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VAPOR INTRUSION MITIGATION DESIGN PLAN

5815 4TH AVENUE SOUTH—NORTH BUILDING
SEATTLE, WASHINGTON

AGREED ORDER NO. DE 5348

Submitted by:
Farallon Consulting, L.L.C.
975 5th Avenue Northwest
Issaquah, Washington 98027

Farallon PN: 457-007

For:
Mr. Ron Taylor
Capital Industries, Inc.
5801 Third Avenue South
Seattle, Washington

November 10, 2014

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ACRONYMS AND ABBREVIATIONS

Agreed Order	Agreed Order No. DE 5348 between the Washington State Department of Ecology and Capital Industries, Inc., which includes Exhibits B and D regarding vapor intrusion investigation and mitigation requirements.
Capital	Capital Industries, Inc.
COCs	constituents of concern
Ecology	Washington State Department of Ecology
Farallon	Farallon Consulting, L.L.C.
HVOCs	Halogenated Volatile Organic Compounds
IPIM	Inhalation Pathway Interim Measures
PSC	Philip Services Corporation
PVC	Schedule 40 polyvinyl chloride or 3043 polyvinyl chloride heavy wall pipe
SSDS	sub-slab depressurization system
TCE	trichloroethene
EPA	U.S. Environmental Protection Agency
VI	Vapor Intrusion
VIMD Plan	Vapor Intrusion Mitigation Design Plan
VIM Work Plan	Vapor Intrusion Mitigation Work Plan
VOC	volatile organic compound
WAC	Washington Administrative Code

1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Vapor Intrusion Mitigation Design Plan (VIMD Plan) on behalf of Capital Industries, Inc. (Capital) to provide the design specifications for the vapor intrusion (VI) mitigation system at the Pacific Food Systems North Building at 5815 4th Avenue South in Seattle, Washington (herein referred to as the Building) (Figure 1). Mitigation of VI from volatile constituents of concern (COCs) has been determined to be necessary at the Building by the Washington State Department of Ecology (Ecology) in accordance with Exhibits B and D of Agreed Order No. DE 5348 entered into by Capital and Ecology on January 24, 2008 (Agreed Order). VI mitigation design specifications have been developed in accordance with the Vapor Intrusion Mitigation Work Plan (VIM Work Plan) (Farallon 2008c). The need for mitigation of VI was based on the results of Tier 3 Vapor Intrusion Assessment documented in Farallon's report dated August 20, 2014.

1.1 VIMD PLAN PURPOSE

The purpose of the VIMD Plan is to provide the specifications of the VI mitigation system developed by Farallon that will mitigate the intrusion of volatile COCs that have the potential to migrate from soil and/or Water Table Zone groundwater to indoor ambient air within the Building. The mitigation measures that have been developed are consistent with the Agreed Order.

1.2 VIMD PLAN ORGANIZATION

The VIMD Plan is organized as follows:

- Section 1 presents the purpose of the VIMD Plan;
- Section 2 provides descriptions of and background information on the Capital Site and Building;
- Section 3 describes the VI mitigation system design;
- Section 4 discusses reports and work plans that will be prepared following the VIMD Plan; and
- Section 5 provides a list of documents used in preparation of the VIMD Plan.

2.0 SITE DESCRIPTION AND BACKGROUND

The following sections provide a description of the Capital Area of Investigation, within which the Building is located.

2.1 Site Description

Capital is defined as the property at 5801 3rd Avenue South between South Mead Street on the north and South Fidalgo Street on the south, and between 4th Avenue South on the east and 1st Avenue South on the west in Section 39, Township 24 South, Range 4 East in Seattle, King County, Washington (Figure 1); and is a source of halogenated volatile organic compounds (HVOCs) in the subsurface with the potential to result in a VI condition at Capital and buildings within the Capital Area of Investigation. The Capital Area of Investigation was initially defined in the *Remedial Investigation Work Plan, Capital Industries, Inc., 5801 Third Avenue South, Seattle, Washington* dated September 16, 2008, prepared by Farallon (2008a); and revised in the *Revised Draft Remedial Investigation Report, 5901 4th Avenue South, Seattle, Washington* dated October 2012, prepared by Farallon (2012b), as the area where concentrations of HVOCs associated with confirmed or suspected source areas at Capital exceed the screening levels (Figure 1). The Capital Area of Investigation is within the Seattle city limits in King County, Washington (2007) and is zoned for industrial light manufacturing. Properties within the Capital Area of Investigation include a mixture of light industrial, commercial, and residential properties.

The Building is located within the Capital Area of Investigation, east of Capital Plant 4 (Figure 1), and currently is used by Pacific Food Systems for warehouse storage and equipment maintenance.

2.2 BACKGROUND

The volatile HVOCs tetrachloroethene (PCE), trichloroethene (TCE), and/or cis-1, 2-dichloroethene were detected in two subslab soil gas samples collected at the Building in April 2011 at concentrations exceeding the preliminary cleanup standards used to evaluate VI risk (Figure 1). The standards used to evaluate VI risk were set forth in the Revised Inhalation Pathway Interim Measures (IPIM) Work Plan prepared by Philip Services Corporation (PSC) (2002); the Draft Interim Vapor Intrusion Plan prepared by Arrow Environmental et al. (2007), which is Exhibit D of the Agreed Order; and the *Updated Air and Groundwater IPIMALs/VIRLs for Residential and Commercial Scenarios for the Georgetown Site* prepared by Pioneer Technologies Corporation (2012). The subslab sample results indicated the potential for VI into the Building, and warranted indoor air analysis to further evaluate whether a VI risk exists.

The results of the assessment of indoor and outdoor ambient air conducted between 2012 and 2014 indicate that a source of volatile COCs in the subsurface is resulting in a VI condition for the Building. Results of the indoor air sampling events have remained relatively consistent

despite sealing the core holes in the floor slab and eliminating the potential contribution of COCs from the parts cleaner.

Concentrations of TCE detected in indoor air samples have consistently exceeded the preliminary cleanup level of 1.5 micrograms per cubic meter for a carcinogenic compound (Figure 1). Due to the association of the TCE source with a release of HVOCs beneath or proximate to the Building with no apparent contributing operational source within the building, Tier 4 mitigation measures must be implemented.

3.0 VAPOR INTRUSION MITIGATION DESIGN

This section presents the VI mitigation system design for the subslab depressurization system (SSDS) developed by Farallon for the Building. The design has been developed to achieve the objectives presented in the VIM Work Plan and in accordance with the IPIM approach (PSC 2002) and Arrow et al. (2007). The design elements include an overview of the mitigation system, a summary of the of the diagnostic testing procedure, a summary of design components, a summary of the City of Seattle permit application requirements, and a summary of post-installation performance testing.

3.1 DESIGN OVERVIEW

Mitigation via installation of an SSDS has been approved by Ecology under the IPIM (PSC 2002) approach as an adequate system to depressurize the area beneath the floor slab to prevent volatile COCs in groundwater in the Water Table Zone and/or affected soil from entering the interior of the building.

The SSDS depressurizes the ground immediately below the slab by using an exhaust blower that will generate sufficient negative pressure to prevent the flux of air from the soil, through the slab, and into the building. This type of system is applicable to a wide variety of VOCs that migrate through soil, largely through diffusion.

The SSDS decreases the pressure below the building slab by drawing air from the subsurface. Negative subsurface pressure induces the flow of air and VOCs between the building and slab downward, through the slab, and into the subsurface. An exhaust blower draws the air and VOCs from the subsurface and vents them to the ambient air via an exhaust stack located on the roof of the building. Negative pressure is applied to the subsurface at sumps installed at locations determined by a Farallon Engineer during a site investigation. The exhaust fan is connected to the sumps via risers and piping network. The blower size will be determined by diagnostic testing after the installed piping and sump network.

3.2 DIAGNOSTIC TESTING

Diagnostic testing will be conducted after the installation of the subslab monitoring ports and the piping and sump network. The results of the diagnostic testing will be used by Farallon to develop an SSDS blower specific to the Building that will mitigate VI. A detailed summary of diagnostic testing performed will be included in the draft Post-Installation Vapor Intrusion Mitigation Report.

The scope of work for the diagnostic testing includes:

- Sealing all cracks and other floor penetrations as described in Sheet No. 3 of the Subslab Depressurization System design in Appendix A;

- Connecting a pilot test blower to both of the sumps with a vacuum/flow control gate valve near the vacuum blower, and a filtered & gate-valve air inlet between the vacuum/flow control valve and the blower, to apply a controlled vacuum to the sumps;
- Measuring the negative soil vapor pressure at each of the subslab monitoring ports using a manometer, while multiple static vacuum pressures are applied and measured at the sumps; and
- Measuring the exhaust flow and vacuum reading at the pilot test blower while multiple static vacuum pressures are applied.

The negative soil vapor pressure readings collected at each of the sub-slab monitoring ports, as well as the pilot test blower vacuum and flow readings, will be used to determine blower size required to depressurize the Building. During the diagnostic testing, all doors and other large openings into the building will be closed, and the Building HVAC/heating system will operate under normal winter operation. A minimal negative soil vapor pressure of 0.025-inches of water column measured under the slab will be used as the criteria for blower selection.

A schematic of the SSDS design prepared by Farallon is presented on Sheet Nos. 1 through 4 of the Subslab Depressurization System design included in Appendix A.

3.3 DESIGN COMPONENTS

Sump locations are proposed near the center wall and workbenches in the Building to facilitate simple routing of the sumps and piping, and limit impact to occupant operations. The exhaust fan will be mounted on the south side of the building under the lean-on roof, and the exhaust stack will be mounted on the south side of the Building extending above the roof surface. Sumps will be networked via piping through the building.

The design components and locations were determined by Farallon from site investigation and communication with building occupants. The SSDS includes sumps, risers and piping, exhaust blower, exhaust stack, and monitoring ports and pressure gauges. Each of these components is discussed below and is detailed on Sheet Nos. 1 through 4 of the Subslab Depressurization System design prepared by Farallon included in Appendix A.

3.3.1 Sumps

Sumps provide the interface between the subsurface and the suction applied by the exhaust blower. Each sump will consist of a 3-inch-diameter slotted schedule 40 polyvinyl chloride (PVC) pipe extended in a 12-inch-diameter subslab cavity that will extend 14 inches below the bottom of the Building floor slab. The 3-inch-diameter slotted PVC pipe will extend 6 inches below the bottom of the Building floor slab. The 3-inch diameter slotted PVC pipe will extend though the slab with solid wall PVC pipe and will be sealed to the slab to prevent air from being drawn from the interior of the Building. A schematic of each sump location is presented on Sheet No. 4 of Appendix A.

3.3.2 Risers and Piping

Risers and piping will provide the conduit from the sumps to the exhaust blower, which will be mounted on the south side of the Building. Risers will be connected to the sump with a Fernco rubber coupling and will extend from the sump at ground level, up adjacent walls, and will be routed through the south side of the Building. The Fernco rubber coupling's hose clamps will have silicon sealant applied to the hose clamp screw heads to prevent tampering and removal. The point at which the piping network penetrates the south side of the Building will be sealed with flashing and waterproof sealant. Risers and pipe network will be securely fastened to walls with pipe supports to provide the pipe network structural support. Piping and risers will be labeled "Depressurization System Pipe for Indoor Air Protection" at least once in every room, and next to the exhaust blower.

Piping will connect risers to the exhaust blower mounted to the south side of the Building. All of the piping will connect to form one network, and will be angled so that the connection to the exhaust blower is at the highest point and the connection to each sump riser is at the lowest point. Piping will be angled to prevent low spots where water vapor could condense into pools. Piping will consist of 3-inch-diameter and 4-inch-diameter schedule 40 PVC pipe. Specifications of piping are presented in detail on Sheet Nos. 2 and 3 of Appendix A.

3.3.3 Exhaust Blower

The exhaust blower will provide the suction to the sumps via the risers and piping of the SSDS. The specifications for the exhaust blower will be determined by Farallon based on information collected during the diagnostic testing to be conducted at the Building. The exhaust blower will be mounted to a raised platform on the south side of the Building. Vibration isolators will be used between the exhaust blower platform and the building to prevent vibration and excess noise. The exhaust blower will be connected to piping and the exhaust stack. Diagnostic testing flow and vacuum data collected will be used to determine the size of exhaust blower needed.

3.3.4 Exhaust Stack

The exhaust stack will discharge the VOCs/air emissions to the ambient air at a height that does not pose a threat to human health or the environment. Constructed of PVC, the exhaust stack will effectively extend the exhaust blower outlet to a height approximately 4 feet above the building roof line. The exhaust stack will attach to the exhaust blower, be routed up the south side of the Building, and discharge 4 feet above the roof line. The exhaust stack will be angled 45 degrees off vertical from approximately 4 feet above roof level, and the outlet will be cut on the vertical to prevent precipitation from entering the exhaust stack while continuing to exhaust VOC vapors/air. The exhaust stack discharge point will be at least 10 feet from any window, door, or other opening into an occupied space, and from any HVAC/ventilation inlet. A schematic showing the specific details of the exhaust stack are presented on Sheet No. 4 of Appendix A.

3.3.5 Monitoring Ports and Pressure Gauges

A monitoring port will be installed at each riser to measure and confirm that negative pressure is being applied throughout the SSDS. Monitoring ports consist of a tapped one-quarter-inch hole with a brass plug that can be removed to gauge vacuum and flow to each sump. The tapped one-quarter-inch hole will be perpendicular to the pipe to accurately gauge flow. A manometer will be used to measure the pressure of the system

A Dwyer Magnehelics or equivalent will be permanently installed into the 4-inch diameter PVC piping inside the Building to measure and confirm that negative pressure is being applied throughout the SSDS. The Dwyer Magnehelics gauge and valve system will be mounted to the riser with solid or flexible tubing. Mounted location will be based in relation to preventing possible impact from facility operations. The Magnehelics pressure range will be selected after the diagnostic testing and exhaust blower selection. The Magnehelics pressure gauge will be labeled "Vacuum to be 10-inches W.G. or stronger at all times," or as determined appropriate during the diagnostic test.

The valve system, installed to protect the Magnehelics from failure, consists of a main valve and a relief valve. The main valve will be installed between the riser and the pressure gauge that will connect/disconnect pressure applied to the gauge from the riser. The relief valve will open the pressure gauge to the ambient air pressure during non-monitoring events and relieve the pressure within the tubing after the main valve is closed. The main valve will remain closed and the relief valve will remain open when the system monitoring is not in progress. During system monitoring events, the main valve will be opened and the relief valve will be closed to engage the pressure gauge. The pressure gauge will provide confirmation that adequate negative pressure is being applied by the exhaust blower to the subsurface via the common riser.

3.3.6 Subslab Monitoring Ports

Two subslab monitoring ports will be installed for measuring pressure below the Building floor slab. Each subslab monitoring port consists of a brass barbed tube adaptor, 1/8-inch ball valve, and 1/8-inch brass pipe with perforations below the slab. The subslab monitoring port will be sealed in the slab to prevent air from being drawn from interior of the Building. The subslab monitoring ports will be installed adjacent to interior walls or permanent machines to prevent tripping hazards and protect from damage. Except during monitoring events, each subslab monitoring port's ball valve will be closed, and the handle will be removed and stored. During diagnostic and post-construction testing, the subslab monitoring ports will be used to determine vacuum below the slab. A schematic showing the specific details of the subslab monitoring ports is presented on Sheet Nos. 3 and 4 of Appendix A.

3.4 PERMIT APPLICATION

A permit application will be prepared by Farallon and submitted to the City of Seattle to obtain a Mechanical Expedited (Full) Permit, and other required permits for the scope of the SSDS installation. The permit application will include:

- Completed Mechanical Plan cover sheet;
- Year of code with which the permit complies;
- Vicinity map;
- Site plan, to scale, showing adjacent zoning;
- Legal description of the property;
- Assessor's parcel number; and
- Related building permit numbers.

3.5 POST-INSTALLATION PERFORMANCE/CONFIRMATION TESTING

Upon completion of the SSDS installation at the Building, pressure field extension testing and air sampling will be conducted to confirm that the SSDS is adequately depressurizing the immediate subsurface.

3.5.1 Pressure Field Extension Testing

A post-construction round of negative pressure measurements will be collected with the SSDS running to determine if the SSDS is adequately depressurizing the Building.

The subslab monitoring ports used during the diagnostic pilot testing will be used to monitor post-installation monitoring. Using a manometer, the negative soil vapor pressure at each subslab monitoring port will be recorded. A minimal negative subslab pressure measurement of 0.025-inch water column will be used as pass/fail criteria. Subslab pressure measurements collected at subslab monitoring ports will be recorded and presented in the post-installation Vapor Intrusion Mitigation Report.

3.5.2 Air Sampling

Indoor and outdoor ambient air samples will be collected approximately 1 month after start-up of the SSDS. Air samples will be collected at the approximate sampling locations used during previous investigations using either Summa canisters or other appropriate sampling method. Samples will be analyzed for volatile COCs using U.S. Environmental Protection Agency Method TO-15. All sampling will be performed in general accordance with the standard operating procedures established during completion of the Tier 3 VI Assessments, modified if necessary to accommodate relevant changes in sampling protocols. If the sampling protocols

change in response to updated regulatory standards, the Sampling and Analysis Plan will be amended and submitted to Ecology for concurrence prior to performing sampling activities.

Results of air sampling will be compared to the relevant cleanup standards to determine if further action is necessary to protect human health and whether additional samples are required to confirm the performance of the SSDS. The initial sampling results will be presented to Ecology for review following validation of the data package. The air sampling results will also be presented in the post-installation Vapor Intrusion Mitigation Report described in Section 4.0.

4.0 REPORTING

4.1 DRAFT POST-INSTALLATION VAPOR INTRUSION MITIGATION REPORT

A draft post-installation Vapor Intrusion Mitigation Report describing the data collection, design, and installation of the SSDS at the Building, and results of the initial air sampling event will be prepared by Farallon and submitted to Capital for review within 45 days of receipt of post-installation ambient air analytical data. Following review and approval by Capital, the report will be provided to Ecology for review and comment. The report will include:

- A summary of the results of the data collection used for the design of the SSDS;
- The final as-built design of the SSDS;
- A brief narrative of the scope of work and procedures followed for installation of the SSDS;
- A summary of the field activities;
- Operation parameters for the SSDS; and
- Figures depicting the final design, including the number, location, and configuration of SSDS components.

The final as-built design drawings will be provided to Ecology and the building owner upon completion and in advance of the report above for their use.

4.2 DRAFT VAPOR INTRUSION INSPECTION, MONITORING, MAINTENANCE WORK PLAN

The draft Vapor Intrusion Inspection, Monitoring, and Maintenance Work Plan (VIIMM Work Plan) will propose continuing operational maintenance, inspection, and monitoring tasks for the Building. The draft VIIMM Work Plan will be submitted 4 weeks from the completion of the SSDS at the Building. Farallon will meet with the building owner representatives following installation of the SSDS to present the details of the system construction and operations along with contact information in the event the system shuts down. A more detailed training session will follow completion of the VIIMM.

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FIGURE

VAPOR INTRUSION MITIGATION DESIGN PLAN
Pacific Food Systems North Building
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

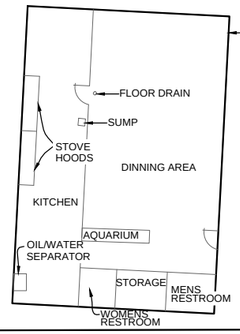
Farallon PN: 457-007

VACANT HOUSE

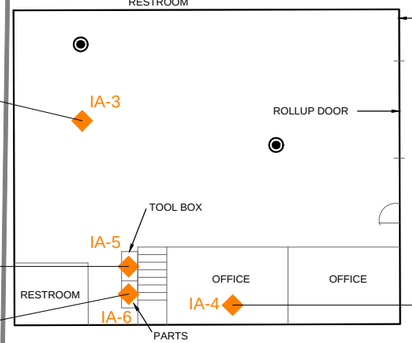
CAPITAL INDUSTRIES, INC. PROPERTY
5801 3rd AVENUE SOUTH

4TH AVENUE SOUTH

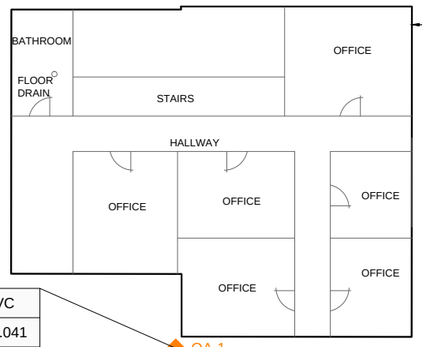
CHINESE RESTAURANT
5807 4th AVENUE SOUTH



PACIFIC FOOD SYSTEMS - NORTH BUILDING
5815 4th AVENUE SOUTH



PACIFIC FOOD SYSTEMS - SOUTH BUILDING
5815 4TH AVENUE SOUTH



PLANT 4

DATE	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCE	VC
2/21/12	**1.5**	**4.4**	**0.98**	<0.67	<0.067	<0.043
3/20/13	**1.6**	**7.0**	**1.6**	<0.68	<0.068	<0.044

DATE	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCE	VC
4/24/14	**1.1**	**3.4**	**0.49**	<0.65	<0.065	<0.042

DATE	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCE	VC
5/5/14	**0.95**	**3.6**	**0.34**	<0.65	<0.065	<0.042

DATE	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCE	VC
2/21/12	**0.60**	**1.9**	**0.32**	<0.68	<0.068	<0.044
3/20/13	**0.66**	**2.4**	**0.43**	<0.67	<0.067	<0.043

DATE	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCE	VC
2/21/12	<0.22	<0.17	<0.13	<0.64	<0.064	<0.041
3/20/13	<0.23	<0.18	<0.13	<0.64	<0.066	<0.043

DATE	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	1,1-DCE	VC
4/24/14	<0.21	**0.27**	<0.12	<0.61	<0.061	<0.039

MW-6

CI-7-40 MW-7 CI-7-60

OA-1

OA-2

SOUTH FIDALGO STREET

0 20
APPROXIMATE SCALE IN FEET

LEGEND

- INDOOR/OUTDOOR AIR SAMPLING LOCATION
- 3" FOUNDATION CORE
- CAPITAL INDUSTRIES MONITORING WELL

ALL LOCATIONS ARE APPROXIMATE

ANALYTICAL RESULTS (MICROGRAMS PER CUBIC METER)

PCE = TETRACHLOROETHENE
TCE = TRICHLOROETHENE
cis-1,2-DCE = cis-1,2-DICHLOROETHENE
trans-1,2-DCE = trans-1,2-DICHLOROETHENE
1,1-DCE = 1,1-DICHLOROETHENE
VC = VINYL CHLORIDE

RESULTS IN **BOLD** DENOTE CONCENTRATIONS ABOVE LABORATORY METHOD REPORTING LIMITS.

< DENOTES ANALYTE NOT DETECTED AT OR ABOVE THE REPORTING LIMIT LISTED

FARALLON CONSULTING
Quality Service for Environmental Solutions | farallonconsulting.com

Washington
Issaquah | Bellingham | Seattle

Oregon
Portland

California
Oakland | Sacramento

FIGURE 1

VAPOR INTRUSION ASSESSMENT
AIR SAMPLING ANALYTICAL RESULTS
CAPITAL INDUSTRIES, INC.
SEATTLE, WASHINGTON

FARALLON PN: 457-007

Drawn By: DEW Checked By: JK Date: 9/26/2014 Disk Reference: 457007c

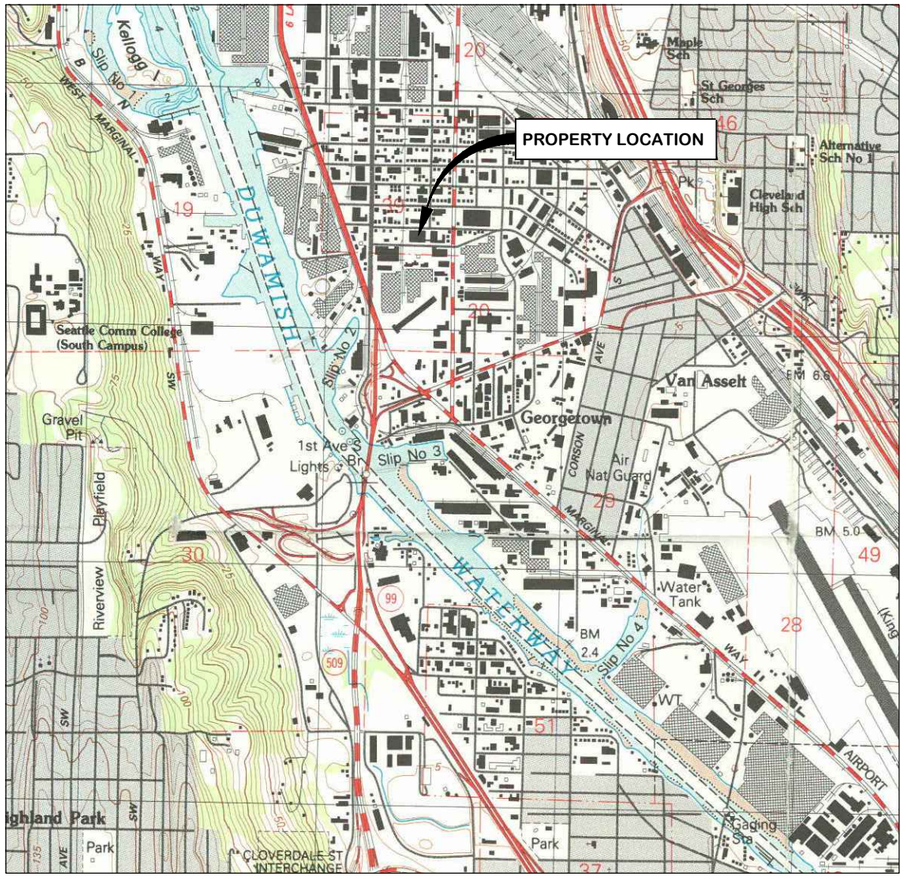
APPENDIX A
SUBSLAB DEPRESSURIZATION SYSTEM ENGINEERING DRAWINGS

VAPOR INTRUSION MITIGATION DESIGN PLAN
Pacific Food Systems North Building
Capital Industries, Inc.
5801 3rd Avenue South
Seattle, Washington

Farallon PN: 457-007

SUB-SLAB DEPRESSURIZATION SYSTEM

PACIFIC FOOD SYSTEMS
5815 4TH AVE SOUTH
SEATTLE, WA 98108



REFERENCE: 7.5 MINUTE USGS QUADRANGLE SOUTH SEATTLE, WASHINGTON. DATED 1983

SITE LOCATION MAP
(NOT TO SCALE)

0 500
APPROXIMATE SCALE IN METERS

WASHINGTON

DRAWING INDEX

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4	DETAILS

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	9/25/14	ISSUED FOR CLIENT REVIEW	CM/DEW	CM	
	DATE	DESCRIPTION	BY	CKD.	APP.

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PREPARED FOR

CAPITAL INDUSTRIES,INC.
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SUB-SLAB DEPRESSURIZATION SYSTEM

TITLE SHEET,
SITE LOCATION MAP, AND
DRAWING INDEX

SCALE	AS SHOWN
PROJECT NO.	457-007
FILE NAME:	SYSTEM.dwg
SHEET NO.	1
OF	4

ELECTRICAL ABBREVIATIONS

A/AMP	AMP
AC	ALTERNATING CURRENT
BD	BUS DUCT
C	CURRENT
CB	CIRCUIT BREAKER
CLG	CEILING
DC	DIRECT CURRENT
DIS	DISCONNECT
DP	DOUBLE POLE
DT	DOUBLE THROW
EG	ENCLOSED AND GASKETED
E(OH)	ELECTRICAL (OVERHEAD)
E(UG)	ELECTRICAL (UNDERGROUND)
EMER	EMERGENCY
EPO	EMERGENCY POWER OFF
EMT	ELECTRICAL METALLIC TUBING
EXP	EXPOSED
FBO	FURNISHED BY OTHERS
FLEX	FLEXIBLE METAL CONDUIT
FRN	DUAL ELEMENT FUSE
GEN	GENERATOR
GFIC	GROUND FAULT INTERRUPTER
GND	GROUND
GRC	GALVANIZED RIGID CONDUIT
HOA	HAND-OFF-AUTO SWITCH
IRD	INFRARED DETECTOR
HP	HORSE POWER
HZ	CYCLES PER SECOND
JB	JUNCTION BOX
LFMC	LIQUID TIGHT FLEXIBLE METAL CONDUIT
M	MOTOR/MOTOR STARTER COIL
MCC	MOTOR CONTROL CENTER
MCP	MOTOR CIRCUIT PROTECTOR
NC	NORMALLY CLOSED
NEC	NATIONAL ELECTRIC CODE
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NF	NON-FUSED
NO	NORMALLY OPEN
OL	OVERLOADS
PBS	PUSHBUTTON
PF	POWER FACTOR
PL	PILOT LIGHT
PLC	PROGRAMMABLE LOGIC CONTROLLER
RC	RIGID CONDUIT
RCPT	RECEPTACLE
SN	SOLID NEUTRAL
SP	SINGLE POLE
ST	SINGLE THROW
SW	SWITCH
TF/TRAN	TRANSFORMER
UF	UNDERFLOOR
UG	UNDERGROUND
V	VOLTS
VFD	VARIABLE FREQUENCY DRIVE
VP	VAPOR PROOF
WHT	WHITE
WP	WEATHER PROOF
XP	EXPLOSION PROOF

STANDARD ABBREVIATIONS

AF	AIR FILTER
AB	AGGREGATE BASE
AC	ASPHALTIC CONCRETE
APPROX	APPROXIMATELY
AF	AIR FILTER
AS	AIR SPARGE
BF	BLIND FLANGE
B.G.S.	BELOW GROUND SURFACE
BLDG	BUILDING
BOP	BOTTOM OF PIPE
BV	BALL VALVE
CONC	CONCRETE
CPLG	COUPLING
℄ /CL	CENTERLINE
CV	CONTROL VALVE/CHECK VALVE
DC	DOUBLE CONTAINED
/DIA	DIAMETER
DWG	DRAWING
DP	DUAL PHASE
DPI	DIFFERENTIAL PRESSURE INDICATOR
EF	EACH FACE
EL/ELEV	ELEVATION
ELEC	ELECTRICAL
ELB	ELBOW
EPDM	ETHYLENE PROPYLENE RUBBER
EXIST/(E)	EXISTING
EXP	EXPANSION
EW	EACH WAY
EA	EACH
FC	FAIL CLOSE
FO	FAIL OPEN
FLXC	FLEXIBLE CONNECTION
FM	FLOW METER
FL	FLOW LINE
FT	FOOT
FUT	FUTURE
FIN GR	FINISHED GRADE
FE	FLANGED END
FNPT	FEMALE NATIONAL PIPE THREAD
GA	GAUGE
GAC	GRANULAR ACTIVATED CARBON
GALV	GALVANIZED
GI	GALVANIZED IRON
GPM	GALLONS PER MINUTE
GR	GRADE
GND	GROUND
GSKT	GASKET
GW	GROUNDWATER
GV	GATE VALVE
HDPE	HIGH DENSITY POLYETHYLENE
HORIZ	HORIZONTAL
HP	HORSEPOWER/HIGH PRESSURE
HR	HOUR
HS	HOSE
HYD	HYDRANT
HOA	HAND OFF AUTOMATIC
ID	INSIDE DIAMETER
IN	INCHES
INV	INVERT
IPS	IRON PIPE SIZE
JT	JOINT
JB	JUNCTION BOX
KO	KNOCK OUT
LSHH	LEVEL SWITCH
M	MOTOR
MAX	MAXIMUM
MH	MANHOLE
MJ	MECHANICAL JOINT
MIN	MINUTE/MINIMUM
MISC	MISCELLANEOUS
MNPT	MALE NATIONAL PIPE THREAD
MP	METER PUMP
MON.PORT	MONITORING PORT
MW	MONITORING WELL
NC	NORMALLY CLOSED
NIC	NOT IN CONTRACT
NO	NORMALLY OPEN
NO.	NUMBER
N	NEW
NTS	NOT TO SCALE
NPDES	NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM
OC	ON CENTER
OD	OUTSIDE DIAMETER
OSHA	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION
OVHD	OVERHEAD
#/LB	POUND
PB	PULL BOX
PBF	PROVIDED BY FARALLON
PC	PORTLAND CEMENT
PCC	PORTLAND CEMENT CONCRETE
PG	PRESSURE GAS
PL	PROPERTY LINE/PIPE LINE
PO	PUMP OUT
P	PRESSURE
PRV	PRESSURE RELEASE VALVE
PSI	POUNDS PER SQUARE INCH
PSIA	POUNDS PER SQUARE INCH, ABSOLUTE
PSIG	POUNDS PER SQUARE INCH, GAUGE
PTW	PRESSURE TREATMENT
PVC	POLYVINYL CHLORIDE
PV	PROCESS VARIABLE
PR	PAIR
PUE	PUBLIC UTILITY EASEMENT
R	RADIUS/RISER
RC	REINFORCED CONCRETE
REQ	REQUIRED
REF	REFERENCE
SCH	SCHEDULE
SDR	STANDARD DIMENSION RATIO
SECT	SECTION
SHT	SHEET
SPEC	SPECIFICATION
SQ	SQUARE
STA	STATION
STD	STANDARD
STL	STEEL
SBO	SUPPLIED BY OWNER
ST	SAMPLE TAP
STR	STRAINER
SS	STAINLESS STEEL
STL	STEEL
SVE	SOIL VAPOR EXTRACTION
SW	SWITCH
TYP	TYPICAL
TOC	TOP OF CASING/CURB
TOS	TOP OF STEEL
TOW	TOP OF WALL
UBC	UNIFORM BUILDING CODE
UGPS	UNDERGROUND PULL SECTION
UTIL	UTILITY
V	VALVE/VENT/VOLTS
VAC	VACUUM
VAR	VARIES/VARIABLE
VERT	VERTICAL
VP	VAPOR
VRV	VACUUM RELIEF VALVE
W/	WITH
W/O	WITHOUT
WS	WATER SURFACE/WATER STOP

PIPING, ELECTRICAL AND EQUIPMENT SYMBOLS

- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- BUTTERFLY VALVE
- CHECK VALVE
- DIAPHRAGM OPERATED VALVE
- SOLENOID VALVE
- MOTOR OPERATED VALVE
- PRESSURE REGULATING VALVE
- DRAIN
- WELD CAP
- SCREWED CAP
- SCREWED PLUG
- FLANGE
- BLIND FLANGE
- REDUCER/INCREASER
- DIRECTION OF FLOW
- UNION
- FLEXIBLE PIPE COUPLING
- BLOWER OR FAN
- CENTRIFUGAL PUMP
- PITOT TUBE
- STRAINER
- TRAP
- FILTER
- DIAMETER
- FEMALE ADAPTER
- SILENCER
- NEEDLE VALVE
- FLOW METER
- HOSE BIB
- SAMPLE TAP/MONITORING PORT
- HEAT EXCHANGER
- PRESSURE RELIEF OR AIR RELIEF
- VACUUM RELIEF
- NORMALLY OPEN
- NORMALLY CLOSED
- MAGNETIC STARTER
- DUPLEX RECEPTACLE, 15A; WP-WEATHER PROOF
- ELAPSED TIME METER
- FUSE
- FUSED DISCONNECT
- CAMLOCK CONNECTION
- VERTICAL PIPERUN
- GROUND
- GROUND ROD (3/4" COPPER WELD)
- HEATER STRIP
- JUNCTION BOX, PB-PULLBOX
- KILOWATT HOUR METER
- MOTOR
- MOTOR OVERLOAD
- NON-FUSABLE DISCONNECT SWITCH
- PILOT LIGHT, R=RED, W=WHITE, G=GREEN
- SELECTOR SWITCH AO=AUTO OFF, HOA=HAND OFF AUTO
- SWITCH, 120-277V, 2-2POLE, 20A
- THERMOSTAT
- TIME DELAY RELAY, CR=CONTROL RELAY
- TRANSFORMER
- UNDERGROUND PULLBOX
- WEATHER PROTECTED
- 120/208V PANEL
- 277/480V PANEL
- *HIGH LIGHT STANDARD
- REVISION TO PLANS

INSTRUMENTATION ABBREVIATIONS AND SYMBOLS

INSTRUMENT LEGEND

FIRST LETTER INITIATING VARIABLE		SUCCEEDING LETTERS OUTPUT FUNCTIONS
A	ANALYSIS	ALARM
B	BURNER	
C	CONDUCTIVITY	CONTROL
D	DENSITY	DIFFERENTIAL
E	POTENTIAL (VOLTS)	PRIMARY ELEMENT
F	FLOW RATE	RATIO (FRACTION)
G	FIRE ALARM	GLASS (SIGHT GAUGE)
H	HAND (MANUALLY)	HIGH
I	CURRENT (AMPERES)	INDICATE
J	POWER	
K	TIME	
L	LEVEL	LEAK, LOW
M	MOISTURE/HUMIDITY	LIGHT (PILOT)
N	EQUIPMENT STATUS	
P	PRESSURE/VACUUM	POINT (TEST CONNECTION)
Q	QUANTITY	INTEGRATE (TOTALIZE)
R		RECORD/PRINT
S	SPEED	SWITCH
T	TEMPERATURE	TRANSMIT
U	MULTIVARIABLE	MULTIFUNCTION
V	VIBRATION/VOLUME	VALVE/DAMPER
W	WEIGHT/FORCE/TORQUE	
X	UNCLASSIFIED	UNCLASSIFIED
Y		RELAY/COMPUTE
Z	POSITION	DRIVE/ACTUATE

INSTRUMENT SYMBOLS

SYMBOL	DESCRIPTION
M	MOTOR
HOA	HAND-OFF-AUTO SELECTOR SWITCH
	LOCALLY MOUNTED INSTRUMENT
	CONTROL PANEL MOUNTED INSTRUMENT
I	INTERLOCK
-10	PLC SHUTDOWN ALARM

STANDARD SYMBOLS

SECTION — 4 / 3|6 — DETAIL NUMBER; CURRENT; REFERENCED

GENERAL NOTES

1. A COPY OF THE PROJECT DESIGN DRAWINGS AND SPECIFICATIONS SHALL BE MAINTAINED ON THE JOB SITE AT ALL TIMES.
2. COPIES OF ALL PERMITS SHALL BE MAINTAINED ON THE JOB SITE AT ALL TIMES. THE CONTRACTOR SHALL COMPLY WITH ALL PERMIT REQUIREMENTS.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING ALL DIMENSIONS.
4. BURIED UTILITIES SHOWN ON THE DRAWINGS ARE FOR GENERAL INFORMATION ONLY. UTILITY LOCATIONS ARE APPROXIMATE AND MAY NOT BE INCLUSIVE OF ALL UTILITIES THAT EXIST ON THE PROPERTY.
5. THE CONTRACTOR SHALL HAVE A PRIVATE UTILITY LOCATE SERVICE VERIFY ALL UTILITIES AND MARK THEIR LOCATIONS ON THE GROUND PRIOR TO STARTING CONSTRUCTION. FARALLON SHALL BE CONTACTED IMMEDIATELY IF A CONFLICT IS FOUND BETWEEN EXISTING UTILITIES AND THE PROJECT DESIGN.
6. FARALLON SHALL BE NOTIFIED OF DISCREPANCIES BETWEEN CONTRACT DRAWINGS AND ACTUAL SITE CONDITIONS.
7. THE CONTRACTOR SHALL ASSUME RESPONSIBILITY FOR THE JOB SITE CONDITIONS AND ENSURE THE SAFETY OF ALL PERSONS AND PROPERTY FOR THE DURATION OF ON SITE PROJECT WORK. THE CONTRACTOR SHALL PROTECT STRUCTURES, UTILITIES, AND PAVING FROM DAMAGE, DIRECT OR INDIRECT, RESULTING FROM THE WORK. THIS REQUIREMENT SHALL APPLY CONTINUOUSLY OVER THE DURATION OF ON SITE ACTIVITIES AND NOT BE LIMITED TO NORMAL WORKING HOURS.
8. ALL EXCAVATIONS SHALL BE PERFORMED IN STRICT ACCORDANCE WITH APPLICABLE U.S. DEPARTMENT OF LABOR OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) AND THE WASHINGTON INDUSTRIAL SAFETY AND HEALTH ACT (WISHA) REGULATIONS. THE CONTRACTOR ASSUMES FULL RESPONSIBILITY FOR THE SAFETY OF ALL CONSTRUCTION OPERATIONS.
9. NO TRENCHES SHALL BE LEFT OPEN WHEN WORK IS NOT IN PROGRESS. ALL OPEN EXCAVATIONS SHALL BE FENCED.

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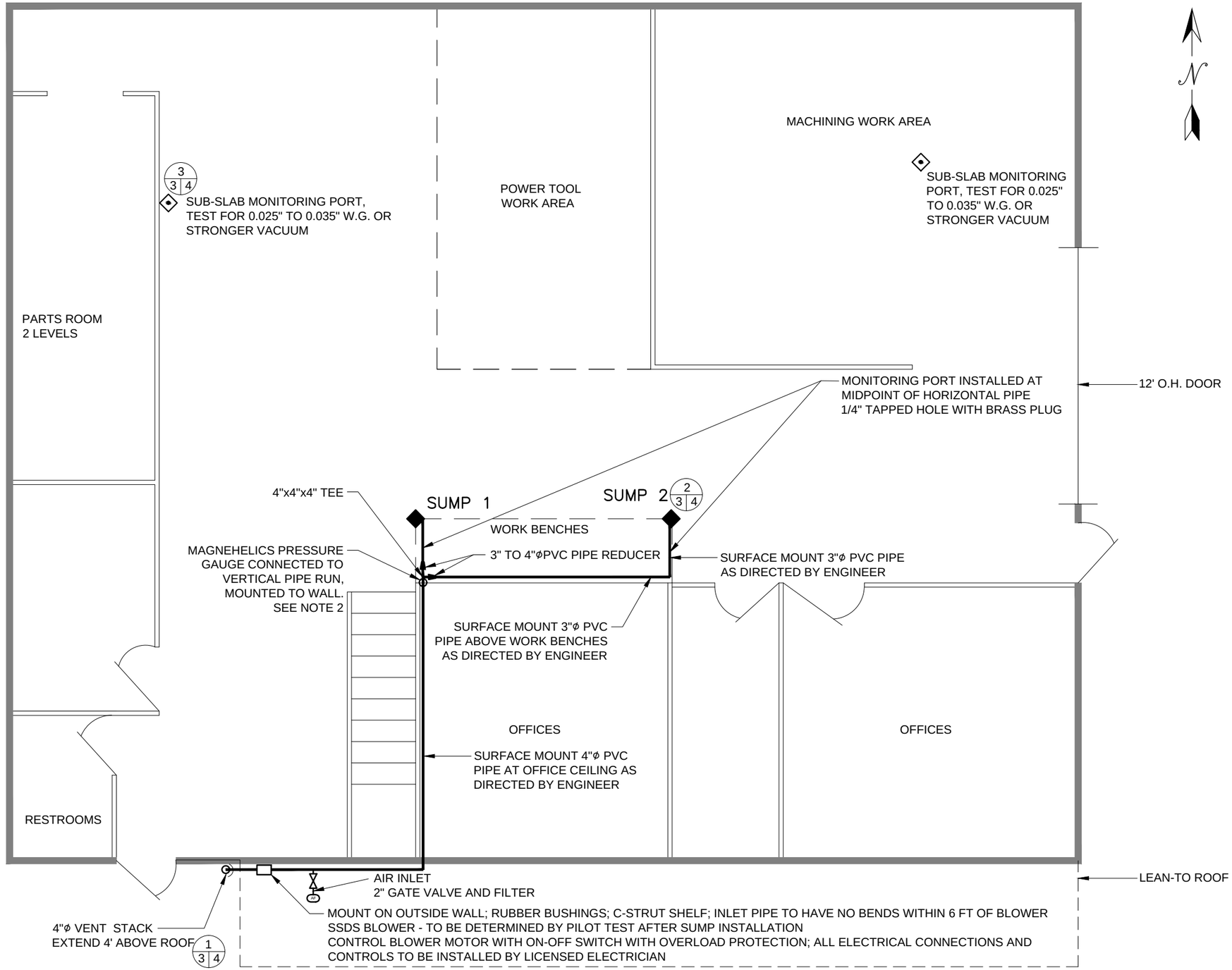
SUB-SLAB DEPRESSURIZATION SYSTEM

GENERAL NOTES, LEGEND,SYMBOLS, AND ABBREVIATIONS

SCALE	AS SHOWN
PROJECT NO.	457-007
FILE NAME:	SYSTEM.dwg
SHEET NO.	2
OF	4

NOTES:

1. SEAL ALL CONCRETE FLOOR CRACKS, LARGER THAN HAIRLINE CRACKS, WITH THOROSEAL WATERPROOF CEMENT-BASED COATING, (www.thoroproducts.com) MIXED WITH ACRYL-60 AT MFG. RECOMMEND RATE. CRACKS TO BE THOROUGHLY CLEANED WITH HIGH-PRESSURE (2,500 psi min) WATER SPRAY INCORPORATING OIL-GREASE REMOVING DETERGENT AND BRUSH TO COMPLETELY REMOVE OIL, GREASE, AND PAINT FROM CONCRETE SURFACE WITHIN 1-INCH OF THE CRACKS TO BE SEALED.
2. MAGNEHELICS PRESSURE GAUGE RANGE DETERMINED AFTER PILOT TEST AND BLOWER SELECTION. LABELED "VACUUM TO BE 10" W.G. OR STRONGER AT ALL TIMES" (10" W.G. OR AS DETERMINED BY PILOT TEST). MAGNEHELICS PRESSURE GAUGE RANGE AND MOUNTED LOCATION TO BE DETERMINED BY ENGINEER.
3. ALL EXPOSED PIPE TO BE PERMANENTLY LABELED "DEPRESSURIZATION SYSTEM PIPE FOR INDOOR AIR PROTECTION", TWO PLACES INSIDE, AND NEXT TO BLOWER AS DIRECTED BY ENGINEER.



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	DATE	DESCRIPTION	BY	CKD.	APP.

SITE PLAN

0 5
Scale in feet

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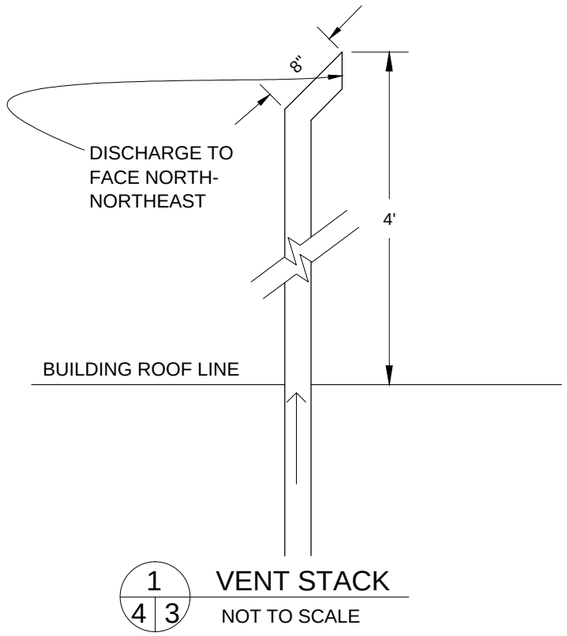
SUB-SLAB DEPRESSURIZATION SYSTEM

SITE PLAN WITH SUB-SLAB DEPRESSURIZATION SYSTEM

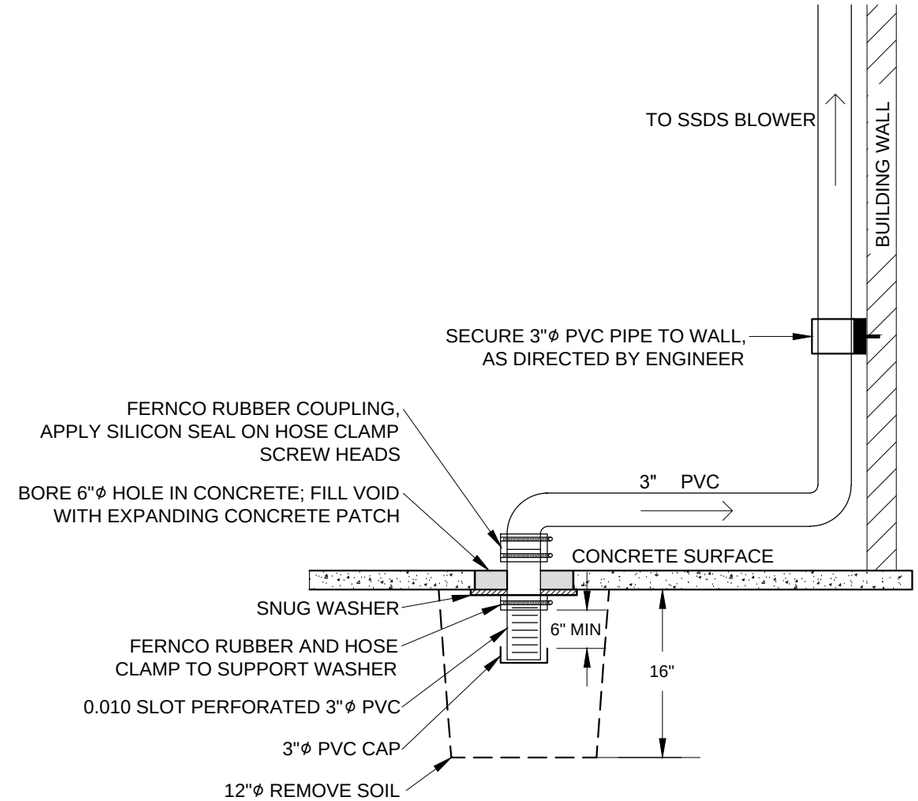
SCALE **AS SHOWN**
PROJECT NO. 457-007
FILE NAME: SYSTEM.dwg
SHEET NO. 3 OF 4



1 / 4 3 VENT STACK

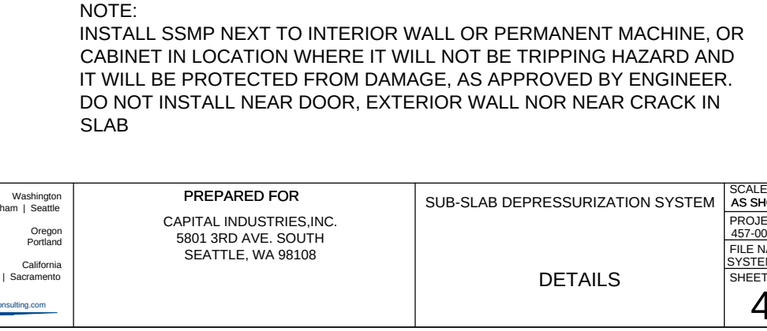
NOT TO SCALE

NOTE:
1. VENT STACK TO BUILDING SUPPORT CONNECTIONS TO BE APPROVED BY ENGINEER
2. VENT TO BE LOCATED AT LEAST 10 FT FROM CLOSEST SIDE OF ANY DOOR, WINDOW, OR OTHER OPENING INTO BUILDING INTERIOR, AND TO HVAC/VENTILATION INLET.



2 / 4 3 SUMP DETAIL

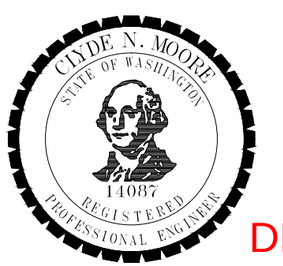
NOT TO SCALE



3 / 4 3 SUB-SLAB MONITORING PORT

NOT TO SCALE

NOTE:
INSTALL SSMP NEXT TO INTERIOR WALL OR PERMANENT MACHINE, OR CABINET IN LOCATION WHERE IT WILL NOT BE TRIPPING HAZARD AND IT WILL BE PROTECTED FROM DAMAGE, AS APPROVED BY ENGINEER. DO NOT INSTALL NEAR DOOR, EXTERIOR WALL NOR NEAR CRACK IN SLAB



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SUB-SLAB DEPRESSURIZATION SYSTEM

DETAILS

SCALE **AS SHOWN**
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FILE NAME: SYSTEM.dwg
SHEET NO. 4 OF 4