GeoDesign Inc
AN NV5 COMPANY

VAPOR MITIGATION SYSTEM MAINTENANCE MANUAL

Former Mt. Hood Solutions Warehouse Site
4444 NW Yeon Avenue
Portland, Oregon

For
Oregon Department of Environmental Quality
and
Summit Properties, Inc.

January 16, 2020
GeoDesign Project: MtHoodChem-4-002

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ACRONYMS AND ABBREVIATIONS

cfm	cubic feet per minute
DEQ	Oregon Department of Environmental Quality
ECSI	Environmental Cleanup Site Information
HDPE	high-density polyethylene
iow	inches of water
O&M	operations and maintenance
PVC	polyvinyl chloride
SSD	sub-slab depressurization
SSV	sub-slab ventilation
SVE	soil vapor extraction

1.0 INTRODUCTION

GeoDesign, Inc. has prepared this Vapor Mitigation System Manual (manual) for the vapor mitigation system comprised of an active SSV system at the former Mt. Hood Solutions Warehouse Site located at 4444 NW Yeon Avenue in Portland, Oregon, specifically under the warehouse portion of the existing building (project site). This manual contains instructions and reference information used to operate and maintain the SSV system in accordance with requirements set forth by DEQ as a condition of regulatory closure for the project site and is identified in the Easement and Equitable Servitude for the project site.

Acronyms and abbreviations used herein are defined immediately following the Table of Contents.

1.1 VAPOR MITIGATION SYSTEM OVERVIEW

The purpose of the active SSV system is to intercept volatile organic compounds potentially originating in the subsurface area below the building. The active SSV system consists of an array of ventilation pipes located in trenches beneath the concrete floor slab of the existing warehouse area. The ventilation pipes create a preferential pathway to remove potentially impacted vapors from beneath the warehouse portion of the building. The ventilation lines are connected to a series of in-line extraction (ventilation) fans located on the building exterior, which draw vapors into the below-grade sections of perforated ventilation pipe and transfers the vapors to roof exhaust stacks. The air discharge is considered maintenance-related and is currently exempt from regulatory permitting.

1.2 RESPONSIBLE INDIVIDUALS INFORMATION

The O&M duties for the SSV system at the site may be delegated to an individual or subcontracted entity, as determined by the owner. The contact information for the SSV system O&M shall be made available at the facility and the contact information should be indicated inside this manual. As-built drawings for the active SSV system are presented in Appendix A.

The SSV system designer contact information follows:

GeoDesign, Inc.
Erik Hedberg, P.E.
(503) 968-8787
ehedberg@geodesigninc.com

2.0 ACTIVE VAPOR MITIGATION SYSTEM DETAILED DESCRIPTION

GeoDesign implemented an active SSV system to address the potential for vapor intrusion into indoor air from potentially impacted media beneath a portion of the warehouse area of the existing building at the project site. Drawings and details are presented in Appendix A.

The design objective of the SSV system was to provide a conservative measure to mitigate the potential migration of residual contaminant vapors into indoor air spaces following remediation of soil at the project site using SVE. Installation and operation of the SSV system occurred

between December 2016 and April 2017, including eight in-line fans connected to an array of perforated pipes beneath the building floor slab (see Appendix A). Fan placements in relation to the array of subsurface ventilation pipes included in the former SVE trench piping system are summarized as follows:[1]

- Fan #1: SVE line VE-4
- Fan #2: SVE lines 1n, 1s, and 2s
- Fan #3: SVE lines 3s and 5s
- Fan #4: SVE lines 6s and 7s
- Fan #5: SVE line VE-1d
- Fan #6: SVE line VE-2d
- Fan #7: SVE lines VE-3d
- Fan #8: SVE lines VE-5d, VE-6d, and VE-7d

Within each SVE trench, perforated PVC and/or HDPE extraction pipes are bedded in crushed rock. The in-line fans consist of RadonAway® Model No. HS5000 units. Each fan routes extracted vapors to exhaust stacks located on the roofline near the south building exterior. Refer to Appendix A for SSV system drawings. A user's manual for the in-line extraction fans is presented in Appendix B.

Following implementation, GeoDesign conducted monitoring of the SSV system and sub-slab conditions throughout the warehouse area. An array of sub-slab vapor monitoring points was established to facilitate performance monitoring activities. GeoDesign recorded operational parameters and vacuum response measurements from the array of sub-slab observation points to assess the SSV system effectiveness in achieving a negative pressure field beneath the warehouse floor slab. The SSV monitoring program was completed in 2018 and reported to DEQ. Upon submittal of performance monitoring data to DEQ, it was concluded that the active SSV system is an effective measure to mitigate the potential for indoor air intrusion. Regulatory information is included in DEQ ECSI File No. 081.

3.0 ACTIVE VAPOR MITIGATION SYSTEM O&M

The SSV system O&M includes periodic inspections and maintenance as needed if the SSV system experiences operational issues. This section is only intended to provide an overview of the SSV system maintenance activities. Additional maintenance activities may result from other building maintenance activities as discussed in Section 4.0.

3.1 ROUTINE OPERATION

The active SSV system is designed to operate continuously with no requirement for specialized service.

[1] Refer to reports on file with DEQ for a detailed description of the SVE system formerly in operation at the project site. With the exception of SVE leg VE-4 (which is a standalone, 3-inch-diameter piping system), each SVE trench includes a deep, 4-inch-diameter extraction line and a shallow (sub-slab), 3-inch-diameter extraction/ventilation line. The "d" designation on the SVE legs denotes the deep, 4-inch-diameter extraction/ventilation line within each SVE trench. The "s" designation on the SVE legs denotes the shallow, 3-inch-diameter extraction/ventilation line within each SVE trench. The "n" designation denotes a separate ventilation line located in the former neutralization sump area.

If any proposed site work includes cutting or trenching in proximity to the SSV system trenches, the owner shall be notified. The owner or owner's environmental consultant will provide recommendations to maintain the integrity of the SSV system. Subsurface disturbances beneath the building structure shall also adhere to the procedures set forth in the Contaminated Media Management Plan prepared by GeoDesign and available in DEQ ECSI File No. 081.

3.2 MAINTENANCE AND REPAIR PROTOCOL

The summary of maintenance tasks to be performed is provided in Table 1. The major maintenance objective is to keep the SSV system in continuous operation. If operational issues are encountered (e.g., if one or more in-line fans appear to be non-operational), the owner and/or owner's environmental consultant shall be contacted. Contact information is provided in Section 1.2. Any necessary repairs will be coordinated by the system designer (GeoDesign).

Table 1. Maintenance Tasks Summary

System Component	Inspection Frequency	Maintenance Inspections and Actions
In-line extraction fans (8)	Monthly	Confirm that all fans are operational. Check for flow and vacuum at each PVC riser. If flow is not present and negative pressure is not within 10 percent of the initial vacuum measured following fan installation, evaluate for blockage (see below) and notify the owner and/or owner's environmental consultant.
Exhaust pipe assembly	As needed	Visually inspect exhaust risers for integrity or damage. Repair/clean exhaust pipe assembly as necessary to maintain free flow in the riser pipes to the rooftop exhaust stacks.
Vapor monitoring and evaluations	Not applicable	DEQ requirements have been met. The owner's representative and/or design engineer (GeoDesign) may conduct separate evaluations over the next five years and report the results to DEQ, if applicable.

A monthly monitoring form is presented in Appendix C.

4.0 ACTIVE VAPOR MITIGATION SYSTEM MONITORING

In conjunction with the owner's representative, the SSV system designer (GeoDesign) will perform periodic system monitoring in accordance with DEQ requirements as a condition of regulatory closure. Specifically, this monitoring may include semi-annual or annual monitoring of the SSV system performance and evaluation of sub-slab vapor conditions for a period of up to five years. Pending the results of periodic monitoring, the requirement for continuous operation of the SSV

system may be removed by DEQ as a condition of regulatory closure, and routine inspections associated with the SSV system may be discontinued. GeoDesign will notify the owner in this case.

SSV system monitoring may be adjusted on an as-needed basis, considering the following:

- Building use changes
- Invasive work (e.g., trenching in proximity to the SSV system ventilation lines)
- Changes in subsurface conditions or if additional information is needed to further evaluate the vapor intrusion exposure pathway

If any of the above conditions are anticipated or encountered, the owner and system designer (GeoDesign) shall be notified for consultation.

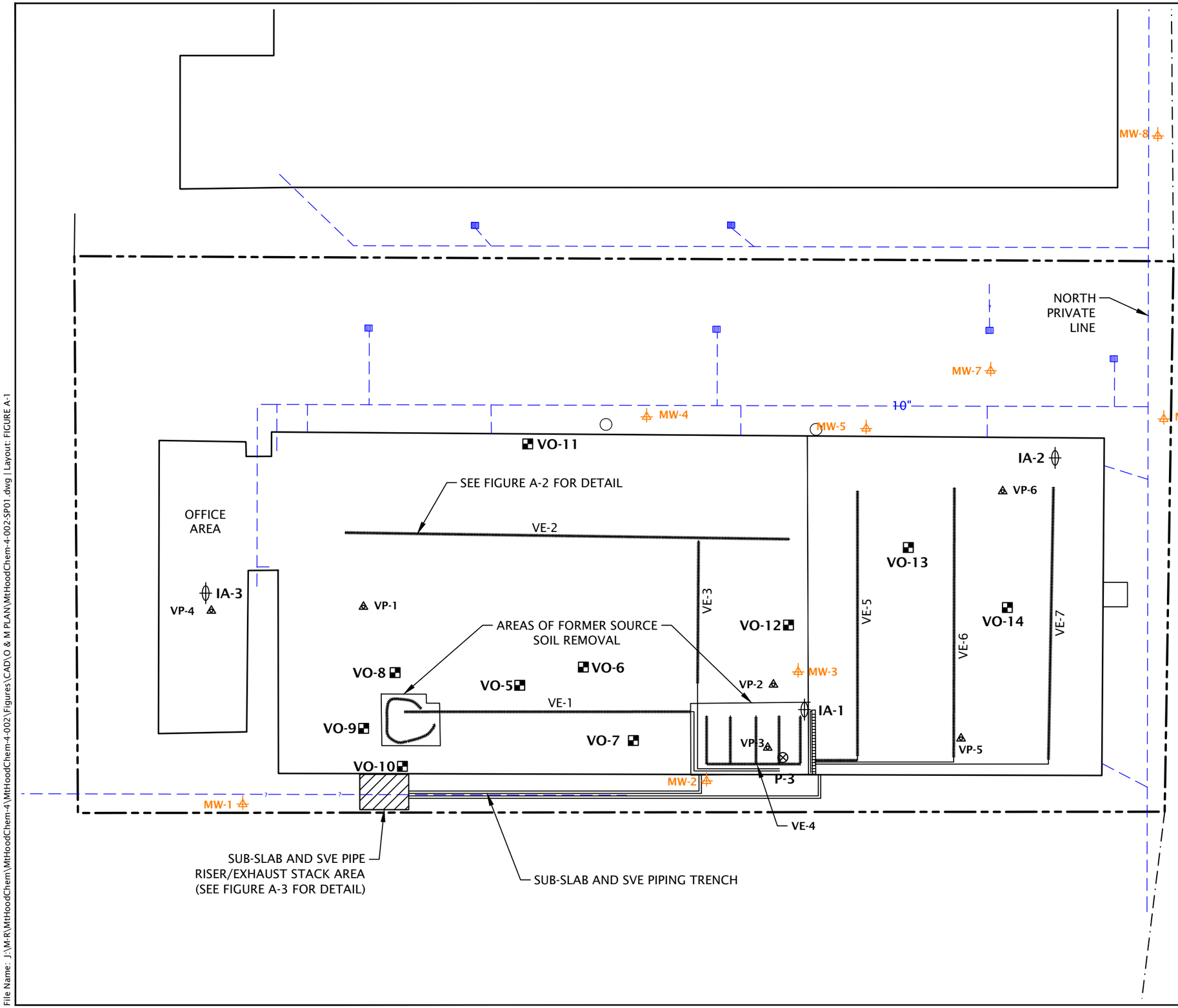
5.0 LIMITATIONS

This manual was prepared exclusively for the former Mt. Hood Solutions Warehouse Site active vapor mitigation system located at 4444 NW Yeon Avenue in Portland, Oregon. The information and recommendations provided herein are consistent with DEQ requirements and the information available at the time of preparation. Any other use or reliance of this manual is at the party's sole risk. If changes are made in the nature, use, or layout of the project site, the conclusions and recommendations contained in this manual may not be valid. If additional information becomes available, it should be provided to the owner and GeoDesign so the original conclusions and recommendations can be modified as necessary.

APPENDIX A

APPENDIX A

SSV SYSTEM DRAWINGS AND DETAILS



LEGEND:

- MW-1 — MONITORING WELL (GEODESIGN)
- VP-1 — SUB-SLAB VAPOR SAMPLE (GEODESIGN, DECEMBER 2016)
- P-3 — PIEZOMETER
- CATCH BASIN
- STORM AND SEWER LINES
- APPROXIMATE PROJECT SITE BOUNDARY
- VE-1 — SVE AND SUB-SLAB EXTRACTION PIPING
- IA-1 — INDOOR AIR SAMPLE LOCATION (APPROXIMATE)
- VO-5 — VADOSE OBSERVATION POINT

0 40 80

(SCALE IN FEET)

SITE PLAN BASED ON IMAGE OBTAINED FROM EVREN NORTHWEST, INC., SITE PLAN DATED MARCH 28, 2007

SITE PLAN

FIGURE A-1

FORMER MT. HOOD SOLUTIONS WAREHOUSE SITE
PORTLAND, OR

MTHOODCHEM-4-002

JANUARY 2020

GeoDesign Inc. AN NV5 COMPANY

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File Name: J:\M-R\MtHoodChem\MtHoodChem-4\MtHoodChem-4-002\Figures\CAD\O & M PLAN\MtHoodChem-4-002-SP01.dwg | Layout: FIGURE A-1

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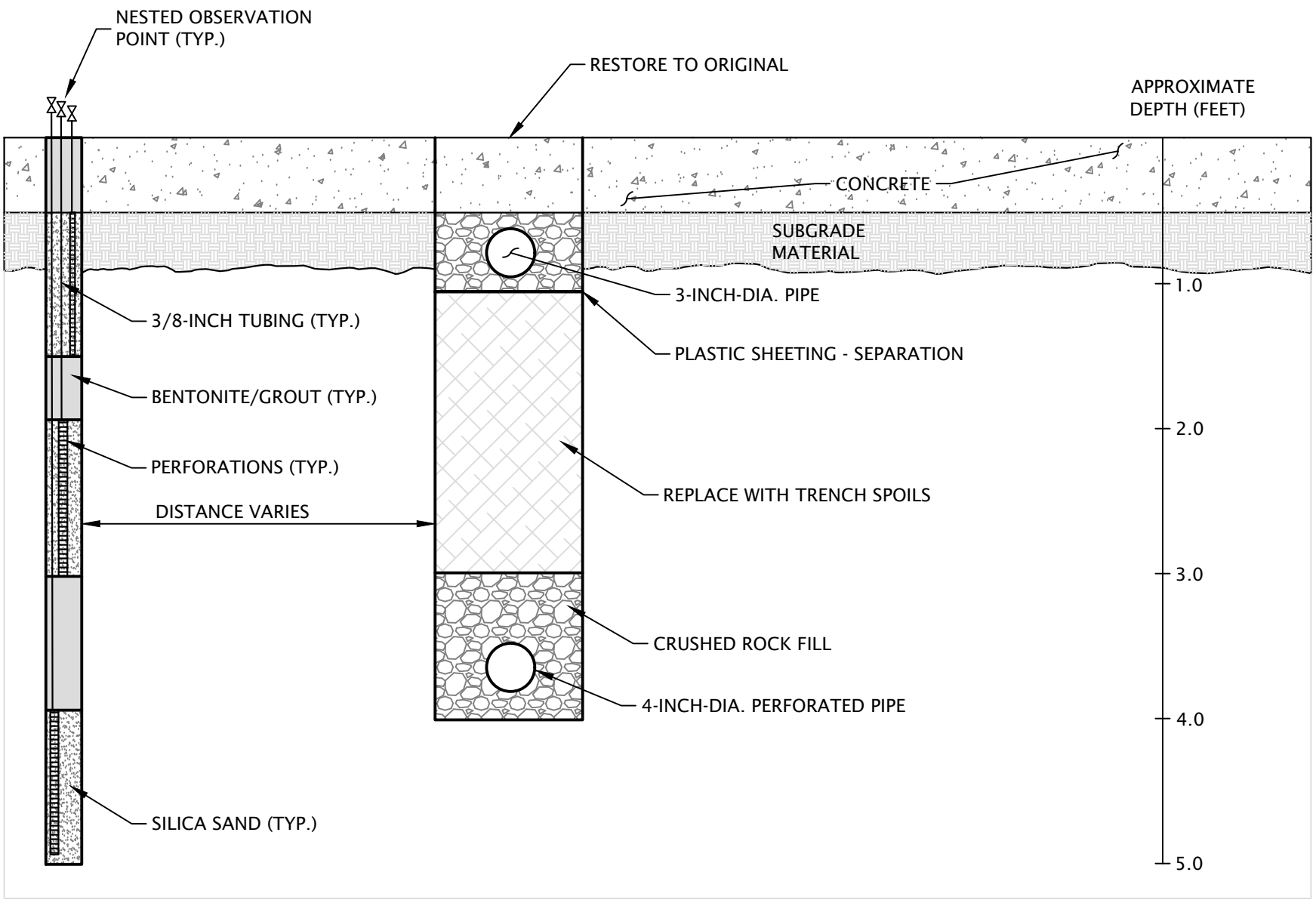


GEODESIGN INC AN NV5 COMPANY	MTHOODCHEM-4-002	**SVE/SSD TRENCH AND OBSERVATION POINT DETAIL**	
	JANUARY 2020	FORMER MT. HOOD SOLUTIONS WAREHOUSE SITE PORTLAND, OR	**FIGURE A-2**

Printed By: mmiller | Print Date: 1/15/2020 4:47:02 PM
File Name: J:\M-R\MtHoodChem\MtHoodChem-4\MtHoodChem-4-002\Figures\CAD\O & M PLAN\MtHoodChem-4-002-DET01.dwg | Layout: FIGURE A-3

GEODESIGN INC AN NV5 COMPANY	MTHOODCHEM-4-002	**SSD FAN LAYOUT**	
	JANUARY 2020	FORMER MT. HOOD SOLUTIONS WAREHOUSE SITE PORTLAND, OR	**FIGURE A-3**

APPENDIX B

APPENDIX B

RADONAWAY® HS5000 USER'S MANUAL

RadonAway®

The world's leading radon fan manufacturer

HS Series Installation & Operating Instructions

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** Do not use fan in hazardous environments where fan electrical system could provide ignition to combustible or flammable materials.

2. **WARNING!** Check voltage at the fan to ensure it corresponds with nameplate. See Vapor Intrusion Application Note #AN001 for important information on VI Applications. RadonAway.com/vapor-intrusion

3. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

4. **NOTICE!** There are no user serviceable parts located inside the fan unit.
   Do NOT attempt to open. Return unit to the factory for service.

5. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA) "National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician.

6. **WARNING!** In the event that the fan is immersed in water, return unit to factory for service before operating.

7. **WARNING!** Do not twist or torque fan inlet or outlet piping as leakage may result.

8. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

9. **WARNING!** TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

   a) Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.

   b) Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The HS Series Fan is intended for use by trained, certified/licensed, professional radon mitigators. The purpose of this instruction is to provide additional guidance for the most effective use of the HS Series Fan. This instruction should be considered as a supplement to EPA/Radon Industry standard practices, state and local building codes and state regulations. In the event of a conflict, those codes, practices and regulations take precedence over this instruction.

1.2 ENVIRONMENTALS

The HS Series Fan is designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the HS Series Fan should be stored in an area where the temperature is always greater than 32°F or less than 100°F. The HS Series Fan is thermally protected such that it will shut off when the internal temperature is above 194°F +/- 9°F (90°C +/- 5°C). If the HS Series Fan is idle in an area where the ambient temperature exceeds this shut off, it will not restart until the internal temperature falls below 104°F.

1.3 ACOUSTICS

The HS Series Fan, when installed properly, operates with little or no noticeable noise to the building occupants. Recommended system design and installation considerations to minimize noise: When installing the HS Series Fan above sleeping areas, select a location for mounting at the farthest possible distance. Avoid mounting near doors, fold-down stairs or other uninsulated structures which may transmit sound. Ensure a solid mounting for the HS Series Fan to avoid structure-borne vibration or noise.

The velocity of the outgoing air must also be considered in the overall system design. With small diameter piping, the “rushing” sound of the outlet air can be disturbing. The system design should incorporate a means to slow and quiet the outlet air. The use of the RadonAway Exhaust Muffler, p/n 24002, is strongly recommended.

1.4 GROUND WATER

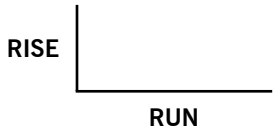
Under no circumstances should water be allowed to be drawn into the inlet of the HS Series Fan as this may result in damage to the unit. The HS Series Fan should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the HS Series Fan with water in installations with occasional high water tables.

In the event that a temporary high water table results in water at or above slab level, water will be drawn into the riser pipes thus blocking air flow to the HS Series Fan. The lack of cooling air will result in the HS Series Fan cycling on and off as the internal temperature rises above the thermal cutoff and falls upon shutoff. Should this condition arise, power down and disconnect the HS Series Fan until the water recedes allowing for return to normal operation; then reconnect and power on to turn the fan back on.

1.5 CONDENSATION & DRAINAGE

WARNING!: Failure to provide adequate drainage for condensation can result in system failure and damage the HS Series Fan.
Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation.

The use of small diameter piping in a system increases the speed at which the air moves. The speed of the air can pull water uphill and, at sufficient velocity, it can actually move water vertically up the side walls of the pipe. This has the potential of creating a problem in the negative pressure (inlet) side piping. For HS Series Fan inlet piping, the following table provides the minimum recommended pipe diameters as well as minimum pitch under several system conditions. Use this chart to size piping for a system.



Pipe Diameter	Minimum Rise per 1 Foot of Run*		
	@ 25 CFM	@ 50 CFM	@ 100 CFM
4"	1/32"	3/32"	3/8"
3"	1/8"	3/8"	1 1/2"

*Typical operational flow rates:

HS2000 12 - 63 CFM
HS3000 19 - 39 CFM
HS5000 16 - 44 CFM

All exhaust piping should be 2" PVC.

1.6 SYSTEM MONITOR & LABEL

A properly designed system should incorporate a "System On" indicator for affirmation of system operation. A Magnehelic pressure gauge is recommended for this purpose. The indicator should be mounted at least 5 feet above the slab penetration to minimize the risk of filling the gauge with water in installations with occasional high water tables. A System Label (P/N 15022) with instructions for contacting the installing contractor for service and also identifying the necessity for regular radon tests to be conducted by the building occupants, must be conspicuously placed where the occupants frequent and can see the label.

1.7 SLAB COVERAGE

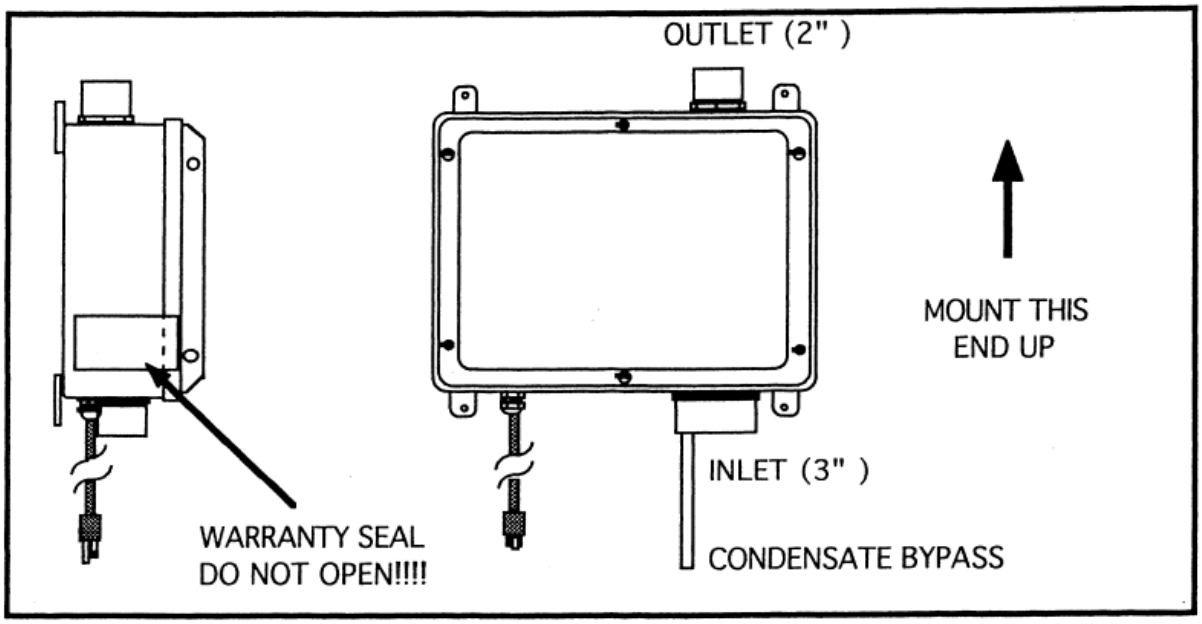
The HS Series Fan can provide coverage of well over 1000 sq. ft. per slab penetration. This will, of course, depend on the sub-slab aggregate in any particular installation and the diagnostic results. In general, sand and gravel are much looser aggregates than dirt and clay. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size; larger as needed) be created below the slab at each suction hole. When fine sand or dirt is present it is recommended that the pit be lined with a material such as clean gravel, size 4, 5, 56, or 6 as classified (ASTM C33).

1.8 ELECTRICAL WIRING

For models with a cord, the HS Series Fan plugs into a standard 120V outlet. The switch box models are hardwired. All wiring must be performed in accordance with the National Fire Protection Association's (NFPA)"National Electrical Code, Standard #70"-current edition for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a UL listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly caulked to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.

1.9 SPEED CONTROLS

Electronic speed controls can **NOT** be used on HS Series units.



2.0 INSTALLATION

2.1 MOUNTING

Mount the HS Series Fan to the wall studs, or similar structure, in the selected location with (4) 1/4" x 1 1/2" lag screws (not provided). Ensure the HS Series Fan is both plumb and level.

2.2 DUCTING CONNECTIONS

Make final ducting connection to HS Series Fan with flexible couplings. Ensure all connections are tight. Do not twist or torque inlet and outlet piping on HS Series Fan or leaks may result.

NOTE: Do NOT solvent weld fittings to unit hubs.

2.3 VENT MUFFLER INSTALLATION

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed above the roofline at the end of the vent pipe.

2.4 OPERATION CHECKS & ANNUAL SYSTEM MAINTENANCE

_____ **Verify** all connections are tight and **leak-free**.

_____ **Ensure** the HS Series Fan and all ducting is secure and vibration-free.

_____ **Verify** system vacuum pressure with Magnehelic. **Ensure** vacuum pressure is within normal operating range and **less than** the maximum recommended as shown below:

HS2000 14" WC
HS3000 21" WC
HS5000 35" WC

(Above are based on sea-level operation, at higher altitudes reduce above by about 4% per 1000 Feet.)
If these are exceeded, increase number of suction points.

_____ **Verify Radon levels** by testing to EPA Protocol and applicable testing standards.

Addendum

Product Specifications

Model	Maximum Static Suction	Recommended Maximum Static Suction	Typical CFM vs Static Suction WC (Recommended Operating Range)						Power* Watts @ 115VAC
			0"	10"	15"	20"	25"	35"	
HS2000	16"	14"	62	40	23	-	-	-	153-314
HS3000	24"	21"	39	30	25	19	-	-	120-250
HS5000	41"	35"	43	35	32	28	24	18	349-381
HS2000E	16"	14"	62	40	23	-	-	-	153-314
HS3000E	24"	21"	39	30	25	19	-	-	120-250
HS5000E	41"	35"	43	35	32	28	24	18	349-381

**Power consumption varies with actual load conditions*

Inlet: 3.0" PVC

Outlet: 2.0" PVC

Mounting: Brackets for vertical mount

Weight: Approximately 18 lbs

Size: Approximately 15"W x 13"H x 8"D

Minimum recommended inlet ducting (greater diameter may always be used):

HS3000, HS5000 --- 2.0" PVC Pipe

HS2000 --- Main feeder line of 3.0" or greater PVC Pipe

Branch lines (if 3 or more) may be 2.0" PVC Pipe

Outlet ducting: 2.0" PVC

Storage Temperature Range: 32°F-100°F

Thermal Cutout: 194°F +/- 9°F (90°C +/- 5°C)

Locked rotor protection

Internal condensate bypass

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the RadonAway® HS Series Fan for shipping damage within 15 days of receipt. **Notify RadonAway® of any damages immediately.** RadonAway® is not responsible for damages incurred during shipping.

There are no user serviceable parts inside the fan. **Do not attempt to open the housing.** Return unit to factory for service.

Install the HS Series Fan in accordance with all EPA standard practices, and state and local building codes and state regulations.

Provide a copy of this instruction or comparable radon system and testing information to the building occupants after completing system installation.

Warranty

RadonAway® warrants that the HS Series Fan (the "Fan") will be free from defects in materials and workmanship for a period of 90 days from the date of purchase (the "Warranty Term").

RadonAway® will repair or replace any Fan which fails due to defects in materials or workmanship during the Warranty Term. The Fan must be returned (at Owner's cost) to the RadonAway® factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway®.

1 YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION

RadonAway® will extend the Warranty Term of the fan to twelve (12) months from date of installation or fifteen (15) months from the date of manufacture, whichever is sooner, if the Fan is installed in a professionally designed and professionally installed active soil depressurization system or installed as a replacement fan in a professionally designed and professionally installed active soil depressurization system. Proof of purchase and/or proof of professional installation may be required for service under this warranty. RadonAway® is not responsible for installation, removal or delivery costs associated with this Warranty.

EXCEPT AS STATED ABOVE, THE HS SERIES FAN IS PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY® BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway® for a Return Material Authorization (RMA) Number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping costs to and from factory.

RadonAway®
3 Saber Way
Ward Hill, MA 01835 USA
TEL (978) 521-3703
FAX (978) 521-3964
Email to: Returns@RadonAway.com

Record the following information for your records:

Serial No. _____

Purchase Date: _____

APPENDIX C

APPENDIX C

MONTHLY MONITORING FORM

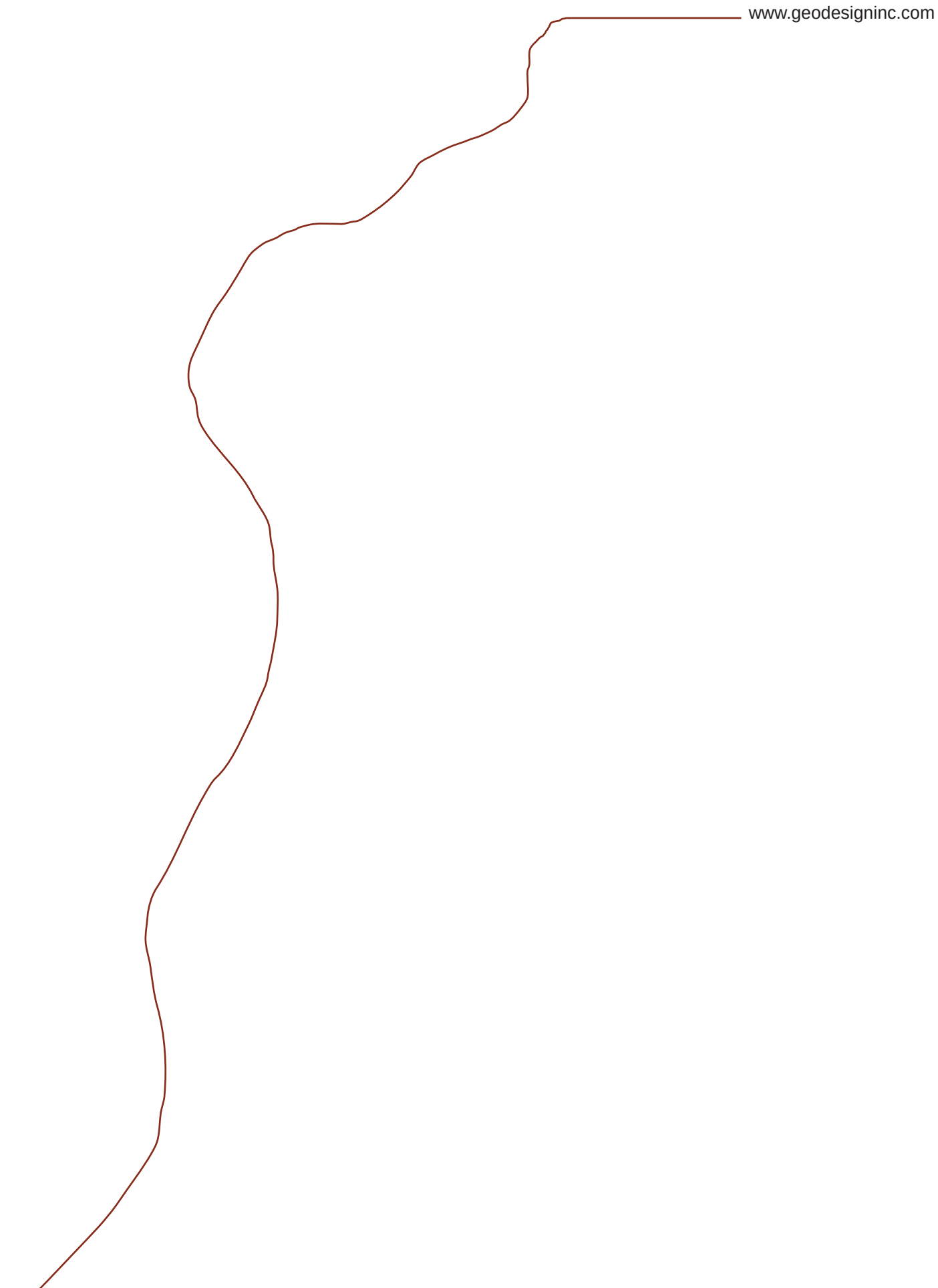
MONTHLY MONITORING FORM
SSD/SSV System Operation
Former Mt. Hood Solutions Warehouse Site
4444 NW Yeon Avenue
Portland, Oregon

Date	Fan #1			Fan #2									Fan #3						Fan #4						Fan #5			Fan #6			Fan #7			Fan #8								
	VE-4			VE-1n			VE-1s			VE-2s			VE-3s			VE-5s			VE-6s			VE-7s			VE-1d			VE-2d			VE-3d			VE-5d			VE-6d			VE-7d		
	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)	Fan Operational?	Vacuum (iow)	Flow (cfm)

Notes:
Initial vacuum readings upon fan installation as follows:

2.4	iow
1.4	iow
1.3	iow
1.2	iow
1.7	iow
1.6	iow
1.8	iow
1.8	iow
2.3	iow
2.0	iow
2.0	iow
1.3	iow
1.3	iow
1.3	iow

iow:
cfm:
--: not analyzed or accessible


www.geodesigninc.com