bottom of the installation/extraction tool and will extract from the hole like a wine cork, DO NOT PULL.

2) Fill the void with hydraulic cement and smooth with a trowel or putty knife.

Figure 7. Removing the VAPOR PIN®

- Prior to reuse, remove the silicone sleeve and protective cap and discard. Decontaminate the VAPOR PIN® in a hot water and Alconox® wash, then heat in an oven to a temperature of 265° F (130° C) for 15 to 30 minutes. For both steps, **STAINLESS – ½ hour, BRASS 8 minutes**

3) Replacement parts and supplies are available online.