

REMEDIATION IMPLEMENTATION REPORT

**BADGER CLEANERS
616 OAK STREET
BARABOO, WISCONSIN
WDNR BRRTS# 02-57-548538**

July 27, 2020

Prepared By:

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A blue ink signature of Robert Fedorchak, consisting of stylized cursive letters.

Robert Fedorchak, PE
Senior Engineer

A blue ink signature of Rob Hoverman, consisting of stylized cursive letters.

Rob Hoverman, PG
Senior Project Manager

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CERTIFICATIONS

I, Robert Fedorchak, hereby certify that I am a registered professional engineer in the State of Wisconsin, registered in accordance with the requirements of ch. A-E 4, Wis. Adm. Code; that this document has been prepared in accordance with the Rules of Professional Conduct in ch. A-E 8, Wis. Adm. Code; and that, to the best of my knowledge, all information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.



Signature, title and P.E. number

P.E. stamp

I, Robert Hoverman, hereby certify that I am a hydrogeologist as that term is defined in s. NR 712.03 (1), Wis. Adm. Code, am registered in accordance with the requirements of ch. GHSS 2, Wis. Adm. Code, or licensed in accordance with the requirements of ch. GHSS 3, Wis. Adm. Code, and that, to the best of my knowledge, all of the information contained in this document is correct and the document was prepared in compliance with all applicable requirements in chs. NR 700 to 726, Wis. Adm. Code.



Senior Project Manager

7/27/2020

Signature and title

Date

1.0 INTRODUCTION

EnviroForensics, LLC (EnviroForensics) has prepared this Remediation Implementation Report on behalf of Badger Cleaners dry cleaning facility located at 616 Oak Street, Baraboo Wisconsin (Site). This report has been prepared in accordance with Wisconsin Administrative Code (WAC) Chapter NR 724 and other associated State of Wisconsin Chapter NR 700 series rules.

The Site is located within an area of mixed residential and commercial land use in downtown Baraboo, Wisconsin. The site consists of a single parcel of approximately 2,740 square feet with a single-story commercial building of approximately 2,420 square feet. The building was primarily constructed between 1913 and 1922 and subsequently added on to after 1947. The building is constructed slab on grade on the east and west ends with a basement beneath the central portion, and the remainder of the property is a paved asphalt parking area. The Site is bound by commercial buildings to the north, east and south, and Oak Street to the west. The Site layout is presented as **Figure 1**. Soil gas and vapor intrusion assessments identified concentrations of PCE above sub-slab, indoor air, and soil gas screening levels in the area immediately surrounding the Site. An SVE pilot test was conducted in 2018, followed by system design and infrastructure installation activities throughout 2019, with final equipment connections and start-up of the full-scale system being completed January 2020 per WAC Chapter 419.07. The primary objective of SVE is to remove contaminant mass from unsaturated soil. SVE may provide the additional benefit of vapor intrusion mitigation at the Site building during operation.

2.0 SOIL VAPOR EXTRACTION

2.1 Design

The full-scale SVE system design was derived from data collected during the SVE pilot test conducted in March 2018. The final system layout and construction activities are discussed in the following sections.

2.2 System Construction

The SVE system was constructed in three general phases between March 2018 and June 2019:

- Extraction well and monitoring point installation;
- Wellhead and conveyance piping installation; and
- Mechanical system construction and connection.

2.2.1 Extraction Well Installation

The infrastructure installed prior to completion of the SVE pilot testing included two (2) co-located extraction wells set at staggered depths, and six (6) sets of nested vacuum monitoring points. Existing soil gas sampling points and monitoring wells were also utilized to collect vacuum measurements during the pilot testing. The locations of the extraction well pair and vacuum monitoring points are shown on the attached **Figure 1**. The SVE well construction diagrams are presented in **Appendix A**. Additional installation detail for the SVE wells is presented below.

- Installed one shallow and one deep SVE well.
 - Each well was constructed of 4-inch diameter PVC, 15 ft of 0.020 v-wire screen, installed within 6.25 inner-diameter hollow-stem augers;
 - The shallow SVE well is screened from 6 to 21 ft bgs;
 - The deep SVE well is screened from 25 to 40 ft bgs;
 - Annular space around the screen was filled with #5 silica sand to 1 ft above the screen; and
 - A 1.5-ft hydrated bentonite chip seal will be installed above sand pack, with the remaining annular space filled with a cement bentonite-grout to ground surface.
- The SVE wells were completed at grade with flush-mount vaults suitable to enclose the 4-inch diameter well heads and other connections.

2.2.2 Monitoring Point Installation

The nested vacuum monitoring points were installed using a Geoprobe[®] percussive drill rig in December 2018.

- Installed two (2) nested sets of vapor monitoring points at new locations (SG-5A/B/C/D and SG-6A/B/C/D) as shown on **Figure 1**.

- Each new vacuum monitoring location contains four separately screened points consisting of 1-inch diameter PVC with 2 ft of 0.010 slotted screen, installed within the same 6.25 inner-diameter hollow-stem auger borehole;
 - Each Shallow soil gas monitoring point is screened from 8 to 10 ft bgs;
 - Each Intermediate shallow monitoring point is screened from 18 to 20 ft bgs;
 - Each Intermediate deep soil gas monitoring point is screened from 28 to 30 ft bgs
 - Each Deep soil gas monitoring point is screened from 38 to 40 ft bgs;
 - The annular borehole space was filled with #5 quartz sand across each screened interval, and filled with hydrated bentonite chips between screened intervals;
 - Each monitoring point was equipped with fittings to facilitate vacuum measurements; and
 - Each vacuum monitoring point set was completed at grade within a 12-inch flush-mount vault.
- Additional vapor monitoring points were installed at existing soil gas locations SG-1 through SG-4 as shown on **Figure 1**.
 - Two (2) or three (3) additional 1-inch diameter PVC points were installed at these locations, each containing 2 ft of 0.010 slot screen per screened interval, installed within 4.25 inner-diameter hollow-stem auger boreholes;
 - At the SG-1 location, three (3) additional monitoring points were installed with screened intervals set at 18 to 20 ft bgs, 28 to 30 ft bgs, and 38 to 40 ft bgs;
 - At the SG-2 location, two (2) additional monitoring points were installed with screen intervals set at 28 to 30 ft bgs and 38 to 40 ft bgs;
 - At the SG-3 location, two (2) additional monitoring points were installed with screened intervals set at 28 to 30 ft bgs and 38 to 40 ft bgs;
 - At the SG-4 location, three (3) additional monitoring points were installed with screened intervals set at 18 to 20 ft bgs, 28 to 30 ft bgs, and 38 to 40 ft bgs;
 - Annular space within the borehole was filled with #5 quartz sand across screened interval, and hydrated bentonite chips between screened intervals;
 - Each monitoring point was equipped with fittings to facilitate vacuum measurements during pilot testing; and
 - Each monitoring point location was completed at grade within a 12-inch flush-mount vault.

Previously installed soil gas sampling points, sub-slab vapor points and monitoring wells were utilized as vacuum monitoring probes to facilitate negative pressure measurements during the pilot tests. Existing soil gas points are set in the same sand unit but at shallower depths.

Monitoring point locations used during the pilot test are depicted on **Figure 1**

2.2.3 Wellhead and Conveyance Piping Installation

Once the pilot testing was completed, the data evaluated, and a full-scale system design prepared, system infrastructure installation activities were initiated. The installation work was completed throughout 2019 as system components became available. Conveyance piping consisting of 4-inch diameter PVC was installed to connect the SVE well pair to the blower. Air flow from each SVE well is regulated by a ball valve located prior to the blower. The conveyance piping and system layout is depicted on **Figure 2**.

2.3 Mechanical System Components

The mechanical system consists of the following components:

- Kaeser Omega 52 Plus Vac, Com-Pak Tri Lobe Positive Displacement Blower Package
 - 40 hp Totally Enclosed Fan Cooled (TEFC) premium efficiency drive motor
 - Inlet silencer with filter
 - Fully enclosed powder coated and insulated steel cabinet
 - 1/6 hp steel cabinet blower enclosure fan
 - Sigma 2 blower control with Variable Frequency Drive
- Custom built air-water separator - 220-gallons
- Moyno Model 35601, 1.5hp TEFC (motor), progressive cavity transfer pump with applicable switches and controls.
- Main Control Panel (NEMA 4) with applicable controls equipped with a “Flite-Link” Cellular Web Based Control and Communications System capable of sending E-Mail alerts, displaying all alarms and analog signals, and enabling remote access for system control and operational data viewing.

The SVE exhaust stack was installed from the blower through the block building side wall, extending to the roof, and terminating at an approximate height of 20 feet above ground surface. Exhaust samples are collected from a port in the stack downstream from the blower. A system process and instrumentation diagram are presented in the Operation Manual provided as **Appendix B**

3.0 SYSTEM COMMISSIONING AND PERFORMANCE MONITORING

Samples of the SVE system air emissions are collected from a port in the exhaust stack and analyzed for VOCs to track mass removal and to determine operational changes to optimize system performance. The effluent laboratory reports are included as **Appendix C**.

A commissioning phase was completed per WAC Chapter 419.07 to confirm that system emissions are below permitting thresholds and ambient air standards. The results of the initial samples collected during the first three (3) days of system operation demonstrate that system emissions are below the following permitting thresholds that apply to SVE systems (WAC Chapters NR 406 and 407, respectively):

- Total VOC limit of 5.7 pounds per hour (lb/hr); and
- PCE limits of 9.11 lb/hr and 301 pounds per year.

Samples of the SVE system air emissions are collected from a port in the exhaust stack and analyzed for VOCs to calculate mass removal rates and cumulative mass removed; and to determine operational changes to optimize system performance. Performance monitoring has been conducted in accordance with the following emissions testing schedule required under WAC Chapter 419.07:

- Once each day for the first 3 days of system operation;
- Weekly for the next 3 weeks; and
- Monthly thereafter.

On January 15, 2020, vacuum measurements were collected from the aforementioned monitoring points with a digital manometer during normal SVE operations. The estimated radius of influence (ROI) of the SVE system based on vacuum measurements are depicted on **Figure 3** for the shallow interval and **Figure 4** for the deep interval. Please note that vacuum data collected from the sub-slab vapor points was not used in determining SVE ROI.

Approximately 13 pounds of VOCs were removed through July 2020 from the subsurface by the SVE system since startup in January 2020. Graphs showing mass removal rates and cumulative

VOC mass removed are included as **Appendix D**. Operational and Mass Removal Tables are presented as **Table 1** and **Table 2** respectively. Remediation Site Operation, Maintenance, Monitoring & Optimization Reports (Form 4400-194) will be prepared and submitted to WDNR semi-annually as required.

4.0 OPERATION AND MAINTENANCE

The SVE system was designed to allow various operational configurations. Each extraction well can be disconnected from service by closing the ball valve installed at the wellhead. This design allows the operators to target specific areas as the remediation progresses to maximize efficiency. We will make operational changes as needed during the maintenance visits described below.

Operation and Maintenance (O&M) activities are conducted by EnviroForensics personnel to:

- Maximize system efficiency and contaminant mass removal rates;
- Keep the mechanical equipment in good working order; and
- Collect data to track system performance and determine a timeframe for shutdown.

Routine maintenance activities performed quarterly include the following:

- Service the blower as recommended by the manufacturer
- Record operational parameters and vapor concentrations to evaluate efficiency
 - Effluent VOC vapor concentration
 - System runtime
 - System vacuum
 - Wellhead vacuums
 - Vacuum at monitoring points
 - Flow rates
 - Exhaust temperature

Additional maintenance visits may be required to address system shutdowns or operational issues. Remote telemetry is available on the system. As such any alarms are communicated via

email, and the system can be monitored via the internet to observe operational parameters, change minor operational conditions, and restart the system in event of a shutdown.

5.0 CONCLUSIONS

The implemented remedial actions are designed to address VOC impacts in unsaturated soil. Mass removal via SVE is in progress, and the system will be adjusted and operated to maximize efficiency. In addition, the SVE system has interrupted vapor transport mechanisms and has likely improved mitigation of the vapor exposure pathway near the Site building. Additional testing and evaluation of the exposure pathways will be evaluated as the SVE is operated.

TABLES

TABLE 1
SOIL VAPOR EXTRACTION SYSTEM OPERATIONAL DATA

Badger Cleaners
616 Oak St, Baraboo WI 53913

Date	Time	System Runtime	VFD Setting	Dilution	System Vacuum	Conveyance Line Vacuum		Exhaust Pressure	Influent Temperature	Exhaust Temperature	Pre-Filter Differential Pressure	Post-Filter Differential Pressure	Vaccum at Exhaust Pipe	Flow Rate	Calculated Flow Rate	Effluent VOC Concentration	
		Panel Display	Panel Display	Valve	Panel Display	1	2	Exhaust Gauge	Pitot Tube	Exhaust Pipe	Pitot Tube	Pitot Tube	Test Plug w/ Manometer	Panel Display			Exhaust Port
		Hours	Hertz	%	in Hg	in Hg		in H ₂ O	°F	°F	in H ₂ O	in H ₂ O	in Hg	in H ₂ O	SCFM	µg/m ³	
01/14/20	1530	1.3	65.0	40.0	-2.0	-2.0	-2.0	-2.5	40	79.8	NM	NM	0.12	0.51	350	63,037	
01/15/20	1024	20.3	65.0	0.0	-12.0	-12.0	-12.0	0.5	40	160.5	0.4	0.2	0.04	0.20	262	82,326	
01/16/20	1211	46.2	65.0	0.0	-11.0	-11.5	-10.5	0.5	38	159.7	0.4	0.2	0.45	0.21	269	58,219	
01/17/20	1120	59.4	65.0	0.0	-11.0	-11.5	-10.5	0.5	37	159.9	0.2	0.2	0.38	0.20	269	0	
1/23/2020*	1147	175.3	60.0	0.0	-11.0	-11.0	-10.5	0.5	40	145.0	0.3	0.2	NM	0.15	150	25,240	
01/30/20	925	340.9	50.0	0.0	-9.4	-9.5	-9.0	0.4	37	124.1	0.3	0.2	0.34	0.1	140	18,900	
02/05/20	1056	486.4	50.0	10.0	-9.5	-9.0	-10.0	0.3	37	125.1	0.2	0.2	0.21	0.1	130	16,121	
03/13/20	1306	1,235.3	50.0	10.0	-9.2	-9.0	-9.5	0.5	40	127.3	0.1	0.1	0.58	0.1	130	4,210	
04/15/20	1049	2,025.9	50.0	10.0	-9.7	-8.0	-9.0	0.5	34	136.4	0.1	0.1	0.5	0.1	135	3,510	
05/13/20	1152	2,698.9	50.0	10.0	-9.5	-9.0	-9.5	0.4	47	141.2	0.2	0.2	NM	0.2	175	1,300	
06/22/20	1222	3,615.8	50.0	10.0	-10.41	-10.0	-10.0	0.0	60	166.6	0.2	0.2	0.30	0.1	129	3,766	

Notes:

in Hg = inches of mercury

in H₂O = inches of water

µg/m³ = micrograms per cubic meter

AWS = Air-water separator

NM = not measured due to gauge malfunction

SCFM = Standard cubic feet per minute

* some values estimated.

TABLE 2
SOIL VAPOR EXTRACTION SYSTEM MASS REMOVAL DATA

Badger Cleaners
616 oak Street, Baraboo, Wisconsin

Sample Date	Pitot Tube Calculation		VOC Concentration	VOC Concentration	Runtime	Sample	Sample	Pitot Tube Calculation	
	Flow Rate	Flow Rate				Duration	Duration	Mass Removed	Cumulative Mass
	SCFM	SCFM (m ³ /min)	ug/m ³	lbs/m ³	hrs	hrs	mins	lbs	lbs
1/14/2020	350	9.9	63,037	0.000139	1.3	1.3	78	0.11	0.11
1/15/2020	262	7.4	82,326	0.000182	20.3	19.0	1,140	1.54	1.64
1/16/2020	269	7.6	58,219	0.000128	46.2	25.9	1,554	1.52	3.16
1/23/2020	150	4.2	25,240	0.000056	175.3	129.1	7,746	1.83	4.99
1/30/2020	140	4.0	18,900	0.000042	340.9	165.6	9,936	1.64	6.64
2/4/2020	130	3.7	16,121	0.000036	486.4	145.5	8,730	1.14	7.78
3/13/2020	130	3.7	4,210	0.000009	1,235.3	748.9	44,934	1.54	9.31
4/15/2020	135	3.8	3,510	0.000008	2,025.9	790.6	47,436	1.40	10.72
5/13/2020	175	5.0	1,300	0.000003	2,698.9	673.0	40,380	0.57	11.29
6/22/2020	129	3.7	3,766	0.000008	3,615.8	916.9	55,014	1.67	12.96

Notes:

µg/m³ = micrograms per cubic meter







lbs/m³ = pounds per cubic meter

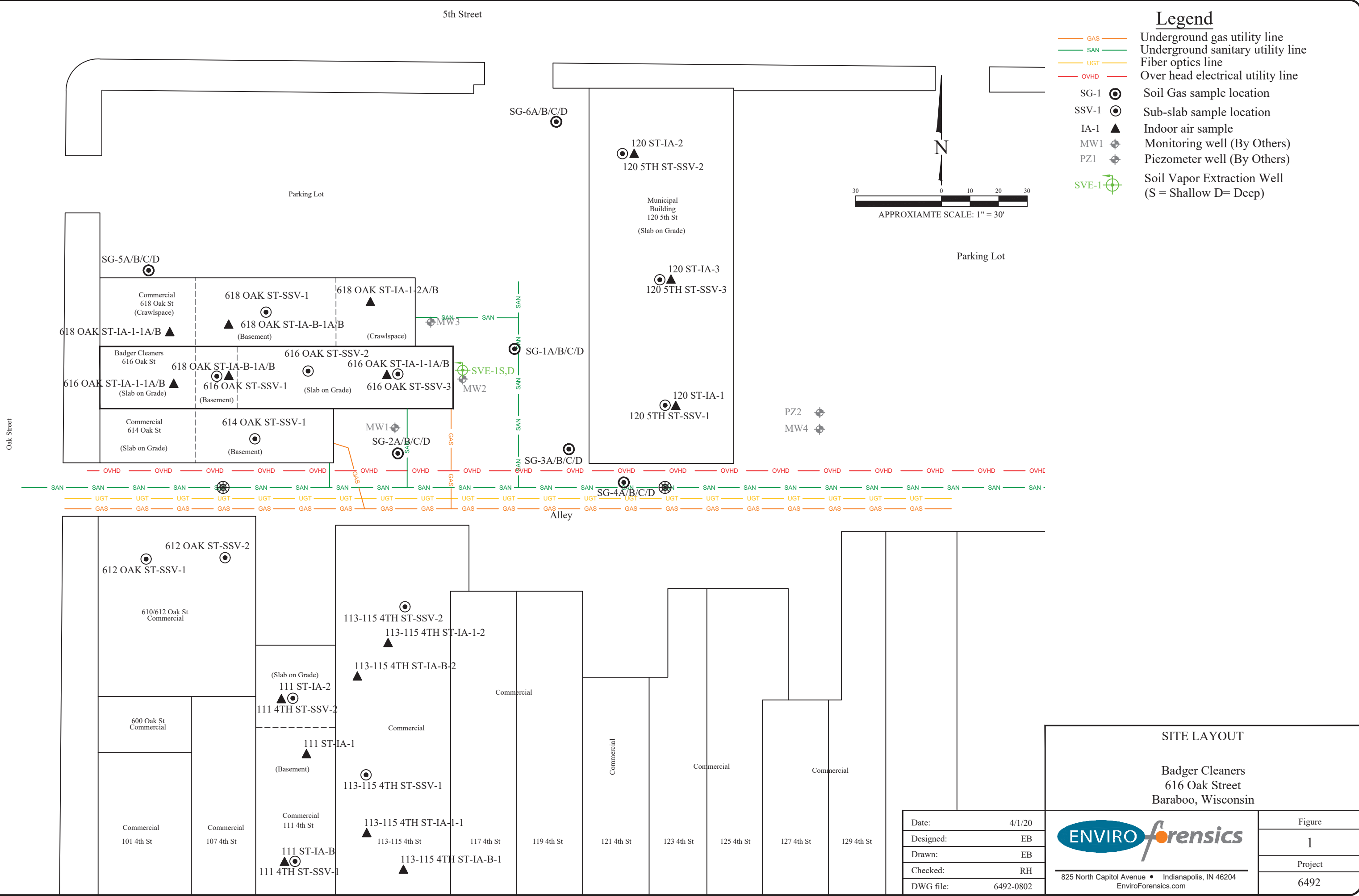
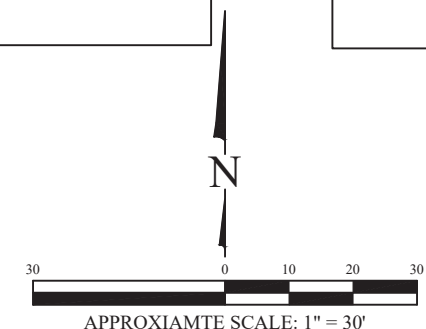
scfm = standard cubic feet per minute

FIGURES

5th Street

Legend

- GAS — Underground gas utility line
- SAN — Underground sanitary utility line
- UGT — Fiber optics line
- OVHD — Over head electrical utility line
- SG-1  Soil Gas sample location
- SSV-1  Sub-slab sample location
- IA-1  Indoor air sample
- MW1  Monitoring well (By Others)
- PZ1  Piezometer well (By Others)
- SVE-1  Soil Vapor Extraction Well (S = Shallow D= Deep)









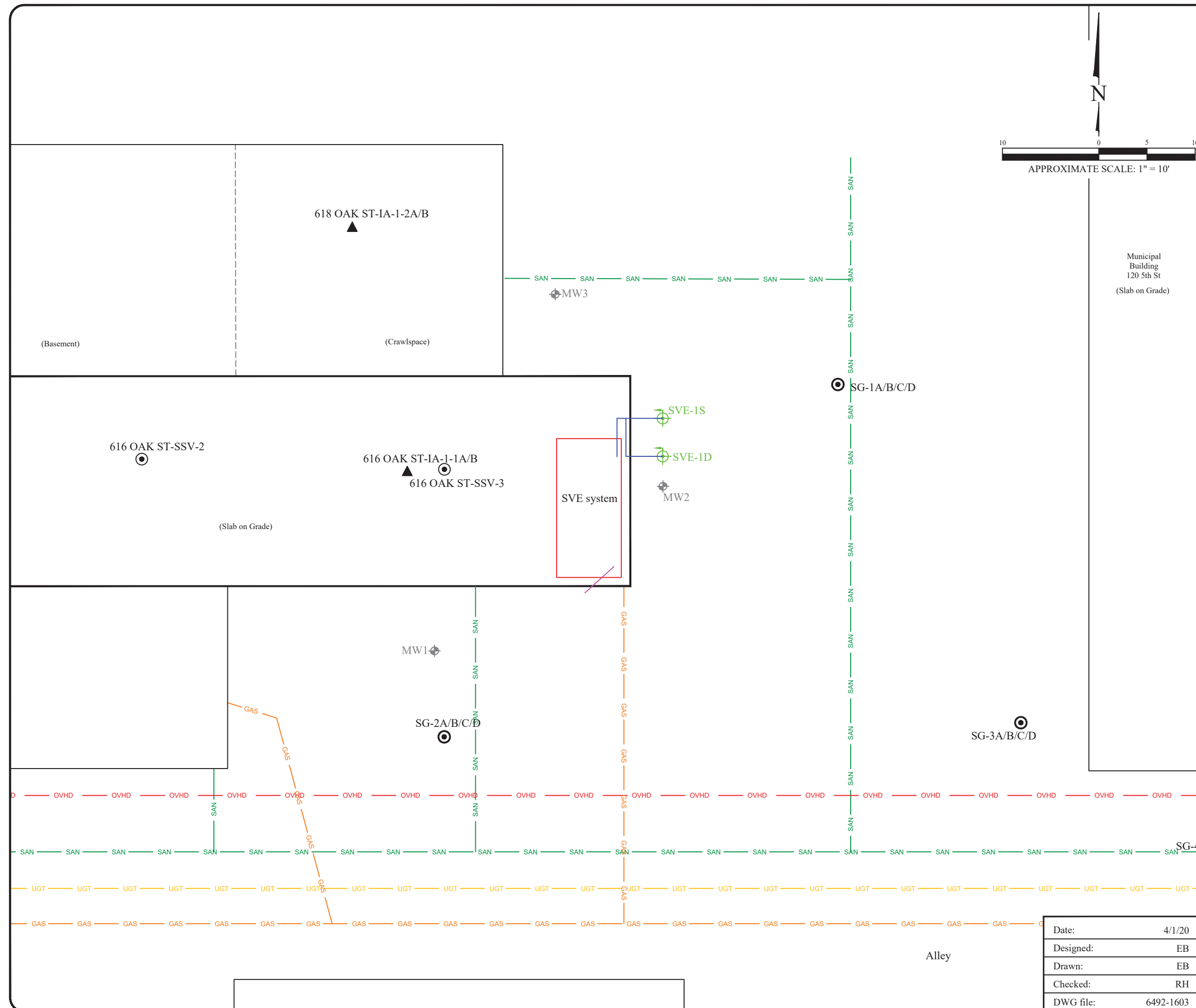
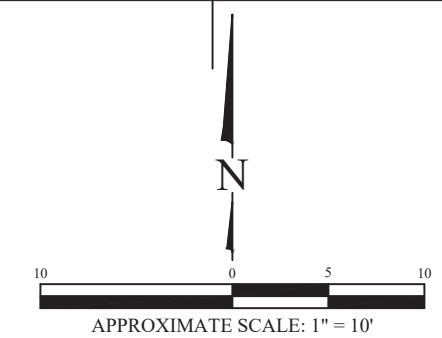
SITE LAYOUT

Badger Cleaners
616 Oak Street
Baraboo, Wisconsin

Date: 4/1/20 Designed: EB Drawn: EB Checked: RH DWG file: 6492-0802	 825 North Capitol Avenue • Indianapolis, IN 46204 EnviroForensics.com	Figure 1 Project 6492
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Legend

- GAS — Underground gas utility line
- SAN — Underground sanitary utility line
- UGT — Fiber optics line
- OVHD — Over head electrical utility line
- SG-1  Soil Gas sample location
- SSV-1  Sub-slab sample location
- IA-1  Indoor air sample
- MW1  Monitoring well (By Others)
- PZ1  Piezometer well (By Others)
- SVE-1  Soil Vapor Extraction Well (S = Shallow D= Deep)
- SVE conveyance piping
- SVE exhaust piping



Municipal Building
120 5th St
(Slab on Grade)

SVE EXTRACTION SYSTEM LAYOUT

Badger Cleaners
616 Oak Street
Baraboo, Wisconsin





Date:	4/1/20
Designed:	EB
Drawn:	EB
Checked:	RH
DWG file:	6492-1603

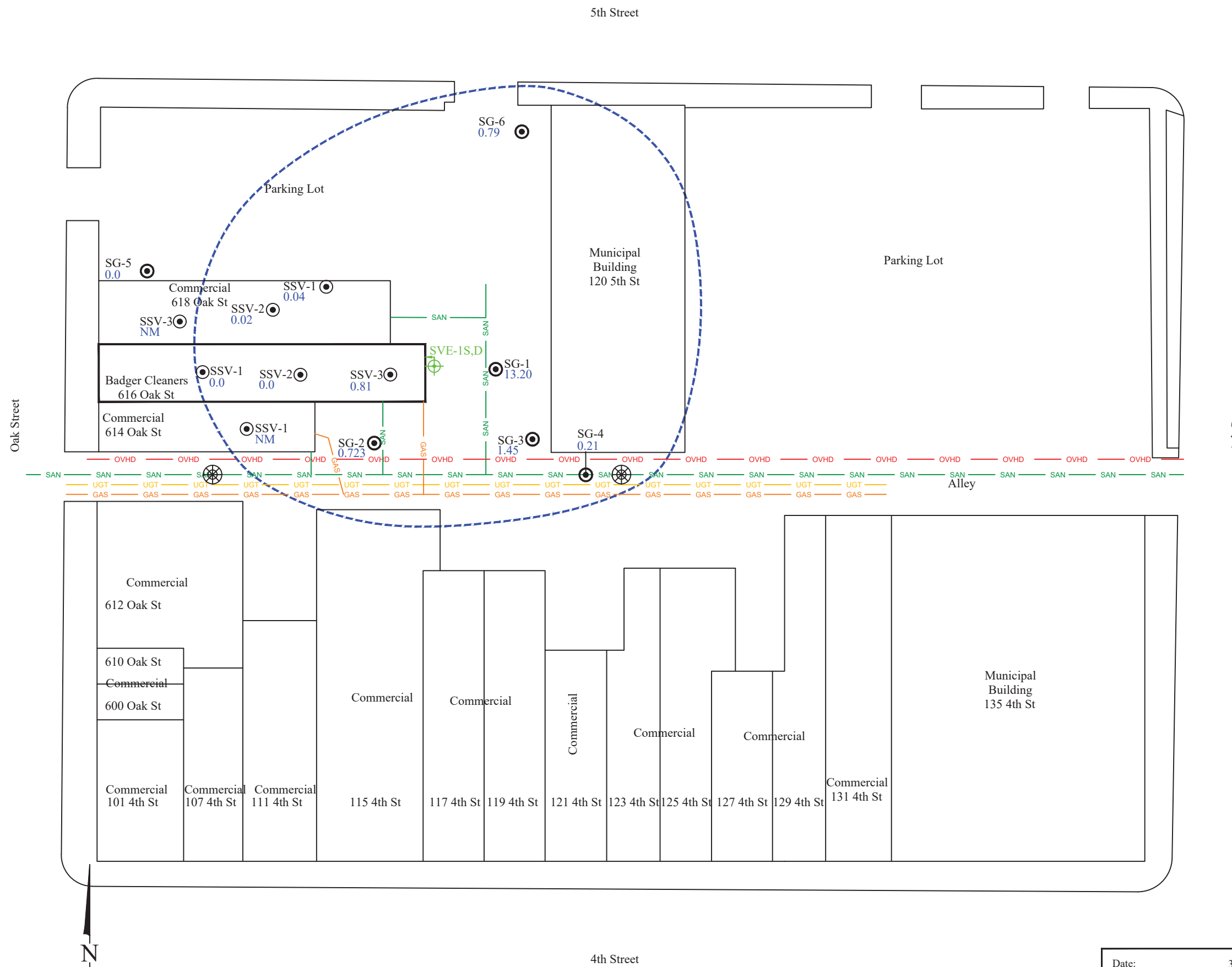


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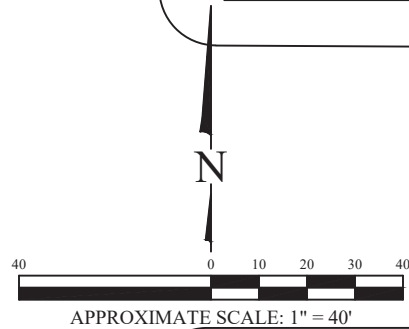
Figure	2
Project	6492

Legend

- SG-1  Soil gas sample port
- SS-1  Sub-slab vapor sample port
- SVE-1  Soil Vapor Extraction Well
(S = Shallow D= Deep)
- 0.01  Vacuum influence from SVE system
in inches of water
(Dashed where inferred)
- 0.01 = Pressure field extension
results (inches of water)
- NM = Not measured



SHALLOW RADIUS OF INFLUENCE MAP
 JANUARY 15, 2020
 Badger Cleaners
 616 Oak Street
 Baraboo, Wisconsin






Date:	3/16/20
Designed:	EB
Drawn:	EB
Checked:	RH
DWG file:	6492-1586

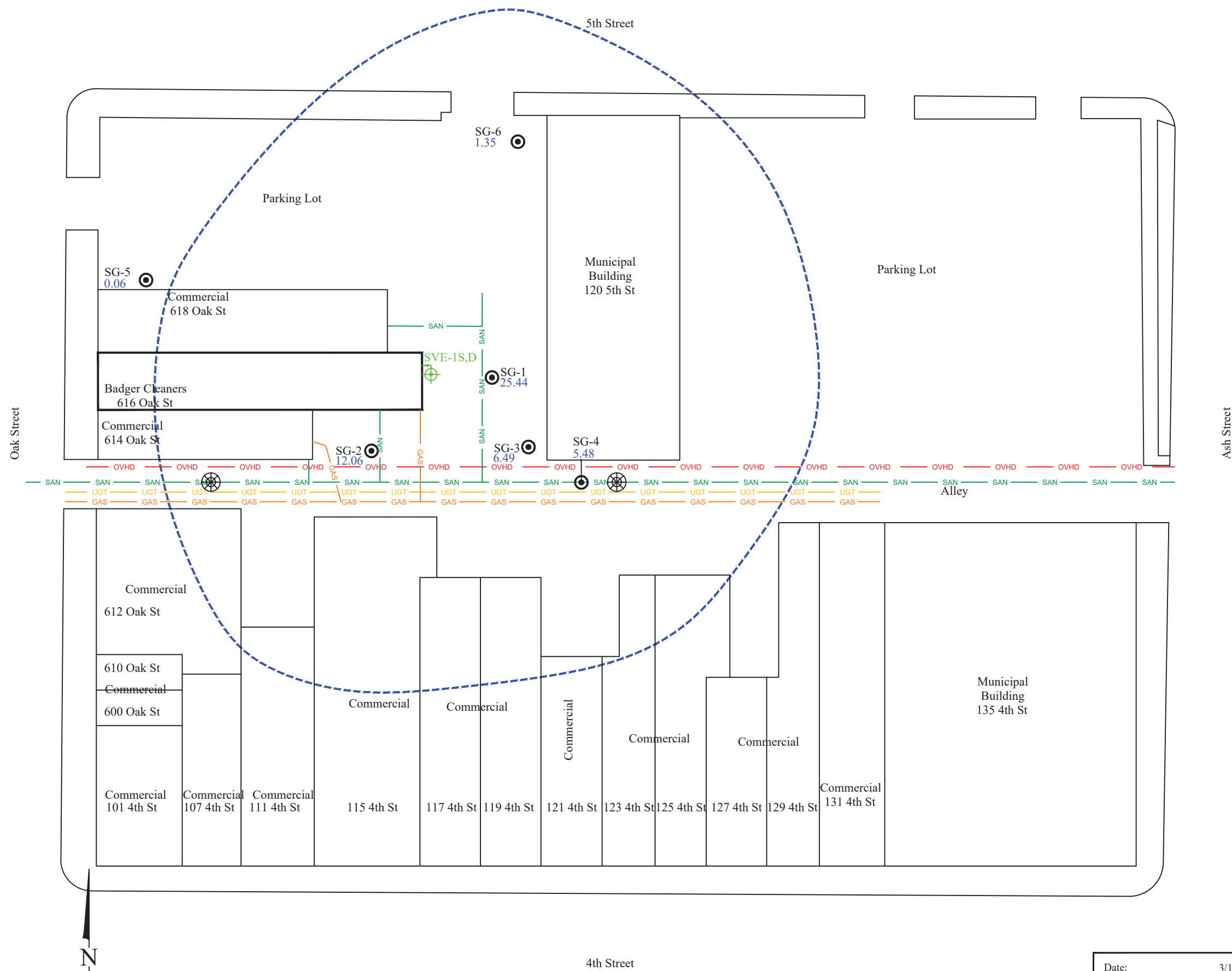


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Figure	3
Project	6492

Legend

- SG-1  Soil gas sample port
- SVE-1  Soil Vapor Extraction Well
(S = Shallow D= Deep)
- 0.01  Vacuum influence from SVE system
in inches of water
(Dashed where inferred)
- 0.01 = Pressure field extension
results (inches of water)



DEEP RADIUS OF INFLUENCE MAP
 JANUARY 15, 2020
 Badger Cleaners
 616 Oak Street
 Baraboo, Wisconsin



Date:	3/16/20
Designed:	EB
Drawn:	EB
Checked:	RH
DWG file:	6492-1587

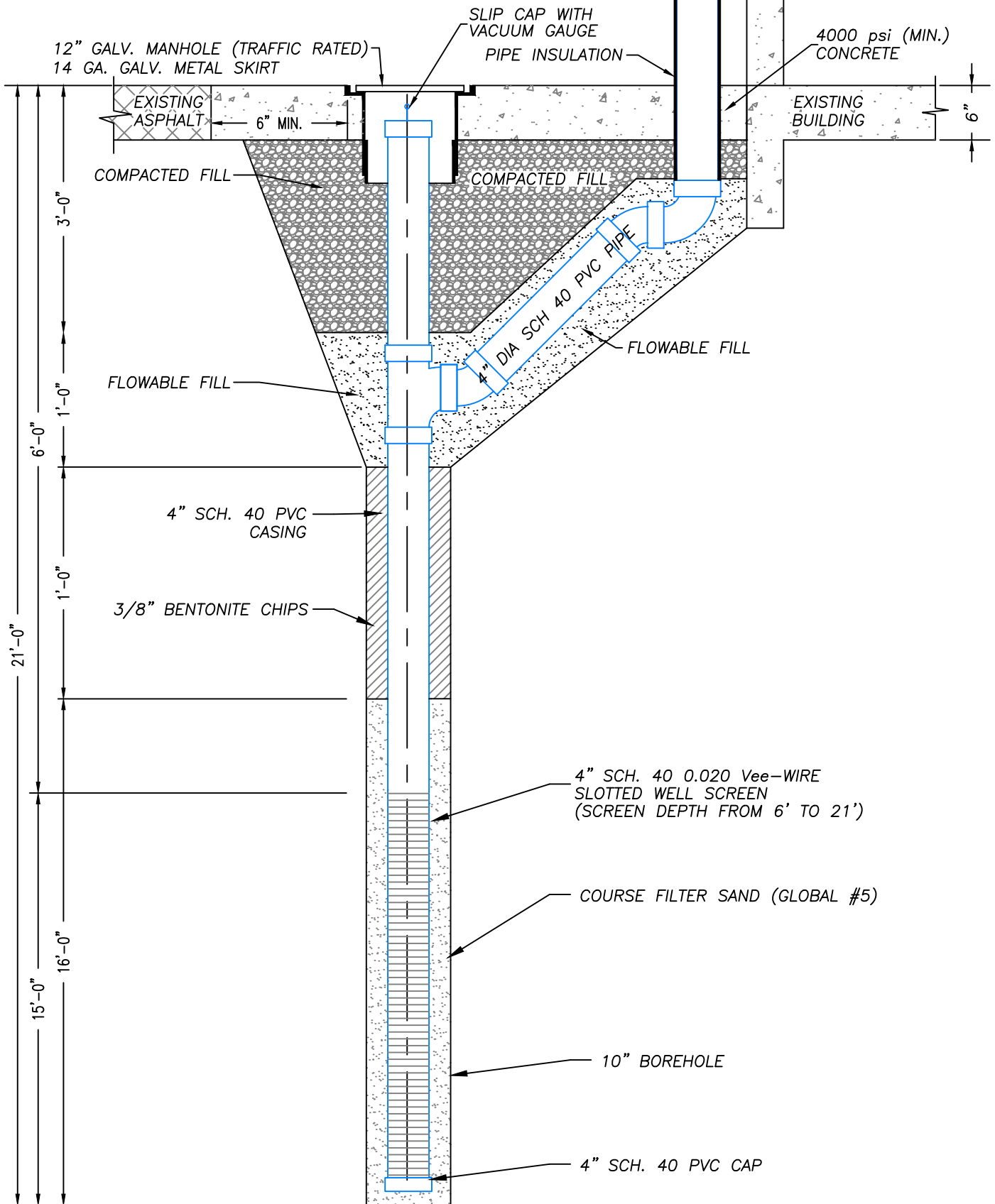


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Figure	4
Project	6492

APPENDIX A

SVE Well Construction Diagrams



No.	Date	Revision	Approved

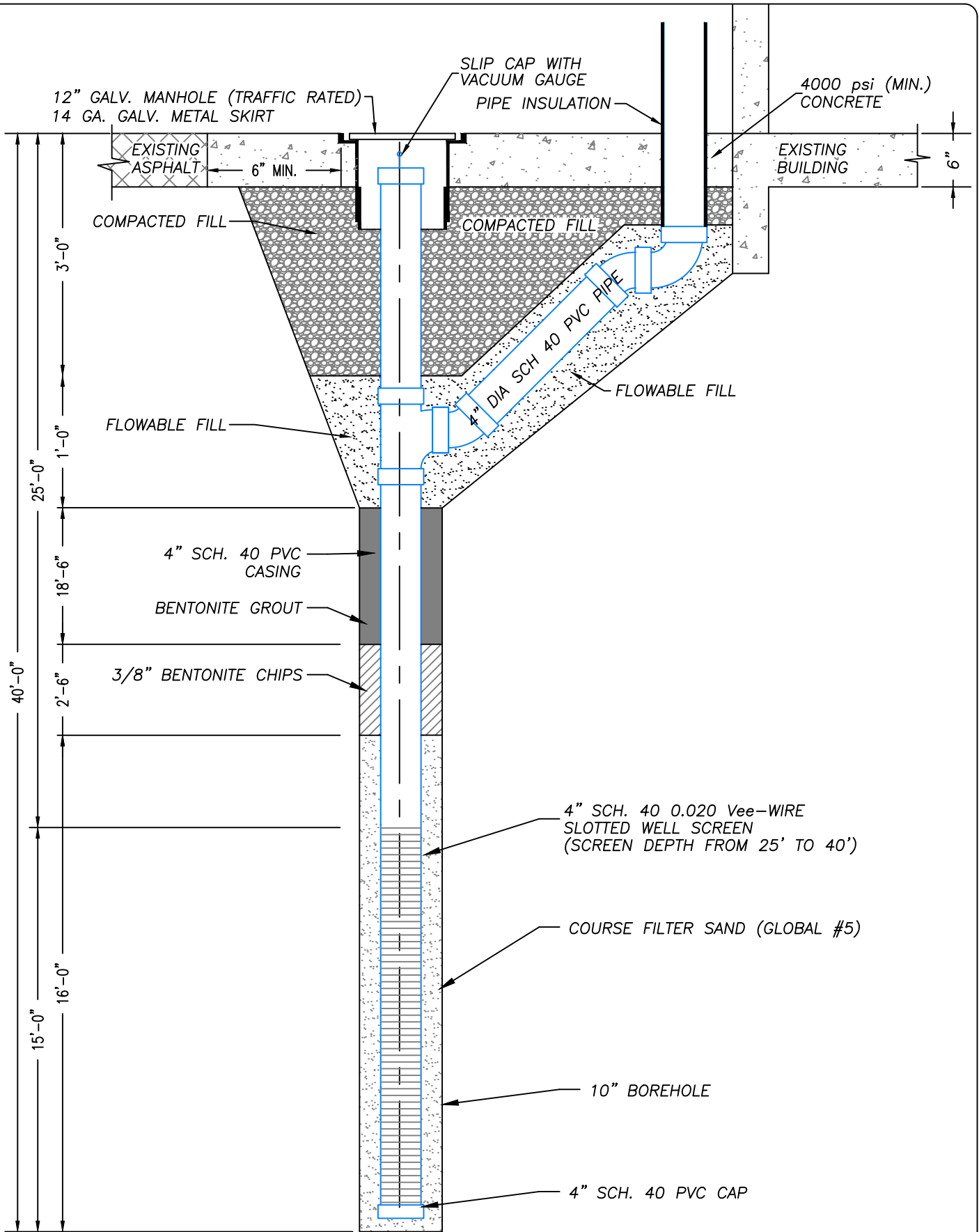


Date: 2/14/19
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DWG file: 6492-1185

SVE-1S EXTERIOR WELLHEAD CONNECTION DIAGRAM

Badger Cleaners
616 Oak Street
Baraboo, Wisconsin

Figure
1
Project
6492



No.	Date	Revision	Approved



Date: 2/14/19
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Drawn: EB
Checked: KH
DWG file: 6492-1185

SVE-1D EXTERIOR WELLHEAD CONNECTION DIAGRAM

Badger Cleaners
616 Oak Street
Baraboo, Wisconsin

Figure
2
Project
6492



APPENDIX B

Operation and Maintenance Manual



Fliteway Technologies, Inc.

Operations and Maintenance Manual

Q14877

EnviroForensics

Baraboo, WI

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Cudahy, WI 53110

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Fliteway Technologies, Inc.

SVE Treatment System

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Cudahy, WI 53110

Office: (414) 483-5600 Fax: (414) 483-1957

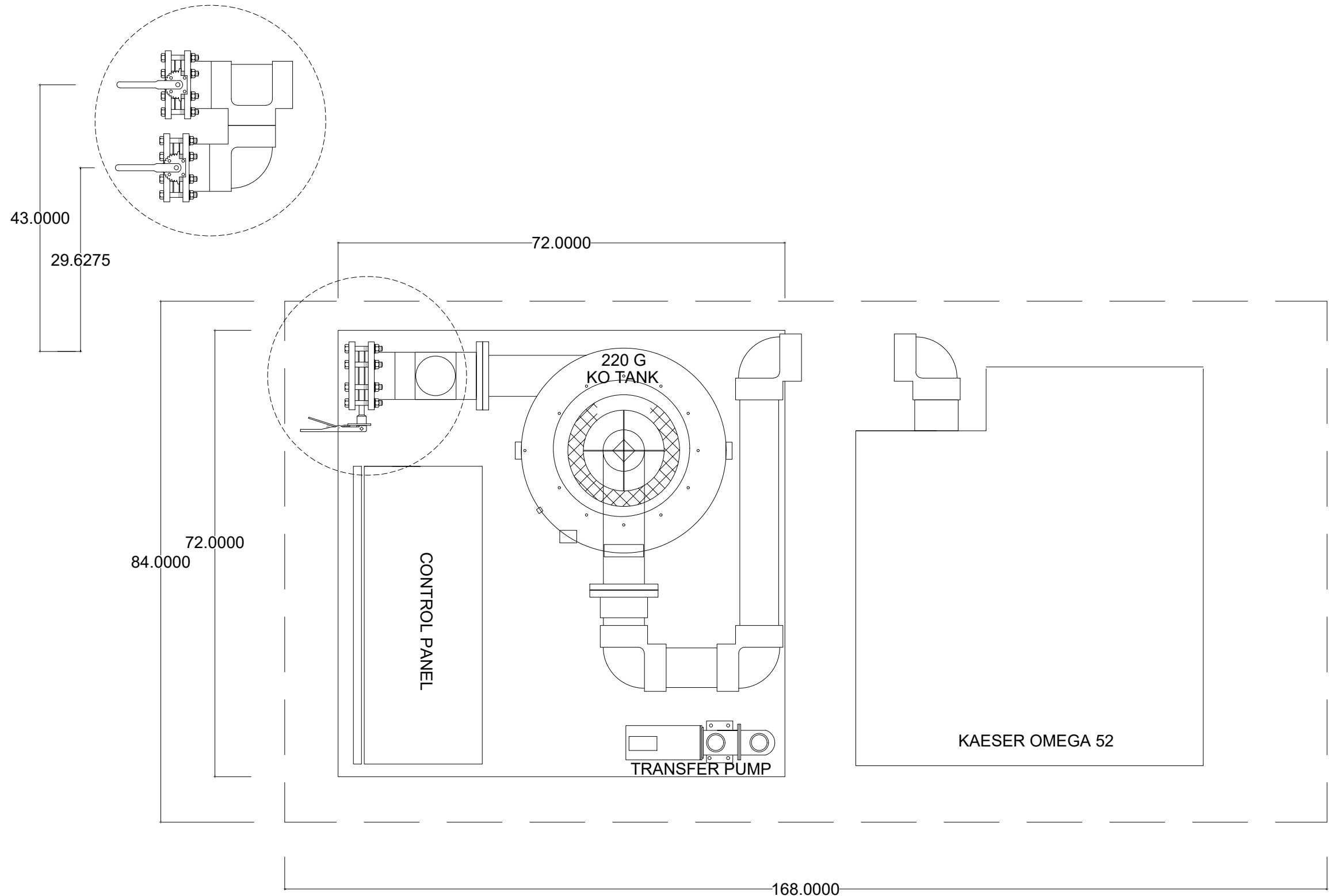


Fliteway Technologies, Inc.

**Process & Instrumentation
Diagram and Skid Layout**

2129 E. Birchwood Avenue
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Office: (414) 483-5600 Fax: (414) 483-1957



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NOT FOR CONSTRUCTION

REV.	ISSUED DATE	DESCRIPTION	BY	CK'D
0	02/19/2020	CONSTRUCTION RECORD	PAP	MPS

SEAL

Prepared for:



Turning Environmental Liabilities Into Assets®

EnviroForensics
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www.enviroforensics.com

Prepared by:



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www.fileway.com

SOIL VAPOR EXTRACTION SYSTEM
BARABOO, WI

SHEET TITLE
**SKID LAYOUT
ELEVATION VIEW**

APPROVED BY
MPS

DESIGNED BY
JF

PROJECT NUMBER
Q14877

CHECKED BY
MPS

DRAWN BY
JF

DRAWING NUMBER
P-01

SHEET **1** OF **3**

Q14877



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0	02/19/2020	CONSTRUCTION RECORD	PAP	MPS

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**SOIL VAPOR EXTRACTION SYSTEM
BARABOO, WI**

SHEET TITLE
SKID FRAMING

APPROVED BY
MPS

DESIGNED BY
JF

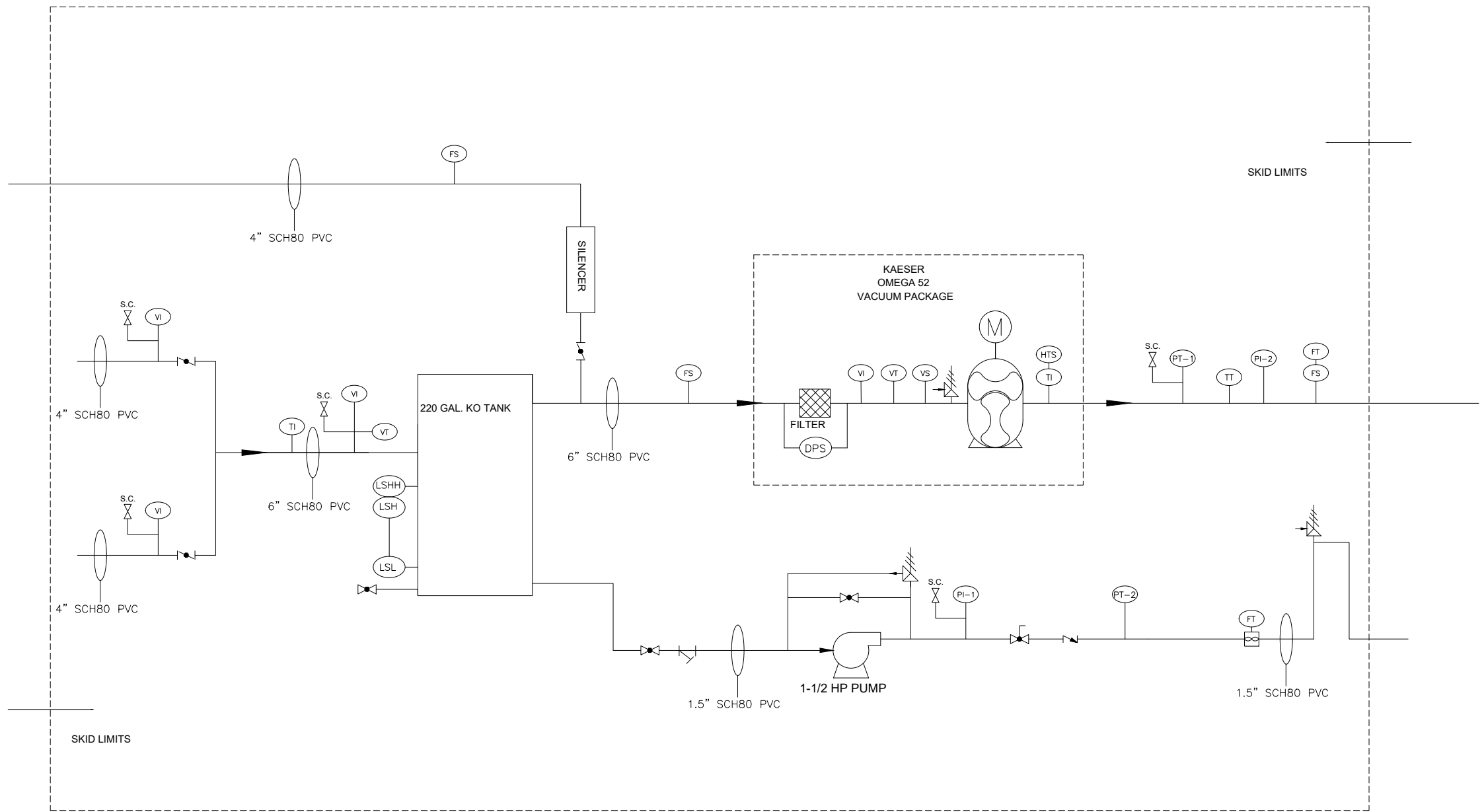
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Q14877

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MPS

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JF

DRAWING NUMBER
P-02

SHEET **2** OF **3**



- | | | |
|-----------------------------|------------------------------|-------------------------|
| BALL VALVE | VACUUM INDICATOR 0-30" HG | HIGH TEMPERATURE SWITCH |
| GATE VALVE | PRESSURE INDICATOR 0-30" WC | PRESSURE TRANSMITTER |
| BUTTERFLY VALVE | PRESSURE INDICATOR 0-30 PSI | PRESSURE TRANSMITTER |
| CHECK VALVE | DIFFERENTIAL PRESSURE SWITCH | |
| WYE STRAINER | LEVEL SWITCH HIGH-HIGH LEVEL | |
| VACUUM RELIEF VALVE | LEVEL SWITCH HIGH-HIGH LEVEL | |
| TOTALIZING FLOW METER | LEVEL SWITCH HIGH-HIGH LEVEL | |
| S.C. SAMPLE CONNECTION PORT | TEMPERATURE INDICATOR 0-250 | |
| | FLOW SENSOR | |
| | VACUUM TRANSMITTER | |
| | VACUUM SWITCH | |

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NOT FOR CONSTRUCTION

REV.	ISSUED DATE	DESCRIPTION	BY	CK'D
0	02/19/2020	CONSTRUCTION RECORD	PAP	MPS

SEAL

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Tel: (414) 483-5600 Fax: (414) 483-1957
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**SOIL VAPOR EXTRACTION SYSTEM
BARABOO, WI**

SHEET TITLE
**SVE SYSTEM
P&ID**

APPROVED BY
MPS

DESIGNED BY
JF

PROJECT NUMBER
Q14877

CHECKED BY
MPS

DRAWN BY
JF

DRAWING NUMBER
P-03

SHEET **3** OF **3**



Fliteway Technologies, Inc.

**Control Panel
Drawings**

2129 E. Birchwood Avenue
Cudahy, WI 53110

Office: (414) 483-5600 Fax: (414) 483-1957



Fliteway Technologies, Inc.

2129 East Birchwood Ave. • Cudahy, WI 53110
 (414) 483-5600 • 1-800-236-3580 • FAX (414) 483-1957

SOIL VAPOR EXTRACTION SYSTEM MAIN CONTROL PANEL (MCP)

DRY CLEANING FACILITY
 BARABOO, WISCONSIN

PREPARED BY:

FLITEWAY TECHNOLOGIES, INC.
 2129 East Birchwood Ave.
 Cudahy, WI 53110
 Tel: (414) 483-5600 Fax: (414) 483-1957
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PREPARED FOR:

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 Indianapolis, IN 46204
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TABLE OF CONTENTS

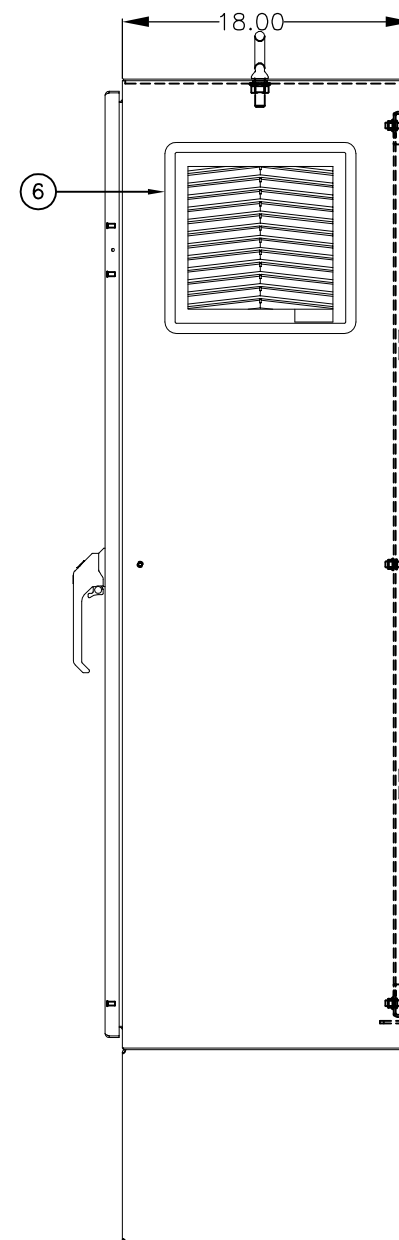
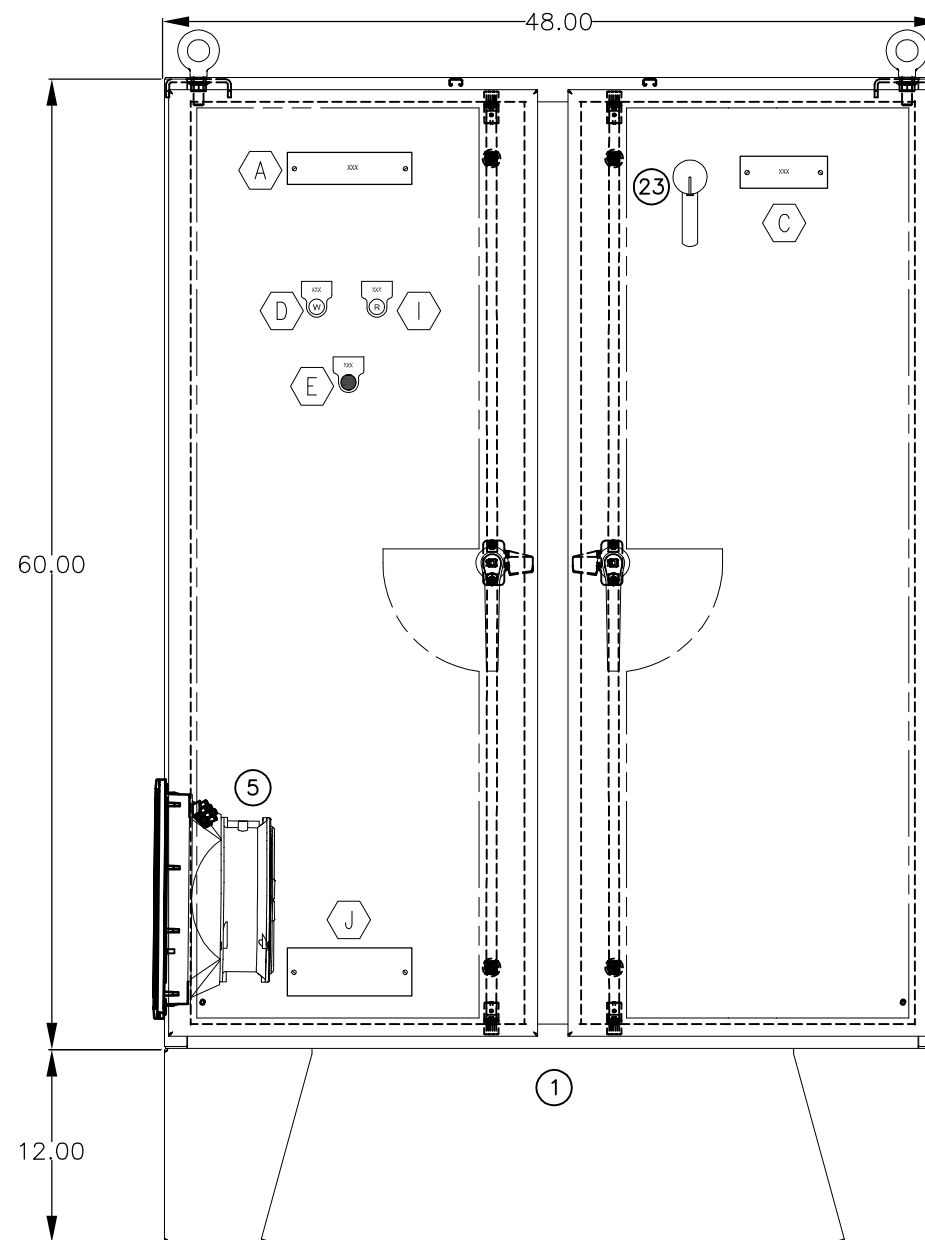
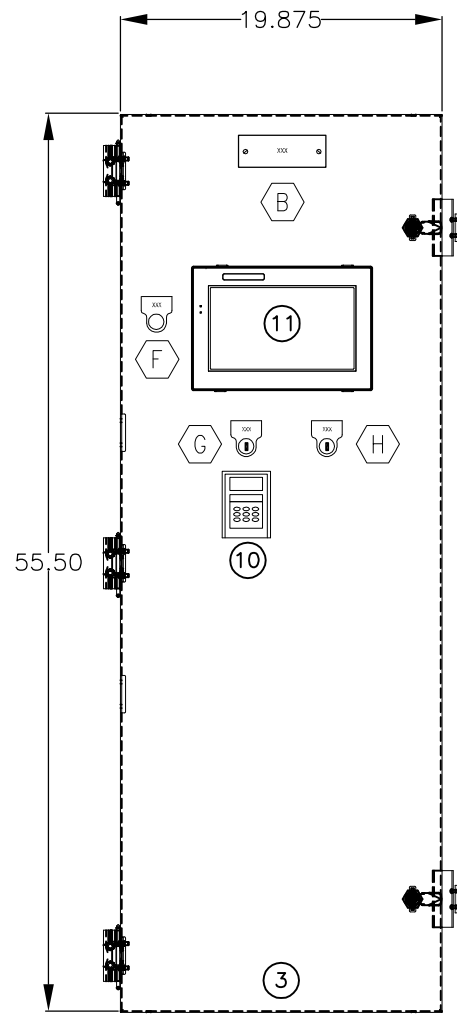
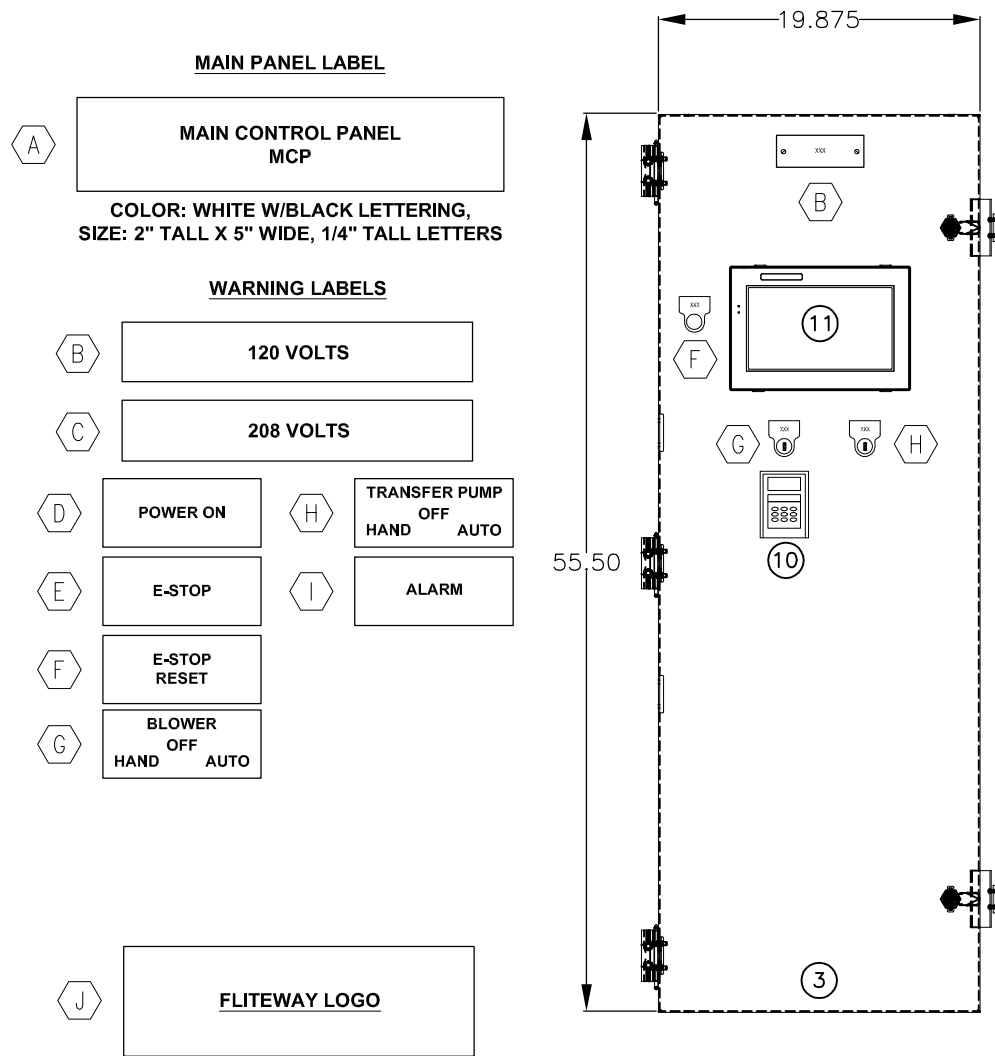
- I-01: MAIN CONTROL PANEL (MCP) SHOP DRAWINGS TITLE SHEET
- I-02: DEADFRONT AND EXTERNAL LAYOUT
- I-03: BILL OF MATERIALS & INTERNAL SUBPANEL LAYOUT
- I-04: 208V/120V POWER DISTRIBUTION
- I-05: 120VAC POWER DISTRIBUTION
- I-06: 120VAC & 24VDC POWER DISTRIBUTION
- I-07: PLC EMBEDDED 24VDC INPUTS
- I-08: PLC EMBEDDED RELAY OUTPUTS
- I-09: SLOT 1 ANALOG INPUTS
- I-10: SLOT 2 ANALOG INPUTS/OUTPUTS
- I-11: ALARM INTERLOCK TABLE

CONSTRUCTION RECORD

Revisions Drawn by: Matthew Davy Date: July 16, 2019

THESE RECORD DRAWINGS HAVE BEEN PREPARED, IN PART, ON THE BASIS OF INFORMATION COMPILED BY OTHERS. THEY ARE NOT INTENDED TO REPRESENT IN DETAIL, THE EXACT LOCATION, TYPE OF COMPONENTS, NOR MANNER OF CONSTRUCTION. THE ENGINEER WILL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH HAVE BEEN INCORPORATED INTO THE RECORD DRAWINGS

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										MPS	MJD
						EnviroForensics 825 North Capitol Avenue Indianapolis, IN Tel: (317) 614-0594 www.enviroforensics.com	Fliteway Technologies, Inc. 2129 East Birchwood Ave. Cudahy, WI 53110 Tel: (414) 483-5600 Fax: (414) 483-1957 www.fliteway.com			DESIGNED BY	DRAWN BY
	1	7/16/2019	CONSTRUCTION RECORD	MD	BDC					JK	JK
								PROJECT NUMBER	DRAWING NUMBER		
0	3/13/2019	ISSUED FOR CUSTOMER REVIEW	JK	BDC				Q14877	I-01		
REV.	ISSUED DATE	DESCRIPTION	BY	CK'D						SHEET 1 OF 11	



LABEL SCHEDULE

SCALE: N.T.S.

DEADFRONT - ASSEMBLED

SCALE: AS SHOWN

FRONT VIEW - ASSEMBLED

SCALE: AS SHOWN

SIDE VIEW

SCALE: AS SHOWN

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SOIL VAPOR EXTRACTION/
 AIR SPARGE REMEDIATION SYSTEM
 MAIN CONTROL PANEL (MCP)

SHEET TITLE

MCP
 EXTERNAL LAYOUT

APPROVED BY
MPS

DESIGNED BY
JK

PROJECT NUMBER
Q14877

CHECKED BY
MJD

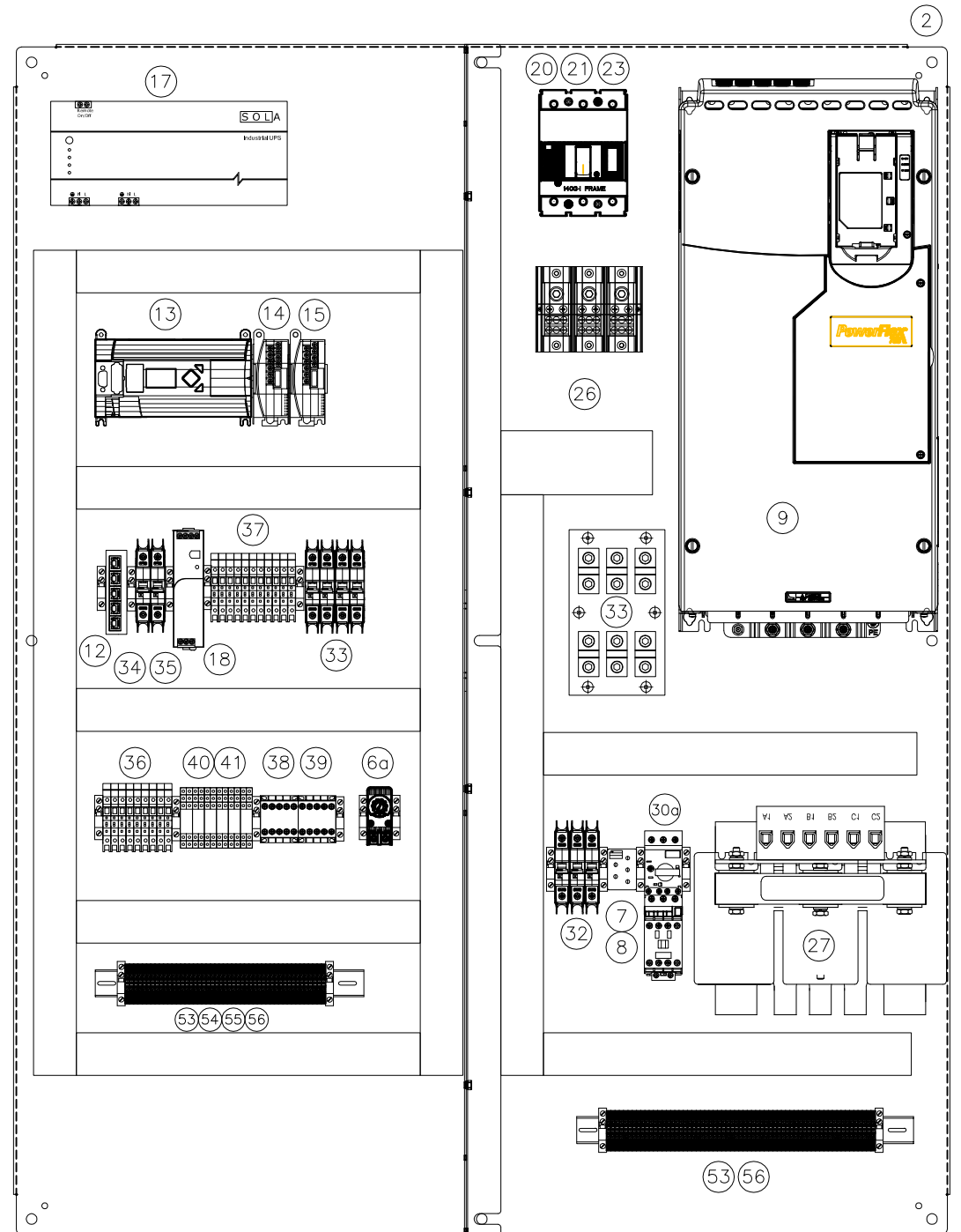
DRAWN BY
JK

DRAWING NUMBER
I-02
 SHEET 2 OF 11

1	Saginaw	SCE-60EL4818LPLP	Enclosure, NEMA 3R, 60"H x 48"W x 18"D	1
2	Saginaw	SCE-60P48	Subpanel for above	1
3	Saginaw	SCE-DF60EL48	Dead Front Kit for above	2
4	Saginaw	SCE-BP5618	Barrier Plate for above	1
5	Saginaw	SCE-N3RFA10HF	NEMA 3R, 12" Enclosure Fan	1
6	Saginaw	SCE-N3RGA1010	NEMA 3R, 12" Exhaust Filter	1
6a	Saginaw	SCE-TENMO	Thermostat	1
7	Macromatic	PMU	Phase Monitor	1
8	Dayon	5X852N	Phase Monitor Socket	1
9	Allen-Bradley	20F1ANB104JNONNNNN	Power Flex 753 VFD, 240-VAC, 3-Phase, 40 HP Normal Duty	1
10	Allen-Bradley	22-HIM-C65	Remote HIM for Poweflex VFD	1
11	Automation Direct	EA9-T10WCL	C-More EA9 Series 10" Touch Screen HMI	1
12	Moxa	EDS-205	5-Port Unmanaged Switch	1
13	Allen Bradley	1766-L32BWA	Micrologix 1400 Base 20 DC Inputs, 12 Relay Outputs	1
14	Spectrum Controls	1762SC-IF8U	8 Ch. Analog Input Card	1
15	Allen Bradley	1762-IF2OF2	4 Ch. Analog Input/Output Card	2
16	Allen-Bradley	4983-DC120-10	Power Filter, 10A	1
17	Sola	SDU850A	850VA, 120VAC Offline UPS	1
18	Mean Well	NDR-240-24	10A 24VDC Power Supply	1
19	Automation Direct	FA-GFCI	Duplex Receptacle Outlet, 15A Combined, Din Mount	1
20	Noark	M2S200T3L	Molded Case Circuit Breaker, TM, 200A, 3 pole, 65KA	1
21	Noark	1100859	MCCB External handle, Nema 3R	1
22	Noark	EH532A	MCCB External handle shaft, 320mm	1
23	Noark	HOM2A	MCCB Operating Handle Mechanism	1
24	Mersen	MPDB69073	Power Distribution Block, 600V, 3P	1
25	Mersen	MPDB69071	Power Distribution Block, 600V, 1P	1
26	Mersen	MPDBC6869	Power Distribution Block cover	4
27	Enerdoor	FF00P1501600954	3% Line Reactor, 600V, 160A	1
28	Littlefuse	LFT602003CS	600V, Class T Fuse Block, 200A, 3 Pole	1
29	Littlefuse	LT60200FBC	Fuse Block Cover	3
30	Littlefuse	JLLS200	Class T Fast Acting Fuse, 200A	3
30a	Sprecher & Schuh	CL7-9E-10-24E-AS6.3	Combination Motor Starter, 6.3A	1
31	Noark	B1N1C15	15A 1P Breaker, C Curve	1
32	Sprecher & Schuh	BR3C15UC	15A 3P Breaker, C Curve	1
32a	Sprecher & Schuh	BR1C15UC	15A 1P Breaker, C Curve	1
33	Sprecher & Schuh	BR1C10UC	10A 1P Breaker, C Curve	5
34	Sprecher & Schuh	BR1C5UC	5A 1P Breaker, C Curve	1
35	Sprecher & Schuh	BR1C2UC	2A 1P Breaker, C Curve	1
36	Allen-Bradley	1492-H4	120-VAC Fuse Holder	8
37	Allen-Bradley	1492-H5	24-VDC Fuse Holder	9
38	Allen-Bradley	700-K40E-D	Control Relay, 4P, 4 NO Contacts, 120VAC Coil	1
39	Allen-Bradley	700-K22Z-D	Control Relay, 4P, 2 NO/2 NC Contacts, 120VAC Coil	1
40	Allen-Bradley	700-HK36224	Slim Line Relay, SPDT, 16A Contact, 24VDC Coil	6
41	Allen-Bradley	700-HN121	Slim Line Relay Base for above	6
42	Allen Bradley	800FP-P7PN5W	22mm 120-VAC White LED Pilot Light	1
42a	Allen Bradley	800FP-P4PN5R	22mm 120-VAC White LED Pilot Light	1
43	Allen-Bradley	800FP-SM32PX20	22mm 3 Pos. Selector Switch - Plastic, Maintained, Black, Standard Knob, 2 NO Contact Blocks	2
44	Allen-Bradley	800FP-MT4PX02	40mm Mushroom Operator, Twist to Release, 40mm, Red, 2 N.C. Contact(s)	1
45	Allen-Bradley	800FP-F2PX20	22mm Push Button - Flush, Black, 2 N.O. Contacts	1
46	Sierra Wireless	RV50	1102326 Sierra Wireless AirLink RV50 - Verizon	1
47	Sierra Wireless	RV-50 DIN RAIL BRKT	RV-50 Din Rail Bracket	1
48	Sierra Wireless	2700384	2700384 AC-12VDC Power Supply - AirLink GX and LS Series Modems	1
49	Polyphaser	N/A	RF Coaxial Surge Arrestor - Bulkhead Mount 10 MHz - 1.0 GHz - N Female Conn.	1
50	Talley	311203	LTE Multi-Band Omni-Directional Antenna, N Female	1
51	Talley	N/A	6' 195 series Coaxial Cable Assembly - N Male to N Male	1
52	Talley	N/A	20' 195 series Coaxial Cable Assembly - N Male to N Male	1
53	Allen-Bradley	1492-J3	1492-J IEC Term. Block, One-Circuit Feed-Thru Block, 10 mm (#22 AWG - #12 AWG)	100
54	Allen-Bradley	1492-J3P	1492-J IEC Term. Block, One-Circuit Feed-Thru Block, 10 mm(#22 AWG - #12 AWG) - Fusible	6
55	Allen-Bradley	1492-FPK224	Plug w/ Blown Fuse Ind (24-VDC)	6
56	Allen-Bradley	1492-JG3	1492-J IEC Term. Block, One-Circuit Feed-Thru Block, 10 mm (#22 AWG - #12 AWG) - Grounding	20
57	Allen-Bradley	1492-EA135	End Anchor, DIN Rail - Heavy Duty	40
58	Allen-Bradley	1492-DR6	Dinrail, Aluminum, 35MM, Raised	2
59	Allen-Bradley	199-DR1	Dinrail, zinc-plated steel, 35MM	8
60	Panduit	TBD	2" Wiring Duct, Grey	2
61	TBD	TBD	24-VDC Panel Light	1
62	Eaton	GBK10	Ground Bar, 10 Terminal	1
63	IlSCO	ILSTA0	Ground Lug	1
64	Misc	TBD	Fuses, Lot	1
65	Misc	TBD	Labels, Lot	1

BILL OF MATERIALS (BOM)

SCALE: N.T.S.



INTERNAL (SUBPANEL) VIEW

SCALE: AS SHOWN

1	7/16/2019	CONSTRUCTION RECORD	MD	BDC
0	3/13/2019	ISSUED FOR CUSTOMER REVIEW	JK	BDC
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Prepared by:

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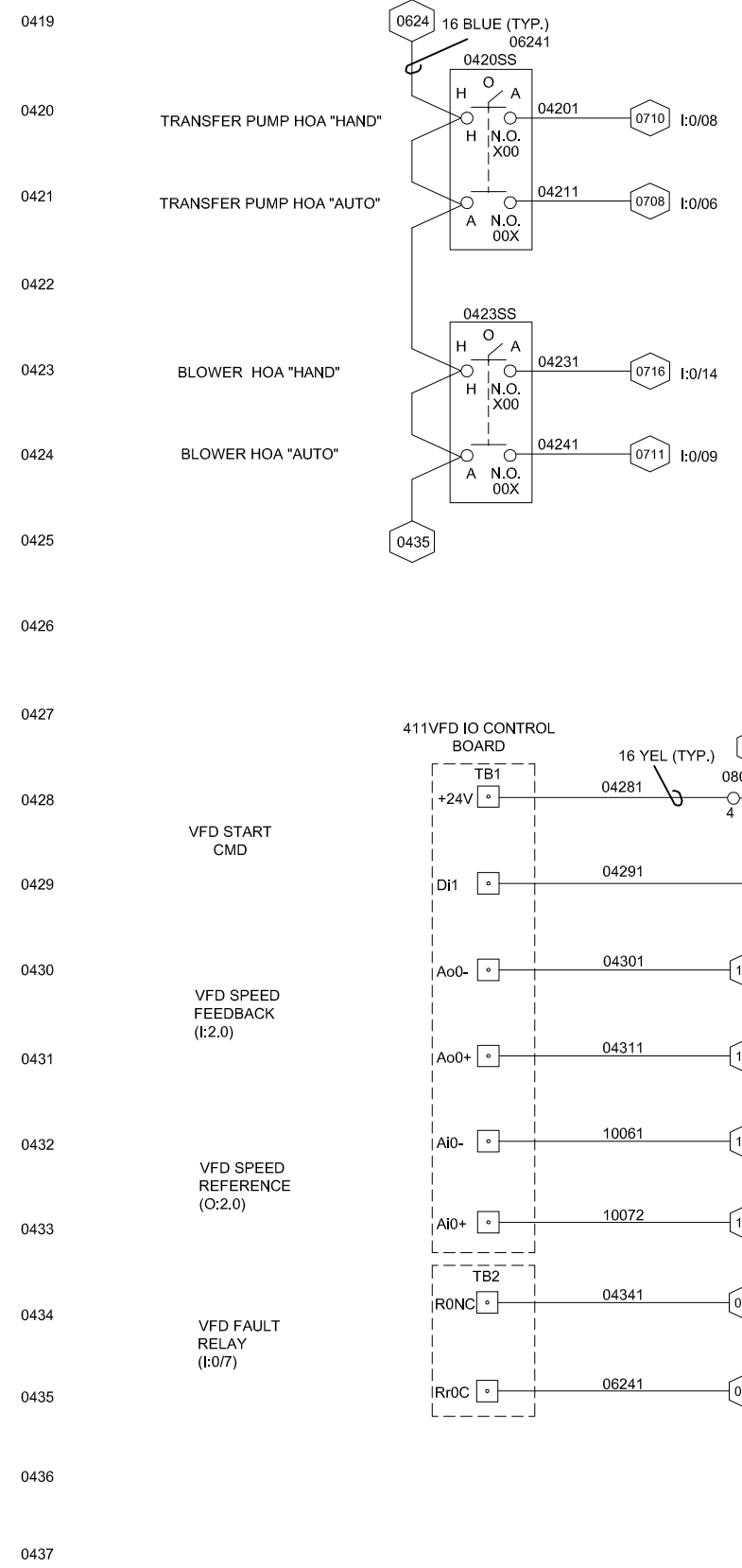
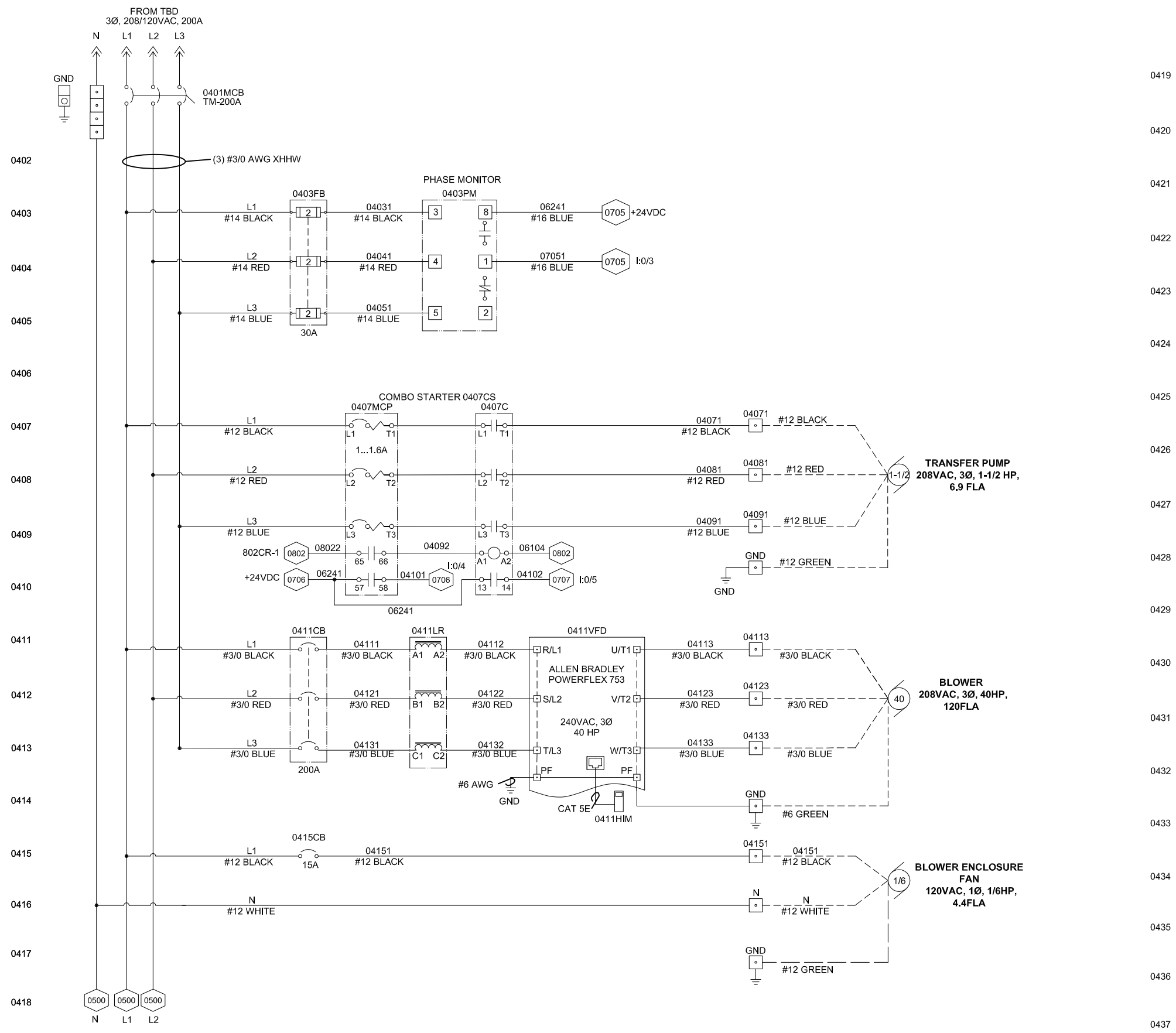
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SOIL VAPOR EXTRACTION/
AIR SPARGE REMEDIATION SYSTEM
MAIN CONTROL PANEL (MCP)

SHEET TITLE

**MCP
BILL OF MATERIALS &
INTERNAL SUBPANEL
LAYOUT**

APPROVED BY	MPS	CHECKED BY	MJD
DESIGNED BY	JK	DRAWN BY	JK
PROJECT NUMBER	Q14877	DRAWING NUMBER	I-03
		SHEET	3 OF 11



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SOIL VAPOR EXTRACTION/
AIR SPARGE REMEDIATION SYSTEM
MAIN CONTROL PANEL (MCP)

SHEET TITLE

**MCP
208/120VAC
POWER DISTRIBUTION**

APPROVED BY
MPS

DESIGNED BY
JK

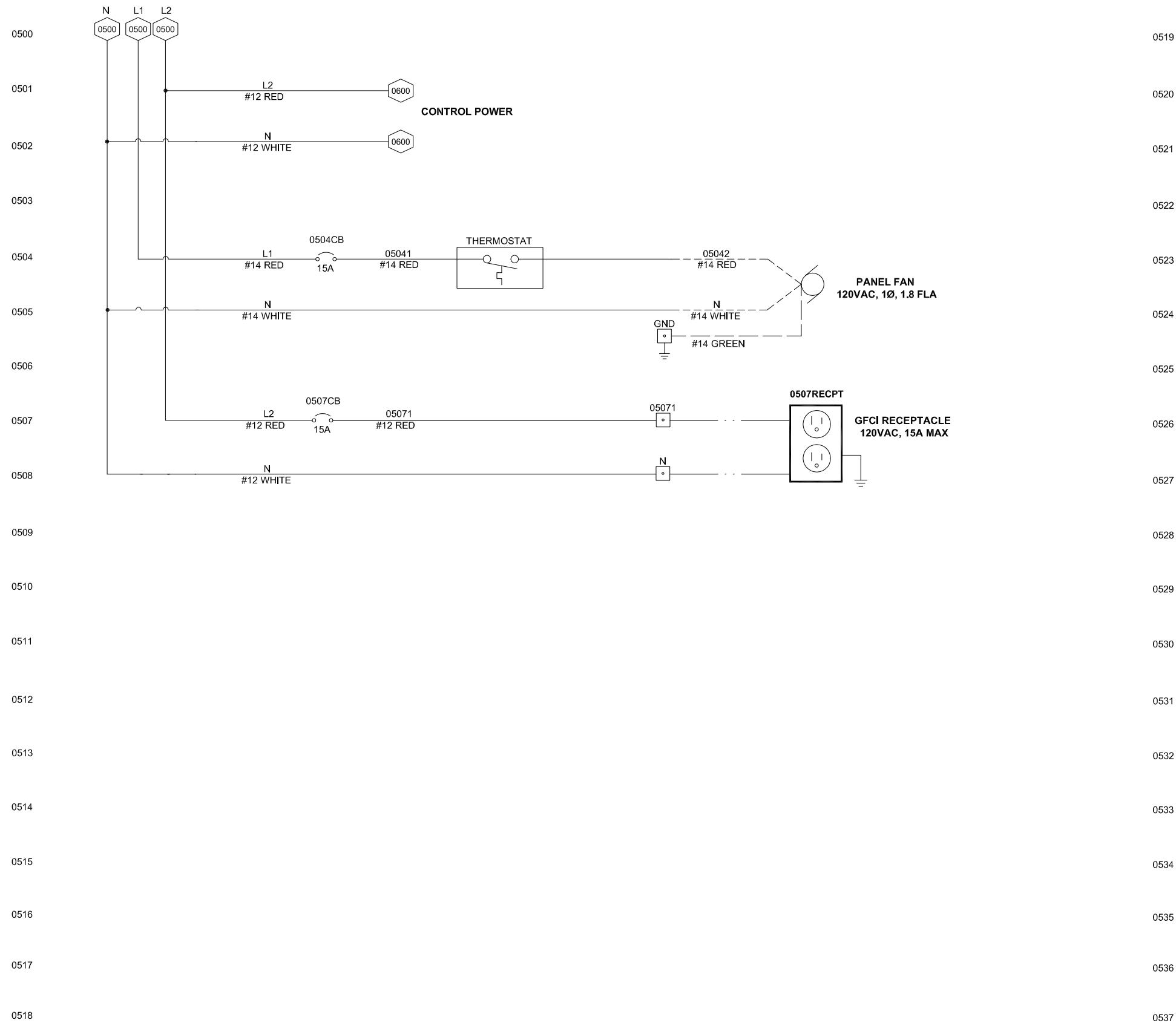
PROJECT NUMBER
Q14877

CHECKED BY
MJD

DRAWN BY
JK

DRAWING NUMBER
I-04


SHEET 4 OF 11



REV.	ISSUED DATE	DESCRIPTION	BY	CK'D
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0	3/13/2019	ISSUED FOR CUSTOMER REVIEW	JK	BDC

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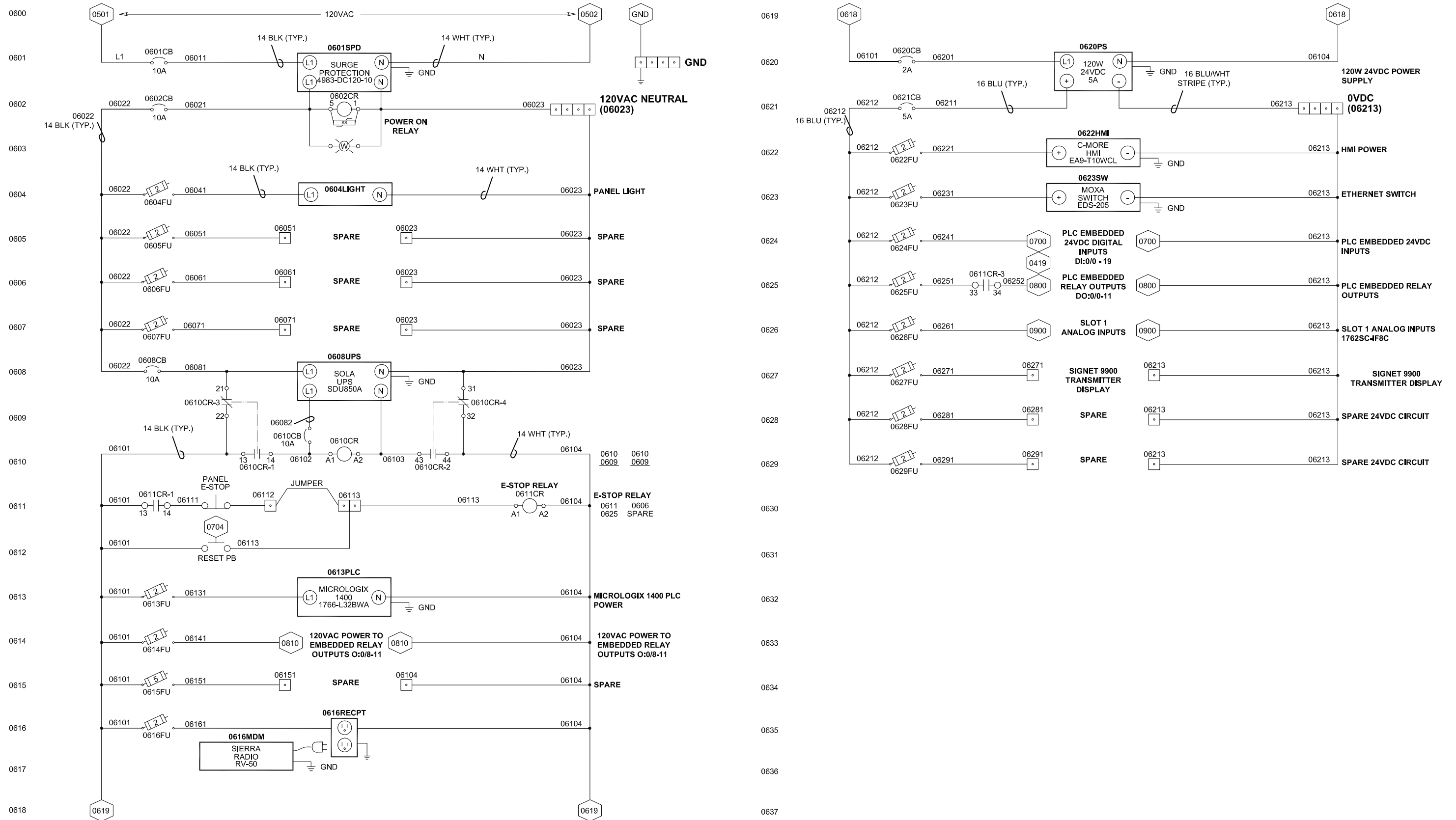
**SOIL VAPOR EXTRACTION/
AIR SPARGE REMEDIATION SYSTEM
MAIN CONTROL PANEL (MCP)**

SHEET TITLE

**MCP
120VAC
POWER DISTRIBUTION**

APPROVED BY MPS
DESIGNED BY JK
PROJECT NUMBER Q14877

CHECKED BY MJD
DRAWN BY JK
DRAWING NUMBER I-05
SHEET 5 OF 11



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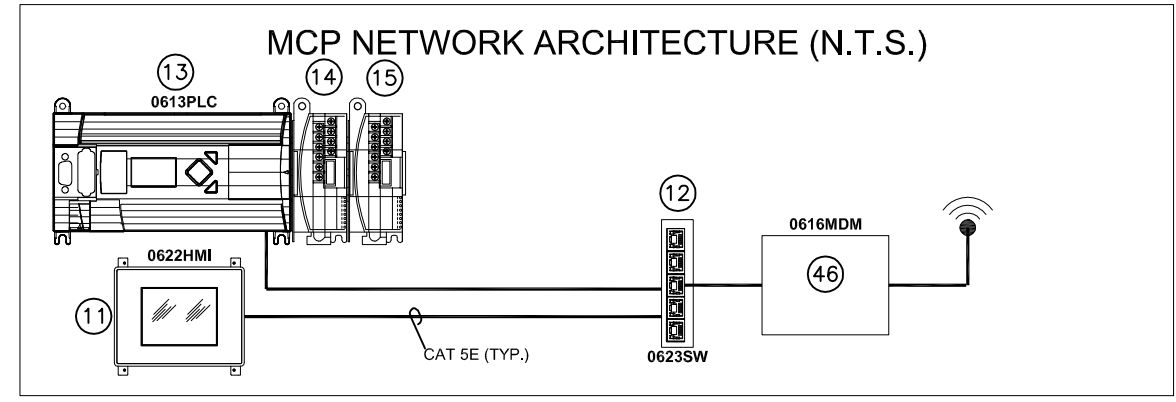
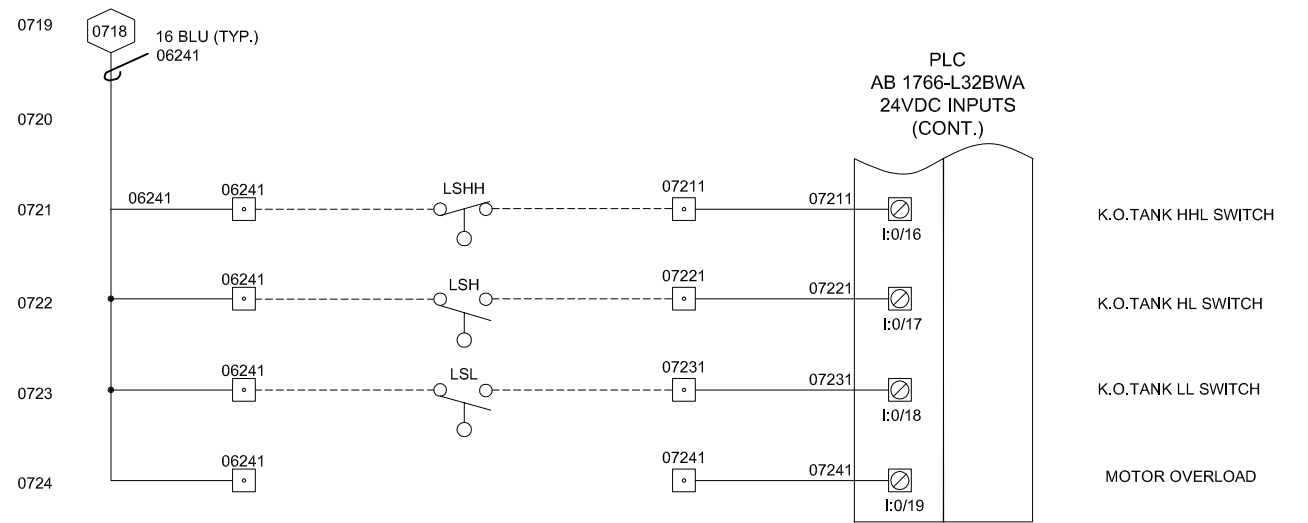
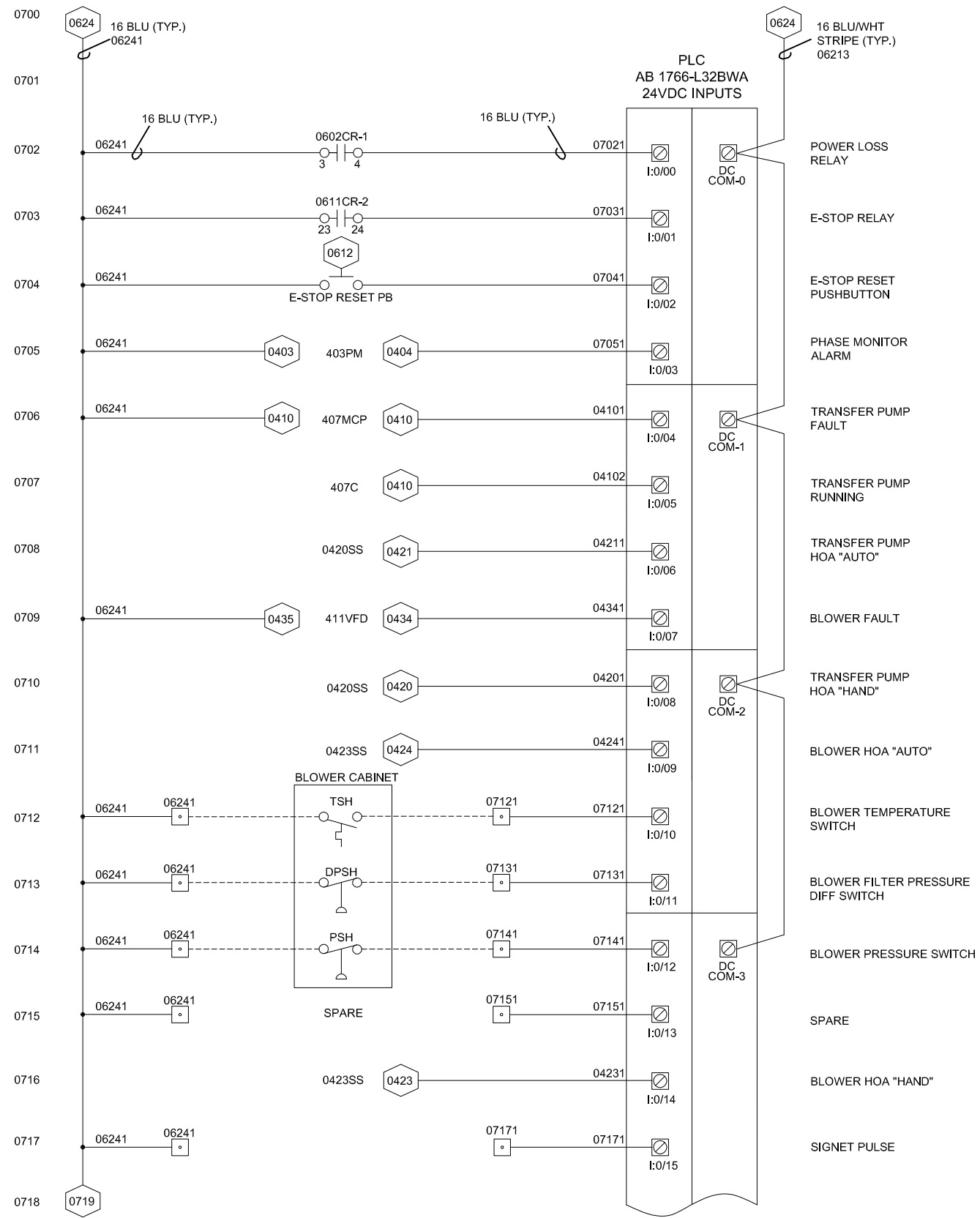
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**SOIL VAPOR EXTRACTION/
AIR SPARGE REMEDIATION SYSTEM
MAIN CONTROL PANEL (MCP)**

SHEET TITLE
**MCP
120VAC/24VDC
POWER DISTRIBUTION**

APPROVED BY MPS	CHECKED BY MJD
DESIGNED BY JK	DRAWN BY JK
PROJECT NUMBER Q14877	DRAWING NUMBER I-06
	SHEET 6 OF 11



LEGEND

- DENOTES TERMINAL CONNECTION OUTSIDE PANEL
- DENOTES TERMINAL BLOCK CONNECTION
- DASHED LINES DENOTES WIRING TO FIELD DEVICES
- DASHED DENOTES DEVICES IN REMOTE LOCATIONS

WIRE NUMBER DESCRIPTION

WIRING DIAGRAM SHEET NUMBER (1 or 2 digits) | 00000 | WIRE NUMBER (Always 1 digit) | LINE NUMBER (Always 2 digits)

INPUT OR OUTPUT WIRE NUMBER CONFIGURATION

OUTPUT = 0 | XXXX | I/O NUMBER

LINE NUMBER DESCRIPTION

WIRING DIAGRAM SHEET NUMBER (1 or 2 digits) | 0000 | LINE NUMBER (Always 2 digits)

PTB POWER TERMINAL BLOCK

TB TERMINAL BLOCK

WP WATERPROOF

© PRESIDIO SYSTEMS, INC.

REV.	ISSUED DATE	DESCRIPTION	BY	CK'D
1	7/16/2019	CONSTRUCTION RECORD	MD	BDC
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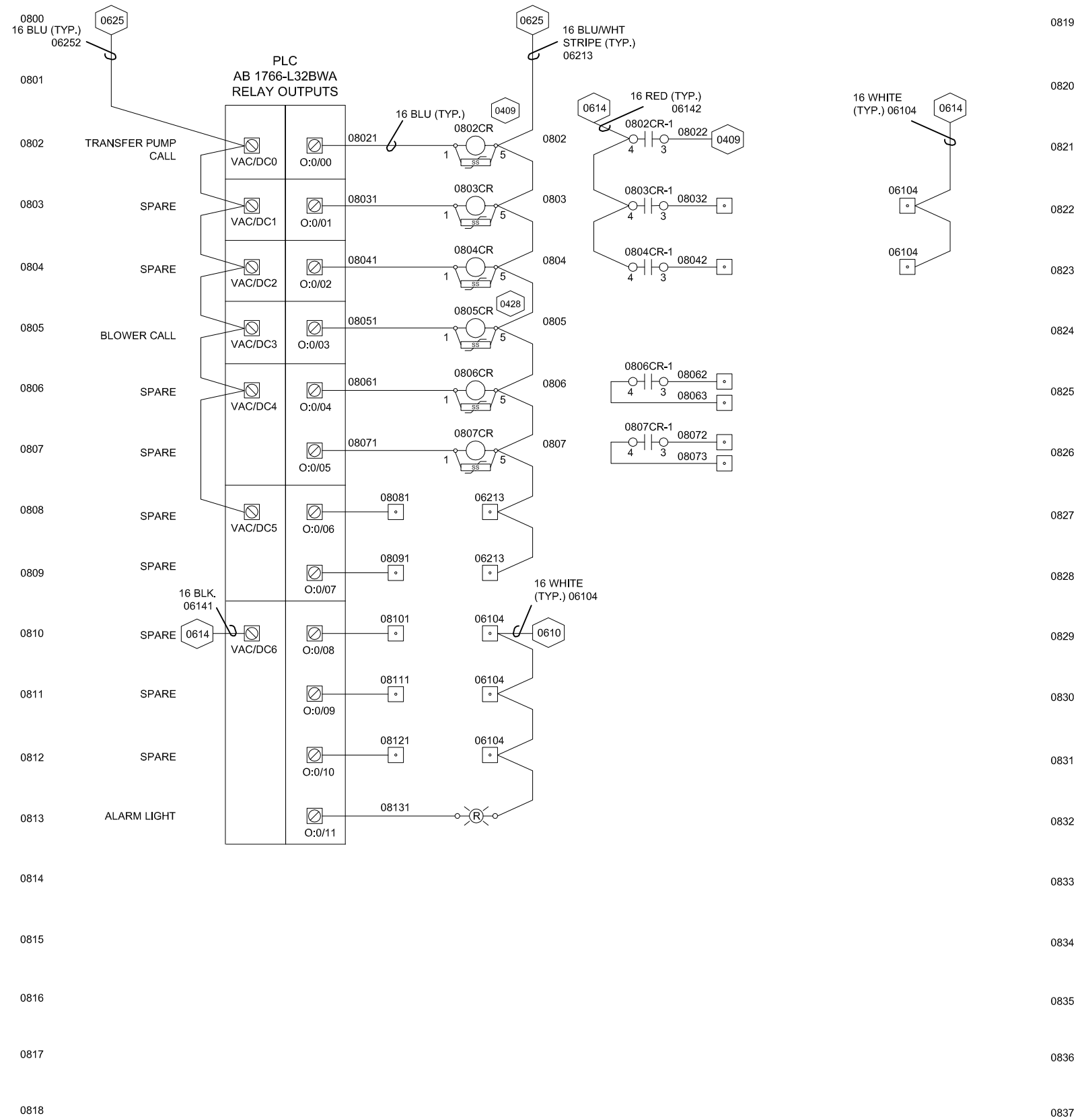
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**SOIL VAPOR EXTRACTION/
 AIR SPARGE REMEDIATION SYSTEM
 MAIN CONTROL PANEL (MCP)**

SHEET TITLE
**MCP
 EMBEDDED DISCRETE
 INPUTS**

APPROVED BY
MPS
 DESIGNED BY
JK
 PROJECT NUMBER
Q14877

CHECKED BY
MJD
 DRAWN BY
JK
 DRAWING NUMBER
I-07
 SHEET 7 OF 11



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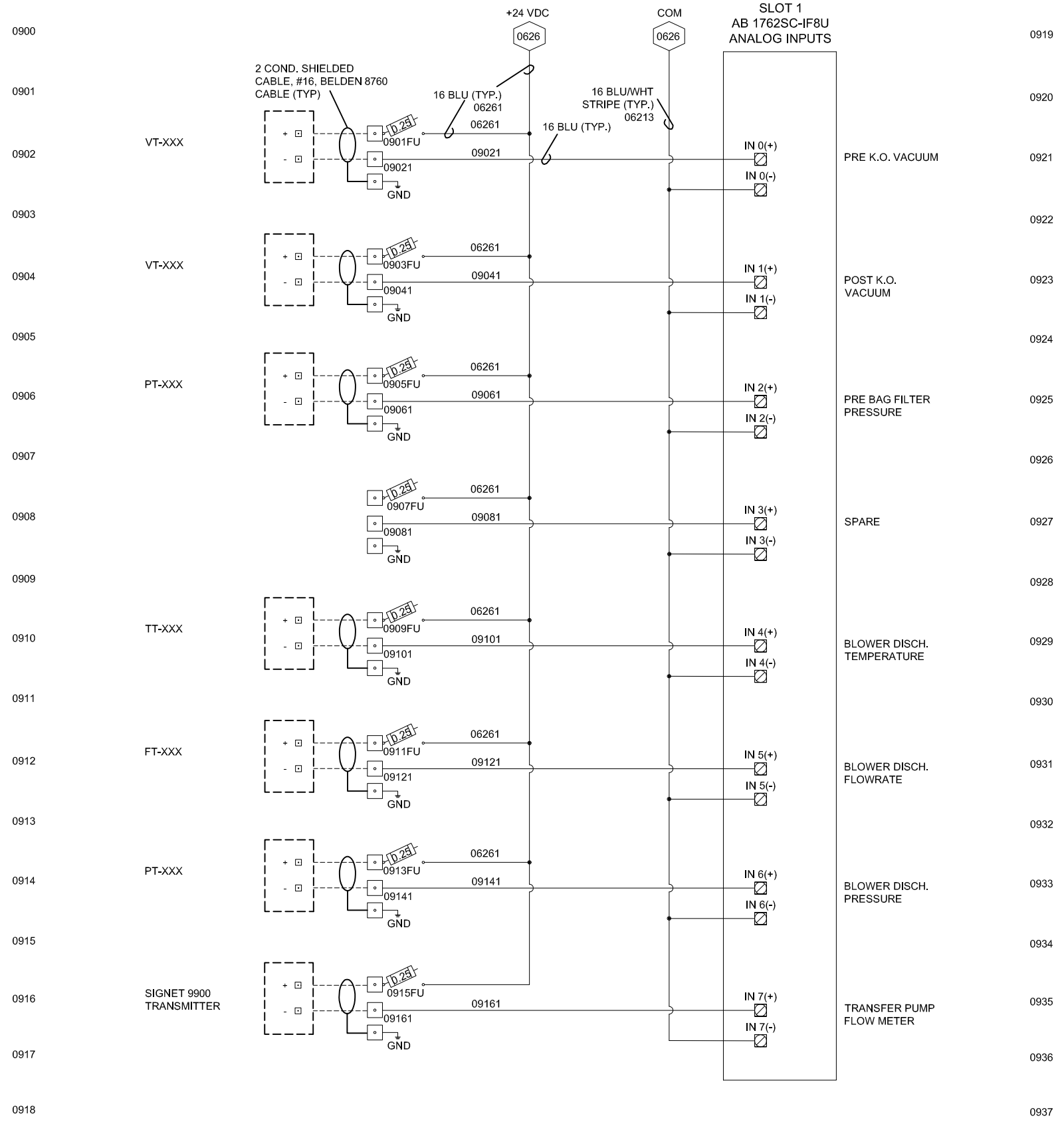
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**SOIL VAPOR EXTRACTION/
 AIR SPARGE REMEDIATION SYSTEM
 MAIN CONTROL PANEL (MCP)**

**SHEET TITLE
 MCP
 EMBEDDED RELAY
 OUTPUTS**

APPROVED BY
MPS
 DESIGNED BY
JK
 PROJECT NUMBER
Q14877

CHECKED BY
MJD
 DRAWN BY
JK
 DRAWING NUMBER
I-08
 SHEET 8 OF 11



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**SOIL VAPOR EXTRACTION/
AIR SPARGE REMEDIATION SYSTEM
MAIN CONTROL PANEL (MCP)**

SHEET TITLE

**MCP
SLOT 1
ANALOG INPUTS**

APPROVED BY MPS	CHECKED BY MJD
DESIGNED BY JK	DRAWN BY JK
PROJECT NUMBER Q14877	DRAWING NUMBER I-09
	SHEET 09 OF 11



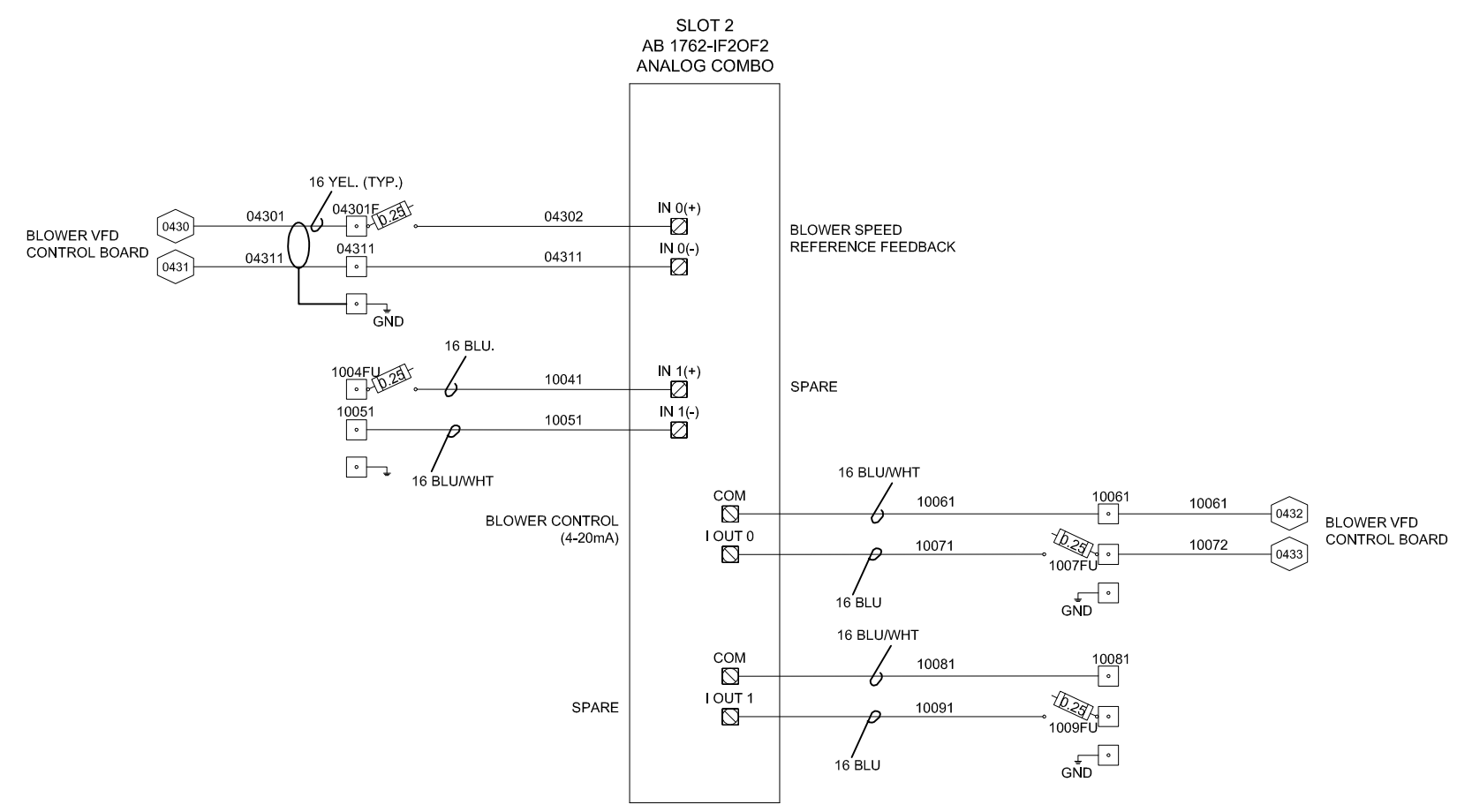
Fliteway Technologies, Inc.

**Mechanical
Equipment**

2129 E. Birchwood Avenue
Cudahy, WI 53110

Office: (414) 483-5600 Fax: (414) 483-1957

1000
1001
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SOIL VAPOR EXTRACTION/
AIR SPARGE REMEDIATION SYSTEM
MAIN CONTROL PANEL (MCP)

SHEET TITLE
**MCP
SLOT 2
ANALOG INPUT/OUTPUT**

APPROVED BY
MPS
DESIGNED BY
JK
PROJECT NUMBER
Q14877

CHECKED BY
MJD
DRAWN BY
JK
DRAWING NUMBER
I-10
SHEET 10 OF 11

Alarm	Description	Interlock
E-Stop	System Emergency Estop Button Pressed	1 Disable System
Power Fail	Phase monitor/120v power monitor relay alarm	2 Disable System
VAL-001	KO Tank intake vacuum transmitter low vacuum warning	8 Notification only
VALL-001	KO Tank intake vacuum transmitter low low vacuum alarm	9 Disable blower
VAH-001	KO Tank intake vacuum transmitter high vacuum warning	8 Notification only
VAHH-001	KO Tank intake vacuum transmitter high high vacuum alarm	9 Disable blower
FALL-001	Blower intake flow transmitter low flow alarm	7 Disable blower
VAL-002	Blower intake vacuum transmitter low vacuum warning	8 Notification only
VALL-002	Blower intake vacuum transmitter low low vacuum alarm	9 Disable blower
VAH-002	Blower intake vacuum transmitter high vacuum warning	8 Notification only
VAHH-002	Blower intake vacuum transmitter high high vacuum alarm	9 Disable blower
DPAH-001	Blower filter high differential pressure switch alarm	10 Disable blower
TAH-001	Blower high temperature switch alarm	11 Disable blower
PAH-001	Blower high pressure switch alarm	12 Disable blower
PAH-002	Blower discharge pressure transmitter high pressure warning	13 Notification only
PAHH-002	Blower discharge pressure transmitter high high pressure alarm	14 Disable blower
LAHH-001	KO tank high high level switch triggered	15 Disable System
Transfer Pump Fault	Transfer pump overload tripped/failed to start	16 Disable transfer pump
PAH-03	Pre-Bag Filter high pressure warning	17 Notification only
PAHH-03	Pre-Bag Filter high high pressure alarm	18 Disable transfer pump
PAH-04	Post-Bag Filter high pressure warning	19 Notification only
PAHH-04	Post-Bag Filter high high pressure alarm	20 Disable transfer pump
PDAH-03	Bag Filter differential high pressure warning	21 Notification only
PDAHH-03	Bag Filter differential high pressure alarm	22 Disable transfer pump

ALARM INTERLOCK TABLE

SCALE: N.T.S.

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REV.	ISSUED DATE	DESCRIPTION	BY	CK'D
1	7/16/2019	CONSTRUCTION RECORD	MD	BDC
0	3/13/2019	ISSUED FOR CUSTOMER REVIEW	JK	BDC

SEAL

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SOIL VAPOR EXTRACTION/
AIR SPARGE REMEDIATION SYSTEM
MAIN CONTROL PANEL (MCP)

SHEET TITLE
**MCP
ALARM INTERLOCK
TABLE**

APPROVED BY
MPS

DESIGNED BY
JK

PROJECT NUMBER
Q14877

CHECKED BY
MJD

DRAWN BY
JK

DRAWING NUMBER
I-11

SHEET 11 OF 11



KAESER Blowers

Low Pressure Solutions

With the world-renowned SIGMA or OMEGA rotor profile

Flow rate 0.59 to 160 m³/min

Pressure differential: Pressure up to 1100 mbar, Vacuum up to 550 mbar

KAESER Blowers

The world-renowned compressor and blower manufacturer

Established by Carl Kaeser Sr. as a machine workshop in 1919, KAESER started on the road to becoming one of the world's leading compressed air systems providers when the first reciprocating compressor left the Coburg production line in 1948. The final breakthrough came in the early 1970s with the development of the rotary screw compressor featuring the energy-saving SIGMA PROFILE.



Gera plant

In 1991, KAESER acquired the 'Geraer Kompressorenwerke', a company with a proud heritage of over 100 years of compressor and blower construction. Production of KAESER's newly developed OMEGA rotary lobe blowers began at the plant in 1993 and today these highly efficient systems are exported, together with all necessary accessories and equipment, to every corner of the

planet. Covering an area of over 60,000 m², the Gera plant currently employs approximately 300 people and produces KAESER's extensive range of rotary lobe blowers, rotary screw blowers and compressed air refrigeration dryers. All companies in the international KAESER group are linked by the very latest information and network technology.

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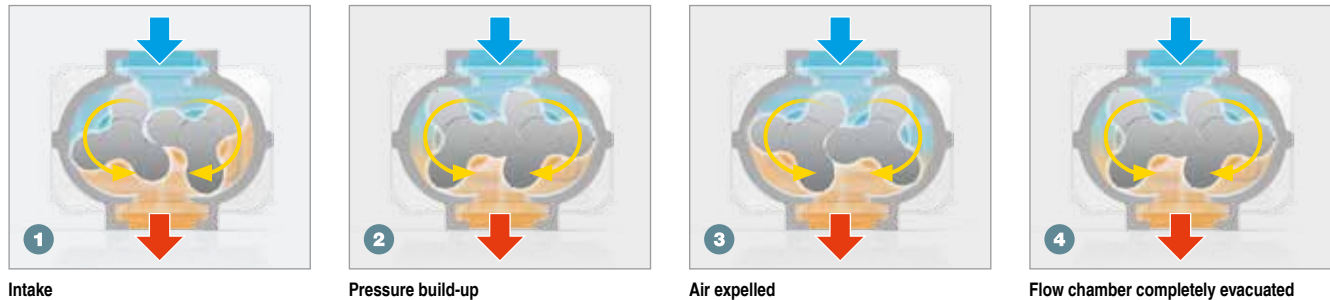
Fields of application



Efficient and oil-free gas transportation, pneumatic conveying, drinking and wastewater treatment (filter cleaning and clarifier aeration), liquid homogenisation and forced air systems for combustion equipment; the possibilities are almost endless – KAESER blowers are as versatile and varied as the applications that they are used for.

How a KAESER rotary lobe blower works

The pressure build-up process – the images show a cross-sectional view through the flow chamber of the KAESER OMEGA rotary lobe blower block.



Oil-free, isochoric compression process

As the intake air passes through the rotary lobe blower's flow chamber, its volume remains constant (isochoric process). Actual compression takes place outside of the blower block with the accumulation of the air mass taking place in the subsequent process. This "adaptive" compression always produces only the amount of pressure needed by the process. This makes rotary lobe blowers particularly suitable for applications with a relatively high proportion of idling (e. g. pneumatic conveying) and/or heavily fluctuating pressure.

The numbers correspond to the points in the pressure-volume diagram.

- 1) Intake and capture of atmospheric air (left rotor).
- 2) Air is conveyed towards the pressure side; compression commences at the 120° rotation angle due to prior influx of already compressed air.
- 3) Compression in the flow chamber ceases; discharge commences.
- 4) Conveyed air mass is discharged into the process.

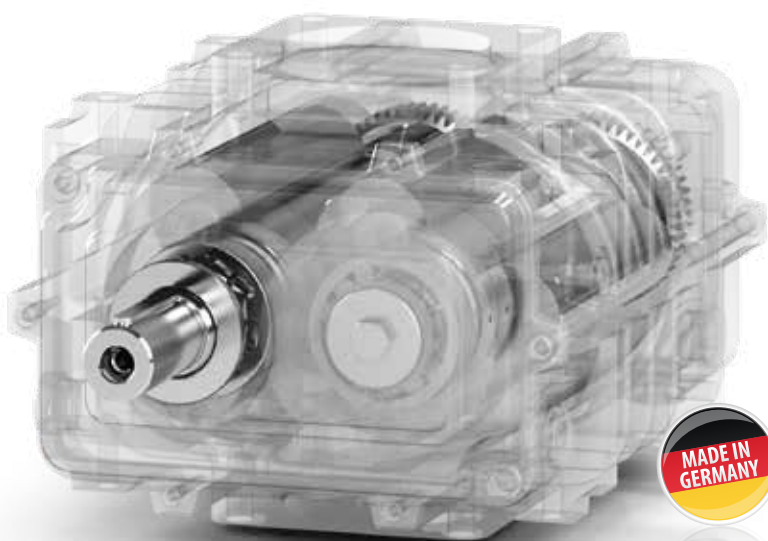
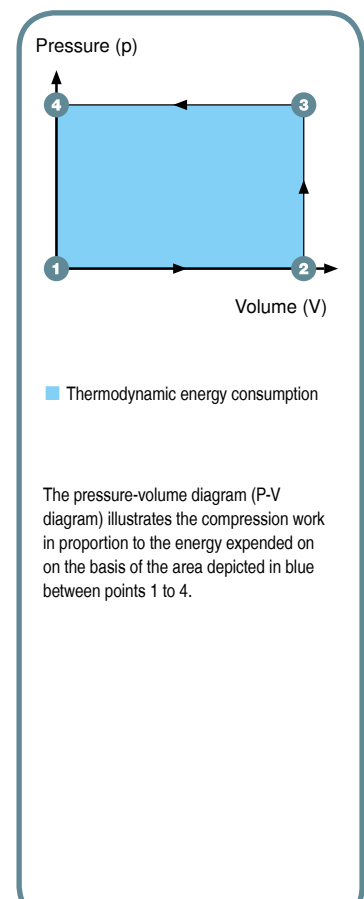


Image: OMEGA block



How a KAESER rotary screw blower works

The pressure build-up process – the images show cross-sections of the enclosed volume in the KAESER SIGMA-B rotary screw blower airend, with a view from the pressure side of the rotor pair.



1 Intake air is captured



2 Volume is reduced



3 Expelled to pressure side



4 Flow chamber completely evacuated

Oil-free, isentropic compression process

As the intake air passes through the rotary screw blower's flow chamber, its volume remains largely constant (isentropic process).

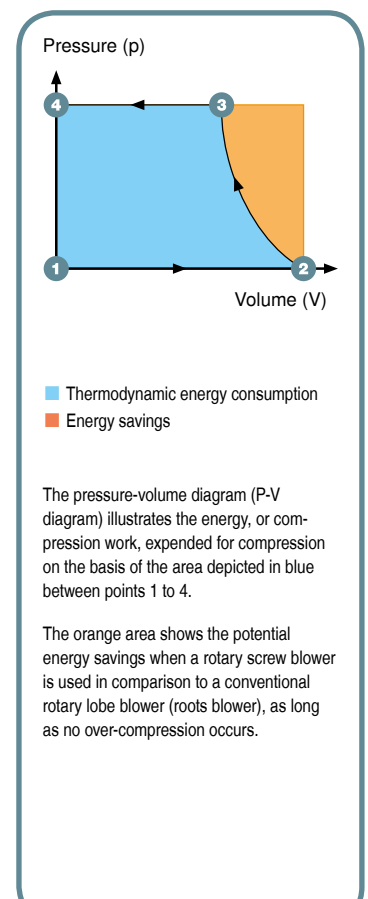
Actual compression takes place inside the airend: The volume of air is continuously reduced until discharge and pushed out under pressure – because less effort is required for compression of the same air volume, energy consumption is lower. Rotary screw blowers are the ideal solution for applications with more or less constant pressure and high running performance requirements, such as aeration for wastewater treatment plants, flotation, etc.

The numbers correspond to the points in the pressure-volume diagram.

- 1) Intake and capture of atmospheric air.
- 2) Air conveyed towards the pressure side for discharge.
- 3) Pressure increases due to volume reduction.
- 4) Compressed air is expelled.



Image: SIGMA blower airend





CBS & DBS drive concept

In the CBS and DBS series, drive power transmission from the motor to the blower airend occurs with an integrated gear transmission. This has proven to be the best solution for the speeds in this performance and size class with regards to efficiency, reliability and durability.



EBS & FBS belt drive – refined to perfection

The pivoting motor base with tensioning spring ensures precision belt tensioning, irrespective of motor weight, to provide optimum transmission efficiency at all times. As a result of KAESER's decades of experience in compressor design and engineering, this power transmission approach has been refined to perfection.



Rotary screw blowers – the efficient SIGMA PROFILE

Developed in the company's in-house Research and Development centre, KAESER rotary screw blower airends with world-renowned SIGMA PROFILE rotors are up to 35 percent more efficient than conventional designs.

This highly efficient blower airend features a wide control range and ensures virtually constant specific power.

In addition to efficiency, durability was also an essential development goal. The use of high-tech bearings and no need for ancillary equipment further minimises energy consumption and also enhances reliability.

Technical specifications:

CBS, DBS, EBS, FBS, HBS series

Usable flow rate:

4.5 to 67 m³/min

Differential pressure:

- Pressure up to 1100 mbar

- Vacuum to 550 mbar



Dependable seals

KAESER's long-proven sliding ring seal on the rotary transmission drive shaft lead-through of the rotary screw blower airend is maintenance-free and provides dependable sealing, even in hot and/or dusty environments.



Durable bearings

All radial gas forces are completely absorbed by four heavy-duty cylinder roller bearings to ensure maximum rotary screw airend service life. The rollers are encased in high-tech cages for optimum lubrication at all speeds. No additional oil pressure lubrication is required.

Rotary screw blowers – CBS, DBS, EBS, FBS & HBS SFC / STC version

Delivered as user-friendly, turnkey systems, KAESER rotary screw blowers simply need to be installed in position, connected to the air distribution network and the electrical supply and you're ready to go! The laborious processes of oil-filling, drive belt installation, motor adjustment, procurement of a suitable frequency converter, programming, cabling in accordance with EMC regulations, drawing of circuit diagrams, arranging CE and EMC certification etc. are thankfully things of the past.

There's no doubt about it: complete, certified machines from systems providers save time and money while delivering many years of dependable operation.

SFC version: Variable speed with frequency converter

STC version: With Y-Δ-Starter



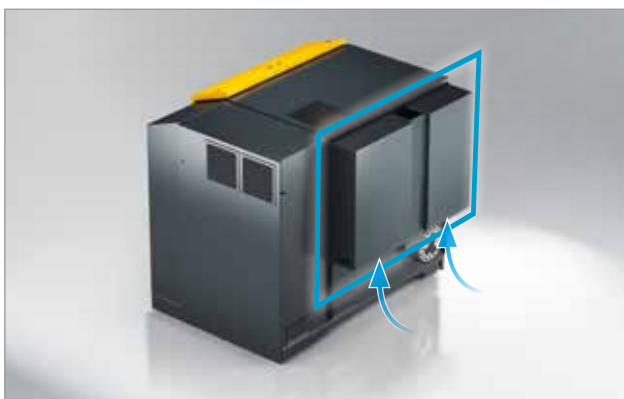
SIGMA CONTROL 2 controller

The SIGMA CONTROL 2 ensures efficient blower control and system monitoring. Various interfaces enable rapid communication with control centres via data bus, whilst the SD card slot makes data storage and updates a breeze. Various operating modes are selectable on SFC/OFC machines.



Seamless system monitoring

Sensors for oil level and temperature monitoring are integrated into the blower airend. The oil chamber is designed to ensure dependable oil level measurement in all operating phases.



Cool inlet air

Process air and cooling air for the motor are drawn in separately from outside of the enclosure. This boosts efficiency and leads to a higher usable air mass flow rate for the same power consumption. The blowers can operate at full capacity at ambient temperatures up to +45 °C.



Optimised specific power

The moderate maximum speed, the extra dense rotary screw profile and the near constant specific power across the wide variable speed control range all combine to achieve significant energy savings throughout the entire operating curve.



Durable OMEGA blower block

The OMEGA blower block delivers pressures up to 1000 mbar(g), discharge temperatures up to 160 °C, wide control range with frequency-controlled operation, Q 2.5 rotor balancing for quieter operation, extended service life and minimal maintenance requirement.



Durable bearings

Heavy-duty cylinder roller bearings completely absorb the continuously changing radial gas-forces. As a result, they avoid the springing effect of self-aligning bearings and last up to ten times longer with the same loading.



Rotary lobe blowers – air at the touch of a button

The special OMEGA Profile in KAESER's three-lobe rotary lobe blowers makes these machines true masters of efficiency. The long-term dependability and durability of these units are legendary.

This is attributed to design features such as the use of straight-cut timing gears, heavy-duty cylinder roller bearings and precisely balanced rotors.

Technical specifications for the full turnkey version:

Usable flow rate:
1.5 to 72 m³/min

Differential pressure:
- Pressure up to 1000 mbar
- Vacuum to 500 mbar



Precision manufacture/synchronisation

KAESER blower blocks feature high-precision 5f 21 quality straight-cut timing gears with minimal flank clearance, which play a major role in contributing to the block's outstanding volumetric efficiency. Since the straight-cut gearing is not subjected to continuously changing axial gas-forces, heavy-duty cylinder roller bearings can be used.



Stable rotors

The extremely high-quality Q 2.5 rotor balancing, combined with the rotor's single-piece design, including the shaft ends, ensures low-vibration and quiet operation. Rotor tips with integrated sealing strips make the blower block more resistant to dust particulate and thermal stress.

Complete turnkey rotary lobe blowers BB-FB series, OFC/STC version

KAESER's COMPACT series turnkey rotary lobe blowers with OMEGA PROFILE rotors provide more than dependable, energy-efficient performance. Delivered ready for immediate operation, these versatile units are equipped with star-delta starter (or frequency converter) and all necessary sensors are CE and EMC certified. As a result, they save considerable costs associated with planning, installation, certification, documentation and commissioning.



START CONTROL (STC)

The version with integrated Y- Δ -starter operates at constant speed and is equipped with a premium contactor, overload protection cut-out and phase loss monitoring. The SIGMA CONTROL 2 and a dependable emergency stop system complete the package.



Frequency control (OFC)

With OMEGA FREQUENCY CONTROL, the frequency converter adjusts blower performance to match required air demand by regulating the motor speed. Everything is ready for immediate operation, since all programming and parametrisation is performed at the factory.



Plug-and-play

The turnkey blowers not only come complete with sensors, STC/OFC, SIGMA CONTROL 2 and emergency stop switch, but are also ready-filled with oil and are fully certified. This significantly reduces the work and costs required for planning, installation, certification, documentation and commissioning.



EMC tested and certified complete system

To ensure seamless integration into any operational environment, the electromagnetic compatibility (EMC) of all components and of the complete machine has been tested and certified in accordance with all applicable regulations





BB-HB series

Usable flow rate:
0.59 to 93 m³/min

Differential pressure:
- Pressure up to 1000 mbar
- Vacuum to 500 mbar

OMEGA 

Rotary lobe blower packages for system integration

Efficient, quiet, durable and versatile – whether used to convey bulk materials or as heeling dampers on a container ship: KAESER blower packages are renowned throughout the world for their impressive performance, no matter what the application. No wonder they're so highly valued by users everywhere!



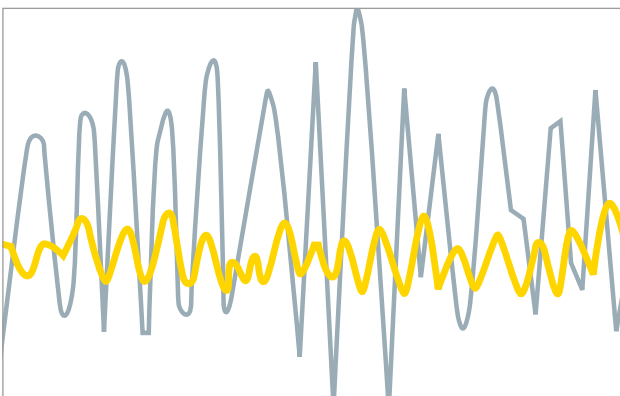
IE3 energy-saving motors

All KAESER blower packages are equipped with dependable, premium efficiency IE3 drive motors (IP55 protection, Insulation Class F). Their exceptional efficiency boosts overall system performance.



Sensors

Various sensors and switches for monitoring pressure values, temperatures, speed, oil level and filters ensure dependable and efficient blower operation and enable remote system monitoring.



Minimal pulsation and quiet operation

As pulsations from the conveying air can cause the connected pipework to generate noise, the soundproofing with KAESER blowers is designed to minimise sound emissions from both the machine itself and from the conveying air. Moreover, highly effective discharge silencers cover a wide frequency range to mitigate conveying air pulsation.



Automatic belt tensioning

The pivoting motor base with tensioning spring ensures precision belt tensioning, irrespective of motor weight, to provide optimum transmission efficiency at all times. Consequently, this system also reduces maintenance and energy costs.

Super-class blowers: HB-PI series – large and versatile

KAESER's HB-PI series rotary lobe blowers are the perfect choice for applications that require large air delivery volumes and maximum availability, such as in large water treatment plants, or in power generation stations.

They are flexible, durable and dependable. Moreover, in combination with rapid-response KAESER Service, uninterrupted operation is guaranteed at all times.

Technical specifications:

HB-PI series

Usable flow rate:
55 to 160 m³/min

Differential pressure:
- Pressure up to 1000 mbar
- Vacuum to 500 mbar



IE3 energy-saving motors

All KAESER blower packages are equipped with dependable, premium efficiency IE3 drive motors (IP55 protection, Insulation Class F). Medium-voltage motors can also be optionally used.



Frequency converter and Y-Δ starter

Special frequency converters and star-delta starters are also available for HB-PI series blowers. The OMEGA FREQUENCY CONTROL (OFC) enables infinite blower speed adjustment and, with the addition of a pressure sensor, also allows pressure regulation.





Dependable belt drive

The pivoted motor base and tensioning spring automatically ensure optimum belt tension and, as a result, optimal transmission efficiency. Consequently, this system also reduces wear whilst boosting reliability.



Clever cooling air flow

Outstanding cooling performance is assured, as the drive motor is equipped with its own cooling air intake and ambient air is used for the process air. This results in maximum efficiency even under high load.



Digital output device, e.g. laptop



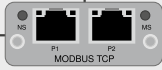
Control centre

KAESER CONNECT



SIGMA AIR MANAGER 4.0

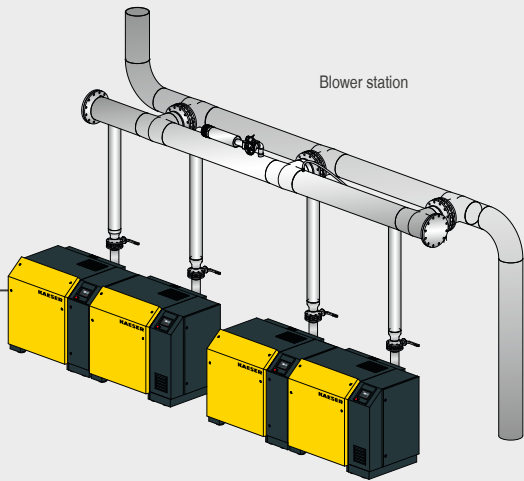
Communications module e.g. Modbus TCP



KAESER SIGMA NETWORK



Controller:
SIGMA CONTROL 2



Blower station



Industrie 4.0 – Join the Network

With the SIGMA CONTROL 2 and SIGMA AIR MANAGER 4.0, all blower stations can be seamlessly integrated into Industrie 4.0 environments to enable continuous system optimisation through analysis of operating data and to provide demand-oriented preventative maintenance and servicing (Predictive Maintenance) through remote diagnostics (Condition Monitoring).

Intelligence inside: SIGMA CONTROL[®] 2 blower controller

Using a range of sensors, the internal SIGMA CONTROL 2 blower controller monitors and controls all relevant machine and process parameters essential to reliable and efficient blower system operation. Available remote monitoring and control further enhance blower availability and efficiency. Versatile communication modules also enable SIGMA CONTROL 2 equipped blower packages to connect to master control systems, such as the SIGMA AIR MANAGER, and/or other centralised control systems via data bus.



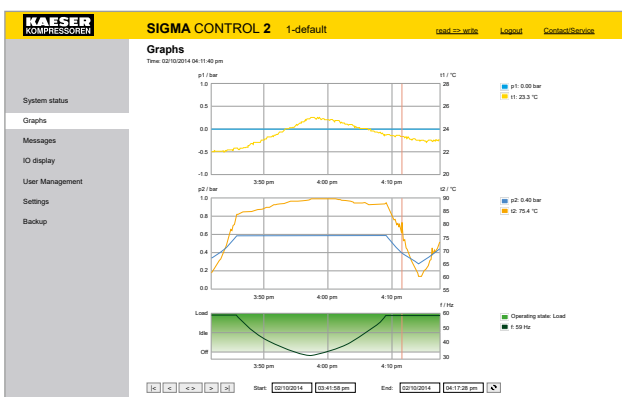
The control centre

The control unit features an easy-to-read display and durable input keys, whilst the clear menu structure, together with 30 selectable languages, enables universal operation. Various operating modes are selectable on SFC/OFC machines.



Stay connected

The Ethernet interface (10/100 Mbit/sec) allows users to call-up operational parameters on an Internet browser via the integrated web server. Optional communication modules: Profibus DP, Modbus RTU and /TCP, Profinet IO and EtherNet/IP.



KAESER-CONNECT

Simply connect a PC and the SIGMA CONTROL 2 (SC2) with the LAN and input the SC2 address and password in the browser. Once this is done, machine status, operating data, alarm messages, as well as graphical representation of pressure, temperature and speed can be viewed in real time.



Update and save data

Software updates and operating parameters can be quickly uploaded and transferred via the convenient SD card slot. Service costs are therefore kept to an absolute minimum. Key operational data can also be stored on the SD card.

One-stop shop: Complete solutions from the systems provider

A business's blower air supply is far more than the sum of the necessary equipment and components, and by that token, as a comprehensive compressed air and blower air systems provider, KAESER KOMPRESSOREN provides far more than just machines.

From detailed demand analysis and seamless integration of the blower station into the business environment, to life-long availability assurance through rapid-response KAESER AIR SERVICE.



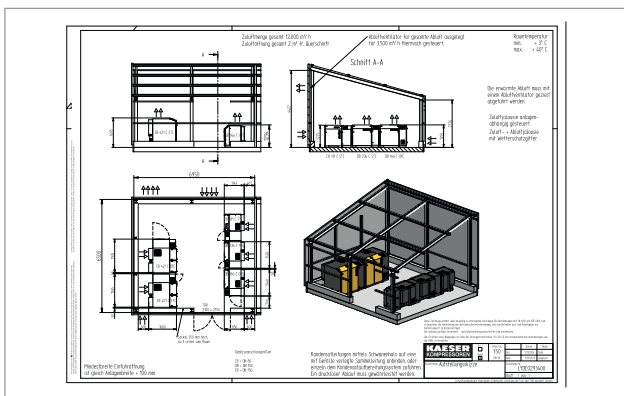
Precise demand analysis (ADA 2)

Using precise Air Demand Analysis (ADA) and the KAESER Energy Saving System (KESS), KAESER's experts are able to plan and design a system that is specially tailored to meet all of your blower air requirements for maximum efficiency and availability.



Fast, worldwide service

Since even the highest quality machines require regular maintenance, KAESER AIR SERVICE, with its specially trained service technicians and advanced logistics systems, ensures continuous blower air availability and reliable delivery of genuine KAESER spare parts throughout the world.



Detailed and expert planning

KAESER's experts meticulously plan and design a system that is tailored to meet the customer's specific blower air needs. Needless to say, this includes room ventilation and pipework, thereby ensuring peace of mind for users and project planners.

Optimum climate control

A holistic approach to the blower station also includes climate control. With expertise and components for optimum blower station climate control, KAESER blower systems always have the right amount of cool intake air available and therefore save energy through enhanced efficiency.



Rotor and block machining

All rotors, blocks and airends are precision machined to micron accuracy, so that the resulting surface quality makes wear-susceptible coatings used for sealing superfluous.



Measurement and inspection

To maintain the very best in product quality, we meticulously inspect and measure every block casing and rotor to ensure that it is manufactured to within the specified tolerances.



Powder coating

The enclosures receive their quality scratch and corrosion-resistant surface coating in an environmentally compatible 180 °C powder coating process.



Advanced manufacture: Quality and performance

The high level of vertical integration ensures exceptional quality of mechanical and electrical components, and ensures seamless interplay between all individual parts and systems. All components are precisely matched with one another and are meticulously documented.

This enables traceability and guarantees trouble-free spare parts supply at all times.



Case manufacture

Just like the rotors, the casing for every KAESER rotary lobe blower block or rotary screw air end is machined using advanced climate-controlled CNC machining centres to ensure consistently high product quality.



Final inspection

All adjustments, such as belt tensioning and alignment, are carried out ex-works prior to delivery. Moreover, every blower block is delivered ready-filled with oil and all valves are adjusted. All data are documented.



Flexible production

The very latest production techniques and processes at KAESER's Gera plant ensure exceptional product quality and enable customer-specific requirements to be met with minimal lead time.



Special versions for specialised applications

Whether used on a tanker lorry as a mobile unloading station, or for compression and/or conveying of media ranging from nitrogen to steam, KAESER blowers are truly dependable and efficient OEM components.



OMEGA B/PB – Corrosion resistant

Rotors and block casings are made from cast chromium-nickel alloy and with special internal block-sealing are available for processes such as the mechanical compression of water vapour in vacuum distillation for the concentration of aqueous media.



WVC series – Fine vacuum

WVC series machines with a volumetric flow rate of up to 6,800 m³/hr are suited for fine vacuum applications such as in pumping stations with a booster pump to increase their volumetric flow rate.



OMEGA PV – Low vacuum

With an intake capacity of up to 120 m³/min for low vacuum applications and a maximum of 900 mbar differential pressure, the OMEGA PV blower block is exceptionally robust, and is perfectly suited for use with silo vehicles. Block cooling is performed via atmospheric air flow through pre-inlet ducts.



OMEGA PN: Nitrogen conveying

These blowers are ideal for pneumatic conveying of bulk materials under nitrogen atmosphere conditions, where leakages of any kind need to be kept to an absolute minimum. PN series blowers are also available with wear-free slide ring sealing of the drive shaft rotary feedthrough. Complete packages with OMEGA PN blocks are available for nitrogen conveying applications.

KAESER blower accessories: For a wide range of applications

A wide range of applications often require a specific air quality: for example, some materials are sensitive to heat, whilst others may clump if humidity is too high. Another potential problem is contamination of the process air by particles contained in the ambient air.

As one of the world's leading and most experienced system providers, KAESER offers a wide range of coolers, dryers and filters for optimal matching of all air production and treatment components.

Furthermore, the SIGMA AIR MANAGER 4.0 enables the flow rate of every blower station to be specifically tailored to meet actual air demand, thereby ensuring maximum energy efficiency.



Co-ordination

Depending on the model, the SIGMA AIR MANAGER control system is able to co-ordinate operation of 4, 8 or 16 blowers within a blower installation and ensures even load distribution between the units.



Heat recovery

Easily integrated into process control systems, the heat exchanger enables exceptional process-air cooling even at high ambient temperatures. The hot water produced as a result of this process can be used for numerous purposes.



Cooling

With an ambient temperature of 20 °C, the highly efficient ACA-type aftercooler is able to reduce compressed air temperature to 30 °C, whilst perfectly maintaining pressure.



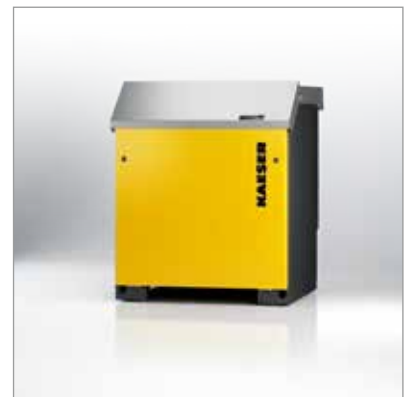
Drying

KAESER's intake air desiccant dryers reduce the pressure dew point of process air with minimum differential pressure, thereby preventing condensate formation.



The operating environment

Carefully matched components, such as weather protection screens, fans, inlet / discharge silencers and appropriate air ducting, help to ensure and maintain optimum operating conditions in the machine room at all times.



Outdoor installation

COMPACT blowers are often installed outdoors in many wastewater treatment plants. These blower packages come equipped with rainproof stainless steel covers and premium powder-coated enclosures for effective protection against the elements.

Technical specifications

Rotary screw blowers (EBS to FBS series, STC/SFC) – up to 110 kW, turnkey with integrated electrical system

Model	Gauge pressure			Vacuum			Pipe connection DN	Dimensions With control cabinet and sound enclosure W x D x H mm	Max. mass kg
	Max. differential pressure	Max. flow rate *	Max. rated motor power	Max. differential pressure	Max. flow rate *	Max. rated motor power			
	mbar (g)	m³/min	kW	mbar (vac)	m³/min	kW			
CBS 120 L SFC	650	12.6	18.5	–	–	–	80	1110 x 1370 x 1670	730
CBS 120 M SFC	1100	12.5	22	550	10	11	80	1110 x 1370 x 1670	750
CBS 120 L STC	650	10.3	18.5	–	–	–	80	1110 x 1370 x 1670	720
CBS 120 M STC	1100	10.2	22	550	12	15	80	1110 x 1370 x 1670	740
DBS 220 L SFC	650	23	30	–	–	–	100	1110 x 1480 x 1670	820
DBS 220 M SFC	1100	22	37	550	22	30	100	1110 x 1480 x 1670	850
DBS 220 L STC	650	19	22	–	–	–	100	1110 x 1480 x 1670	800
DBS 220 M STC	1100	18	37	550	18.5	22	100	1110 x 1480 x 1670	850
EBS 380 L SFC	650	38	45	–	–	–	150	1940 x 1600 x 1700	1400
EBS 380 M SFC	1100	37	75	550	37	37	150	1940 x 1600 x 1700	1600
EBS 380 L STC	650	36.5	45	–	–	–	150	1940 x 1600 x 1700	1400
EBS 380 M STC	1100	36	75	–	–	–	150	1940 x 1600 x 1700	1600
FBS 660 L SFC	650	67	75	–	–	–	200	2250 x 1950 x 1900	1850
FBS 660 M SFC	1100	66	110	550	63	75	200	2250 x 1950 x 1900	2200
FBS 660 L STC	650	66	75	–	–	–	200	2250 x 1950 x 1900	1850
FBS 660 M STC	1100	65	110	–	–	–	200	2250 x 1950 x 1900	2200
HBS 1600 L SFC	650	160	200	–	–	–	300	2065 x 3715 x 2225	5900
HBS 1600 M SFC	1100	160	250	–	–	–		2065 x 3715 x 2225	6000

*) Performance specifications as per ISO 1217 Annex C for STC version, Annex E for SFC version

Compact blowers (BBC to FBC series, STC/OFC) – up to 132 kW, turnkey with integrated electrical system

Model	Gauge pressure		Vacuum		Max. rated motor power kW	Pipe connection DN	Dimensions With control cabinet and sound enclosure W x D x H mm	Max. mass kg
	Max. differential pressure	Max. flow rate *	Max. differential pressure	Max. flow rate *				
	mbar (g)	m³/min	mbar (vac)	m³/min				
BB 69 C	1000	5.9	500	5.9	15	65	1210 x 960 x 1200	455
BB 89 C	1000	8.2	500	5.9	15	65	1210 x 960 x 1200	461
CB 111 C	800	8.8	400	8.9	18.5	80	1530 x 1150 x 1290	583
CB 131 C	1000	12.3	500	12.4	30	80	1530 x 1150 x 1290	642
DB 166 C	1000	15.6	500	15.7	37	100	1530 x 1150 x 1290	802
DB 236 C	1000	22.1	500	22.3	45	100	1530 x 1150 x 1290	822
EB 291 C	1000	28.6	500	28.8	75	150	1935 x 1600 x 1700	1561
EB 421 C	1000	40.1	500	40.4	75	150	1935 x 1600 x 1700	1606
FB 441 C	1000	41.3	500	41.6	90	200	2230 x 1920 x 1910	2326
FB 621 C	1000	58.5	500	58.9	132	200	2230 x 1920 x 1910	2839
FB 791 C	800	71.3	500	71.8	110	250	2230 x 1920 x 2090	2541

*) Performance specifications as per ISO 1217 Annex C for STC version, Annex E for OFC version

Blower packages (BBC to HBPI series)

Model	Gauge pressure		Vacuum		Max. rated motor power kW	Pipe connection DN	Dimensions Without sound enclosure W x D x H mm	Max. mass kg	Dimensions With sound enclosure W x D x H mm	Max. mass kg
	Max. differential pressure mbar (g)	Max. flow rate * m³/min	Max. differential pressure mbar (vac)	Max. flow rate * m³/min						
BB 52 C	1000	4.7	500	4.7	7.5	50	785 x 635 x 940	140	800 x 790 x 1120	210
BB 69 C	1000	5.9	500	5.9	11	65	800 x 660 x 960	195	890 x 790 x 1120	325
BB 89 C	1000	8.2	500	8.3	15	65	890 x 660 x 960	201	800 x 790 x 1120	331
CB 111 C	800	8.8	400	8.9	18	80	855 x 1010 x 1290	263	990 x 1160 x 1290	443
CB 131 C	1000	12.3	500	12.4	30	80	855 x 1010 x 1290	302	990 x 1160 x 1290	482
DB 166 C	1000	15.6	500	15.7	37	100	990 x 1070 x 1120	432	1110 x 1160 x 1290	632
DB 236 C	1000	21.1	500	22.3	45	100	990 x 1070 x 1120	482	1110 x 1160 x 1290	682
EB 291 C	1000	28.6	500	28.8	75	150	1240 x 1370 x 1510	921	1420 x 1600 x 1659	1261
EB 421 C	1000	40.1		40.4	75	150	1240 x 1370 x 1510	966	1420 x 1600 x 1659	1306
FB 441 C	1000	41.3	500	41.6	90	200	1790 x 1450 x 1750	1450	1920 x 1620 x 1910	1960
FB 621 C	1000	58.5	500	58.9	132	200	1790 x 1450 x 1750	1865	1920 x 1620 x 1910	2375
FB 791 C	800	71.3	450	71.8	110	250	1870 x 1450 x 1900	1717	1920 x 1620 x 2090	2247
HB 950 C	1000	93.1	500	91.65	200	250	1700 x 1700 x 1950	3005	2170 x 1864 x 2110	3805
HB 1300 PI	1000	125	500	122.93	250	300	2710 x 1600 x 2350	3465	3205 x 2150 x 2610	4285
HB 1600 PI	800	156	450	153.27	250	300	2710 x 1600 x 2350	3625	3205 x 2150 x 2610	4445

*) Performance specifications as per ISO 1217 Annex C



Guaranteed performance specifications

To ensure that you benefit from the projected savings during actual operation, KAESER provides you with the effective overall power consumption data, as well as the usable flow rate, in accordance with the stringent tolerances of ISO 1217, Appendix C, or E as applicable.



OMEGA

KAESER

STC.ΔΔ

EBS 380L

SIGMA

KAESER



The world is our home

As one of the world's largest compressed air system providers and compressor manufacturers, KAESER KOMPRESSOREN is represented throughout the world by a comprehensive network of branches, subsidiary companies and authorised partners in over 100 countries.

With innovative products and services, KAESER KOMPRESSOREN's experienced consultants and engineers help customers to enhance their competitive edge by working in close partnership to develop progressive system concepts that continuously push the boundaries of performance and compressed air efficiency.

Moreover, the decades of knowledge and expertise from this industry-leading system provider are made available to each and every customer via the KAESER group's global computer network.

These advantages, coupled with KAESER's worldwide service organisation, ensure that every product operates at the peak of its performance at all times and provides maximum availability.

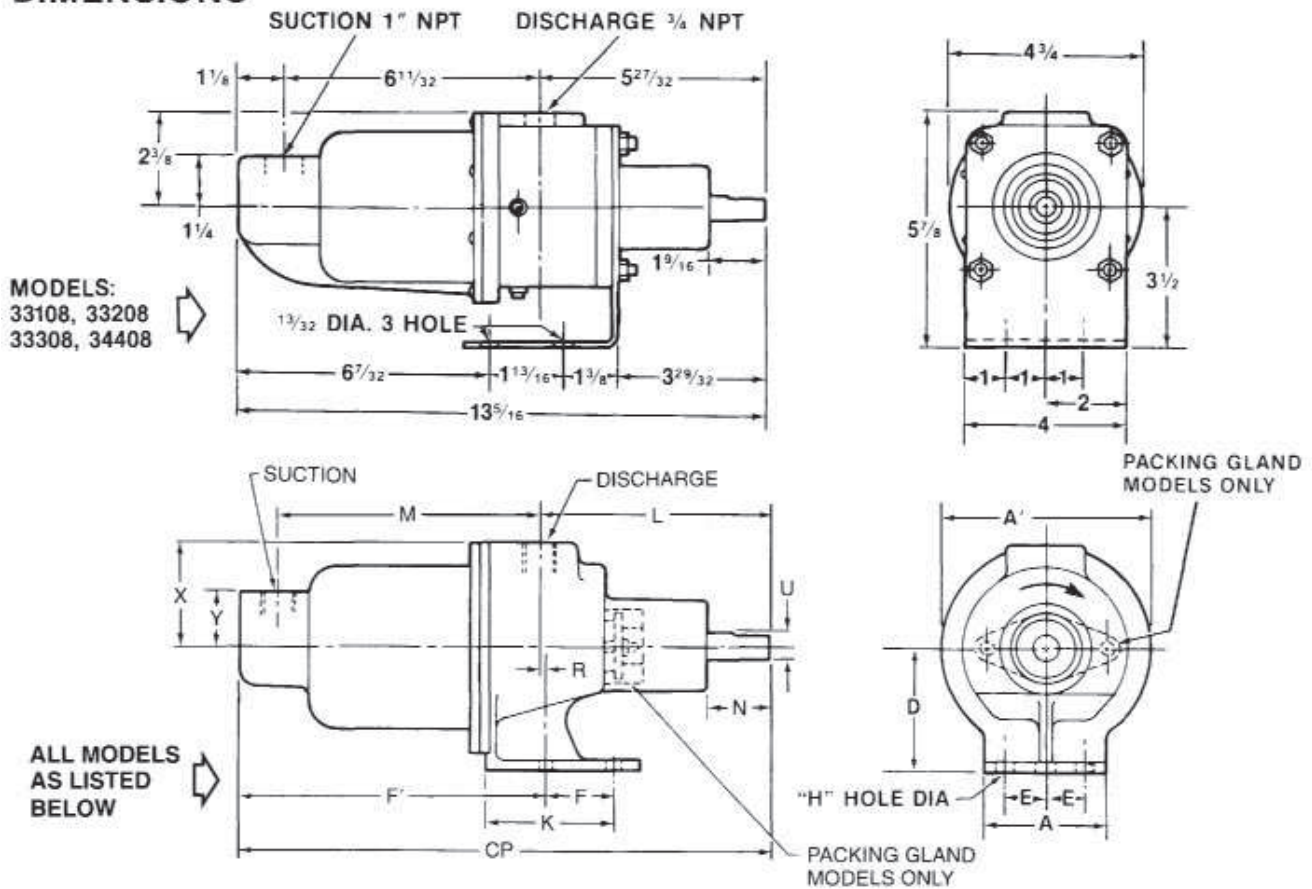


KAESER KOMPRESSOREN SE

P.O. Box 2143 – 96410 Coburg – GERMANY – Tel +49 9561 640-0 – Fax +49 9561 640-130
e-mail: productinfo@kaeser.com – www.kaeser.com

SPECIFICATION DATA
MOYNO® 500 PUMPS
300 SERIES
331, 332, 333, 344, 356 AND 367 MODELS

DIMENSIONS

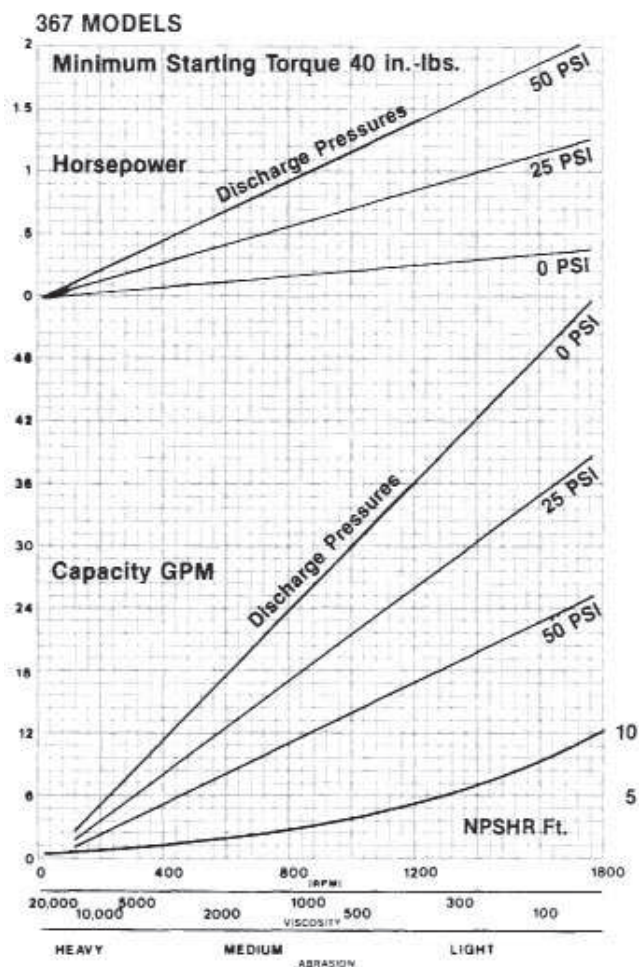
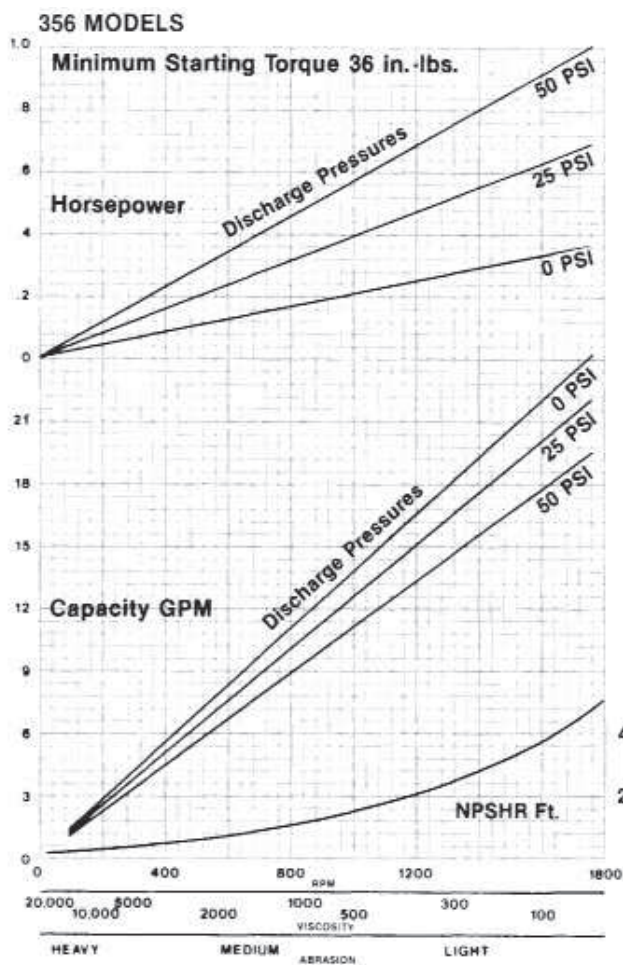


MODELS	CP	A	A ¹	D	E	F	F ¹	H	K	L	M	N	R	U	X	Y	SUCT (NPT)	DISCH (NPT)
33101, 33201 33301, 33104 33204, 33304 34401, 34404	12 ⁵ / ₈	3 ¹ / ₈	4 ³ / ₄	2 ³ / ₄	1	1 ¹³ / ₁₆	6 ¹⁵ / ₁₆	1 ³ / ₃₂	3 ¹ / ₃₂	5 ¹¹ / ₁₆	6 ¹ / ₁₆	1 ⁷ / ₁₆	—	5 ⁵ / ₈	2 ³ / ₈	1 ¹ / ₄	3 ³ / ₄	3 ³ / ₄
*34411	13 ¹⁵ / ₁₆	3 ¹ / ₄	4 ³ / ₄	2 ³ / ₄	1 ¹ / ₈	—	7 ³ / ₁₆	1 ³ / ₃₂	2 ⁷ / ₈	7	6 ¹ / ₁₆	1 ³ / ₈	1 ¹ / ₄	5 ⁹ / ₈	2 ⁵ / ₁₆	1 ¹ / ₄	3 ³ / ₄	3 ³ / ₄
35601, 35604	17 ¹ / ₂	6 ¹ / ₂	7 ⁹ / ₁₆	4 ⁹ / ₃₂	1 ³ / ₄	2	10 ¹⁹ / ₃₂	1 ³ / ₃₂	4 ¹ / ₂	7 ³ / ₈	8 ⁵ / ₈	2 ³ / ₈	1 ⁵ / ₃₂	3 ³ / ₄	3 ²⁵ / ₃₂	2 ¹ / ₈	1 ¹ / ₂	1 ¹ / ₄
*35611, *35613	19 ³ / ₈	6 ¹ / ₂	7 ⁹ / ₁₆	4 ⁹ / ₃₂	1 ³ / ₄	2 ¹ / ₂	10 ¹⁹ / ₃₂	1 ³ / ₃₂	4	9 ¹¹ / ₃₂	8 ⁵ / ₈	2 ¹³ / ₃₂	9 ⁹ / ₁₆	3 ³ / ₄	3 ²⁵ / ₃₂	2 ¹ / ₈	1 ¹ / ₂	1 ¹ / ₄
36701, 36704	20 ¹⁵ / ₁₆	5 ¹ / ₄	8	4 ¹ / ₂	2	2 ⁵ / ₁₆	13	9 ⁹ / ₁₆	4 ¹ / ₁₆	7 ¹⁵ / ₁₆	11 ³ / ₁₆	2 ¹ / ₈	—	1	4	2 ¹ / ₂	2	2

*Packing Gland Model

All dimensions are in inches. Specifications subject to change without notice.

356 and 367 MODELS PERFORMANCE (water at 70°F)



NOTE: For fluids with viscosity over 200 CP (1,000 SSU), pump capacity is reduced by 20%.

MATERIALS OF CONSTRUCTION

COMPONENT	MODELS					
	35601, 35611		35604, 35613		36701	36704
Housing	Cast iron		316 SS		Cast iron	316 SS
Rotor	416 SS/CP		316 SS/CP		416 SS/CP	316 SS/CP
Stator	NBR (Nitrile)		NBR (Nitrile)		NBR (Nitrile)	NBR (Nitrile)
Weight (lbs)	37	40	37	40	54	54

CP=Chrome plated



No.: 00158XT3E145T

Date: 16-OCT-2013

DATA SHEET

Three-phase induction motor - Squirrel cage rotor

Customer :
Product line : Three-Phase : Explosion Proof - NEMA Premium

Frame : 145T
Output : 1.5 HP
Frequency : 60 Hz
Poles : 4
Full load speed : 1760
Slip : 2.22 %
Voltage : 208-230/460 V
Rated current : 4.53-4.10/2.05 A
Locked rotor current : 36.5/18.2 A
Locked rotor current (I_L/I_n) : 8.9
No-load current : 2.64/1.32 A
Full load torque : 4.42 lb.ft
Locked rotor torque : 270 %
Breakdown torque : 380 %
Design : B
Insulation class : F
Temperature rise : 80 K
Locked rotor time : 14 s (hot)
Service factor : 1.15
Duty cycle : S1
Ambient temperature : -20°C - +40°C
Altitude : 1000
Degree of Protection : IP54
Approximate weight : 71 lb
Moment of inertia : 0.13028 sq.ft.lb
Noise level : 51 dB(A)

	D.E.	N.D.E.	Load	Power factor	Efficiency (%)
Bearings	6205 ZZ	6204 ZZ	100%	0.78	86.5
Regreasing interval	---	---	75%	0.70	85.5
Grease amount	---	---	50%	0.58	81.5

Notes:

Performed by

Checked

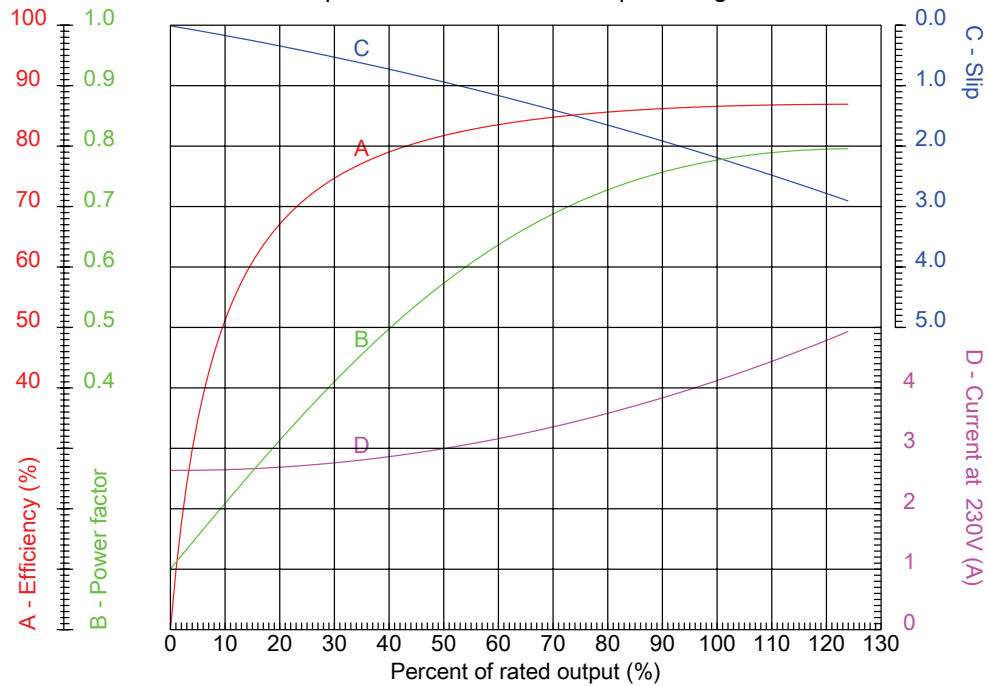


No.: 00158XT3E145T

Date: 16-OCT-2013

PERFORMANCE CURVES RELATED TO RATED OUTPUT

Three-phase induction motor - Squirrel cage rotor



Customer :
Product line : Three-Phase : Explosion Proof - NEMA Premium

Frame : 145T	Locked rotor current (I _L /I _n) : 8.9
Output : 1.5 HP	Duty cycle : S1
Frequency : 60 Hz	Service factor : 1.15
Full load speed : 1760	Design : B
Voltage : 208-230/460 V	Locked rotor torque : 270 %
Rated current : 4.53-4.10/2.05 A	Breakdown torque : 380 %
Insulation class : F	

Notes:

Performed by	Checked
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1 2 3 4 5 6 7 8

A

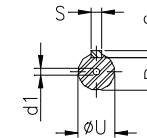
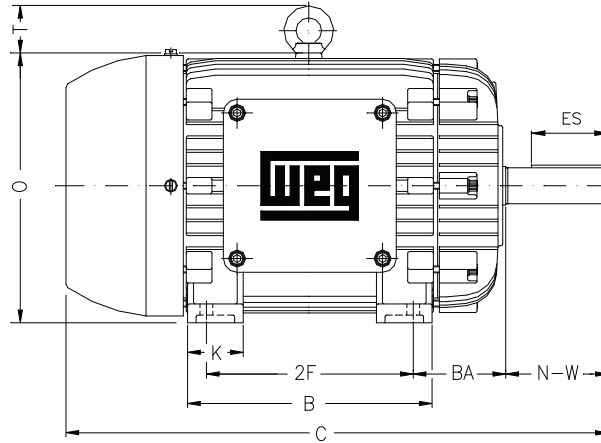
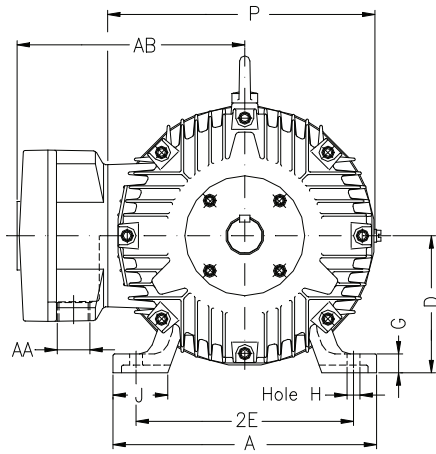
B

C

D

E

F



Notes:

Performed by:

Checked:

Customer:

Three-Phase : Explosion Proof - NEMA Premium

Three-phase induction motor
Frame 145T - IP54

16-OCT-2013
00158XT3E145T



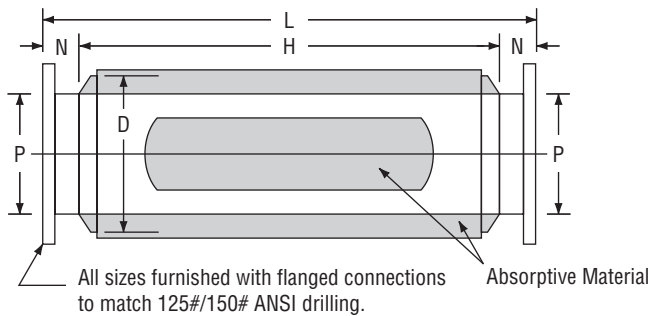
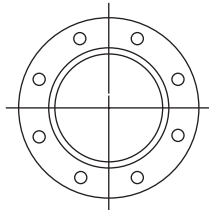
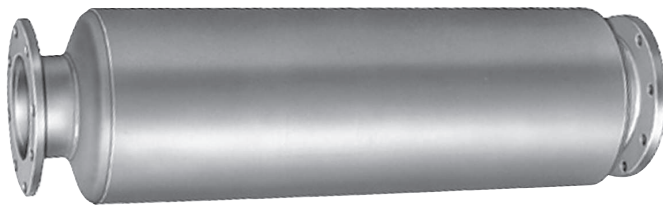
2E 5.500	A 6.457	2F 5.000	B 6.142	BA 2.250
J 1.496	K 1.654	P 7.000	ES 1.575	depth 0.187
S 0.187	N-W 2.250	U 0.875	R 0.765	AB 6.811
D 3.500	G 0.429	O 7.000	T 0.000	H 0.344
C 13.752	AA NPT 3/4"	d1 A 4	d2 A 4	

SU Series

Annular Flow Absorptive Silencer

Note:

SU Series standard paint and acoustical packing are suitable for 325°F.



Common Applications

- inlet and discharge of high-speed, low-pressure centrifugal compressors and blowers (discharge P < 15 psig)
- industrial fan inlet and discharge
- high-pressure centrifugal compressors inlet
- gas turbine inlet
- dry vacuum pump discharge
- some low-pressure vents (< 15 psig)
- high-frequency noise sources
- inlet of turbocharged reciprocating engines

SU5 Series

The SU5 Series is our highest grade standard absorptive silencer. Its design consists of two concentric perforated cylinders lined with acoustical pack, forming an annular flow path. This design features full blocked-line-of-sight, while providing full flow area for low resistance. Mild steel construction, primer-coated exterior.

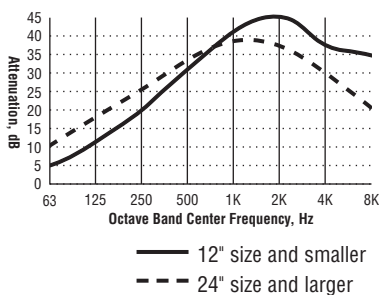
SU4 Series

The SU4 Series provides lower attenuation, ranking just below the SU5 Series. The design of this unit features a bullet centered in the flow tube to provide annular flow path and partial blocked-line-of-sight. Pressure drop is only slightly greater than the SU5. Mild steel construction, primer-coated exterior.

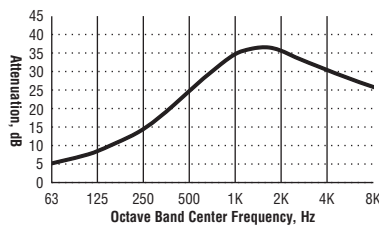
SU3 Series

The SU3 Series is the most economical of Universal's three grades of annular design silencers. Its design is nearly identical to the SU4, including annular flow path and partial blocked-line-of-sight. Pressure drop coefficient is the same as for the SU4 Series. Mild steel construction, primer-coated exterior.

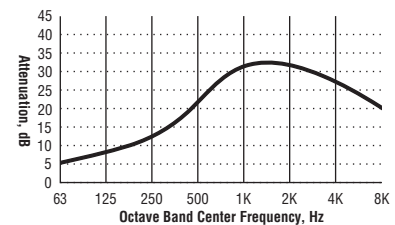
Typical Attenuation Curve



Typical Attenuation Curve



Typical Attenuation Curve



SU Series

Annular Flow Absorptive Silencer

Model	Part	P	D	L	N	H	Weight
SU5-4	14-104-AA	4	10	21.5	3	15.5	30
SU5-5	14-105-AA	5	12	26	3	20	50
SU5-6	14-106-AA	6	12	26	3	20	60
SU5-8	14-108-AA	8	18	36	3.5	29	120
SU5-10	14-110-AA	10	20	44.5	3.5	37.5	200
SU5-12	14-112-AA	12	24	53	3.5	46	295
SU5-14	14-114-AA	14	26	61.5	3.5	54.5	390
SU5-16	14-116-AA	16	28	68	3.5	61	510
SU5-18	14-118-AA	18	30	74	3.5	67	655
SU5-20	14-120-AA	20	36	78	4.5	69	850
SU5-22	14-122-AA	22	36	89	4.5	80	1,040
SU5-24	14-124-AA	24	42	91	4.5	82	1,285
SU5-26	14-126-AA	26	42	102	4.5	93	1,535
SU5-28	14-128-AA	28	48	104	4.5	95	1,985
SU5-30	14-130-AA	30	48	115	4.5	106	2,190
SU5-32	14-132-AA	32	54	128	6	116	2,855
SU5-34	14-134-AA	34	60	136	6	124	3,670
SU5-36	14-136-AA	36	60	145	6	133	4,095
SU5-42	14-142-AA	42	66	170	6	158	5,985
SU5-48	14-148-AA	48	78	186	6	174	8,040
SU5-54	14-154-AA	54	84	198	6	186	9,420
SU5-60	14-160-AA	60	90	210	6	198	11,175
SU4-8	13-108-AA	8	14	33	3.5	26	90
SU4-10	13-110-AA	10	16	35	3.5	28	130
SU4-12	13-112-AA	12	18	47	3.5	40	175
SU4-14	13-114-AA	14	20	51	3.5	44	240
SU4-16	13-116-AA	16	22	59	3.5	52	315
SU4-18	13-118-AA	18	24	63	3.5	56	365
SU4-20	13-120-AA	20	26	73.5	4.5	64.5	485
SU4-22	13-122-AA	22	28	73.5	4.5	64.5	520
SU4-24	13-124-AA	24	30	85.5	4.5	76.5	720
SU4-26	13-126-AA	26	36	96	4.5	87	1,170
SU4-28	13-128-AA	28	36	96	4.5	87	1,205
SU4-30	13-130-AA	30	36	108	4.5	99	1,345
SU4-36	13-136-AA	36	42	122	4.5	113	1,995
SU4-42	13-142-AA	42	48	137	6	125	2,820
SU4-48	13-148-AA	48	54	161.5	6	149.5	4,100
SU4-54	13-154-AA	54	60	178	6	166	5,400
SU4-60	13-160-AA	60	66	192.5	6	180.5	7,300
SU3-8	12-108-AA	8	14	31	3.5	24	85
SU3-10	12-110-AA	10	16	35	3.5	28	120
SU3-12	12-112-AA	12	18	39	3.5	32	155
SU3-14	12-114-AA	14	20	39	3.5	32	195
SU3-16	12-116-AA	16	22	47	3.5	40	270
SU3-18	12-118-AA	18	24	47	3.5	40	290
SU3-20	12-120-AA	20	26	49.5	4.5	40.5	350
SU3-22	12-122-AA	22	28	55.5	4.5	46.5	415
SU3-24	12-124-AA	24	30	55.5	4.5	46.5	500
SU3-26	12-126-AA	26	30	61	4.5	52	680
SU3-28	12-128-AA	28	36	63.5	4.5	54.5	830
SU3-30	12-130-AA	30	36	62	4.5	53	885
SU3-32	12-132-AA	32	36	68	4.5	59	1,120
SU3-34	12-134-AA	34	42	75	4.5	66	1,330
SU3-36	12-136-AA	36	42	80	4.5	71	1,485
SU3-42	12-142-AA	42	48	83	6	71	1,915
SU3-48	12-148-AA	48	54	89.5	6	77.5	2,595
SU3-54	12-154-AA	54	60	96	6	84	3,300
SU3-60	12-160-AA	60	66	108.5	6	96.5	4,430

SU5

SU4

SU3

Toll-Free: 1-888-300-4272
www.universalAET.com
94-1549 Rev 0



Fliteway Technologies, Inc.

**Pressure
Instrumentation**

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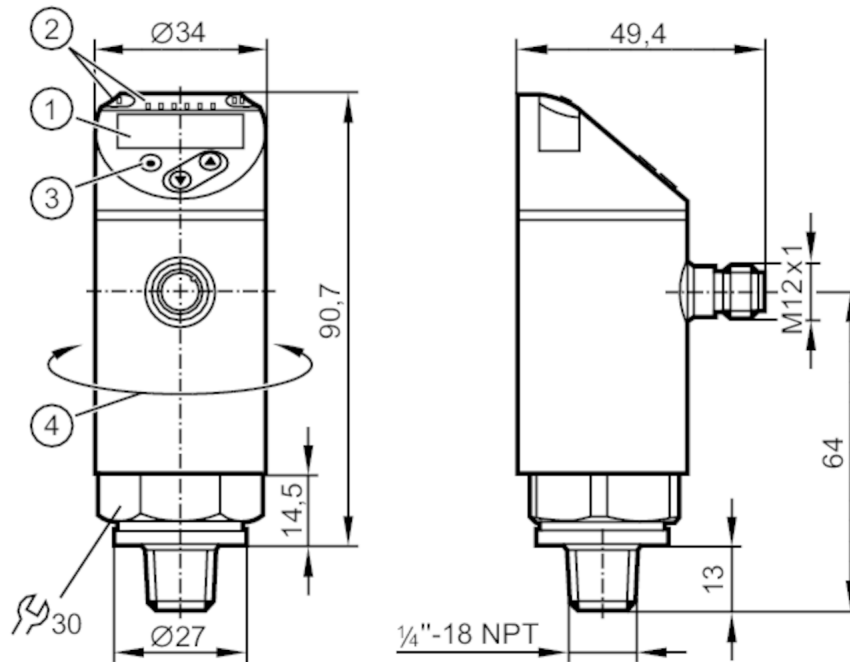
Office: (414) 483-5600 Fax: (414) 483-1957

PN2699



Pressure sensor with display

PN-1-1BREN14-MFRKG/US/ IV



- 1 alphanumeric display 4-digit red/green
- 2 LEDs Display unit / Switching status
- 3 Programming button
- 4 upper part of the housing can be rotated 345°



Product characteristics

Output signal	switching signal; analog signal; IO-Link; (configurable)			
Measuring range	-1...1 bar	-1000...1000 mbar	-14.5...14.5 psi	-100...100 kPa
Process connection	threaded connection 1/4 NPT external thread			

Application

System	gold-plated contacts			
Measuring element	ceramic-capacitive pressure measuring cell			
Application	for industrial applications			
Media	liquids and gases			
Medium temperature [°C]	-25...80			
Pressure rating	10000 mbar	145 psi	1000 kPa	
Min. bursting pressure	30000 mbar	450 psi	3000 kPa	
Vacuum resistance [mbar]	-1000			
Type of pressure	relative pressure; vacuum			
MAWP (for applications according to CRN)	20 bar	20000 mbar	290 psi	2000 kPa



Pressure sensor with display

PN-1-1BREN14-MFRKG/US/ IV

Electrical data					
Operating voltage	[V]	18...30 DC; (according to EN 50178 SELV/PELV)			
Current consumption	[mA]	< 35			
Min. insulation resistance	[MΩ]	100; (500 V DC)			
Protection class		III			
Reverse polarity protection		yes			
Power-on delay time	[s]	0.3			
Integrated watchdog		yes			
Inputs / outputs					
Number of inputs and outputs		Number of digital outputs: 2; Number of analog outputs: 1			
Outputs					
Total number of outputs		2			
Output signal		switching signal; analog signal; IO-Link; (configurable)			
Electrical design		PNP/NPN			
Number of digital outputs		2			
Output function		normally open / closed; (configurable)			
Max. voltage drop switching output DC	[V]	2			
Permanent current rating of switching output DC	[mA]	250			
Switching frequency DC	[Hz]	< 500			
Number of analog outputs		1			
Analog current output	[mA]	4...20; (scalable 1:5)			
Max. load	[Ω]	500			
Analog voltage output	[V]	0...10; (scalable 1:5)			
Min. load resistance	[Ω]	2000			
Short-circuit protection		yes			
Type of short-circuit protection		yes (non-latching)			
Overload protection		yes			
Measuring/setting range					
Measuring range		-1...1 bar	-1000...1000 mbar	-14.5...14.5 psi	-100...100 kPa
Set point SP		-985...1000 mbar		-14.3...14.5 psi	-98.5...100 kPa
Reset point rP		-995...990 mbar		-14.45...14.4 psi	-99.5...99 kPa
Analog start point		-1000...600 mbar		-14.5...8.7 psi	-100...60 kPa
Analog end point		-600...1000 mbar		-8.7...14.5 psi	-60...100 kPa
In steps of		5 mbar		0.05 psi	0.5 kPa
Accuracy / deviations					
Switch point accuracy	[% of the span]	< ± 0,4; (Turn down 1:1)			
Repeatability	[% of the span]	< ± 0,1; (with temperature fluctuations < 10 K; Turn down 1:1)			
Characteristics deviation	[% of the span]	< ± 0,25 (BFSL) / < ± 0,5 (LS); (Turn down 1:1; BFSL = Best Fit Straight Line; LS = limit value setting)			
Hysteresis deviation	[% of the span]	< ± 0,1; (Turn down 1:1)			
Long-term stability		< ± 0,05; (Turn down 1:1; per 6 months)			

PN2699



Pressure sensor with display

PN-1-1BREN14-MFRKG/US/ IV

	[% of the span]	
Temperature coefficient zero point	[% of the span / 10 K]	< ± 0,2; (-0...80 °C)
Temperature coefficient span	[% of the span / 10 K]	< ± 0,2; (-0...80 °C)

Reaction times		
Response time	[ms]	< 1.5
Delay time programmable dS, dr	[s]	0...50
Damping for the switching output dAP	[s]	0...4
Damping for the analog output dAA	[s]	0...4
Max. response time analog output	[ms]	3

Software / programming	
Parameter setting options	hysteresis / window; normally open / closed; switch-on/ switch-off delay; Damping; Display unit; current/voltage output

Interfaces	
Communication interface	IO-Link
Transmission type	COM2
IO-Link revision	1.1
SDCI standard	IEC 61131-9
IO-Link device ID	477 d / 00 01 dd h
Profiles	Smart Sensor: Process Data Variable; Device Identification, Device Diagnosis
SIO mode	yes
Required master port class	A
Process data analogue	1
Process data binary	2
Min. process cycle time	[ms] 2.3

Operating conditions	
Ambient temperature	[°C] -25...80
Storage temperature	[°C] -40...100
Protection	IP 65; IP 67

Tests / approvals		
EMC	DIN EN 61000-6-2	
	DIN EN 61000-6-3	
Shock resistance	DIN EN 60068-2-27	50 g (11 ms)
Vibration resistance	DIN EN 60068-2-6	20 g (10...2000 Hz)
MTTF	[years]	138
UL approval	UL approval number	J012
Pressure equipment directive	sound engineering practice; can be used for group 2 fluids; group 1 fluids on request	

PN2699



Pressure sensor with display

PN-1-1BREN14-MFRKG/US/ IV

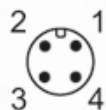
Mechanical data	
Weight [g]	246
Material	stainless steel (1.4404 / 316L); PBT+PC-GF30; PBT-GF20; PC
Materials (wetted parts)	stainless steel (1.4404 / 316L); Al2O3 (ceramics); FKM
Min. pressure cycles	100 million
Tightening torque [Nm]	> 50; (Depends on lubrication, seal and pressure rating)
Process connection	threaded connection 1/4 NPT external thread
Restrictor element integrated	no (can be retrofitted)

Displays / operating elements		
Display	Display unit	5 x LED, green (mbar, psi, kPa, inH2O, inHg)
	Switching status	2 x LED, yellow
	Measured values	alphanumeric display, red/green 4-digit

Remarks	
Pack quantity	1 pcs.

Electrical connection

Connector: 1 x M12; Contacts: gold-plated



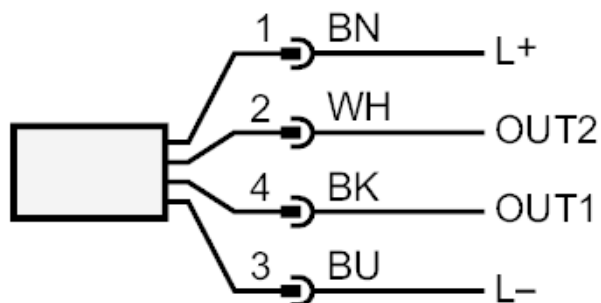
PN2699



Pressure sensor with display

PN-1-1BREN14-MFRKG/US/ IV

Connection



OUT1 Switching output

OUT2 Switching output

analog output

Core colors :

BK = black

BN = brown

BU = blue

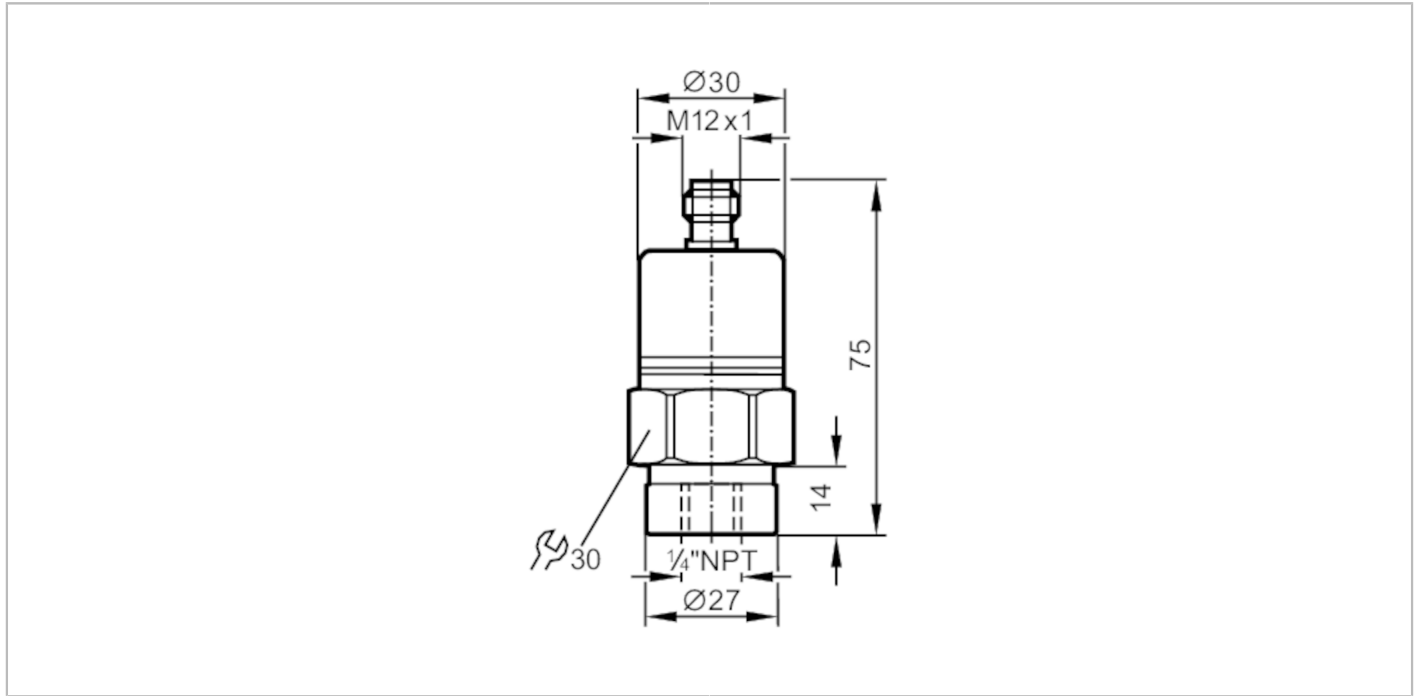
WH = white

PA6229



Pressure transmitter with ceramic measuring cell

PA-0-1-RBN14-A-ZVG/US/ IV



Product characteristics	
Output signal	analog signal
Measuring range	-1...0 bar -1000...0 mbar
Process connection	threaded connection 1/4 NPT Internal thread
Application	
System	gold-plated contacts
Application	for industrial applications
Media	liquids and gases
Medium temperature [°C]	-25...90; (on request: -40...90 °C)
Pressure rating [bar]	10
Min. bursting pressure [bar]	30
Type of pressure	relative pressure; vacuum
Electrical data	
Operating voltage [V]	9.6...32 DC
Min. insulation resistance [MΩ]	100; (500 V DC)
Protection class	III
Reverse polarity protection	yes
Inputs / outputs	
Number of inputs and outputs	Number of analog outputs: 1

PA6229



Pressure transmitter with ceramic measuring cell

PA-0-1-RBN14-A-ZVG/US/ IV

Outputs		
Total number of outputs		1
Output signal		analog signal
Number of analog outputs		1
Analog current output	[mA]	20...4
Max. load	[Ω]	720; (U _b = 24 V; (U _b - 9,6 V) / 20 mA)
Overload protection		yes
Measuring/setting range		
Measuring range		-1...0 bar -1000...0 mbar
Accuracy / deviations		
Repeatability	[% of the span]	< 0,1; (with temperature fluctuations < 10 K)
Characteristics deviation	[% of the span]	< ± 0,25 (BFSL) / < ± 0,5 (LS); (BFSL = Best Fit Straight Line; LS = limit value setting)
Long-term stability	[% of the span]	< ± 0,05; (per 6 months)
Temperature coefficient zero point	[% of the span / 10 K]	0,1; (0...80 °C)
Temperature coefficient span	[% of the span / 10 K]	0,2; (0...80 °C)
Reaction times		
Step response time analogue output	[ms]	3
Operating conditions		
Ambient temperature	[°C]	-25...80
Storage temperature	[°C]	-40...100
Protection		IP 65
Tests / approvals		
EMC	EN 61000-4-2 ESD	4 kV CD / 8 kV AD
	EN 61000-4-3 HF radiated	30 V/m
	EN 61000-4-4 Burst	2 kV
	EN 61000-4-6 HF conducted	10 V
	radiation of interference	according to the automotive directive 2004/104/EC / CISPR 25
	noise immunity	according to the automotive directive 2004/104/EC / ISO 11452-2
	HF radiated	100 V/m
Shock resistance	DIN IEC 68-2-27	50 g (11 ms)
Vibration resistance	DIN IEC 68-2-6	20 g (10...2000 Hz)
MTTF	[years]	506
Pressure equipment directive		sound engineering practice; can be used for group 2 fluids; group 1 fluids on request

PA6229



Pressure transmitter with ceramic measuring cell

PA-0-1-RBN14-A-ZVG/US/ IV

Mechanical data	
Weight [g]	221.5
Material	stainless steel (1.4404 / 316L); FKM; PA; EPDM/X
Materials (wetted parts)	stainless steel (1.4305 / 303); ceramics; FKM
Min. pressure cycles	100 million
Process connection	threaded connection 1/4 NPT Internal thread
Restrictor element integrated	no (can be retrofitted)

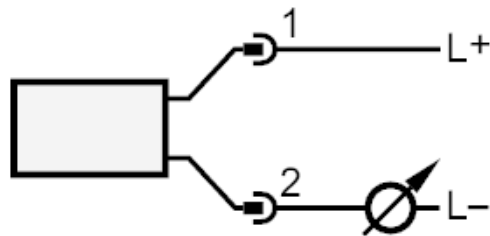
Remarks	
Pack quantity	1 pcs.

Electrical connection

Connector: 1 x M12; Contacts: gold-plated



Connection

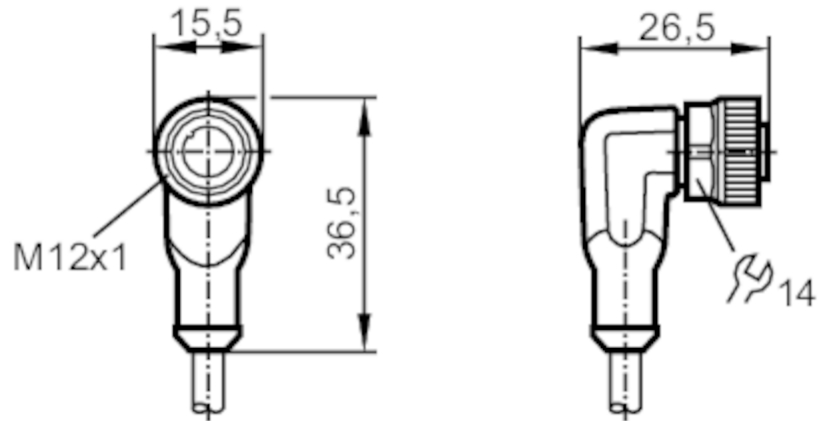


EVC005



Female cordset

ADOAH040MSS0005H04



Application

System	Free from silicone; Halogen-free; gold-plated contacts; Drag chain suitability
Free from silicone	yes

Electrical data

Operating voltage [V]	< 250 AC / < 300 DC
Protection class	II
Max. current load total [A]	4

Operating conditions

Ambient temperature [°C]	-25...90
Note on ambient temperature	cULus: ...75
Ambient temperature (moving) [°C]	-25...90
Note on ambient temperature (moving)	cULus: ...75
Protection	IP 65; IP 67; IP 68; IP 69K

EVC005



Female cordset

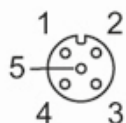
ADOAH040MSS0005H04

Mechanical data		
Weight [g]	176.6	
Dimensions [mm]	26.5 x 15.5 x 36.5	
Material	housing: TPU (urethane) orange; sealing: FKM	
Material nut	brass, nickel-plated	
Drag chain suitability	yes	
Drag chain suitability	Bending radius for flexible applications	min. 10 x cable diameter
	Travel speed	max. 3.3 m/s for a horizontal travel length of 5 m and max. acceleration of 5 m/s ²
	Bending cycles	> 5 Mio.
	Torsional strain	± 180 °/m

Remarks	
Notes	Please see the technical note under "Downloads"
Pack quantity	1 pcs.

Electrical connection
Cable: 5 m, PUR, Halogen-free, black, Ø 4.3 mm; 4 x 0.34 mm² (42 x Ø 0.1 mm)

Electrical connection - Socket
Connector: 1 x M12, angled; Locking: brass, nickel-plated; Contacts: gold-plated; Tightening torque: 0.6...1.5 Nm



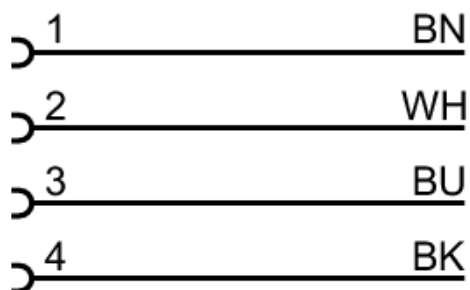
EVC005



Female cordset

ADOAH040MSS0005H04

Connection

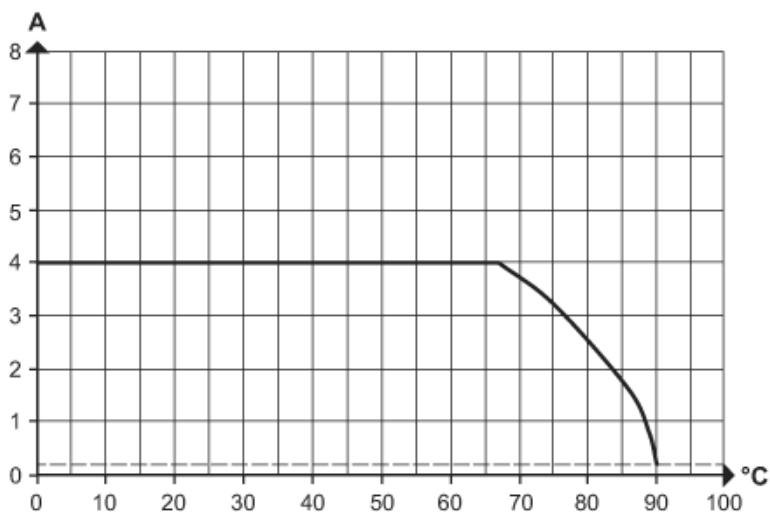


Core colors :

BK = black
BN = brown
BU = blue
WH = white

Diagrams and graphs

Characteristic curve for derating



Derating $I_{max} * 0.8$ (DIN EN 60512-5-2)

X Ambient temperature [°C]

Y Current [A]



200 SERIES LIQUID FILLED GAUGE

Glycerine filled for added durability in applications where vibration or pulsation is present
Stainless steel case and bezel, copper alloy internals

2



STANDARD DIAL CONFIGURATIONS FOR 200 SERIES

Dial Range	Figure Intervals	Graduation Intervals	Dial Range	Figure Intervals	Graduation Intervals	Dial Range	Figure Intervals	Graduation Intervals
30/0"hg Vac	5" hg	0.5" hg	0/60 psi	10 psi	0.5 psi	0/1000 psi	200 psi	20 psi
30/0/15 psi	10" hg/5 psi	1" hg/0.5 psi	0/100 psi	20 psi	2 psi	0/1500 psi	200 psi	20 psi
30/0/30 psi	10" hg/5psi	1" hg/0.5 psi	0/160 psi	20 psi	2 psi	0/2000 psi	400 psi	40 psi
30/0/60 psi	30" hg/10psi	2" hg/1 psi	0/200 psi	40 psi	5 psi	0/3000 psi	500 psi	50 psi
30/0/100 psi	30" hg/20psi	5" hg/2 psi	0/300 psi	50 psi	5 psi	0/4000 psi	500 psi	50 psi
30/0/150 psi	30" hg/30psi	5" hg/2 psi	0/400 psi	50 psi	5 psi	0/5000 psi	1000 psi	100 psi
30/0/300 psi	30" hg/50psi	10" hg/5 psi	0/500 psi	100 psi	10 psi	0/6000 psi	1000 psi	100 psi
0/15 psi	2 psi	0.1 psi	0/600 psi	100 psi	10 psi	0/10,000 psi	2000 psi	200 psi
0/30 psi	5 psi	0.5 psi	0/800 psi	100 psi	10 psi	0/15,000 psi	2000 psi	200 psi

NOTE: Because of continuing improvements, increments/specifications are subject to change without notice. Stock ranges vary by dial size and configuration. Consult PIC for availability.

201L LIQUID FILLED LOWER MOUNT

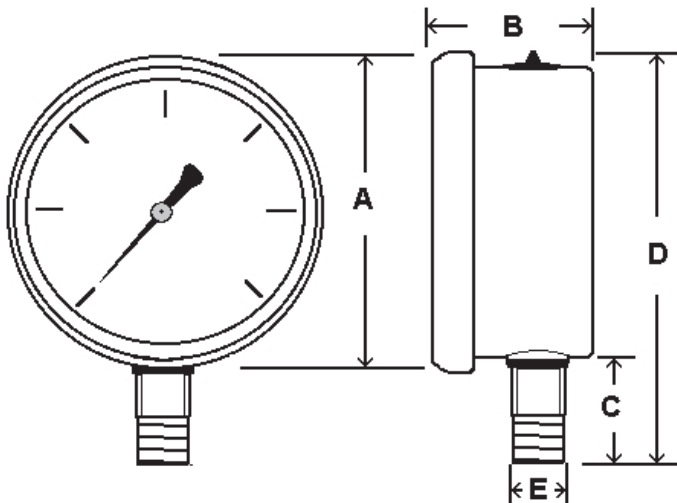


Glycerine filled for added durability in applications where vibration or pulsation is present
Stainless steel case and bezel, copper alloy internals

SPECIFICATIONS

Dial	1 1/2" (40 mm), 2" (50 mm), 2 1/2" (63 mm), 4" (100 mm)
Case	Stainless steel, glycerine filled
Wetted Parts	Copper alloy
Bezel	Stainless steel, fixed
Lens	Polycarbonate
Pointer	Black aluminum
Connection	Lower mount 1 1/2" dial = 1/8" NPT 2" dial = 1/8" or 1/4" NPT 2 1/2" dial = 1/4" NPT 4" dial = 1/4" or 1/2" NPT
Scale	Standard: psi/BAR (x 100 = kPa) Single scale psi available from stock
Accuracy	3-2-3% of span 1 1/2" & 2" ASME B40.1 Grade B 2-1-2% of span 2 1/2" & 4" ASME B40.1 Grade A
Ambient Temp	Glycerine Filled = 30° F to 160° F Dry = -30° F to 180° F

Design meets or exceeds ASME B40.100 pressure gauge standard.



Dial	Unit	A	B	C	D	E
1 1/2"	In.	1.85"	1.00"	0.67"	2.28"	1/8" NPT
	mm	47	25	17	58	
2"	In.	2.27"	1.20"	0.91"	2.95"	1/8" or 1/4" NPT
	mm	58	31	23	75	
2 1/2"	In.	2.80"	1.40"	1.07"	3.55"	1/4" NPT
	mm	71	36	27	90	
4"	In.	4.29"	1.75"	1.17"	5.21"	1/4" or 1/2" NPT
	mm	109	45	30	132	



2

AVAILABLE OPTIONS*

- Certificate of Accuracy, NIST traceable
- Custom Dial
- Liquid Fill Options, see page 176
- Anti-Vibration Movement, see page 109
- Glass Lens
- Dry, Fillable Case
- Cleaned for Oxygen Service (dry only)
- Special Connection Size
- Protective Rubber Cover, see page 121
- Max/Min Pointer, see page 122

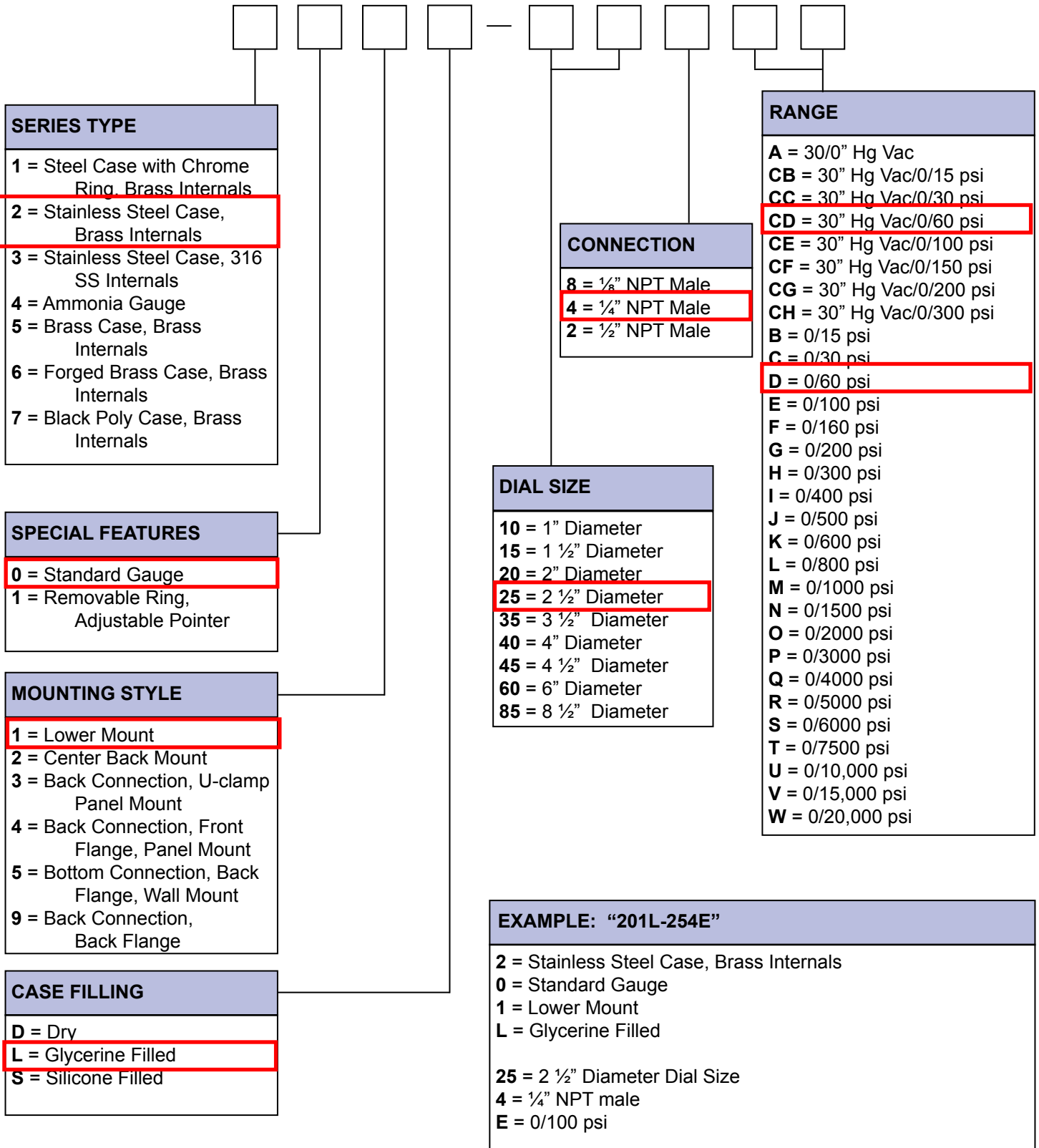
*Lead times/minimums may apply

APPROXIMATE SHIPPING WEIGHTS/ BOX QUANTITIES

Dial Size	Est. Unit Weight	Box Qty
1 1/2"	0.20 lbs (0.10 kg)	100
2"	0.40 lbs (0.18 kg)	100
2 1/2"	0.55 lbs (0.24 kg)	50
4"	1.5 lbs (0.68 kg)	30



PART NUMBERING SYSTEM





Fliteway Technologies, Inc.

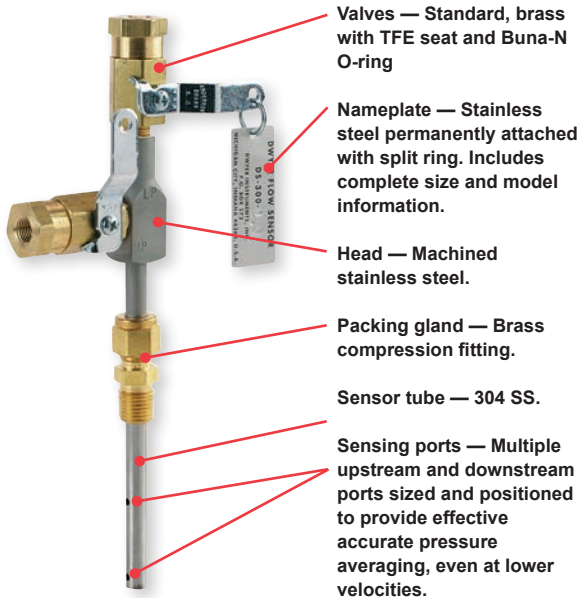
**Flow
Instrumentation**

2129 E. Birchwood Avenue
Cudahy, WI 53110

Office: (414) 483-5600 Fax: (414) 483-1957

IN-LINE FLOW SENSORS

Use with the Dwyer® Differential Pressure Gages or Transmitters



Valves — Standard, brass with TFE seat and Buna-N O-ring

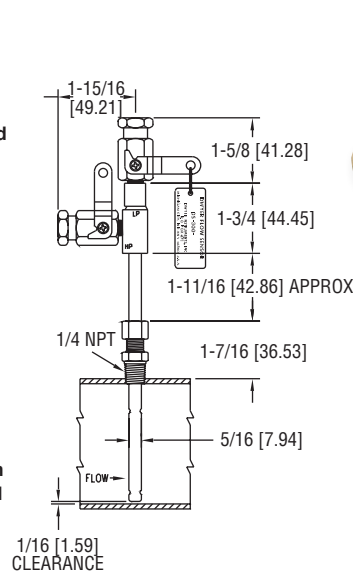
Nameplate — Stainless steel permanently attached with split ring. Includes complete size and model information.

Head — Machined stainless steel.

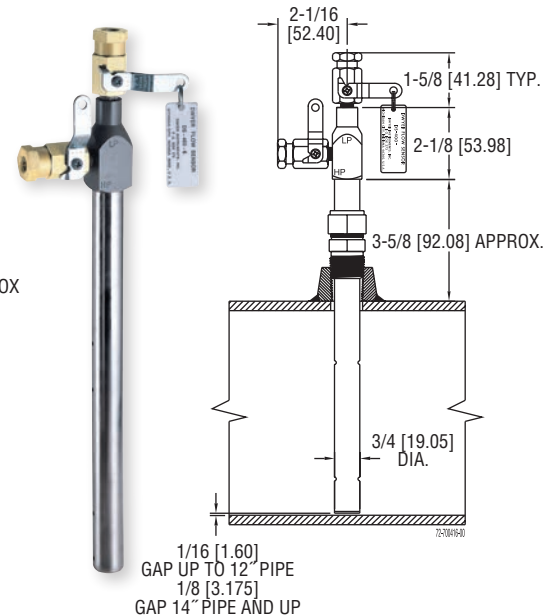
Packing gland — Brass compression fitting.

Sensor tube — 304 SS.

Sensing ports — Multiple upstream and downstream ports sized and positioned to provide effective accurate pressure averaging, even at lower velocities.



Series DS-300



Large 3/4 Inch Diameter for Extra Strength in Lengths to 24 Inches

Series DS-400

The **SERIES DS** In-Line Flow Sensors are two Series of averaging Pitot tubes for compatible gases and liquids that provide accurate and convenient flow rate sensing, for schedule 40 pipe, when purchased with suitable differential pressure gage with appropriate range.

The Series DS-300 Averaging Flow Sensors are designed to be inserted in the pipeline through a compression fitting and available for pipe sizes from 1 to 10" (2.5 to 25.4 cm). Accessories include adapters with 1/4" SAE 45° flared ends compatible with hoses supplied with the Model A-471 Portable Capsuhelic® Gage Kit.

The Series DS-400 Averaging Flow Sensors are designed for insertion lengths up to 24" (61 cm) and include a pair of 1/8" NPT x 1/4" SAE 45° flared adapters which are compatible with hoses used in the Model A-471 Portable Capsuhelic® Gage Kit. The supplied solid brass mounting adapter has a 3/4" dia. compression fitting to lock in required insertion length and a 3/4" male NPT thread for mounting in a threaded branch connection (not included).

FEATURES/BENEFITS

- Multiple sensing point measurement and built-in averaging capability eliminates the need for "traversing" the flowing stream with single point velocity pressure measurement saving time
- Extremely reliable, proven technology, Pitot tubes, have been used in flow measurement for years
- All models include convenient and quick-acting quarter-turn ball valves to isolate the sensor for zeroing with 1/8" female NPT valve assembly process connections.
- Furnished with instrument shut-off valves on both pressure connections with 1/8" female NPT connections rated at 200 psig (13.7 bar) and 200°F (93.3°C)
- Where valves are not required, they can be omitted at reduced cost
- The Series DS-400 Averaging Flow Sensors are quality constructed from extra strong 3/4" dia. stainless steel to resist increased forces encountered at higher flow rates with both air and water
- Economical flow indication when used with appropriate differential pressure gage
- Rugged construction yields, non-clogging, stable design

APPLICATIONS

- Remediation
- Natural, flare, flue, stack gas
- Boiler feedwater
- Cooling water
- Superheated, saturated, or geothermal steam
- Combustion or compressed air
- Oil flow monitoring

IN-LINE FLOW SENSORS

Use with the Dwyer® Differential Pressure Gages or Transmitters

HOW TO ORDER

Merely determine the pipe size into which the flow sensor will be mounted and designate the size as a suffix to Model DS-300. For example, a flow sensor to be mounted in a 2" pipe would be a Model No. DS-300-2".

For non-critical water and air flow monitoring applications, the chart below can be utilized for ordering a stock Capsuhelic® differential pressure gage for use with the DS-300 flow sensor. Simply locate the maximum flow rate for the media being measured under the appropriate pipe size and read the Capsuhelic® gage range in inches of water column to the left. The DS-300 sensor is supplied with installation and operating instructions, Bulletin F-50. It also includes complete flow conversion information for the three media conditions shown in the chart below. This information enables the user to create a complete differential pressure to flow rate conversion table for the sensor and differential pressure gage employed. Both the Dwyer® Capsuhelic® gage and flow sensor feature excellent repeatability so, once the desired flow rate is determined, deviation from that flow in quantitative measure can be easily determined. You may wish to order the adjustable signal flag option for the Capsuhelic® gage to provide an easily identified reference point for the proper flow.

Capsuhelic® gages with special ranges and/or direct reading scales in appropriate flow units are available on special order for more critical applications. Customer supplied data for the full scale flow (quantity and units) is required along with the differential pressure reading at that full flow figure. Prior to ordering a special Capsuhelic® differential pressure gage for flow read-out, we recommend you request Bulletin F-50 to obtain complete data on converting flow rates of various media to the sensor differential pressure output. With this bulletin and after making a few simple calculations, the exact range gage required can easily be determined.

MODEL CHART			
Model	Description	Model	Description
DS-300-1"	1" pipe size	DS-400-6"	6" pipe size
DS-300-1-1/4"	1-1/4" pipe size	DS-400-8"	8" pipe size
DS-300-1-1/2"	1-1/2" pipe size	DS-400-10"	10" pipe size
DS-300-2"	2" pipe size	DS-400-12"	12" pipe size
DS-300-2-1/2"	2-1/2" pipe size	DS-400-14"	14" pipe size
DS-300-3"	3" pipe size	DS-400-16"	16" pipe size
DS-300-4"	4" pipe size	DS-400-18"	18" pipe size
DS-300-6"	6" pipe size	DS-400-20"	20" pipe size
DS-300-8"	8" pipe size	DS-400-24"	24" pipe size
DS-300-10"	10" pipe size		

OPTION	
To order add suffix:	Description
-LV	DS-300 or DS-400 Less Valves

RANGE CHART		Full Range Flows by Pipe Size (Approximate)									
Gage Range (in w.c.)	Media @ 70°F	1"	1-1/4"	1-1/2"	2"	2-1/2"	3"	4"	6"	8"	10"
2	Water (GPM)	4.8	8.3	11.5	20.5	30	49	86	205	350	560
2	Air @ 14.7 PSIA (SCFM)	19.0	33.0	42.0	65.0	113	183	330	760	1340	2130
2	Air @ 100 PSIG (SCFM)	50.0	90.5	120.0	210.0	325	510	920	2050	3600	6000
5	Water (GPM)	7.7	14.0	18.0	34.0	47	78	138	320	560	890
5	Air @ 14.7 PSIA (SCFM)	30.0	51.0	66.0	118.0	178	289	510	1200	2150	3400
5	Air @ 100 PSIG (SCFM)	83.0	142.0	190.0	340.0	610	820	1600	3300	5700	10000
10	Water (GPM)	11.0	19.0	25.5	45.5	67	110	195	450	800	1260
10	Air @ 14.7 PSIA (SCFM)	41.0	72.0	93.0	163.0	250	410	725	1690	3040	4860
10	Air @ 100 PSIG (SCFM)	120.0	205.0	275.0	470.0	740	1100	2000	4600	8100	15000
25	Water (GPM)	18.0	32.0	40.5	72.0	108	173	310	720	1250	2000
25	Air @ 14.7 PSIA (SCFM)	63.0	112.0	155.0	255.0	390	640	1130	2630	4860	7700
25	Air @ 100 PSIG (SCFM)	185.0	325.0	430.0	760.0	1200	1800	3300	7200	13000	22000
50	Water (GPM)	25.0	44.0	57.5	100.0	152	247	435	1000	1800	
50	Air @ 14.7 PSIA (SCFM)	90.0	161.0	205.0	360.0	560	900	1600	3700	6400	
50	Air @ 100 PSIG (SCFM)	260.0	460.0	620.0	1050.0	1700	2600	4600	10000	18500	
100	Water (GPM)	36.5	62.0	82.0	142.0	220	350	620	1500		
100	Air @ 14.7 PSIA (SCFM)	135.0	230.0	300.0	505.0	800	1290	2290	5000		
100	Air @ 100 PSIG (SCFM)	370.0	660.0	870.0	1500.0	2300	3600	6500	15000		

ACCESSORIES	
Model	Description
A-160	Threaded branch connection, 3/8" NPT, forged steel, 3000 psi
A-161	Brass bushing, 1/4" x 3/8"
A-471	Portable Kit. For portable operation, the A-471 Capsuhelic® Portable Gage Kit is available complete with tough polypropylene carrying case, mounting bracket, 3-way manifold valve, two 10' high pressure hoses, and all necessary fittings. ①
631B	Capsuhelic® Wet/Wet Differential Pressure Transmitter. Low pressure transmitter for use with DS-300/400 flow sensors. Use Series 631B Capsuhelic® Wet/Wet Differential Pressure Transmitter. ②



Capsuhelic® Gage Shown Installed In A-471 Portable Kit



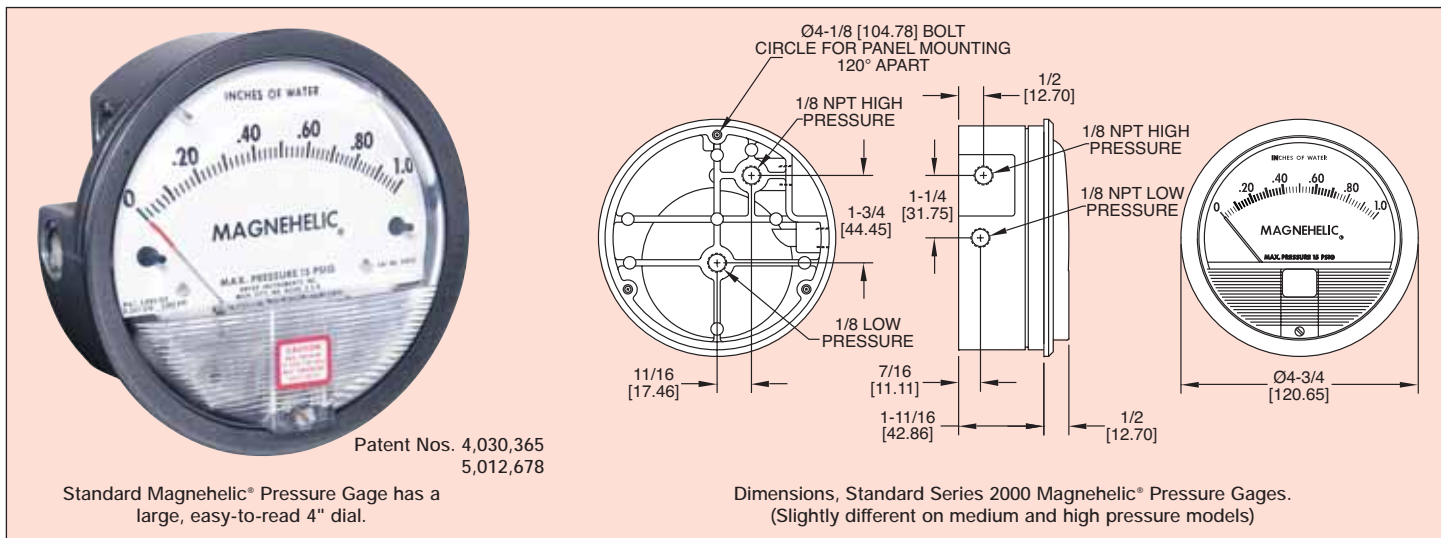
Series 631B

① See page 15 (Series 4000)
② See page 60 (Series 631B)

Series
2000

Magnehelic® Differential Pressure Gages

Indicate Positive, Negative or Differential, Accurate within 2%



Select the Dwyer® Magnehelic® gage for high accuracy – guaranteed within 2% of full scale – and for the wide choice of 81 models available to suit your needs precisely. Using Dwyer's simple, frictionless Magnehelic® gage movement, it quickly indicates low air or non-corrosive gas pressures – either positive, negative (vacuum) or differential. The design resists shock, vibration and over-pressures. No manometer fluid to evaporate, freeze or cause toxic or leveling problems. It's inexpensive, too.

The Magnehelic® gage is the industry standard to measure fan and blower pressures, filter resistance, air velocity, furnace draft, pressure drop across orifice plates, liquid levels with bubbler systems and pressures in fluid amplifier or fluidic systems. It also checks gas-air ratio controls and automatic valves, and monitors blood and respiratory pressures in medical care equipment.

Note: May be used with Hydrogen. When ordering a Buna-N diaphragm pressures must be less than 35 psi.

MOUNTING. A single case size is used for most models of Magnehelic® gages. They can be flush or surface mounted with standard hardware supplied. With the optional A-610



Flush ...Surface...or Pipe Mounted

Pipe Mounting Kit they may be conveniently installed on horizontal or vertical 1/4" - 2" pipe. Although calibrated for vertical position, many ranges above 1" may be used at any angle by simply re-zeroing. However, for maximum accuracy, they must be calibrated in the same position in which they are used. These characteristics make Magnehelic® gages ideal for both stationary and portable applications. A 4% hole is required for flush panel mounting. Complete mounting and connection fittings plus instructions are furnished with each instrument.

VENT VALVES

In applications where pressure is continuous and the Magnehelic® gage is connected by metal or plastic tubing which cannot be easily removed, we suggest using Dwyer A-310A vent valves to connect gage. Pressure can then be removed to check or re-zero the gage.

HIGH AND MEDIUM PRESSURE MODELS

Installation is similar to standard gages except that a 4 13/16" hole is needed for flush mounting. The medium pressure construction is rated for internal pressures up to 35 psig and the high pressure up to 80 psig. Available for all models. Because of larger case, the medium pressure and high pressure models will not fit in a portable case size. Installation of the A-321 safety relief valve on standard Magnehelic® gages often provides adequate protection against infrequent overpressure.

SPECIFICATIONS

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)

Wetted Materials: Consult factory.

Housing: Die cast aluminum case and bezel, with acrylic cover. Exterior finish is coated gray to withstand 168 hour salt spray corrosion test.

Accuracy: ±2% of full scale (±3% on -0, -100 Pa, -125 Pa, 10MM and ±4% on -00, -60 Pa, -6MM ranges), throughout range at 70°F (21.1°C).

Pressure Limits: -20" Hg. to 15 psig.† (-0.677 bar to 1.034 bar); MP option: 35 psig (2.41 bar), HP option: 80 psig (5.52 bar).

Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only.

Temperature Limits: 20 to 140°F.* (-6.67 to 60°C).

Size: 4" (101.6 mm) Diameter dial face.

Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.

Process Connections: 1/8" female NPT duplicate high and low pressure taps - one pair side and one pair back.

Weight: 1 lb 2 oz (510 g), MP & HP 2 lb 2 oz (963 g).

Standard Accessories: Two 1/8" NPT plugs for duplicate pressure taps, two 1/8" pipe thread to rubber tubing adapter and three flush mounting adapters with screws. (Mounting and snap ring retainer substituted for 3 adapters in MP & HP gage accessories.)

*Low temperature models available as special option.

†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Medium and High pressure options at lower left.

OPTIONS AND ACCESSORIES

Transparent Overlays

Furnished in red and green to highlight and emphasize critical pressures.



Adjustable Signal Flag

Integral with plastic gage cover. Available for most models except those with medium or high pressure construction. Can be ordered with gage or separate.



LED Setpoint Indicator

Bright red LED on right of scale shows when setpoint is reached. Field adjustable from gage face, unit operates on 12-24 VDC. Requires MP or HP style cover and bezel.

Portable Units

Combine carrying case with any Magnehelic® gage of standard range, except high pressure connection. Includes 9 ft. (2.7 m) of 3/8" I.D. rubber tubing, standhang bracket and terminal tube with holder.



Air Filter Gage Accessory Package

Adapts any standard Magnehelic® gage for use as an air filter gage. Includes aluminum surface mounting bracket with screws, two 5 ft. (1.5 m) lengths of 1/2" aluminum tubing two static pressure tips and two molded plastic vent valves, integral compression fittings on both tips and valves.



Quality design and construction features

Bezel provides flange for flush mounting in panel.

Clear plastic face is highly resistant to breakage. Provides undistorted viewing of pointer and scale.

Precision litho-printed scale is accurate and easy to read.

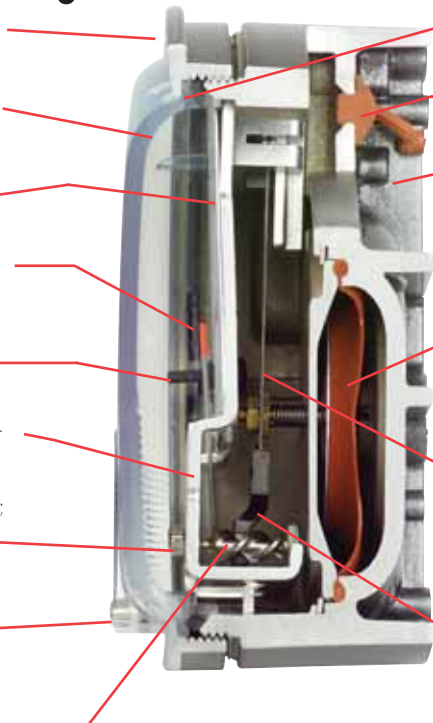
Red tipped pointer of heat treated aluminum tubing is easy to see. It is rigidly mounted on the helix shaft.

Pointer stops of molded rubber prevent pointer over-travel without damage.

“Wishbone” assembly provides mounting for helix, helix bearings and pointer shaft.

Jeweled bearings are shock-resistant mounted; provide virtually friction-free motion for helix. Motion damped with high viscosity silicone fluid.

Zero adjustment screw is conveniently located in the plastic cover, and is accessible without removing cover. O-ring seal provides pressure tightness.



O-ring seal for cover assures pressure integrity of case.

Blowout plug of silicone rubber protects against overpressure on 15 psig rated models. Opens at approximately 25 psig.

Die cast aluminum case is precision made and iridite-dipped to withstand 168 hour salt spray corrosion test. Exterior finished in baked dark gray hammerloid. One case size is used for all standard pressure options, and for both surface and flush mounting.

Silicone rubber diaphragm with integrally molded O-ring is supported by front and rear plates. It is locked and sealed in position with a sealing plate and retaining ring. Diaphragm motion is restricted to prevent damage due to overpressures.

Calibrated range spring is flat spring steel. Small amplitude of motion assures consistency and long life. It reacts to pressure on diaphragm. Live length adjustable for calibration.

Samarium Cobalt magnet mounted at one end of range spring rotates helix without mechanical linkages.

Helix is precision made from an alloy of high magnetic permeability. Mounted in jeweled bearings, it turns freely, following the magnetic field to move the pointer across the scale.

SERIES 2000 MAGNEHELIC® GAGE — MODELS AND RANGES

The models below will fulfill most requirements. Page V also shows examples of special models built for OEM customers. For special scales furnished in ounces per square inch, inches of mercury, metric units, etc., contact the factory.

Dual Scale English/Metric Models		
Model Number	Range, In. W.C.	Range, Pa or kPa
2000-0D	0-0.5	0-125 Pa
2001D	0-1.0	0-250 Pa
2002D	0-2.0	0-500 Pa
2003D	0-3.0	0-750 Pa
2004D	0-4.0	0-1.0 kPa
2006D	0-6.0	0-1.5 kPa
2008D	0-8.0	0-2.0 kPa
2010D	0-10	0-2.5 kPa

Model Number	Range Inches of Water	Model Number	Range Zero Center Inches of Water	Dual Scale Air Velocity Units		Model Number	Range, CM of Water	Model Number	Range, Pascals
				Model Number	Range in W.C. Velocity, F.P.M.				
2000-00N†••	.05-0-.2	2300-0†•	.25-0-.25	2000-00AV†••	0-.25/300-2000	2000-15CM	0-15	Zero Center Ranges	
2000-00†••	0-.25	2301	.5-0-.5	2000-00V†••	0-.50/500-2800	2000-20CM	0-20	2300-60PA	30-0-30
2000-01†•	0-.50	2302	1-0-1	2001AV	0-1.0/500-4000	2000-25CM	0-25	2300-100PA	50-0-50
2001	0-1.0	2304	2-0-2	2002AV	0-2.0/1000-5600	2000-50CM	0-50	2300-120PA	60-0-60
2002	0-2.0	2310	5-0-5	2010AV	0-10/2000-12500	2000-80CM	0-80	2300-250PA	125-0-125
2003	0-3.0	2320	10-0-10	For use with pitot tube.		2000-100CM	0-100	2300-500PA	250-0-250
2004	0-4.0	2330	15-0-15			2000-150CM	0-150		
2005	0-5.0					2000-200CM	0-200		
2006	0-6.0					2000-250CM	0-250		
2008	0-8.0					2000-300CM	0-300		
2010	0-10								
2015	0-15	2201	0-1	2000-6MM†••	0-6	Zero Center Ranges		Model Number	Range, Kilopascals
2020	0-20	2202	0-2	2000-10MM†••	0-10	2300-4CM	2-0-2	2000-1KPA	0-1
2025	0-25	2203	0-3	2000-25MM†••	0-25	2300-10CM	5-0-5	2000-1.5KPA	0-1.5
2030	0-30	2204	0-4	2000-50MM†••	0-50	2300-30CM	15-0-15	2000-2KPA	0-2
2040	0-40	2210*	0-10	2000-80MM†••	0-80			2000-3KPA	0-3
2050	0-50	2215*	0-15	2000-100MM†••	0-100			2000-4KPA	0-4
2060	0-60	2220*	0-20	Zero Center Ranges				2000-5KPA	0-5
2080	0-80	2230**	0-30					2000-8KPA	0-8
2100	0-100							2000-10KPA	0-10
2150	0-150			2300-20MM†	10-0-10			2000-15KPA	0-15
		*MP option standard **HP option standard				Model Number	Range, Pascals	2000-20KPA	0-20
								2000-25KPA	0-25
								2000-30KPA	0-30
								Zero Center Ranges	
								2300-1KPA	.5-0-.5
								2300-3KPA	1.5-0-1.5

Scale Overlays — Red, Green, Mirrored or Combination, Specify Locations

†These ranges calibrated for vertical scale position.

• Accuracy +/-3%. •• Accuracy +/-4%

1011R01-0298P

Signet 2551 Magmeter Flow Sensor



Available in a variety of wetted materials and ideal for pipe sizes up to DN900 (36 in.)



The Signet 2551 Magmeter is an insertion style magnetic flow sensor that features no moving parts. The patented* sensor design is available in corrosion-resistant materials to provide long-term reliability with minimal maintenance costs. Material options include PP with stainless steel, PVDF with Hastelloy-C, or PVDF with Titanium. Utilizing the comprehensive line of Signet installation fittings, sensor alignment and insertion depth is automatic. These versatile, simple-to-install sensors deliver accurate flow measurement over a wide dynamic range in pipe sizes ranging from DN15 to DN900 (½ to 36 inches), satisfying the requirements of many diverse applications.

Signet 2551 Magmeters offer many output options of frequency/digital (S³L) or 4 to 20 mA which are available on both the blind and display versions. The frequency or digital (S³L) sensor output can be used with Signet's extensive line of flow instruments while the 4 to 20 mA output can be used for a direct input to PLCs, chart recorders, etc. Both the 4 to 20 mA output and digital (S³L) sensor interface is available for long distance signal transmission. An additional benefit is the empty pipe detection which features a zero flow output when the sensors are not completely wetted. Also, the frequency output is bi-directional while the 4 to 20 mA output can be set for uni- or bi-directional flow using the display or the 3-0250 USB to Digital (S³L) Configuration/Diagnostic setup tool which connects to PCs for programming capabilities.

In addition the display version of the 2551 Magmeter is available with relays and features permanent and resettable totalizer values which can be stored and seen on the display. Also, the display contains multi-languages with English, Spanish, German, French, Italian and Portuguese menu options.

Features

- Test certificate included for -X0, -X1
- Patented Magmeter technology*
- No moving parts
- Bi-directional flow
- Empty pipe detection
- Installs into pipe sizes DN15 to DN900 (0.5 to 36 in.)
- Operating range 0.05 to 10 m/s (0.15 to 33 ft/s)
- Accurate measurement even in dirty liquids
- Polypropylene or PVDF retaining nuts
- Blind 4 to 20 mA, digital (S³L), frequency, relay output
- No pressure drop
- Corrosion resistant materials; PP or PVDF with SS, Hastelloy-C, or Titanium
- Multi-language display menu available



Applications

- Chemical Processing
- Water and Wastewater Monitoring
- Metal Recovery and Landfill Leachate
- Commercial Pools, Spas, and Aquariums
- HVAC
- Irrigation
- Scrubber Control
- Neutralization Systems
- Industrial Water Distribution

* U.S. Patent No: 7,055,396 B1

Specifications

General			
Operating Range	0.05 to 10 m/s	0.15 to 33 ft/s	
Pipe Size Range	DN15 to DN900	½ in. to 36 in.	
Linearity	± 1% reading plus 0.1% of full scale		
Repeatability	±0.5% of reading @ 25 °C (77 °F)		
Minimum Conductivity	20 µS/cm		
Wetted Materials			
Sensor Body/Electrodes and Grounding Ring	-P0, -P1, -P2: PP/316L SS		
	-T0, -T1, -T2: PVDF/Titanium		
	-V0, -V1, -V2: PVDF/Hastelloy-C		
O-rings	FPM (standard) EPR (EPDM), FFKM (optional)		
Case	PBT		
Display Window	Polyamide (transparent nylon)		
Protection Rating	NEMA 4X/IP65		
Electrical			
Power Requirements	4 to 20 mA	24 VDC ±10%, regulated, 22.1 mA max.	
	Frequency	5 to 24 VDC ±10%, regulated, 15 mA max.	
	Digital (S ³ L)	5 to 6.5 VDC, 15 mA max.	
Auxiliary (only required for units with relays)	9 to 24 VDC, 0.4 A max.		
Reverse Polarity and Short Circuit Protected			
Current Output 4 to 20 mA	Loop Accuracy	32 µA max. error (25 °C @ 24 VDC)	
	Isolation	Low voltage < 48 VAC/DC from electrodes and auxiliary power	
	Maximum Cable	300 m (1000 ft)	
	Error condition	22.1 mA	
	Max. Loop Resistance	300 Ω	
	Compatible with PLC, PC or similar equipment		
	4 to 20 mA load needed		
Frequency Output	Output Modes	Freq., or Mirror Relay (display version only)	
	Max. Pull-up Voltage	30 VDC	
	Max. Current Sink	50 mA, current limited	
	Maximum Cable	300 m (1000 ft)	
	Compatible with Signet Model 8550, 8900, 9900, 9900-1BC		
Digital (S ³ L) Output	Serial ASCII, TTL level 9600 bps		
	Compatible with Model Signet 8900 controller		
Relay Specifications			
#1, #2 Type	Mechanical SPDT		
Rating	5 A @ 30 VDC max., 5 A @ 250 VDC max.		
#3 Type	Solid State		
	50 mA @ 30 VDC, 50 mA @ 42 VAC		
Hysteresis	User adjustable for exiting alarm condition		
Alarm On Trigger Delay	Adjustable (0 to 9999.9 sec.)		
Relay Modes	Off, Low, High, Window, and Proportional Pulse		
Relay Source	Flow Rate, Resettable Totalizer		
Error Condition	Selectable; Fail Open or Closed		
Display			
Characters	2 x 16		
Contrast	User-set in four levels		
Backlighting (only on relay versions)	Requires external 9-24 VDC, 0.4 mA max.		
Max. Temperature/Pressure Rating			
Storage Temperature	-20 °C to 70 °C		-4 °F to 158 °F
Relative Humidity	0 to 95% (non-condensing)		
Operating Temperature	Ambient	-10 °C to 70 °C	14 °F to 158 °F
	Media	0 °C to 85 °C	32 °F to 185 °F
Maximum Operating Pressure	10.3 bar @ 25 °C		150 psi @ 77 °F
	1.4 bar @ 85 °C		20 psi @ 185 °F
Shipping Weight			
	0.680 kg	1.50 lb	
Standards and Approvals			
CE, FCC, UL, CUL (for display versions with relays)			
RoHS compliant, China RoHS			
NEMA 4X / IP65 Enclosure (with cap installed)			
Manufactured under ISO 9001 for Quality and ISO 14001 for Environmental Management and OHSAS 18001 for Occupational Health and Safety			

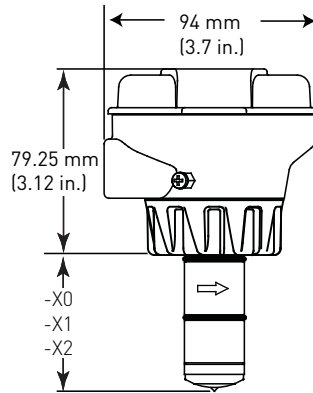
Dimensions

Pipe Range

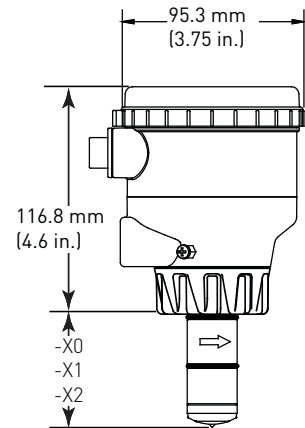
1/2 to 4 in.	-X0 = 58 mm (2.3 in.)
5 to 8 in.	-X1 = 91 mm (3.6 in.)
10 to 36 in.	-X2 = 167 mm (6.6 in.)

X = Sensor Body P, T, or V

Blind version



Display version



System Overview

Stand-Alone	Panel Mount	Field Mount - Pipe, Tank, Wall	4 to 20 mA Input
Signet Model 2551 Magmeter 	Signet Instruments 8550 8900 9900 9900-1BC 	Signet Instruments 8550 9900 with 3-8050 Universal Mount Kit 	Customer Supplied Chart Recorder or Programmable Logic Controller
Signet 2551 Magmeter 			
Signet Fittings 			

All sold separately

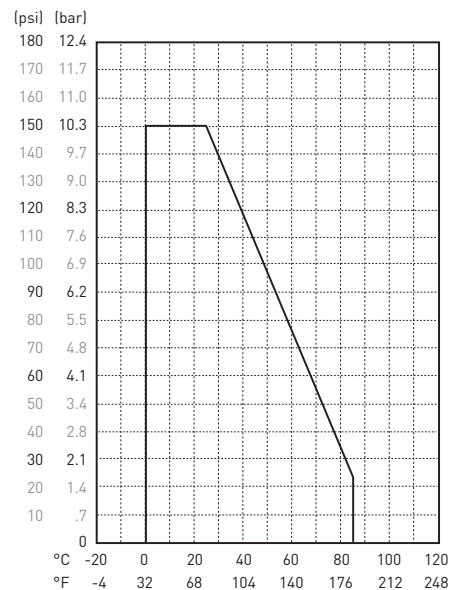
Operating Temperature/Pressure Graphs

Note:

The pressure/temperature graphs are specifically for the Signet sensor. During system design the specifications of all components must be considered. In the case of a metal piping system, a plastic sensor will reduce the system specification. When using a PVDF sensor in a PVC piping system, the fitting will reduce the system specification.

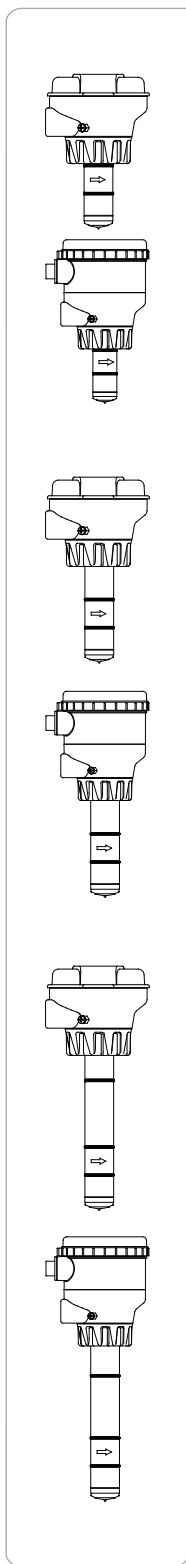
Application Tips

- Note minimum process liquid conductivity requirement is 20 $\mu\text{s}/\text{cm}$.
- Install sensor using standard Signet installation fittings for best results.
- Sensor is capable of retrofitting into existing 515 and 2536 fittings.



Please refer to Wiring, Installation, and Accessories sections for more information.

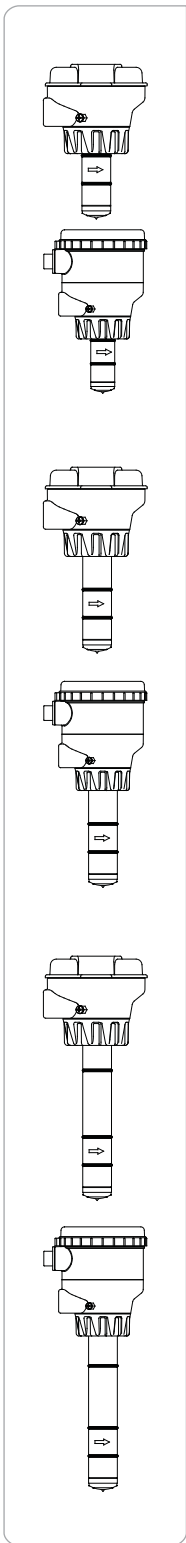
Ordering Information



Pipe Size	Mfr. Part No.	Code	Sensor Body
Frequency or Digital (S²L) output			
programmable open collector for use with any Signet Flow Instrument or the 8900 or 9900 Instruments**			
DN15 to DN100 (½ to 4 in.)			
No Display			
	3-2551-P0-11	159 001 105	Polypropylene and 316L SS
	3-2551-T0-11	159 001 108	PVDF and Titanium
	3-2551-V0-11	159 001 257	PVDF and Hastelloy-C
with Display, two SPDT relays, one solid state relay			
	3-2551-P0-21	159 001 267	Polypropylene and 316L SS
	3-2551-T0-21	159 001 436	PVDF and Titanium
	3-2551-V0-21	159 001 269	PVDF and Hastelloy-C
with display			
	3-2551-P0-41	159 001 261	Polypropylene and 316L SS
	3-2551-T0-41	159 001 433	PVDF and Titanium
	3-2551-V0-41	159 001 263	PVDF and Hastelloy-C
DN125 to DN200 (5 to 8 in.)			
No Display			
	3-2551-P1-11	159 001 106	Polypropylene and 316L SS
	3-2551-T1-11	159 001 109	PVDF and Titanium
	3-2551-V1-11	159 001 258	PVDF and Hastelloy-C
with Display, two SPDT relays, one solid state relay			
	3-2551-P1-21	159 001 268	Polypropylene and 316L SS
	3-2551-T1-21	159 001 437	PVDF and Titanium
	3-2551-V1-21	159 001 270	PVDF and Hastelloy-C
with Display			
	3-2551-P1-41	159 001 262	Polypropylene and 316L SS
	3-2551-T1-41	159 001 434	PVDF and Titanium
	3-2551-V1-41	159 001 264	PVDF and Hastelloy-C
DN250 to DN900 (10 to 36 in.)			
No Display			
	3-2551-P2-11	159 001 107	Polypropylene and 316L SS
	3-2551-T2-11	159 001 448	PVDF and Titanium
	3-2551-V2-11	159 001 450	PVDF and Hastelloy-C
with Display, two SPDT relays, one solid state relay			
	3-2551-P2-21	159 001 435	Polypropylene and 316L SS
	3-2551-T2-21	159 001 454	PVDF and Titanium
	3-2551-V2-21	159 001 456	PVDF and Hastelloy-C
with Display			
	3-2551-P2-41	159 001 432	Polypropylene and 316L SS
	3-2551-T2-41	159 001 460	PVDF and Titanium
	3-2551-V2-41	159 001 462	PVDF and Hastelloy-C

**This option is a programmable open collector output that is available with display versions only.

Ordering Information (continued)



Pipe Size	Mfr. Part No.	Code	Sensor Body
4 to 20 mA output for use with PLC, PC or similar equipment			
DN15 to DN100 (½ to 4 in.)			
No Display			
	3-2551-P0-12	159 001 110	Polypropylene and 316L SS
	3-2551-T0-12	159 001 113	PVDF and Titanium
	3-2551-V0-12	159 001 259	PVDF and Hastelloy-C
with Display, two SPDT relays, one solid state relay			
	3-2551-P0-22	159 001 273	Polypropylene and 316L SS
	3-2551-T0-22	159 001 439	PVDF and Titanium
	3-2551-V0-22	159 001 275	PVDF and Hastelloy-C
with Display			
	3-2551-P0-42	159 001 279	Polypropylene and 316L SS
	3-2551-T0-42	159 001 442	PVDF and Titanium
	3-2551-V0-42	159 001 281	PVDF and Hastelloy-C
DN125 to DN200 (5 to 8 in.)			
No Display			
	3-2551-P1-12	159 001 111	Polypropylene and 316L SS
	3-2551-T1-12	159 001 114	PVDF and Titanium
	3-2551-V1-12	159 001 260	PVDF and Hastelloy-C
with Display, two SPDT relays, one solid state relay			
	3-2551-P1-22	159 001 274	Polypropylene and 316L SS
	3-2551-T1-22	159 001 440	PVDF and Titanium
	3-2551-V1-22	159 001 276	PVDF and Hastelloy-C
with Display			
	3-2551-P1-42	159 001 280	Polypropylene and 316L SS
	3-2551-T1-42	159 001 443	PVDF and Titanium
	3-2551-V1-42	159 001 282	PVDF and Hastelloy-C
DN250 to DN900 (10 to 36 in.)			
No Display			
	3-2551-P2-12	159 001 112	Polypropylene and 316L SS
	3-2551-T2-12	159 001 449	PVDF and Titanium
	3-2551-V2-12	159 001 451	PVDF and Hastelloy-C
with Display, two SPDT relays, one solid state relay			
	3-2551-P2-22	159 001 438	Polypropylene and 316L SS
	3-2551-T2-22	159 001 455	PVDF and Titanium
	3-2551-V2-22	159 001 457	PVDF and Hastelloy-C
with Display			
	3-2551-P2-42	159 001 441	Polypropylene and 316L SS
	3-2551-T2-42	159 001 461	PVDF and Titanium
	3-2551-V2-42	159 001 463	PVDF and Hastelloy-C

Accessories and Replacement Parts

Mfr. Part No.	Code	Description
O-Rings		
1220-0021	198 801 000	O-ring, FPM (2 required per sensor)
1224-0021	198 820 006	O-ring, EPR (EPDM) (2 required per sensor)
1228-0021	198 820 007	O-ring, FFPM (2 required per sensor)
Replacement Transducers		
3-2551-P0	159 001 211	PP/316L SS, DN15 to DN100 (½ to 4 in.) pipe
3-2551-P1	159 001 212	PP/316L SS, DN125 to DN200 (5 to 8 in.) pipe
3-2551-P2	159 001 444	PP/316L SS, DN250 to DN900 (10 to 36 in.) pipe
3-2551-T0	159 001 213	PVDF/Titanium, DN15 to DN100 (½ to 4 in.) pipe
3-2551-T1	159 001 214	PVDF/Titanium, DN125 to DN200 (5 to 8 in.) pipe
3-2551-T2	159 001 445	PVDF/Titanium, DN250 to DN900 (10 to 36 in.) pipe
3-2551-V0	159 001 376	PVDF/Hastelloy-C, DN15 to DN100 (½ to 4 in.) pipe
3-2551-V1	159 001 377	PVDF/Hastelloy-C, DN125 to DN200 (5 to 8 in.) pipe
3-2551-V2	159 001 446	PVDF/Hastelloy-C, DN250 to DN900 (10 to 36 in.) pipe
Replacement Electronics Module		
3-2551-11	159 001 215	Magmeter electronics, frequency or digital (S ³ L) output
3-2551-12	159 001 216	Magmeter electronics, 4 to 20 mA output
3-2551-21	159 001 372	Magmeter display electronics, frequency or digital (S ³ L) output, with relays
3-2551-22	159 001 373	Magmeter display electronics, 4 to 20 mA output w/relays
3-2551-41	159 001 374	Magmeter display electronics, frequency or digital (S ³ L) output
3-2551-42	159 001 375	Magmeter display electronics, 4 to 20 mA output
Other		
P31536	198 840 201	Sensor plug, Polypropylene
7310-1024	159 873 004	24 VDC Power Supply, 0.42 A, 10W
7310-2024	159 873 005	24 VDC Power Supply, 1.0 A , 24W
7310-4024	159 873 006	24 VDC Power Supply, 1.7 A, 40W
7310-6024	159 873 007	24 VDC Power Supply, 2.5 A, 60W
7310-7024	159 873 008	24 VDC Power Supply, 4.0 A, 96W
3-8050.390-1	159 001 702	Retaining Nut Replacement Kit, NPT, Valox
3-8050.390-3	159 310 116	Retaining Nut Replacement Kit, NPT, PP
3-8050.390-4	159 310 117	Retaining Nut Replacement Kit, NPT, PVDF
3-8551.521	159 001 378	Clear plastic cap for display
1222-0042	159 001 379	O-ring for clear plastic cap, EPR (EPDM)
3-0250	159 001 538	USB to digital (S ³ L) Configuration/Diagnostic tool



Fliteway Technologies, Inc.

**Level
Instrumentation**

2129 E. Birchwood Avenue
Cudahy, WI 53110

Office: (414) 483-5600 Fax: (414) 483-1957

Specialty Switches – Continued

Portable Level Switch — Integral Mounting Magnet



Precisely monitors liquid level and is ideal for controlling filling operations and preventing overflows. Permanent magnet attaches unit securely to steel tank wall at exact level required.

LS-750 Series — Weighted for Suspension Cable



With a compact-sized float, slosh shield and weighted collar, the LS-750 provides liquid level detection for a wide variety of applications. Suspend in stand pipes or sumps for leak detection duty, or drop into wells for ground-water monitoring. Supplied with 25 feet of waterproof cable.

U.L. Recognized—
File No. E-45168.
CSA Listed-File No.
LR-30200.

LS-700F Series



Overfill Protection for Refrigerant Tanks. The LS-700F enables safe compliance with EPA directives to recover refrigerants. These units are designed to fit standard 30# and 50# D.O.T. approved refrigerant tanks. They provide 80% full shutoff capability when used as an integral part of a recovery system.

U.L. Recognized—
File No. SA8857.
CSA Listed-File No.
LR-30200-31.

Dimensions

Portable Level Switch	LS-750	LS-700F
SJO, 18/2 10'L., Neoprene	22 AWG, 2-Wire Cable	3- or 4-Pin, Quick-Connect Receptacle

t_L = Switch actuation level. In liquid with specific gravity of 1.0, switch actuation is approximately half the distance from end of stem to mounting, or at the halfway point of float travel.

How To Order — Select Part Number based on specifications required.

Series	Material			Min. Liquid Sp. Gr.	Operating Temperature	Pressure PSI, Max.	Switch*	Electrical Termination Option	Part Number
	Stem and Mounting	Float	Other Wetted						
Portable	Brass	Buna N	Aluminum, 316 S.S.	.85	Oil: -40°F to +230°F (-40°C to +110°C) Water: to 180°F (82°C)	10	SPST, 20 VA N.O., Dry	—	15208
LS-750	Brass	Buna N	Nylon, PVC, Beryllium Copper	.45		150	SPST, 20 VA N.C., Dry	PVC Cable Jacket	149350 ⚡
	316 S.S.**	316 S.S.	PVDF, Viton®	.65	-40°F to 212°F (-40°C to +100°C)	375	SPST, 10 VA N.C., Dry	Teflon® Cable Jacket	197433
LS-700F	Brass	304 S.S.	—	.98	-40°F to +221°F (-40°C to +105°C)	400	SPST, 20 VA N.C., Dry	3-Pin	128500 ⚡
								4-Pin	144900 ⚡

*See "Electrical Data" on Page X-5 for more information.

⚡ – Stock Items.

** Stainless steel is generally recognized as safe (GRAS) with FDA for food contact regulations.

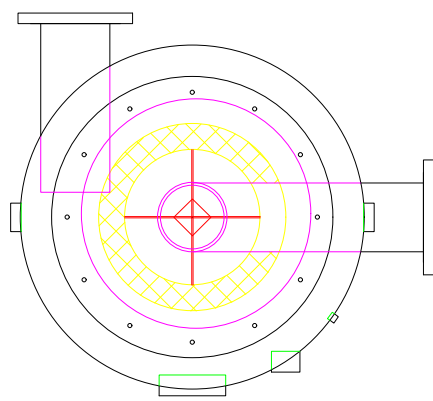
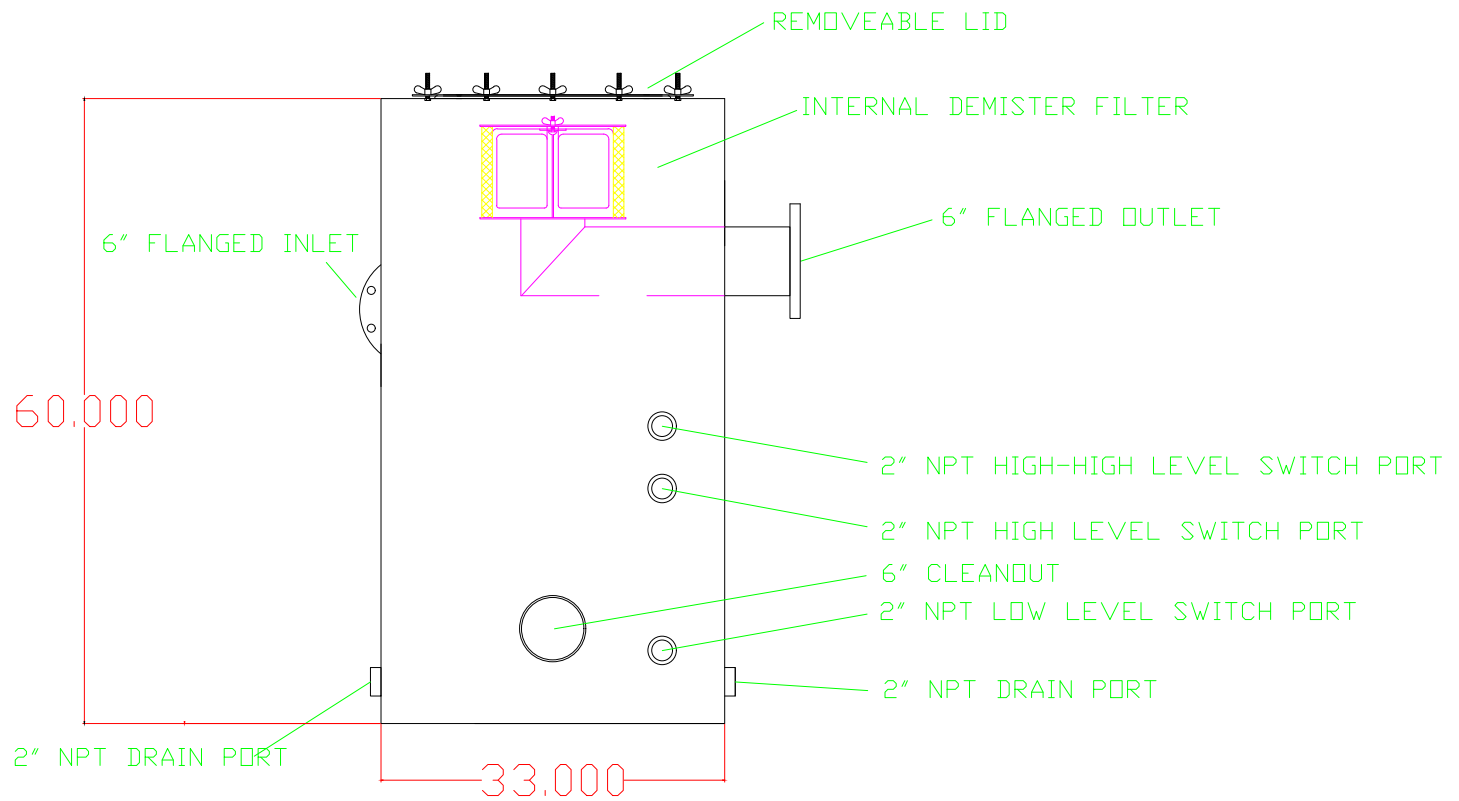


Fliteway Technologies, Inc.

Knockout Tank

2129 E. Birchwood Avenue
Cudahy, WI 53110

Office: (414) 483-5600 Fax: (414) 483-1957



WIRE MESH DEMISTER FILTER

- NOMINAL CAPACITY 1,100 ACFM
- CLEAN ELEMENT PRESSURE DROP 1.6" WC AT 100% OF RATED FLOW
- MAX. OPERATING TEMPERATURE 200° F
- EFFICIENCY 93% AT 10 MICRONS

THIS DRAWING IS THE PROPERTY OF Fliteway Technologies, Inc 2129 EAST BIRCHWOOD AVE CUDAHY WI, 53110 414.483.5600 414.483.1957 AND IS NOT TO BE REPRODUCED WITHOUT WRITTEN PERMISSION	220 GALLON K.O. TANK		
	FLITEWAY		
9/27/18	SIZE	FSCM NO.	DWG NO.
	SCALE NONE		SHEET 1 OF 1

APPENDIX C

SVE System Laboratory Reports



EnvisionAir
1441 Sadler Circle West Drive
Indianapolis, IN 46239
Ph: 317-351-0885
Fax: 317-351-0882
www.envision-air.com

Mr. Rob Hoverman
Enviroforensics
N16 W. 23390 Stone Ridge Dr
Suite G
Waukesha, WI 53188

January 28, 2020

EnvisionAir Project Number: 2020-35
Client Project Name: 6492

Dear Mr. Hoverman,

Please find the attached analytical report for the samples received January 20, 2020. All test methods performed were fully compliant with local, state, and federal EPA methods unless otherwise noted. The project was analyzed as requested on the enclosed chain of custody record. Please review the comments section for additional information about your results or Quality Control data.

Feel free to contact me if you have any questions or comments regarding your analytical report or service.

Thank you for your business. EnvisionAir looks forward to working with you on your next project.

Yours Sincerely,

A handwritten signature in black ink that reads "Stanley A. Hunnicutt".

Stanley A Hunnicutt

Project Manager
EnvisionAir, LLC



EnvisionAir
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Client Name: ENVIROFORENSICS
Project ID: 6492
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-35

Sample Summary

Canister Pressure / Vacuum

<u>Laboratory Sample Number:</u>	<u>Sample Description:</u>	<u>Matrix:</u>	<u>START</u>	<u>START</u>	<u>End Date</u>	<u>End Time</u>	<u>Date</u>	<u>Time</u>	<u>Canister Pressure / Vacuum</u>		<u>Lab</u>
			<u>Date</u>	<u>Time</u>					<u>Initial Field</u>	<u>Final Field</u>	
			<u>Collected:</u>	<u>Collected:</u>	<u>Collected:</u>	<u>Collected:</u>	<u>Received:</u>	<u>Received:</u>	<u>(in. Hg)</u>	<u>(in. Hg)</u>	<u>(in. Hg)</u>
20-172	6492-SVE-EX	A	1/14/20	15:38	1/14/20	15:43	1/20/20	10:30	-29	-3	-3
20-173	6492-SVE-EX	A	1/15/20	10:57	1/15/20	11:02	1/20/20	10:30	-29	-3	-3
20-174	6492-SVE-EX	A	1/16/20	12:30	1/16/20	12:35	1/20/20	10:30	-28	-5	-5



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Client Name: ENVIROFORENSICS

Project ID: 6492

Client Project Manager: ROB HOVERMAN

EnvisionAir Project Number: 2020-35

Analytical Method: TO-15
Analytical Batch: 012420AIR(1)

Client Sample ID: 6492-SVE-EX

Sample Collection START Date/Time: 1/14/20 15:38
Sample Collection END Date/Time: 1/14/20 15:43
Sample Received Date/Time: 1/20/20 10:30

EnvisionAir Sample Number: 20-172
Sample Matrix: AIR

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
4-Ethyltoluene	< 4920	4920	
4-Methyl-2-pentanone (MIBK)	< 20500	20500	
1,1,1-Trichloroethane	< 5460	5460	
1,1,2,2-Tetrachloroethane	< 3.36	3.36	1
1,1,2-Trichloroethane	< 2.10	2.10	1
1,1-Dichloroethane	< 40.5	40.5	
1,1-Dichloroethene	< 1980	1980	
1,2,4-Trichlorobenzene	< 7.42	7.42	
1,2,4-Trimethylbenzene	< 49.2	49.2	
1,2-dibromoethane (EDB)	< 0.32	0.32	1
1,2-Dichlorobenzene	< 601	601	
1,2-Dichloroethane	< 4.05	4.05	
1,2-Dichloropropane	< 4.62	4.62	
1,3,5-Trimethylbenzene	< 49.2	49.2	
1,3-Butadiene	< 2.21	2.21	
1,3-Dichlorobenzene	< 601	601	
1,4-Dichlorobenzene	< 6.01	6.01	
1,4-Dioxane	< 18.0	18.0	
2-Butanone (MEK)	< 29500	29500	
2-Hexanone	< 205	205	
Acetone	< 23800	23800	
Benzene	< 16.0	16.0	
Benzyl Chloride	< 4.14	4.14	1
Bromodichloromethane	< 5.36	5.36	1
Bromoform	< 103	103	
Bromomethane	< 38.8	38.8	
Carbon Disulfide	< 3110	3110	
Carbon Tetrachloride	< 6.29	6.29	
Chlorobenzene	< 230	230	
Chloroethane	< 132	132	



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<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
Chloroform	< 8.30	8.30	
Chloromethane	< 206	206	
cis-1,2-Dichloroethene	< 198	198	
cis-1,3-Dichloropropene	< 45.4	45.4	
Cyclohexane	< 55100	55100	
Dibromochloromethane	< 8.52	8.52	
Dichlorodifluoromethane	< 495	495	
Ethyl Acetate	< 541	541	
Ethylbenzene	< 86.8	86.8	
Hexachloro-1,3-butadiene	< 10.7	10.7	
Isooctane	< 4670	4670	
m,p-Xylene	< 434	434	
Methylene Chloride	< 417	417	
Methyl-tert-butyl ether	< 361	361	
N-Heptane	< 4100	4100	
N-Hexane	< 1760	1760	
o-Xylene	< 434	434	
Propylene	< 1720	1720	
Styrene	< 4260	4260	
Tetrachloroethene	63,000	2550	2
Tetrahydrofuran	< 2950	2950	
Toluene	< 37700	37700	
trans-1,2-Dichloroethene	< 396	396	
trans-1,3-Dichloropropene	< 45.4	45.4	
Trichloroethene	37.1	10.7	
Trichlorofluoromethane	< 5620	5620	
Vinyl Acetate	< 1760	1760	
Vinyl Bromide	< 4.37	4.37	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	92%		
Analysis Date/Time:	1-27-20/01:31		
Analyst Initials	tjg		



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Client Name: ENVIROFORENSICS

Project ID: 6492

Client Project Manager: ROB HOVERMAN

EnvisionAir Project Number: 2020-35

Analytical Method: TO-15
Analytical Batch: 012420AIR(2)

Client Sample ID: 6492-SVE-EX

EnvisionAir Sample Number: 20-173
Sample Matrix: AIR

Sample Collection START Date/Time: 1/15/20 10:57
Sample Collection END Date/Time: 1/15/20 11:02
Sample Received Date/Time: 1/20/20 10:30

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
4-Ethyltoluene	< 4920	4920	
4-Methyl-2-pentanone (MIBK)	< 20500	20500	
1,1,1-Trichloroethane	< 5460	5460	
1,1,2,2-Tetrachloroethane	< 3.36	3.36	1
1,1,2-Trichloroethane	< 2.10	2.10	1
1,1-Dichloroethane	< 40.5	40.5	
1,1-Dichloroethene	< 1980	1980	
1,2,4-Trichlorobenzene	< 7.42	7.42	
1,2,4-Trimethylbenzene	< 49.2	49.2	
1,2-dibromoethane (EDB)	< 0.32	0.32	1
1,2-Dichlorobenzene	< 601	601	
1,2-Dichloroethane	< 4.05	4.05	
1,2-Dichloropropane	< 4.62	4.62	
1,3,5-Trimethylbenzene	< 49.2	49.2	
1,3-Butadiene	< 2.21	2.21	
1,3-Dichlorobenzene	< 601	601	
1,4-Dichlorobenzene	< 6.01	6.01	
1,4-Dioxane	< 18.0	18.0	
2-Butanone (MEK)	< 29500	29500	
2-Hexanone	< 205	205	
Acetone	< 23800	23800	
Benzene	< 16.0	16.0	
Benzyl Chloride	< 4.14	4.14	1
Bromodichloromethane	< 5.36	5.36	1
Bromoform	< 103	103	
Bromomethane	< 38.8	38.8	
Carbon Disulfide	< 3110	3110	
Carbon Tetrachloride	< 6.29	6.29	
Chlorobenzene	< 230	230	
Chloroethane	< 132	132	



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<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
Chloroform	< 8.30	8.30	
Chloromethane	< 206	206	
cis-1,2-Dichloroethene	< 198	198	
cis-1,3-Dichloropropene	< 45.4	45.4	
Cyclohexane	< 55100	55100	
Dibromochloromethane	< 8.52	8.52	
Dichlorodifluoromethane	< 495	495	
Ethyl Acetate	< 541	541	
Ethylbenzene	< 86.8	86.8	
Hexachloro-1,3-butadiene	< 10.7	10.7	
Isooctane	< 4670	4670	
m,p-Xylene	< 434	434	
Methylene Chloride	< 417	417	
Methyl-tert-butyl ether	< 361	361	
N-Heptane	< 4100	4100	
N-Hexane	< 1760	1760	
o-Xylene	< 434	434	
Propylene	< 1720	1720	
Styrene	< 4260	4260	
Tetrachloroethene	82,300	2550	2
Tetrahydrofuran	< 2950	2950	
Toluene	< 37700	37700	
trans-1,2-Dichloroethene	< 396	396	
trans-1,3-Dichloropropene	< 45.4	45.4	
Trichloroethene	26.3	10.7	
Trichlorofluoromethane	< 5620	5620	
Vinyl Acetate	< 1760	1760	
Vinyl Bromide	< 4.37	4.37	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	95%		
Analysis Date/Time:	1-27-20/10:40		
Analyst Initials	tjg		



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Client Name: ENVIROFORENSICS

Project ID: 6492

Client Project Manager: ROB HOVERMAN

EnvisionAir Project Number: 2020-35

Analytical Method: TO-15
Analytical Batch: 012420AIR(2)

Client Sample ID: 6492-SVE-EX

EnvisionAir Sample Number: 20-174
Sample Matrix: AIR

Sample Collection START Date/Time: 1/16/20 12:30
Sample Collection END Date/Time: 1/16/20 12:35
Sample Received Date/Time: 1/20/20 10:30

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
4-Ethyltoluene	< 4920	4920	
4-Methyl-2-pentanone (MIBK)	< 20500	20500	
1,1,1-Trichloroethane	< 5460	5460	
1,1,2,2-Tetrachloroethane	< 3.36	3.36	1
1,1,2-Trichloroethane	< 2.10	2.10	1
1,1-Dichloroethane	< 40.5	40.5	
1,1-Dichloroethene	< 1980	1980	
1,2,4-Trichlorobenzene	< 7.42	7.42	
1,2,4-Trimethylbenzene	< 49.2	49.2	
1,2-dibromoethane (EDB)	< 0.32	0.32	1
1,2-Dichlorobenzene	< 601	601	
1,2-Dichloroethane	< 4.05	4.05	
1,2-Dichloropropane	< 4.62	4.62	
1,3,5-Trimethylbenzene	< 49.2	49.2	
1,3-Butadiene	< 2.21	2.21	
1,3-Dichlorobenzene	< 601	601	
1,4-Dichlorobenzene	< 6.01	6.01	
1,4-Dioxane	< 18.0	18.0	
2-Butanone (MEK)	< 29500	29500	
2-Hexanone	< 205	205	
Acetone	< 23800	23800	
Benzene	< 16.0	16.0	
Benzyl Chloride	< 4.14	4.14	1
Bromodichloromethane	< 5.36	5.36	1
Bromoform	< 103	103	
Bromomethane	< 38.8	38.8	
Carbon Disulfide	< 3110	3110	
Carbon Tetrachloride	< 6.29	6.29	
Chlorobenzene	< 230	230	
Chloroethane	< 132	132	



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<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
Chloroform	< 8.30	8.30	
Chloromethane	< 206	206	
cis-1,2-Dichloroethene	< 198	198	
cis-1,3-Dichloropropene	< 45.4	45.4	
Cyclohexane	< 55100	55100	
Dibromochloromethane	< 8.52	8.52	
Dichlorodifluoromethane	< 495	495	
Ethyl Acetate	< 541	541	
Ethylbenzene	< 86.8	86.8	
Hexachloro-1,3-butadiene	< 10.7	10.7	
Isooctane	< 4670	4670	
m,p-Xylene	< 434	434	
Methylene Chloride	< 417	417	
Methyl-tert-butyl ether	< 361	361	
N-Heptane	< 4100	4100	
N-Hexane	< 1760	1760	
o-Xylene	< 434	434	
Propylene	< 1720	1720	
Styrene	< 4260	4260	
Tetrachloroethene	58,200	2550	2
Tetrahydrofuran	< 2950	2950	
Toluene	< 37700	37700	
trans-1,2-Dichloroethene	< 396	396	
trans-1,3-Dichloropropene	< 45.4	45.4	
Trichloroethene	18.8	10.7	
Trichlorofluoromethane	< 5620	5620	
Vinyl Acetate	< 1760	1760	
Vinyl Bromide	< 4.37	4.37	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	105%		
Analysis Date/Time:	1-27-20/11:59		
Analyst Initials	tjg		

TO-15 Quality Control Data

EnvisionAir Batch Number: 012420AIR(1)

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
4-Ethyltoluene	< 100	100	
4-Methyl-2-pentanone (MIBK)	< 500	500	
1,1,1-Trichloroethane	< 100	100	
1,1,1,2-Tetrachloroethane	< 0.049	0.049	1
1,1,2-Trichloroethane	< 0.038	0.038	1
1,1-Dichloroethane	< 1	1	
1,1-Dichloroethene	< 50	50	
1,2,4-Trichlorobenzene	< 0.1	0.1	
1,2,4-Trimethylbenzene	< 1	1	
1,2-dibromoethane (EDB)	< 0.0041	0.0041	1
1,2-Dichlorobenzene	< 10	10	
1,2-Dichloroethane	< 0.1	0.1	
1,2-Dichloropropane	< 0.1	0.1	
1,3,5-Trimethylbenzene	< 1	1	
1,3-Butadiene	< 0.1	0.1	
1,3-Dichlorobenzene	< 10	10	
1,4-Dichlorobenzene	< 0.1	0.1	
1,4-Dioxane	< 0.5	0.5	
2-Butanone (MEK)	< 1000	1000	
2-Hexanone	< 5	5	
Acetone	< 1000	1000	
Benzene	< 0.5	0.5	
Benzyl Chloride	< 0.08	0.08	1
Bromodichloromethane	< 0.08	0.08	1
Bromoform	< 1	1	
Bromomethane	< 1	1	
Carbon Disulfide	< 100	100	
Carbon Tetrachloride	< 0.1	0.1	
Chlorobenzene	< 5	5	
Chloroethane	< 5	5	
Chloroform	< 0.17	0.17	
Chloromethane	< 10	10	
cis-1,2-Dichloroethene	< 5	5	
cis-1,3-Dichloropropene	< 1	1	
Cyclohexane	< 1600	1600	
Dibromochloromethane	< 0.1	0.1	
Dichlorodifluoromethane	< 10	10	
Ethyl Acetate	< 15	15	
Ethylbenzene	< 2	2	
Hexachloro-1,3-butadiene	< 0.1	0.1	
Isooctane	< 100	100	
m,p-Xylene	< 10	10	
Methylene Chloride	< 12	12	
Methyl-tert-butyl ether	< 10	10	
N-Heptane	< 100	100	
N-Hexane	< 50	50	
o-Xylene	< 10	10	
Propylene	< 100	100	
Styrene	< 100	100	
Tetrachloroethene	< 0.47	0.47	
Tetrahydrofuran	< 100	100	

Analytical Report

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
Toluene	< 1000	1000	
trans-1,2-Dichloroethene	< 10	10	
trans-1,3-Dichloropropene	< 1	1	
Trichloroethene	< 0.2	0.2	
Trichlorofluoromethane	< 100	100	
Vinyl Acetate	< 50	50	
Vinyl Bromide	< 0.1	0.1	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	96%		
Analysis Date/Time:	1-26-20/07:06		
Analyst Initials	tjg		

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D</u>	<u>LCS</u>	<u>LCSD</u>	<u>RPD</u>	<u>Flag</u>
			<u>Conc(ppbv)</u>	<u>Rec.</u>	<u>Rec.</u>		
Propylene	9.29	10.1	10	93%	101%	8.4%	
Dichlorodifluoromethane	9.56	11	10	96%	110%	14.0%	
Chloromethane	8.76	9.41	10	88%	94%	7.2%	
Vinyl Chloride	9.6	10.7	10	96%	107%	10.8%	
1,3-Butadiene	8.93	8.59	10	89%	86%	3.9%	
Bromomethane	9.45	8.42	10	95%	84%	11.5%	
Chloroethane	9.26	8.15	10	93%	82%	12.8%	
Vinyl Bromide	8.85	9.26	10	89%	93%	4.5%	
Trichlorofluoromethane	8.99	9.35	10	90%	94%	3.9%	
Acetone	9.95	10.5	10	100%	105%	5.4%	
1,1-Dichloroethene	9.22	9.52	10	92%	95%	3.2%	
Methylene Chloride	9.82	9.5	10	98%	95%	3.3%	
Carbon Disulfide	9.57	10.6	10	96%	106%	10.2%	
trans-1,2-Dichloroethene	9.43	10	10	94%	100%	5.9%	
Methyl-tert-butyl ether	8.34	9.02	10	83%	90%	7.8%	
1,1-Dichloroethane	10.3	11	10	103%	110%	6.6%	
Vinyl Acetate	10.9	11.6	10	109%	116%	6.2%	
N-Hexane	10.7	10.9	10	107%	109%	1.9%	
2-Butanone (MEK)	11.1	11.6	10	111%	116%	4.4%	
cis-1,2-Dichloroethene	10.7	11.1	10	107%	111%	3.7%	
Ethyl Acetate	10.4	10.5	10	104%	105%	1.0%	
Chloroform	9.53	9.77	10	95%	98%	2.5%	
Tetrahydrofuran	10	10.1	10	100%	101%	1.0%	
1,2-Dichloroethane	8.96	9.36	10	90%	94%	4.4%	
1,1,1-Trichloroethane	8.55	8.84	10	86%	88%	3.3%	
Carbon Tetrachloride	8.69	8.99	10	87%	90%	3.4%	
Benzene	9.39	9.4	10	94%	94%	0.1%	
Cyclohexane	8.77	9.04	10	88%	90%	3.0%	
1,2-Dichloropropane	9.71	9.78	10	97%	98%	0.7%	
Trichloroethene	9.86	9.96	10	99%	100%	1.0%	
Bromodichloromethane	9.31	9.34	10	93%	93%	0.3%	
1,4-Dioxane	10.1	9.07	10	101%	91%	10.7%	
Isooctane	9.29	9.46	10	93%	95%	1.8%	
N-Heptane	9.07	9.33	10	91%	93%	2.8%	
cis-1,3-Dichloropropene	9.92	9.91	10	99%	99%	0.1%	
4-Methyl-2-pentanone (MIBK)	9.43	10.4	10	94%	104%	9.8%	
trans-1,3-Dichloropropene	9.26	9.46	10	93%	95%	2.1%	
1,1,2-Trichloroethane	9.01	9.09	10	90%	91%	0.9%	
Toluene	9.54	9.61	10	95%	96%	0.7%	
2-Hexanone	9.34	9.8	10	93%	98%	4.8%	
Dibromochloromethane	9.63	9.94	10	96%	99%	3.2%	
1,2-dibromoethane (EDB)	10.4	10.8	10	104%	108%	3.8%	
Tetrachloroethene	10.6	11	10	106%	110%	3.7%	
Chlorobenzene	9.78	10.2	10	98%	102%	4.2%	
Ethylbenzene	9.73	10	10	97%	100%	2.7%	
m,p-Xylene	20	21.1	20	100%	106%	5.4%	
Bromoform	11.1	11.4	10	111%	114%	2.7%	

Analytical Report

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D</u> <u>Conc(ppbv)</u>	<u>LCS</u> <u>Rec.</u>	<u>LCSD</u> <u>Rec.</u>	<u>RPD</u>	<u>Flag</u>
Styrene	10.3	10.7	10	103%	107%	3.8%	
1,1,2,2-Tetrachloroethane	8.67	8.82	10	87%	88%	1.7%	
o-Xylene	10.1	10.5	10	101%	105%	3.9%	
4-Ethyltoluene	8.68	9.1	10	87%	91%	4.7%	
1,3,5-Trimethylbenzene	9.09	9.36	10	91%	94%	2.9%	
1,2,4-Trimethylbenzene	8.6	8.93	10	86%	89%	3.8%	
1,3-Dichlorobenzene	11.2	11.6	10	112%	116%	3.5%	
Benzyl Chloride	9.84	10.3	10	98%	103%	4.6%	
1,4-Dichlorobenzene	9.73	10.3	10	97%	103%	5.7%	
1,2-Dichlorobenzene	9.4	9.92	10	94%	99%	5.4%	
1,2,4-Trichlorobenzene	9.71	9.48	10	97%	95%	2.4%	
Hexachloro-1,3-butadiene	8.92	9.27	10	89%	93%	3.8%	
4-bromofluorobenzene (surrogate)	107%	103%					
Analysis Date/Time:	1-26-20/07:51	1-26-20/08:37					
Analyst Initials	tjg	tjg					



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Analytical Report

TO-15 Quality Control Data

EnvisionAir Batch Number: 012420AIR(2)

Method Blank (MB):	MB Results (ppbv)	Reporting Limit (ppbv)	Flags
4-Ethyltoluene	< 100	100	
4-Methyl-2-pentanone (MIBK)	< 500	500	
1,1,1-Trichloroethane	< 100	100	
1,1,1,2-Tetrachloroethane	< 0.049	0.049	1
1,1,2-Trichloroethane	< 0.038	0.038	1
1,1-Dichloroethane	< 1	1	
1,1-Dichloroethene	< 50	50	
1,2,4-Trichlorobenzene	< 0.1	0.1	
1,2,4-Trimethylbenzene	< 1	1	
1,2-dibromoethane (EDB)	< 0.0041	0.0041	1
1,2-Dichlorobenzene	< 10	10	
1,2-Dichloroethane	< 0.1	0.1	
1,2-Dichloropropane	< 0.1	0.1	
1,3,5-Trimethylbenzene	< 1	1	
1,3-Butadiene	< 0.1	0.1	
1,3-Dichlorobenzene	< 10	10	
1,4-Dichlorobenzene	< 0.1	0.1	
1,4-Dioxane	< 0.5	0.5	
2-Butanone (MEK)	< 1000	1000	
2-Hexanone	< 5	5	
Acetone	< 1000	1000	
Benzene	< 0.5	0.5	
Benzyl Chloride	< 0.08	0.08	1
Bromodichloromethane	< 0.08	0.08	1
Bromoform	< 1	1	
Bromomethane	< 1	1	
Carbon Disulfide	< 100	100	
Carbon Tetrachloride	< 0.1	0.1	
Chlorobenzene	< 5	5	
Chloroethane	< 5	5	
Chloroform	< 0.17	0.17	
Chloromethane	< 10	10	
cis-1,2-Dichloroethene	< 5	5	
cis-1,3-Dichloropropene	< 1	1	
Cyclohexane	< 1600	1600	
Dibromochloromethane	< 0.1	0.1	
Dichlorodifluoromethane	< 10	10	
Ethyl Acetate	< 15	15	
Ethylbenzene	< 2	2	
Hexachloro-1,3-butadiene	< 0.1	0.1	
Isooctane	< 100	100	
m,p-Xylene	< 10	10	
Methylene Chloride	< 12	12	
Methyl-tert-butyl ether	< 10	10	
N-Heptane	< 100	100	
N-Hexane	< 50	50	
o-Xylene	< 10	10	
Propylene	< 100	100	
Styrene	< 100	100	
Tetrachloroethene	< 0.47	0.47	
Tetrahydrofuran	< 100	100	

Analytical Report

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
Toluene	< 1000	1000	
trans-1,2-Dichloroethene	< 10	10	
trans-1,3-Dichloropropene	< 1	1	
Trichloroethene	< 0.2	0.2	
Trichlorofluoromethane	< 100	100	
Vinyl Acetate	< 50	50	
Vinyl Bromide	< 0.1	0.1	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	100%		
Analysis Date/Time:	1-27-20/05:09		
Analyst Initials	tjg		

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D</u>	<u>LCS</u>	<u>LCSD</u>	<u>RPD</u>	<u>Flag</u>
			<u>Conc(ppbv)</u>	<u>Rec.</u>	<u>Rec.</u>		
Propylene	8.62	9.26	10	86%	93%	7.2%	
Dichlorodifluoromethane	9.33	9.28	10	93%	93%	0.5%	
Chloromethane	9.83	10	10	98%	100%	1.7%	
Vinyl Chloride	9.94	10.3	10	99%	103%	3.6%	
1,3-Butadiene	8.2	9.29	10	82%	93%	12.5%	
Bromomethane	8.82	9.65	10	88%	97%	9.0%	
Chloroethane	8.47	9.18	10	85%	92%	8.0%	
Vinyl Bromide	8.81	9.1	10	88%	91%	3.2%	
Trichlorofluoromethane	10.4	10.4	10	104%	104%	0.0%	
Acetone	10.4	9.69	10	104%	97%	7.1%	
1,1-Dichloroethene	10.7	10.8	10	107%	108%	0.9%	
Methylene Chloride	8.74	8.79	10	87%	88%	0.6%	
Carbon Disulfide	11.2	11.1	10	112%	111%	0.9%	
trans-1,2-Dichloroethene	10.1	9.77	10	101%	98%	3.3%	
Methyl-tert-butyl ether	9.18	9.47	10	92%	95%	3.1%	
1,1-Dichloroethane	11.2	11.4	10	112%	114%	1.8%	
Vinyl Acetate	10.8	11.2	10	108%	112%	3.6%	
N-Hexane	11.5	11.6	10	115%	116%	0.9%	
2-Butanone (MEK)	10.1	11.2	10	101%	112%	10.3%	
cis-1,2-Dichloroethene	11.3	11.7	10	113%	117%	3.5%	
Ethyl Acetate	10.6	9.94	10	106%	99%	6.4%	
Chloroform	10.2	10.2	10	102%	102%	0.0%	
Tetrahydrofuran	9.67	10.1	10	97%	101%	4.4%	
1,2-Dichloroethane	9.34	9.64	10	93%	96%	3.2%	
1,1,1-Trichloroethane	8.95	9.41	10	90%	94%	5.0%	
Carbon Tetrachloride	9.19	9.67	10	92%	97%	5.1%	
Benzene	9.79	10.2	10	98%	102%	4.1%	
Cyclohexane	9.55	9.91	10	96%	99%	3.7%	
1,2-Dichloropropane	10.3	10.5	10	103%	105%	1.9%	
Trichloroethene	10.3	10.7	10	103%	107%	3.8%	
Bromodichloromethane	9.55	9.86	10	96%	99%	3.2%	
1,4-Dioxane	9.59	9.79	10	96%	98%	2.1%	
Isooctane	10.2	10.5	10	102%	105%	2.9%	
N-Heptane	9.61	10	10	96%	100%	4.0%	
cis-1,3-Dichloropropene	10.1	10.6	10	101%	106%	4.8%	
4-Methyl-2-pentanone (MIBK)	9.01	10.3	10	90%	103%	13.4%	
trans-1,3-Dichloropropene	9.19	9.61	10	92%	96%	4.5%	
1,1,2-Trichloroethane	9.27	9.44	10	93%	94%	1.8%	
Toluene	9.86	10.2	10	99%	102%	3.4%	
2-Hexanone	9.5	10.6	10	95%	106%	10.9%	
Dibromochloromethane	10.5	10.2	10	105%	102%	2.9%	
1,2-dibromoethane (EDB)	11.2	10.9	10	112%	109%	2.7%	
Tetrachloroethene	11.6	11.3	10	116%	113%	2.6%	
Chlorobenzene	10.7	10.4	10	107%	104%	2.8%	
Ethylbenzene	10.7	10.4	10	107%	104%	2.8%	
m,p-Xylene	22.4	22	20	112%	110%	1.8%	
Bromoform	11.9	11.6	10	119%	116%	2.6%	



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Analytical Report

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D</u> <u>Conc(ppbv)</u>	<u>LCS</u> <u>Rec.</u>	<u>LCSD</u> <u>Rec.</u>	<u>RPD</u>	<u>Flag</u>
Styrene	11.1	10.9	10	111%	109%	1.8%	
1,1,2,2-Tetrachloroethane	9.28	9.14	10	93%	91%	1.5%	
o-Xylene	11.2	11	10	112%	110%	1.8%	
4-Ethyltoluene	9.43	9.32	10	94%	93%	1.2%	
1,3,5-Trimethylbenzene	9.84	9.64	10	98%	96%	2.1%	
1,2,4-Trimethylbenzene	9.4	9.19	10	94%	92%	2.3%	
1,3-Dichlorobenzene	11.7	11.5	10	117%	115%	1.7%	
Benzyl Chloride	9.82	10.3	10	98%	103%	4.8%	
1,4-Dichlorobenzene	9.53	9.92	10	95%	99%	4.0%	
1,2-Dichlorobenzene	9.8	9.7	10	98%	97%	1.0%	
1,2,4-Trichlorobenzene	8.9	9.09	10	89%	91%	2.1%	
Hexachloro-1,3-butadiene	9.17	9.15	10	92%	92%	0.2%	
4-bromofluorobenzene (surrogate)	100%	98%					
Analysis Date/Time:	1-27-20/03:45	1-27-20/04:33					
Analyst Initials	tjg	tjg					



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Flag Number

Comments

- | | |
|---|--|
| 1 | Reporting limit is supported by MDL. TJG |
| 2 | Reported value is from an 800x dilution. TJG 1/28/20 |

CHAIN OF CUSTODY RECORD

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REQUESTED PARAMETERS

TO-15 Full List
TO-15 Short List (Specify in notes)

Sampling Type:
Soil-Gas:
Sub-Slab:
Indoor-Air:

Canister Pressure / Vacuum

Client: EnvisionAir
 Report Name or Number: N16 W23390 Stone Ridge
 Address: Whisper, WI 53188
 Report To: R. Hooverman / N.D. Duda
 Phone: 414-630-0060
 Invoice Address: Same
 P.O. Number: 2020-1241
 Project Name or Number: 6492
 Sampled by: ND
 QA/QC Required: (circle if applicable)
 Level III Level IV
 Reporting Units needed: (circle)
 ug/m³ mg/m³ PPBV PPMV
 Media type: 1LC = 1 Liter Canister
 6LC = 6 Liter Canister
 TB = Tedlar Bag
 TD = Thermal Desorption Tube
 Desired TAT: (Please Circle One)
 1 day 2 days 3 days Std (5 bus. days)

Air Sample ID	Media Type (see code above)	Coll. Date (Grab/Comp Start)	Coll. Time (Grab/Comp Start)	Coll. Date (Comp. End)	Coll. Time (Comp. End)	Canister Serial #	Flow Controller Serial #	Initial Field (in. Hg)	Final Field (in. Hg)	Lab Received (in. Hg)	EnvisionAir Sample Number
6492-SVE-EX	1LC	1-14-20	1538	1-14-20	1543	2207	0089	-29	-7	-3	20-172
6492-SVE-EX	1LC	1-15-20	1057	1-15-20	1102	83734	0018	-29	-7	-3	20-173
6492-SVE-EX	1LC	1-16-20	1230	1-16-20	1235	2212	0041	-20	-5	-5	20-174

Comments:

Relinquished by: [Signature] Date: 1-17-20 Time: 1000

Received by: Federia O'Flaherty Date: 1-17-20 Time: 1000

[Signature] Date: 1/20/20 Time: 1030



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Mr. Rob Hoverman
Enviroforensics
N16 W. 23390 Stone Ridge Dr
Suite G
Waukesha, WI 53188

February 3, 2020

EnvisionAir Project Number: 2020-54
Client Project Name: 6492

Dear Mr. Hoverman,

Please find the attached analytical report for the samples received January 27, 2020. All test methods performed were fully compliant with local, state, and federal EPA methods unless otherwise noted. The project was analyzed as requested on the enclosed chain of custody record. Please review the comments section for additional information about your results or Quality Control data.

Feel free to contact me if you have any questions or comments regarding your analytical report or service.

Thank you for your business. EnvisionAir looks forward to working with you on your next project.

Yours Sincerely,

A handwritten signature in black ink that reads "Stanley A. Hunnicutt".

Stanley A Hunnicutt

Project Manager
EnvisionAir, LLC



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Client Name: ENVIROFORENSICS
Project ID: 6492
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-54

Sample Summary

Canister Pressure / Vacuum

<u>Laboratory Sample Number:</u>	<u>Sample Description:</u>	<u>Matrix:</u>	<u>START</u>	<u>START</u>	<u>End Date</u>	<u>End Time</u>	<u>Date</u>	<u>Time</u>	<u>Canister Pressure / Vacuum</u>		<u>Lab</u>
			<u>Date</u>	<u>Time</u>					<u>Initial Field</u>	<u>Final Field</u>	
			<u>Collected:</u>	<u>Collected:</u>	<u>Collected:</u>	<u>Collected:</u>	<u>Received:</u>	<u>Received:</u>	<u>(in. Hg)</u>	<u>(in. Hg)</u>	<u>(in. Hg)</u>
20-263	6492-SVE-EX	A	1/23/20	12:33	1/23/20	12:39	1/27/20	11:50	-30	-3	-3
20-264	6492-SVE-1	A	1/23/20	12:44	1/23/20	12:55	1/27/20	11:50	-30	-13	-13
20-265	6492-SVE-2	A	1/23/20	13:00	1/23/20	13:08	1/27/20	11:50	-30	-13	-13



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Client Name: ENVIROFORENSICS

Project ID: 6492

Client Project Manager: ROB HOVERMAN

EnvisionAir Project Number: 2020-54

Analytical Method: TO-15
Analytical Batch: 012920AIR

Client Sample ID: 6492-SVE-EX

Sample Collection START Date/Time: 1/23/20 12:33
Sample Collection END Date/Time: 1/23/20 12:39
Sample Received Date/Time: 1/27/20 11:50

EnvisionAir Sample Number: 20-263
Sample Matrix: AIR

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
4-Ethyltoluene	< 4920	4920	
4-Methyl-2-pentanone (MIBK)	< 20500	20500	
1,1,1-Trichloroethane	< 5460	5460	
1,1,2,2-Tetrachloroethane	< 3.36	3.36	1
1,1,2-Trichloroethane	< 2.10	2.10	1
1,1-Dichloroethane	< 40.5	40.5	
1,1-Dichloroethene	< 1980	1980	
1,2,4-Trichlorobenzene	< 7.42	7.42	
1,2,4-Trimethylbenzene	< 49.2	49.2	
1,2-dibromoethane (EDB)	< 0.32	0.32	1
1,2-Dichlorobenzene	< 601	601	
1,2-Dichloroethane	< 4.05	4.05	
1,2-Dichloropropane	< 4.62	4.62	
1,3,5-Trimethylbenzene	< 49.2	49.2	
1,3-Butadiene	< 2.21	2.21	
1,3-Dichlorobenzene	< 601	601	
1,4-Dichlorobenzene	< 6.01	6.01	
1,4-Dioxane	< 18.0	18.0	
2-Butanone (MEK)	< 29500	29500	
2-Hexanone	< 205	205	
Acetone	< 23800	23800	
Benzene	< 16.0	16.0	
Benzyl Chloride	< 4.14	4.14	1
Bromodichloromethane	< 5.36	5.36	1
Bromoform	< 103	103	
Bromomethane	< 38.8	38.8	
Carbon Disulfide	< 3110	3110	
Carbon Tetrachloride	< 6.29	6.29	
Chlorobenzene	< 230	230	
Chloroethane	< 132	132	



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<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
Chloroform	19.5	8.30	
Chloromethane	< 206	206	
cis-1,2-Dichloroethene	< 198	198	
cis-1,3-Dichloropropene	< 45.4	45.4	
Cyclohexane	< 55100	55100	
Dibromochloromethane	< 8.52	8.52	
Dichlorodifluoromethane	< 495	495	
Ethyl Acetate	< 541	541	
Ethylbenzene	< 86.8	86.8	
Hexachloro-1,3-butadiene	< 10.7	10.7	
Isooctane	< 4670	4670	
m,p-Xylene	< 434	434	
Methylene Chloride	< 417	417	
Methyl-tert-butyl ether	< 361	361	
N-Heptane	< 4100	4100	
N-Hexane	< 1760	1760	
o-Xylene	< 434	434	
Propylene	< 1720	1720	
Styrene	< 4260	4260	
Tetrachloroethene	25,100	1280	2
Tetrahydrofuran	< 2950	2950	
Toluene	< 37700	37700	
trans-1,2-Dichloroethene	< 396	396	
trans-1,3-Dichloropropene	< 45.4	45.4	
Trichloroethene	130	10.7	
Trichlorofluoromethane	< 5620	5620	
Vinyl Acetate	< 1760	1760	
Vinyl Bromide	< 4.37	4.37	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	94%		
Analysis Date/Time:	1-31-20/12:32		
Analyst Initials	tjg		



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Client Name: ENVIROFORENSICS

Project ID: 6492

Client Project Manager: ROB HOVERMAN

EnvisionAir Project Number: 2020-54

Analytical Method: TO-15
Analytical Batch: 012920AIR

Client Sample ID: 6492-SVE-1

EnvisionAir Sample Number: 20-264
Sample Matrix: AIR

Sample Collection START Date/Time: 1/23/20 12:44
Sample Collection END Date/Time: 1/23/20 12:55
Sample Received Date/Time: 1/27/20 11:50

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
4-Ethyltoluene	< 4920	4920	
4-Methyl-2-pentanone (MIBK)	< 20500	20500	
1,1,1-Trichloroethane	< 5460	5460	
1,1,2,2-Tetrachloroethane	< 3.36	3.36	1
1,1,2-Trichloroethane	< 2.10	2.10	1
1,1-Dichloroethane	< 40.5	40.5	
1,1-Dichloroethene	< 1980	1980	
1,2,4-Trichlorobenzene	< 7.42	7.42	
1,2,4-Trimethylbenzene	< 49.2	49.2	
1,2-dibromoethane (EDB)	< 0.32	0.32	1
1,2-Dichlorobenzene	< 601	601	
1,2-Dichloroethane	< 4.05	4.05	
1,2-Dichloropropane	< 4.62	4.62	
1,3,5-Trimethylbenzene	< 49.2	49.2	
1,3-Butadiene	< 2.21	2.21	
1,3-Dichlorobenzene	< 601	601	
1,4-Dichlorobenzene	< 6.01	6.01	
1,4-Dioxane	< 18.0	18.0	
2-Butanone (MEK)	< 29500	29500	
2-Hexanone	< 205	205	
Acetone	< 23800	23800	
Benzene	< 16.0	16.0	
Benzyl Chloride	< 4.14	4.14	1
Bromodichloromethane	< 5.36	5.36	1
Bromoform	< 103	103	
Bromomethane	< 38.8	38.8	
Carbon Disulfide	< 3110	3110	
Carbon Tetrachloride	< 6.29	6.29	
Chlorobenzene	< 230	230	
Chloroethane	< 132	132	



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<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
Chloroform	< 8.30	8.30	
Chloromethane	< 206	206	
cis-1,2-Dichloroethene	< 198	198	
cis-1,3-Dichloropropene	< 45.4	45.4	
Cyclohexane	< 55100	55100	
Dibromochloromethane	< 8.52	8.52	
Dichlorodifluoromethane	< 495	495	
Ethyl Acetate	< 541	541	
Ethylbenzene	< 86.8	86.8	
Hexachloro-1,3-butadiene	< 10.7	10.7	
Isooctane	< 4670	4670	
m,p-Xylene	< 434	434	
Methylene Chloride	< 417	417	
Methyl-tert-butyl ether	< 361	361	
N-Heptane	< 4100	4100	
N-Hexane	< 1760	1760	
o-Xylene	< 434	434	
Propylene	< 1720	1720	
Styrene	< 4260	4260	
Tetrachloroethene	20,400	1280	2
Tetrahydrofuran	< 2950	2950	
Toluene	< 37700	37700	
trans-1,2-Dichloroethene	< 396	396	
trans-1,3-Dichloropropene	< 45.4	45.4	
Trichloroethene	48.9	10.7	
Trichlorofluoromethane	< 5620	5620	
Vinyl Acetate	< 1760	1760	
Vinyl Bromide	< 4.37	4.37	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	93%		
Analysis Date/Time:	1-31-20/13:10		
Analyst Initials	tjg		



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Client Name: ENVIROFORENSICS

Project ID: 6492

Client Project Manager: ROB HOVERMAN

EnvisionAir Project Number: 2020-54

Analytical Method: TO-15
Analytical Batch: 013120AIR

Client Sample ID: 6492-SVE-2

EnvisionAir Sample Number: 20-265
Sample Matrix: AIR

Sample Collection START Date/Time: 1/23/20 13:00
Sample Collection END Date/Time: 1/23/20 13:08
Sample Received Date/Time: 1/27/20 11:50

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
4-Ethyltoluene	< 4920	4920	
4-Methyl-2-pentanone (MIBK)	< 20500	20500	
1,1,1-Trichloroethane	< 5460	5460	
1,1,2,2-Tetrachloroethane	< 3.36	3.36	1
1,1,2-Trichloroethane	< 2.10	2.10	1
1,1-Dichloroethane	< 40.5	40.5	
1,1-Dichloroethene	< 1980	1980	
1,2,4-Trichlorobenzene	< 7.42	7.42	
1,2,4-Trimethylbenzene	< 49.2	49.2	
1,2-dibromoethane (EDB)	< 0.32	0.32	1
1,2-Dichlorobenzene	< 601	601	
1,2-Dichloroethane	< 4.05	4.05	
1,2-Dichloropropane	< 4.62	4.62	
1,3,5-Trimethylbenzene	< 49.2	49.2	
1,3-Butadiene	< 2.21	2.21	
1,3-Dichlorobenzene	< 601	601	
1,4-Dichlorobenzene	< 6.01	6.01	
1,4-Dioxane	< 18.0	18.0	
2-Butanone (MEK)	< 29500	29500	
2-Hexanone	< 205	205	
Acetone	< 23800	23800	
Benzene	< 16.0	16.0	
Benzyl Chloride	< 4.14	4.14	1
Bromodichloromethane	< 5.36	5.36	1
Bromoform	< 103	103	
Bromomethane	< 38.8	38.8	
Carbon Disulfide	< 3110	3110	
Carbon Tetrachloride	< 6.29	6.29	
Chlorobenzene	< 230	230	
Chloroethane	< 132	132	



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<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
Chloroform	< 8.30	8.30	
Chloromethane	< 206	206	
cis-1,2-Dichloroethene	< 198	198	
cis-1,3-Dichloropropene	< 45.4	45.4	
Cyclohexane	< 55100	55100	
Dibromochloromethane	< 8.52	8.52	
Dichlorodifluoromethane	< 495	495	
Ethyl Acetate	< 541	541	
Ethylbenzene	< 86.8	86.8	
Hexachloro-1,3-butadiene	< 10.7	10.7	
Isooctane	< 4670	4670	
m,p-Xylene	< 434	434	
Methylene Chloride	< 417	417	
Methyl-tert-butyl ether	< 361	361	
N-Heptane	< 4100	4100	
N-Hexane	< 1760	1760	
o-Xylene	< 434	434	
Propylene	< 1720	1720	
Styrene	< 4260	4260	
Tetrachloroethene	15,000	1280	2
Tetrahydrofuran	< 2950	2950	
Toluene	< 37700	37700	
trans-1,2-Dichloroethene	< 396	396	
trans-1,3-Dichloropropene	< 45.4	45.4	
Trichloroethene	< 10.7	10.7	
Trichlorofluoromethane	< 5620	5620	
Vinyl Acetate	< 1760	1760	
Vinyl Bromide	< 4.37	4.37	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	92%		
Analysis Date/Time:	1-31-20/15:04		
Analyst Initials	tjg		

TO-15 Quality Control Data

EnvisionAir Batch Number: 012920AIR

Method Blank (MB):	MB Results (ppbv)	Reporting Limit (ppbv)	Flags
4-Ethyltoluene	< 100	100	
4-Methyl-2-pentanone (MIBK)	< 500	500	
1,1,1-Trichloroethane	< 100	100	
1,1,1,2-Tetrachloroethane	< 0.049	0.049	1
1,1,2-Trichloroethane	< 0.038	0.038	1
1,1-Dichloroethane	< 1	1	
1,1-Dichloroethene	< 50	50	
1,2,4-Trichlorobenzene	< 0.1	0.1	
1,2,4-Trimethylbenzene	< 1	1	
1,2-dibromoethane (EDB)	< 0.0041	0.0041	1
1,2-Dichlorobenzene	< 10	10	
1,2-Dichloroethane	< 0.1	0.1	
1,2-Dichloropropane	< 0.1	0.1	
1,3,5-Trimethylbenzene	< 1	1	
1,3-Butadiene	< 0.1	0.1	
1,3-Dichlorobenzene	< 10	10	
1,4-Dichlorobenzene	< 0.1	0.1	
1,4-Dioxane	< 0.5	0.5	
2-Butanone (MEK)	< 1000	1000	
2-Hexanone	< 5	5	
Acetone	< 1000	1000	
Benzene	< 0.5	0.5	
Benzyl Chloride	< 0.08	0.08	1
Bromodichloromethane	< 0.08	0.08	1
Bromoform	< 1	1	
Bromomethane	< 1	1	
Carbon Disulfide	< 100	100	
Carbon Tetrachloride	< 0.1	0.1	
Chlorobenzene	< 5	5	
Chloroethane	< 5	5	
Chloroform	< 0.17	0.17	
Chloromethane	< 10	10	
cis-1,2-Dichloroethene	< 5	5	
cis-1,3-Dichloropropene	< 1	1	
Cyclohexane	< 1600	1600	
Dibromochloromethane	< 0.1	0.1	
Dichlorodifluoromethane	< 10	10	
Ethyl Acetate	< 15	15	
Ethylbenzene	< 2	2	
Hexachloro-1,3-butadiene	< 0.1	0.1	
Isooctane	< 100	100	
m,p-Xylene	< 10	10	
Methylene Chloride	< 12	12	
Methyl-tert-butyl ether	< 10	10	
N-Heptane	< 100	100	
N-Hexane	< 50	50	
o-Xylene	< 10	10	
Propylene	< 100	100	
Styrene	< 100	100	
Tetrachloroethene	< 0.47	0.47	
Tetrahydrofuran	< 100	100	

Analytical Report

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
Toluene	< 1000	1000	
trans-1,2-Dichloroethene	< 10	10	
trans-1,3-Dichloropropene	< 1	1	
Trichloroethene	< 0.2	0.2	
Trichlorofluoromethane	< 100	100	
Vinyl Acetate	< 50	50	
Vinyl Bromide	< 0.1	0.1	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	98%		
Analysis Date/Time:	1-30-20/18:54		
Analyst Initials	tjg		

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D</u>	<u>LCS</u>	<u>LCSD</u>	<u>RPD</u>	<u>Flag</u>
			<u>Conc(ppbv)</u>	<u>Rec.</u>	<u>Rec.</u>		
Propylene	9.92	9.37	10	99%	94%	5.7%	
Dichlorodifluoromethane	10.1	9.41	10	101%	94%	7.1%	
Chloromethane	10.2	8.82	10	102%	88%	14.5%	
Vinyl Chloride	9.14	10.2	10	91%	102%	11.0%	
1,3-Butadiene	9.54	10.4	10	95%	104%	8.6%	
Bromomethane	8.41	9.08	10	84%	91%	7.7%	
Chloroethane	9.55	9.08	10	96%	91%	5.0%	
Vinyl Bromide	8.53	9.27	10	85%	93%	8.3%	
Trichlorofluoromethane	10.2	8.7	10	102%	87%	15.9%	
Acetone	9.32	9.36	10	93%	94%	0.4%	
1,1-Dichloroethene	11.1	9.46	10	111%	95%	16.0%	
Methylene Chloride	9.26	8.56	10	93%	86%	7.9%	
Carbon Disulfide	11.5	9.97	10	115%	100%	14.3%	
trans-1,2-Dichloroethene	10.7	9.91	10	107%	99%	7.7%	
Methyl-tert-butyl ether	9.73	8.62	10	97%	86%	12.1%	
1,1-Dichloroethane	11.4	10.5	10	114%	105%	8.2%	
Vinyl Acetate	10.7	9.85	10	107%	99%	8.3%	
N-Hexane	11.9	10.8	10	119%	108%	9.7%	
2-Butanone (MEK)	10.8	9.8	10	108%	98%	9.7%	
cis-1,2-Dichloroethene	10.5	11	10	105%	110%	4.7%	
Ethyl Acetate	11.1	10	10	111%	100%	10.4%	
Chloroform	10.9	9.93	10	109%	99%	9.3%	
Tetrahydrofuran	10.3	9.69	10	103%	97%	6.1%	
1,2-Dichloroethane	9.83	9.28	10	98%	93%	5.8%	
1,1,1-Trichloroethane	9.75	9.08	10	98%	91%	7.1%	
Carbon Tetrachloride	10	9.5	10	100%	95%	5.1%	
Benzene	10.4	10.1	10	104%	101%	2.9%	
Cyclohexane	10.1	9.74	10	101%	97%	3.6%	
1,2-Dichloropropane	11.1	10.8	10	111%	108%	2.7%	
Trichloroethene	11.3	10.9	10	113%	109%	3.6%	
Bromodichloromethane	10.3	9.94	10	103%	99%	3.6%	
1,4-Dioxane	9.24	9.52	10	92%	95%	3.0%	
Isooctane	10.6	10.3	10	106%	103%	2.9%	
N-Heptane	10.3	9.88	10	103%	99%	4.2%	
cis-1,3-Dichloropropene	11.2	10.8	10	112%	108%	3.6%	
4-Methyl-2-pentanone (MIBK)	10.5	10.8	10	105%	108%	2.8%	
trans-1,3-Dichloropropene	10.5	10.2	10	105%	102%	2.9%	
1,1,2-Trichloroethane	10.5	10.2	10	105%	102%	2.9%	
Toluene	11.1	10.8	10	111%	108%	2.7%	
2-Hexanone	9.57	10.4	10	96%	104%	8.3%	
Dibromochloromethane	10.3	10.2	10	103%	102%	1.0%	
1,2-dibromoethane (EDB)	10.9	11	10	109%	110%	0.9%	
Tetrachloroethene	11.3	11.2	10	113%	112%	0.9%	
Chlorobenzene	10.8	10.6	10	108%	106%	1.9%	
Ethylbenzene	10.6	10.4	10	106%	104%	1.9%	
m,p-Xylene	22.9	22.5	20	115%	113%	1.8%	
Bromoform	10.8	10.7	10	108%	107%	0.9%	



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Analytical Report

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D</u> <u>Conc(ppbv)</u>	<u>LCS</u> <u>Rec.</u>	<u>LCSD</u> <u>Rec.</u>	<u>RPD</u>	<u>Flag</u>
Styrene	11.3	11.2	10	113%	112%	0.9%	
1,1,2,2-Tetrachloroethane	9.24	9.22	10	92%	92%	0.2%	
o-Xylene	11.4	11.4	10	114%	114%	0.0%	
4-Ethyltoluene	9.75	9.68	10	98%	97%	0.7%	
1,3,5-Trimethylbenzene	10.4	10.3	10	104%	103%	1.0%	
1,2,4-Trimethylbenzene	9.86	9.76	10	99%	98%	1.0%	
1,3-Dichlorobenzene	10.3	10.9	10	103%	109%	5.7%	
Benzyl Chloride	8.74	9.35	10	87%	94%	6.7%	
1,4-Dichlorobenzene	10.7	10.5	10	107%	105%	1.9%	
1,2-Dichlorobenzene	10.6	10.3	10	106%	103%	2.9%	
1,2,4-Trichlorobenzene	8.98	8.89	10	90%	89%	1.0%	
Hexachloro-1,3-butadiene	10.3	9.63	10	103%	96%	6.7%	
4-bromofluorobenzene (surrogate)	107%	108%					
Analysis Date/Time:	1-30-20/17:43	1-30-20/19:41					
Analyst Initials	tjg	tjg					



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<u>Flag Number</u>	<u>Comments</u>
1	Reporting limit is supported by MDL. TJG
2	Reported value is from a 400x dilution. TJG 1/31/20

CHAIN OF CUSTODY RECORD

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Sampling Type:
 Soil-Gas:
 Sub-Slab:
 Indoor-Air:

Canister Pressure / Vacuum

REQUESTED PARAMETERS

TO-15 Full List
 TO-15 Short List (Specify in notes)

Client: ENVIRO FORENSICS
 Report: N16W23390 STONE
 Address: RIDGE DR, WAKESHA, WI 54982
 Report To: R. HOVERMAN
 Phone: 414.430.0060
 Invoice Address:
 Desired TAT: (Please Circle One)
 1 day 2 days 3 days Std (5 bus. days)

P.O. Number: 2020-1257
 Project Name or Number: 6492
 Sampled by: R. HOVERMAN
 QA/QC Required: (circle if applicable)
 Level III Level IV
 Reporting Units needed: (circle)
 ug/m³ mg/m³ PPBV PPMV

Media type: 1LC = 1 Liter Canister
 6LC = 6 Liter Canister
 TB = Tedlar Bag
 TD = Thermal Desorption Tube

Air Sample ID	Media Type (see code above)	Coll. Date (Grab/Comp Start)	Coll. Time (Grab/Comp Start)	Coll. Date (Comp. End)	Coll. Time (Comp. End)	TO-15 Full List	TO-15 Short List (Specify in notes)	Canister Serial #	Flow Controller Serial #	Initial Field (in. Hg)	Final Field (in. Hg)	Lab Received (in. Hg)	EnvisionAir Sample Number
1A92-SVE-EX	1LC	01/23/20	1233	1/23/20	1239	X		83840	121	-30	-3	-3	20-263
1A92-SVE-1	1LC	01/23/20	1344	1/23/20	1255	X		84138	82	-30	-13	-13	20-264
1A92-SVE-2	1LC	01/23/20	1300	1/23/20	1308	X		2221	16	-30	-13	-13	20-265

Comments:

Relinquished by:	Date: 1/24/20	Time: 1142	Received by: FEDEX	Date: 1/27/20	Time: 1150
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Mr. Rob Hoverman
Enviroforensics
N16 W. 23390 Stone Ridge Dr
Suite G
Waukesha, WI 53188

February 11, 2020

EnvisionAir Project Number: 2020-69
Client Project Name: 6492

Dear Mr. Hoverman,

Please find the attached analytical report for the samples received February 5, 2020. All test methods performed were fully compliant with local, state, and federal EPA methods unless otherwise noted. The project was analyzed as requested on the enclosed chain of custody record. Please review the comments section for additional information about your results or Quality Control data.

Feel free to contact me if you have any questions or comments regarding your analytical report or service.

Thank you for your business. EnvisionAir looks forward to working with you on your next project.

Yours Sincerely,

A handwritten signature in black ink that reads "Stanley A. Hunnicutt".

Stanley A Hunnicutt

Project Manager
EnvisionAir, LLC



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Client Name: ENVIROFORENSICS
Project ID: 6492
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-69

Sample Summary

Canister Pressure / Vacuum

<u>Laboratory Sample Number:</u>	<u>Sample Description:</u>	<u>START</u>	<u>START</u>	<u>End Date</u>	<u>End Time</u>	<u>Date</u>	<u>Time</u>	<u>Initial Field</u>	<u>Final Field</u>	<u>Lab</u>	
		<u>Date</u>	<u>Time</u>								<u>Received</u>
20-356	6492-SVE-EX	A	1/30/20	9:44	1/30/20	9:49	2/5/20	11:20	-28	-3	-3



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Client Name: ENVIROFORENSICS

Project ID: 6492

Client Project Manager: ROB HOVERMAN

EnvisionAir Project Number: 2020-69

Analytical Method: TO-15
Analytical Batch: 021020AIR

Client Sample ID: 6492-SVE-EX

Sample Collection START Date/Time: 1/30/20 9:44
Sample Collection END Date/Time: 1/30/20 9:49
Sample Received Date/Time: 2/5/20 11:20

EnvisionAir Sample Number: 20-356
Sample Matrix: AIR

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
4-Ethyltoluene	< 4920	4920	
4-Methyl-2-pentanone (MIBK)	< 20500	20500	
1,1,1-Trichloroethane	< 5460	5460	
1,1,2,2-Tetrachloroethane	< 3.36	3.36	1
1,1,2-Trichloroethane	< 2.10	2.10	1
1,1-Dichloroethane	< 40.5	40.5	
1,1-Dichloroethene	< 1980	1980	
1,2,4-Trichlorobenzene	< 7.42	7.42	
1,2,4-Trimethylbenzene	< 49.2	49.2	
1,2-dibromoethane (EDB)	< 0.32	0.32	1
1,2-Dichlorobenzene	< 601	601	
1,2-Dichloroethane	< 4.05	4.05	
1,2-Dichloropropane	< 4.62	4.62	
1,3,5-Trimethylbenzene	< 49.2	49.2	
1,3-Butadiene	< 2.21	2.21	
1,3-Dichlorobenzene	< 601	601	
1,4-Dichlorobenzene	< 6.01	6.01	
1,4-Dioxane	< 18.0	18.0	
2-Butanone (MEK)	< 29500	29500	
2-Hexanone	< 205	205	
Acetone	< 23800	23800	
Benzene	< 16.0	16.0	
Benzyl Chloride	< 4.14	4.14	1
Bromodichloromethane	< 5.36	5.36	1
Bromoform	< 103	103	
Bromomethane	< 38.8	38.8	
Carbon Disulfide	< 3110	3110	
Carbon Tetrachloride	< 6.29	6.29	
Chlorobenzene	< 230	230	
Chloroethane	< 132	132	



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<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
Chloroform	< 8.30	8.30	
Chloromethane	< 206	206	
cis-1,2-Dichloroethene	< 198	198	
cis-1,3-Dichloropropene	< 45.4	45.4	
Cyclohexane	< 55100	55100	
Dibromochloromethane	< 8.52	8.52	
Dichlorodifluoromethane	< 495	495	
Ethyl Acetate	< 541	541	
Ethylbenzene	< 86.8	86.8	
Hexachloro-1,3-butadiene	< 10.7	10.7	
Isooctane	< 4670	4670	
m,p-Xylene	< 434	434	
Methylene Chloride	< 417	417	
Methyl-tert-butyl ether	< 361	361	
N-Heptane	< 4100	4100	
N-Hexane	< 1760	1760	
o-Xylene	< 434	434	
Propylene	< 1720	1720	
Styrene	< 4260	4260	
Tetrachloroethene	18,900	638	2
Tetrahydrofuran	< 2950	2950	
Toluene	< 37700	37700	
trans-1,2-Dichloroethene	< 396	396	
trans-1,3-Dichloropropene	< 45.4	45.4	
Trichloroethene	< 10.7	10.7	
Trichlorofluoromethane	< 5620	5620	
Vinyl Acetate	< 1760	1760	
Vinyl Bromide	< 4.37	4.37	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	107%		
Analysis Date/Time:	2-10-20/17:57		
Analyst Initials	tjg		

TO-15 Quality Control Data

EnvisionAir Batch Number: 021020AIR

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
4-Ethyltoluene	< 100	100	
4-Methyl-2-pentanone (MIBK)	< 500	500	
1,1,1-Trichloroethane	< 100	100	
1,1,2,2-Tetrachloroethane	< 0.049	0.049	1
1,1,2-Trichloroethane	< 0.038	0.038	1
1,1-Dichloroethane	< 1	1	
1,1-Dichloroethene	< 50	50	
1,2,4-Trichlorobenzene	< 0.1	0.1	
1,2,4-Trimethylbenzene	< 1	1	
1,2-dibromoethane (EDB)	< 0.0041	0.0041	1
1,2-Dichlorobenzene	< 10	10	
1,2-Dichloroethane	< 0.1	0.1	
1,2-Dichloropropane	< 0.1	0.1	
1,3,5-Trimethylbenzene	< 1	1	
1,3-Butadiene	< 0.1	0.1	
1,3-Dichlorobenzene	< 10	10	
1,4-Dichlorobenzene	< 0.1	0.1	
1,4-Dioxane	< 0.5	0.5	
2-Butanone (MEK)	< 1000	1000	
2-Hexanone	< 5	5	
Acetone	< 1000	1000	
Benzene	< 0.5	0.5	
Benzyl Chloride	< 0.08	0.08	1
Bromodichloromethane	< 0.08	0.08	1
Bromoform	< 1	1	
Bromomethane	< 1	1	
Carbon Disulfide	< 100	100	
Carbon Tetrachloride	< 0.1	0.1	
Chlorobenzene	< 5	5	
Chloroethane	< 5	5	
Chloroform	< 0.17	0.17	
Chloromethane	< 10	10	
cis-1,2-Dichloroethene	< 5	5	
cis-1,3-Dichloropropene	< 1	1	
Cyclohexane	< 1600	1600	
Dibromochloromethane	< 0.1	0.1	
Dichlorodifluoromethane	< 10	10	
Ethyl Acetate	< 15	15	
Ethylbenzene	< 2	2	
Hexachloro-1,3-butadiene	< 0.1	0.1	
Isooctane	< 100	100	
m,p-Xylene	< 10	10	
Methylene Chloride	< 12	12	
Methyl-tert-butyl ether	< 10	10	
N-Heptane	< 100	100	
N-Hexane	< 50	50	
o-Xylene	< 10	10	
Propylene	< 100	100	
Styrene	< 100	100	
Tetrachloroethene	< 0.47	0.47	
Tetrahydrofuran	< 100	100	

Analytical Report

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
Toluene	< 1000	1000	
trans-1,2-Dichloroethene	< 10	10	
trans-1,3-Dichloropropene	< 1	1	
Trichloroethene	< 0.2	0.2	
Trichlorofluoromethane	< 100	100	
Vinyl Acetate	< 50	50	
Vinyl Bromide	< 0.1	0.1	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	98%		
Analysis Date/Time:	2-10-20/13:05		
Analyst Initials	tjg		

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D Conc(ppbv)</u>	<u>LCS Rec.</u>	<u>LCSD Rec.</u>	<u>RPD</u>	<u>Flag</u>
Propylene	9.58	11	10	96%	110%	13.8%	
Dichlorodifluoromethane	8.86	9.04	10	89%	90%	2.0%	
Chloromethane	8.71	9.19	10	87%	92%	5.4%	
Vinyl Chloride	9.66	10.4	10	97%	104%	7.4%	
1,3-Butadiene	10.3	9.98	10	103%	100%	3.2%	
Bromomethane	9.2	9.92	10	92%	99%	7.5%	
Chloroethane	9.02	9.61	10	90%	96%	6.3%	
Vinyl Bromide	9.47	9.51	10	95%	95%	0.4%	
Trichlorofluoromethane	10.9	10.3	10	109%	103%	5.7%	
Acetone	9.01	9.29	10	90%	93%	3.1%	
1,1-Dichloroethene	11.4	10	10	114%	100%	13.1%	
Methylene Chloride	10.9	11.2	10	109%	112%	2.7%	
Carbon Disulfide	10.8	10.8	10	108%	108%	0.0%	
trans-1,2-Dichloroethene	10.6	10.3	10	106%	103%	2.9%	
Methyl-tert-butyl ether	11	10.1	10	110%	101%	8.5%	
1,1-Dichloroethane	9.23	9.44	10	92%	94%	2.2%	
Vinyl Acetate	10.2	10	10	102%	100%	2.0%	
N-Hexane	10.1	10.4	10	101%	104%	2.9%	
2-Butanone (MEK)	9.65	8.45	10	97%	85%	13.3%	
cis-1,2-Dichloroethene	10.2	10.5	10	102%	105%	2.9%	
Ethyl Acetate	8.29	9.12	10	83%	91%	9.5%	
Chloroform	10.6	10.8	10	106%	108%	1.9%	
Tetrahydrofuran	8.62	8.91	10	86%	89%	3.3%	
1,2-Dichloroethane	10.4	10.2	10	104%	102%	1.9%	
1,1,1-Trichloroethane	11.6	11.3	10	116%	113%	2.6%	
Carbon Tetrachloride	11.4	11	10	114%	110%	3.6%	
Benzene	10.1	9.88	10	101%	99%	2.2%	
Cyclohexane	11.4	11	10	114%	110%	3.6%	
1,2-Dichloropropane	10.1	9.78	10	101%	98%	3.2%	
Trichloroethene	10.4	10.1	10	104%	101%	2.9%	
Bromodichloromethane	10.9	10.8	10	109%	108%	0.9%	
1,4-Dioxane	10.1	8.94	10	101%	89%	12.2%	
Isooctane	10	9.87	10	100%	99%	1.3%	
N-Heptane	10.3	10.3	10	103%	103%	0.0%	
cis-1,3-Dichloropropene	10.9	10.8	10	109%	108%	0.9%	
4-Methyl-2-pentanone (MIBK)	10.1	10.5	10	101%	105%	3.9%	
trans-1,3-Dichloropropene	9.94	9.27	10	99%	93%	7.0%	
1,1,2-Trichloroethane	10.9	10.5	10	109%	105%	3.7%	
Toluene	10.3	11.4	10	103%	114%	10.1%	
2-Hexanone	9.58	9.74	10	96%	97%	1.7%	
Dibromochloromethane	10.6	10.8	10	106%	108%	1.9%	
1,2-dibromoethane (EDB)	9.36	9.46	10	94%	95%	1.1%	
Tetrachloroethene	10.4	10.5	10	104%	105%	1.0%	
Chlorobenzene	9.36	9.53	10	94%	95%	1.8%	
Ethylbenzene	10.5	10.7	10	105%	107%	1.9%	
m,p-Xylene	21	21.4	20	105%	107%	1.9%	
Bromoform	10.4	10.6	10	104%	106%	1.9%	

Analytical Report

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D</u> <u>Conc(ppbv)</u>	<u>LCS</u> <u>Rec.</u>	<u>LCSD</u> <u>Rec.</u>	<u>RPD</u>	<u>Flag</u>
Styrene	10.6	10.6	10	106%	106%	0.0%	
1,1,2,2-Tetrachloroethane	8.76	8.8	10	88%	88%	0.5%	
o-Xylene	10	10.2	10	100%	102%	2.0%	
4-Ethyltoluene	10.4	11.5	10	104%	115%	10.0%	
1,3,5-Trimethylbenzene	10.5	10.7	10	105%	107%	1.9%	
1,2,4-Trimethylbenzene	11.4	11.4	10	114%	114%	0.0%	
1,3-Dichlorobenzene	9	9.07	10	90%	91%	0.8%	
Benzyl Chloride	10.3	9.78	10	103%	98%	5.2%	
1,4-Dichlorobenzene	10.2	10.7	10	102%	107%	4.8%	
1,2-Dichlorobenzene	10.3	10.3	10	103%	103%	0.0%	
1,2,4-Trichlorobenzene	9.46	9.59	10	95%	96%	1.4%	
Hexachloro-1,3-butadiene	11.1	11.2	10	111%	112%	0.9%	
4-bromofluorobenzene (surrogate)	97%	103%					
Analysis Date/Time:	2-10-20/11:43	2-10-20/12:29					
Analyst Initials	tjg	tjg					



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<u>Flag Number</u>	<u>Comments</u>
1	Reporting limit is supported by MDL. TJG
2	Reported value is from a 200x dilution. TJG 2/11/20

CHAIN OF CUSTODY RECORD

EnvisionAir | 1441 Sadlier Circle West Drive | Indianapolis, IN 46239 | Phone: (317) 351-0885 | Fax: (317) 351-0882

Client: Environforisics
 Report N16 W 233rd Street & 57th St
 Address: Wishkahway 57188
 Report To: R. Hoverson / N.D. &
 Phone: 262-510-0612
 Invoice Address: 54re

P.O. Number: 2020-1276
 Project Name or Number: 6442
 Sampled by: NIP
 QA/QC Required: (circle if applicable)
 Level III Level IV

Desired TAT: (Please Circle One)
 1 day 2 days 3 days **5 days (Std (5 bus. days))**
 Media type: 1LC = 1 Liter Canister
 6LC = 6 Liter Canister
 TB = Tedlar Bag
 TD = Thermal Description Tube

Requested Parameters:
 TO-15 Full List
 TO-15 Short List (Specify in notes)

Sampling Type:
 Soil-Gas:
 Sub-Slab:
 Indoor-Air:



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Canister Pressure / Vacuum

Air Sample ID	Media Type (see code above)	Coll. Date (grab/comp Start)	Coll. Time (grab/comp Start)	Coll. Date (Comp. End)	Coll. Time (Comp. End)	Canister Serial #	Flow Controller Serial #	Initial Field (in. Hg)	Final Field (in. Hg)	Lab Received (in. Hg)	EnvisionAir Sample Number
6442-SVE-EX	1LC	1-30-20	944	1-30-20	949	83919	0062	-28	-3	-3	20-356

Comments:

Relinquished by:		Date	Time	Received by:	Date	Time
<u>R. J. [Signature]</u>		<u>2/3/20</u>	<u>1630</u>	<u>Fede X</u>	<u>2/3/20</u>	<u>1630</u>
				<u>Kan [Signature]</u>	<u>2/5/20</u>	<u>1120</u>



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Mr. Rob Hoverman
Enviroforensics
N16 W. 23390 Stone Ridge Dr
Suite G
Waukesha, WI 53188

February 21, 2020

EnvisionAir Project Number: 2020-102
Client Project Name: 6492

Dear Mr. Hoverman,

Please find the attached analytical report for the samples received February 14, 2020. All test methods performed were fully compliant with local, state, and federal EPA methods unless otherwise noted. The project was analyzed as requested on the enclosed chain of custody record. Please review the comments section for additional information about your results or Quality Control data.

Feel free to contact me if you have any questions or comments regarding your analytical report or service.

Thank you for your business. EnvisionAir looks forward to working with you on your next project.

Yours Sincerely,

A handwritten signature in black ink that reads "Stanley A. Hunnicutt".

Stanley A Hunnicutt

Project Manager
EnvisionAir, LLC



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 Fax: 317-351-0882
 www.envision-air.com

Client Name: ENVIROFORENSICS
Project ID: 6492
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-102

Sample Summary

Canister Pressure / Vacuum

<u>Laboratory Sample Number:</u>	<u>Sample Description:</u>	<u>START</u>	<u>START</u>	<u>End Date</u>	<u>End Time</u>	<u>Date</u>	<u>Time</u>	<u>Initial Field</u>	<u>Final Field</u>	<u>Lab</u>
		<u>Date</u>	<u>Time</u>							
20-513	6492-SVE-EX	A	2/5/20 11:06	2/5/20	11:11	2/14/20	13:00	-24	-2	-2



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Client Name: ENVIROFORENSICS

Project ID: 6492

Client Project Manager: ROB HOVERMAN

EnvisionAir Project Number: 2020-102

Analytical Method: TO-15
Analytical Batch: 021920AIR

Client Sample ID: 6492-SVE-EX

Sample Collection START Date/Time: 2/5/20 11:06
Sample Collection END Date/Time: 2/5/20 11:11
Sample Received Date/Time: 2/14/20 13:00

EnvisionAir Sample Number: 20-513
Sample Matrix: AIR

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
4-Ethyltoluene	< 4920	4920	
4-Methyl-2-pentanone (MIBK)	< 20500	20500	
1,1,1-Trichloroethane	< 5460	5460	
1,1,2,2-Tetrachloroethane	< 3.36	3.36	1
1,1,2-Trichloroethane	< 2.10	2.10	1
1,1-Dichloroethane	< 40.5	40.5	
1,1-Dichloroethene	< 1980	1980	
1,2,4-Trichlorobenzene	< 7.42	7.42	
1,2,4-Trimethylbenzene	< 49.2	49.2	
1,2-dibromoethane (EDB)	< 0.32	0.32	1
1,2-Dichlorobenzene	< 601	601	
1,2-Dichloroethane	< 4.05	4.05	
1,2-Dichloropropane	< 4.62	4.62	
1,3,5-Trimethylbenzene	< 49.2	49.2	
1,3-Butadiene	< 2.21	2.21	
1,3-Dichlorobenzene	< 601	601	
1,4-Dichlorobenzene	< 6.01	6.01	
1,4-Dioxane	< 18.0	18.0	
2-Butanone (MEK)	< 29500	29500	
2-Hexanone	< 205	205	
Acetone	< 23800	23800	
Benzene	< 16.0	16.0	
Benzyl Chloride	< 4.14	4.14	1
Bromodichloromethane	< 5.36	5.36	1
Bromoform	< 103	103	
Bromomethane	< 38.8	38.8	
Carbon Disulfide	< 3110	3110	
Carbon Tetrachloride	< 6.29	6.29	
Chlorobenzene	< 230	230	
Chloroethane	< 132	132	



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<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
Chloroform	20.5	8.30	
Chloromethane	< 206	206	
cis-1,2-Dichloroethene	< 198	198	
cis-1,3-Dichloropropene	< 45.4	45.4	
Cyclohexane	< 55100	55100	
Dibromochloromethane	< 8.52	8.52	
Dichlorodifluoromethane	< 495	495	
Ethyl Acetate	< 541	541	
Ethylbenzene	< 86.8	86.8	
Hexachloro-1,3-butadiene	< 10.7	10.7	
Isooctane	< 4670	4670	
m,p-Xylene	< 434	434	
Methylene Chloride	< 417	417	
Methyl-tert-butyl ether	< 361	361	
N-Heptane	< 4100	4100	
N-Hexane	< 1760	1760	
o-Xylene	< 434	434	
Propylene	< 1720	1720	
Styrene	< 4260	4260	
Tetrachloroethene	16,100	638	2
Tetrahydrofuran	< 2950	2950	
Toluene	< 37700	37700	
trans-1,2-Dichloroethene	< 396	396	
trans-1,3-Dichloropropene	< 45.4	45.4	
Trichloroethene	< 10.7	10.7	
Trichlorofluoromethane	< 5620	5620	
Vinyl Acetate	< 1760	1760	
Vinyl Bromide	< 4.37	4.37	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	107%		
Analysis Date/Time:	2-19-20/10:59		
Analyst Initials	tjg		

TO-15 Quality Control Data

EnvisionAir Batch Number: 021720CAIR

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
4-Ethyltoluene	< 100	100	
4-Methyl-2-pentanone (MIBK)	< 500	500	
1,1,1-Trichloroethane	< 100	100	
1,1,2,2-Tetrachloroethane	< 0.049	0.049	1
1,1,2-Trichloroethane	< 0.038	0.038	1
1,1-Dichloroethane	< 1	1	
1,1-Dichloroethene	< 50	50	
1,2,4-Trichlorobenzene	< 0.1	0.1	
1,2,4-Trimethylbenzene	< 1	1	
1,2-dibromoethane (EDB)	< 0.0041	0.0041	1
1,2-Dichlorobenzene	< 10	10	
1,2-Dichloroethane	< 0.1	0.1	
1,2-Dichloropropane	< 0.1	0.1	
1,3,5-Trimethylbenzene	< 1	1	
1,3-Butadiene	< 0.1	0.1	
1,3-Dichlorobenzene	< 10	10	
1,4-Dichlorobenzene	< 0.1	0.1	
1,4-Dioxane	< 0.5	0.5	
2-Butanone (MEK)	< 1000	1000	
2-Hexanone	< 5	5	
Acetone	< 1000	1000	
Benzene	< 0.5	0.5	
Benzyl Chloride	< 0.08	0.08	1
Bromodichloromethane	< 0.08	0.08	1
Bromoform	< 1	1	
Bromomethane	< 1	1	
Carbon Disulfide	< 100	100	
Carbon Tetrachloride	< 0.1	0.1	
Chlorobenzene	< 5	5	
Chloroethane	< 5	5	
Chloroform	< 0.17	0.17	
Chloromethane	< 10	10	
cis-1,2-Dichloroethene	< 5	5	
cis-1,3-Dichloropropene	< 1	1	
Cyclohexane	< 1600	1600	
Dibromochloromethane	< 0.1	0.1	
Dichlorodifluoromethane	< 10	10	
Ethyl Acetate	< 15	15	
Ethylbenzene	< 2	2	
Hexachloro-1,3-butadiene	< 0.1	0.1	
Isooctane	< 100	100	
m,p-Xylene	< 10	10	
Methylene Chloride	< 12	12	
Methyl-tert-butyl ether	< 10	10	
N-Heptane	< 100	100	
N-Hexane	< 50	50	
o-Xylene	< 10	10	
Propylene	< 100	100	
Styrene	< 100	100	
Tetrachloroethene	< 0.47	0.47	
Tetrahydrofuran	< 100	100	

Analytical Report

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
Toluene	< 1000	1000	
trans-1,2-Dichloroethene	< 10	10	
trans-1,3-Dichloropropene	< 1	1	
Trichloroethene	< 0.2	0.2	
Trichlorofluoromethane	< 100	100	
Vinyl Acetate	< 50	50	
Vinyl Bromide	< 0.1	0.1	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	88%		
Analysis Date/Time:	2-18-20/22:44		
Analyst Initials	tjg		

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D Conc(ppbv)</u>	<u>LCS Rec.</u>	<u>LCSD Rec.</u>	<u>RPD</u>	<u>Flag</u>
Propylene	10.5	9.7	10	105%	97%	7.9%	
Dichlorodifluoromethane	9.36	8.65	10	94%	87%	7.9%	
Chloromethane	8.72	9.01	10	87%	90%	3.3%	
Vinyl Chloride	9.21	9.1	10	92%	91%	1.2%	
1,3-Butadiene	9.93	8.94	10	99%	89%	10.5%	
Bromomethane	10.2	9.58	10	102%	96%	6.3%	
Chloroethane	9.75	9.51	10	98%	95%	2.5%	
Vinyl Bromide	10.1	10.3	10	101%	103%	2.0%	
Trichlorofluoromethane	10.5	11	10	105%	110%	4.7%	
Acetone	9.98	11.6	10	100%	116%	15.0%	
1,1-Dichloroethene	10.5	10.7	10	105%	107%	1.9%	
Methylene Chloride	9.32	9.88	10	93%	99%	5.8%	
Carbon Disulfide	10	9.4	10	100%	94%	6.2%	
trans-1,2-Dichloroethene	9.67	9.49	10	97%	95%	1.9%	
Methyl-tert-butyl ether	10.3	9.15	10	103%	92%	11.8%	
1,1-Dichloroethane	10.5	9.75	10	105%	98%	7.4%	
Vinyl Acetate	9.82	9.08	10	98%	91%	7.8%	
N-Hexane	10.3	9.39	10	103%	94%	9.2%	
2-Butanone (MEK)	8.46	10.3	10	85%	103%	19.6%	
cis-1,2-Dichloroethene	11.3	10.3	10	113%	103%	9.3%	
Ethyl Acetate	10.3	9.42	10	103%	94%	8.9%	
Chloroform	10.6	10.6	10	106%	106%	0.0%	
Tetrahydrofuran	9.71	8.72	10	97%	87%	10.7%	
1,2-Dichloroethane	10.4	9.51	10	104%	95%	8.9%	
1,1,1-Trichloroethane	9.46	9.2	10	95%	92%	2.8%	
Carbon Tetrachloride	8.97	9.75	10	90%	98%	8.3%	
Benzene	9.37	9.36	10	94%	94%	0.1%	
Cyclohexane	9.67	9.84	10	97%	98%	1.7%	
1,2-Dichloropropane	9.01	9	10	90%	90%	0.1%	
Trichloroethene	9.51	9.74	10	95%	97%	2.4%	
Bromodichloromethane	9.95	9.39	10	100%	94%	5.8%	
1,4-Dioxane	9.96	8.21	10	100%	82%	19.3%	
Isooctane	8.54	8.47	10	85%	85%	0.8%	
N-Heptane	9.59	8.36	10	96%	84%	13.7%	
cis-1,3-Dichloropropene	10.9	9.11	10	109%	91%	17.9%	
4-Methyl-2-pentanone (MIBK)	9.99	10.1	10	100%	101%	1.1%	
trans-1,3-Dichloropropene	11.3	11.4	10	113%	114%	0.9%	
1,1,2-Trichloroethane	10.2	10.6	10	102%	106%	3.8%	
Toluene	9.99	10.6	10	100%	106%	5.9%	
2-Hexanone	9.75	10.2	10	98%	102%	4.5%	
Dibromochloromethane	9.28	10.7	10	93%	107%	14.2%	
1,2-dibromoethane (EDB)	9.97	11.2	10	100%	112%	11.6%	
Tetrachloroethene	8.93	10.1	10	89%	101%	12.3%	
Chlorobenzene	8.65	9.72	10	87%	97%	11.6%	
Ethylbenzene	9.83	11.3	10	98%	113%	13.9%	
m,p-Xylene	18.7	21.2	20	94%	106%	12.5%	
Bromoform	9.13	10.4	10	91%	104%	13.0%	



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Analytical Report

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D Conc(ppbv)</u>	<u>LCS Rec.</u>	<u>LCSD Rec.</u>	<u>RPD</u>	<u>Flag</u>
Styrene	9.91	11.3	10	99%	113%	13.1%	
1,1,2,2-Tetrachloroethane	8.08	9.34	10	81%	93%	14.5%	
o-Xylene	9.18	10.5	10	92%	105%	13.4%	
4-Ethyltoluene	10.3	10.6	10	103%	106%	2.9%	
1,3,5-Trimethylbenzene	9.39	11.1	10	94%	111%	16.7%	
1,2,4-Trimethylbenzene	9.98	10.8	10	100%	108%	7.9%	
1,3-Dichlorobenzene	9.9	11.3	10	99%	113%	13.2%	
Benzyl Chloride	10.3	11.1	10	103%	111%	7.5%	
1,4-Dichlorobenzene	10.3	11.5	10	103%	115%	11.0%	
1,2-Dichlorobenzene	10.3	10.5	10	103%	105%	1.9%	
1,2,4-Trichlorobenzene	10.2	10.5	10	102%	105%	2.9%	
Hexachloro-1,3-butadiene	9.72	9.13	10	97%	91%	6.3%	
4-bromofluorobenzene (surrogate)	103%	101%					
Analysis Date/Time:	2-18-20/21:34	2-19-20/07:38					
Analyst Initials	tjg	tjg					



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Fax: 317-351-0882
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Flag Number

Comments

- | | |
|---|---|
| 1 | Reporting limit is supported by MDL. TJG |
| 2 | Reported value is from a 200x dilution. TJG 2/20/20 |

CHAIN OF CUSTODY RECORD

EnvisionAir | 1441 Sadlier Circle West Drive | Indianapolis, IN 46239 | Phone: (317) 351-0885 | Fax: (317) 351-0882



Sampling Type:
 Soil-Gas:
 Sub-Slab:
 Indoor-Air:
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REQUESTED PARAMETERS

TO-15 Full List
 TO-15 Short List (Specify in notes)

Client: *Enviroforensics*
 Report: *NI/6 w 2370 Stone Ridge*
 Address: *Washington, IN 53108*
 Report To: *r. Hoveman*
 Phone: *262.510.0612*
 Invoice Address: *Same*
 Desired TAT: (Please Circle One)
 1 day 2 days 3 days **Std (5 bus. days)**
 P.O. Number: *2020-1288*
 Project Name or Number: *6492*
 Sampled by: *ND*
 QA/QC Required: (circle if applicable)
 Level III Level IV
 Reporting Units needed: (circle)
 ug/m³ mg/m³ PPBV PPMV
 Media type: 1LC = 1 Liter Canister
 6LC = 6 Liter Canister
 TB = Tedlar Bag
 TD = Thermal Desorption Tube

Air Sample ID	Media Type (see table above)	Coll. Date (Start/Comp/End)	Coll. Time (Start)	Coll. Date (Comp. End)	Coll. Time (Comp. End)	Canister Serial #	Flow Controller Serial #	Initial Field (in. Hg)	Final Field (in. Hg)	Lab Received (in. Hg)	EnvisionAir Sample Number
6492-SVE-EX	1LC	2-5-20	1106	2-5-20	1111	83813	0062	-29	-2	-2	20-513

Comments:

Relinquished by: _____ Date: _____ Time: _____

Received by: *FedEx Juan Hernandez* Date: *2/19/20* Time: *1300*



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Mr. Rob Hoverman
Enviroforensics
N16 W. 23390 Stone Ridge Dr
Suite G
Waukesha, WI 53188

March 26, 2020

EnvisionAir Project Number: 2020-208
Client Project Name: 6492 Badger Clnr

Dear Mr. Hoverman,

Please find the attached analytical report for the samples received March 19, 2020. All test methods performed were fully compliant with local, state, and federal EPA methods unless otherwise noted. The project was analyzed as requested on the enclosed chain of custody record. Please review the comments section for additional information about your results or Quality Control data.

Feel free to contact me if you have any questions or comments regarding your analytical report or service.

Thank you for your business. EnvisionAir looks forward to working with you on your next project.

Yours Sincerely,

A handwritten signature in black ink that reads "Stanley A. Hunnicutt".

Stanley A Hunnicutt

Project Manager
EnvisionAir, LLC



EnvisionAir
 1441 Sadlier Circle West Drive
 Indianapolis, IN 46239
 Ph: 317-351-0885
 Fax: 317-351-0882
 www.envision-air.com

Client Name: ENVIROFORENSICS
Project ID: 6492 BADGER CLNR
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-208

Sample Summary

Canister Pressure / Vacuum

<u>Laboratory Sample Number:</u>	<u>Sample Description:</u>	<u>START</u>	<u>START</u>	<u>End Date</u>	<u>End Time</u>	<u>Date</u>	<u>Time</u>	<u>Initial Field</u>	<u>Final Field</u>	<u>Lab</u>	
		<u>Collected:</u>	<u>Collected:</u>	<u>Collected:</u>	<u>Collected:</u>	<u>Received:</u>	<u>Received:</u>	<u>(in. Hg)</u>	<u>(in. Hg)</u>	<u>(in. Hg)</u>	
20-976	6492-SVE-EX	A	3/13/20	13:30	3/13/20	13:35	3/19/20	16:00	-28	-4	-4



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Client Name: ENVIROFORENSICS

Project ID: 6492 BADGER CLNR

Client Project Manager: ROB HOVERMAN

EnvisionAir Project Number: 2020-208

Analytical Method: TO-15
Analytical Batch: 032020AIR

Client Sample ID: 6492-SVE-EX

Sample Collection START Date/Time: 3/13/20 13:30

Sample Collection END Date/Time: 3/13/20 13:35

EnvisionAir Sample Number: 20-976

Sample Received Date/Time: 3/19/20 16:00

Sample Matrix: AIR

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
cis-1,2-Dichloroethene	< 198	198	
Tetrachloroethene	4,210	638	1
trans-1,2-Dichloroethene	< 396	396	
Trichloroethene	< 10.7	10.7	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	101%		
Analysis Date/Time:	3-23-20/02:00		
Analyst Initials	tjg		

TO-15 Quality Control Data

EnvisionAir Batch Number: 032020AIR

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
cis-1,2-Dichloroethene	< 5	5	
Tetrachloroethene	< 0.47	0.47	
trans-1,2-Dichloroethene	< 10	10	
Trichloroethene	< 0.2	0.2	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	88%		
Analysis Date/Time:	3-22-20/15:23		
Analyst Initials	tjg		

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D Conc(ppbv)</u>	<u>LCS Rec.</u>	<u>LCSD Rec.</u>	<u>RPD</u>	<u>Flag</u>
Vinyl Chloride	10.9	10.3	10	109%	103%	5.7%	
trans-1,2-Dichloroethene	9.66	10.2	10	97%	102%	5.4%	
cis-1,2-Dichloroethene	9.33	10.3	10	93%	103%	9.9%	
Trichloroethene	10.4	10.4	10	104%	104%	0.0%	
Tetrachloroethene	10.4	10.5	10	104%	105%	1.0%	
4-bromofluorobenzene (surrogate)	99%	100%					
Analysis Date/Time:	3-22-20/14:48	3-22-20/22:36					
Analyst Initials	tjg	tjg					



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Flag Number

1

Comments

Reported value is from a 200x dilution. TJK 3/24/20

CHAIN OF CUSTODY RECORD

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REQUESTED PARAMETERS

TO-15 Full List
TO-15 Short List (Specify in notes)

Client: Envision Services
 Report: M/GW 2390 Stone Ridge Dr
 Address: Suite G, NAWKESHA WZ 53186
 Report To: R. HOVERMAN
 Phone: 414.630.006
 Invoice Address:
 Desired TAT: (Please Circle One)
 1 day 2 days 3 days Std (5 bus. days)

P.O. Number: 2020-1343
 Project Name or Number: 6492 BADGER CREEK
 Sampled by:
 QA/QC Required: (circle if applicable)
 Level III Level IV
 Reporting Units needed: (circle)
 ug/m³ mg/m³ PPBV PPMV

Media type: 1LC = 1 Liter Canister
 6LC = 6 Liter Canister
 TB = Tedlar Bag
 TD = Thermal Desorption Tube

Sampling Type:
 Soil-Gas:
 Sub-Slab:
 Indoor-Air:

Canister Pressure / Vacuum

Air Sample ID	Media Type (see code above)	Coll. Date (Grab/Comp Start)	Coll. Time (Grab/Comp Start)	Coll. Date (Comp. End)	Coll. Time (Comp. End)	TO-15 Full List	TO-15 Short List (Specify in notes)	Canister Serial #	Flow Controller Serial #	Initial Field (in. Hg)	Final Field (in. Hg)	Lab Received (in. Hg)	EnvisionAir Sample Number
6492-SVE-EX	1LC	3/13/20	1330	3/13/20	1335	X		83814		-28	-4	-4	20-976

Comments:

Relinquished by: <u>[Signature]</u>	Date: <u>3/17/20</u>	Time: <u>945</u>	Received by: <u>FEDESA [Signature]</u>	Date: <u>3/19/20</u>	Time: <u>1600</u>
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EnvisionAir
1441 Sadlier Circle West Drive
Indianapolis, IN 46239
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Fax: 317-351-0882
www.envision-air.com

Mr. Rob Hoverman
Enviroforensics
N16 W. 23390 Stone Ridge Dr
Suite G
Waukesha, WI 53188

April 23, 2020

EnvisionAir Project Number: 2020-259
Client Project Name: Badger Cleaners

Dear Mr. Hoverman,

Please find the attached analytical report for the samples received April 21, 2020. All test methods performed were fully compliant with local, state, and federal EPA methods unless otherwise noted. The project was analyzed as requested on the enclosed chain of custody record. Please review the comments section for additional information about your results or Quality Control data.

Feel free to contact me if you have any questions or comments regarding your analytical report or service.

Thank you for your business. EnvisionAir looks forward to working with you on your next project.

Yours Sincerely,

A handwritten signature in black ink that reads "Stanley A. Hunnicutt".

Stanley A Hunnicutt

Project Manager
EnvisionAir, LLC



EnvisionAir
 1441 Sadlier Circle West Drive
 Indianapolis, IN 46239
 Ph: 317-351-0885
 Fax: 317-351-0882
 www.envision-air.com

Client Name: ENVIROFORENSICS
Project ID: BADGER CLEANERS
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-259

Sample Summary

Canister Pressure / Vacuum

<u>Laboratory Sample Number:</u>	<u>Sample Description:</u>	<u>START</u>	<u>START</u>	<u>End Date</u>	<u>End Time</u>	<u>Date</u>	<u>Time</u>	<u>Initial Field</u>	<u>Final Field</u>	<u>Lab</u>
		<u>Date</u>	<u>Time</u>							
20-1195	6492-SVE-EX	A	4/15/20 12:42	4/15/20	12:48	4/21/20	10:45	-28	-1	-1



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Client Name: ENVIROFORENSICS
Project ID: BADGER CLEANERS
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-259

Analytical Method: TO-15
Analytical Batch: 042220AIR

Client Sample ID: 6492-SVE-EX
EnvisionAir Sample Number: 20-1195
Sample Matrix: AIR

Sample Collection START Date/Time: 4/15/20 12:42
Sample Collection END Date/Time: 4/15/20 12:48
Sample Received Date/Time: 4/21/20 10:45

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
cis-1,2-Dichloroethene	< 198	198	
Tetrachloroethene	3,510	128	1
trans-1,2-Dichloroethene	< 396	396	
Trichlorethene	< 10.7	10.7	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	88%		
Analysis Date/Time:	4-22-20/23:19		
Analyst Initials	tjg		

TO-15 Quality Control Data

EnvisionAir Batch Number: 042220AIR

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
cis-1,2-Dichloroethene	< 5	5	
Tetrachloroethene	< 0.47	0.47	
trans-1,2-Dichloroethene	< 10	10	
Trichloroethene	< 0.2	0.2	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	101%		
Analysis Date/Time:	4-22-20/13:06		
Analyst Initials	tjg		

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D Conc(ppbv)</u>	<u>LCS Rec.</u>	<u>LCSD Rec.</u>	<u>RPD</u>	<u>Flag</u>
Vinyl Chloride	11	10.8	10	110%	108%	1.8%	
trans-1,2-Dichloroethene	9.58	8.88	10	96%	89%	7.6%	
cis-1,2-Dichloroethene	11	10.6	10	110%	106%	3.7%	
Trichloroethene	9.82	9.95	10	98%	100%	1.3%	
Tetrachloroethene	10.4	9.94	10	104%	99%	4.5%	
4-bromofluorobenzene (surrogate)	92%	100%					
Analysis Date/Time:	4-22-20/11:12	4-22-20/11:56					
Analyst Initials	tjg	tjg					



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Indianapolis, IN 46239
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Fax: 317-351-0882
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Flag Number

1

Comments

Reported value is from a 40x dilution. TJG 4/23/20

CHAIN OF CUSTODY RECORD

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REQUESTED PARAMETERS

TO-15 Full List
TO-15 Short List (Specify in notes)

Sampling Type:
Soil-Gas:
Sub-Slab:
Indoor-Air:

Canister Pressure / Vacuum

Client: ENVIROFORENSICS
 Report # 16N03390 STONE RIDGE DA
 Address: WANKESHA, WI
 Report To: R. HOVERMAN
 Phone: 414.630.0060
 Invoice Address:
 P.O. Number: 2020-1485
 Project Name or Number: BADGER CLEANERS
 Sampled by: R. HOVERMAN
 QA/QC Required: (circle if applicable)
 Level III Level IV
 Reporting Units needed: (circle)
 ug/m³ mg/m³ PPBV PPMV

Media type: 1LC = 1 Liter Canister
 6LC = 6 Liter Canister
 TB = Tedlar Bag
 TD = Thermal Desorption Tube
 Desired TAT: (Please Circle One)
 1 day 2 days 3 days 5 days

Air Sample ID	Media Type (see code above)	Coll. Date (Grab/Comp Start)	Coll. Time (Grab/Comp Start)	Coll. Date (Comp. End)	Coll. Time (Comp. End)	Canister Serial #	Flow Controller Serial #	Initial Field (in. Hg)	Final Field (in. Hg)	Lab Received (in. Hg)	EnvisionAir Sample Number
1492-SUE-EX	1LC	4/15/2020	1242	4/15/2020	1246	83813	6025	-28	-1	-1	20-1195

Comments: chlorinated VOCs

Relinquished by:	Date	Time	Received by:	Date	Time
	4/15/2020	1456	J. Fedex Stan Hummer	4/21/20	1045



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Fax: 317-351-0882
www.envision-air.com

Mr. Rob Hoverman
Enviroforensics
N16 W. 23390 Stone Ridge Dr
Suite G
Waukesha, WI 53188

May 22, 2020

EnvisionAir Project Number: 2020-288
Client Project Name: 6492 Badger Cleaners

Dear Mr. Kappen,

Please find the attached analytical report for the samples received May 18, 2020. All test methods performed were fully compliant with local, state, and federal EPA methods unless otherwise noted. The project was analyzed as requested on the enclosed chain of custody record. Please review the comments section for additional information about your results or Quality Control data.

Feel free to contact me if you have any questions or comments regarding your analytical report or service.

Thank you for your business. EnvisionAir looks forward to working with you on your next project.

Yours Sincerely,

A handwritten signature in black ink that reads "Stanley A. Hunnicutt".

Stanley A Hunnicutt

Project Manager
EnvisionAir, LLC



EnvisionAir
 1441 Sadlier Circle West Drive
 Indianapolis, IN 46239
 Ph: 317-351-0885
 Fax: 317-351-0882
 www.envision-air.com

Client Name: ENVIROFORENSICS
Project ID: 6492 BADGER CLEANERS
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-288

Sample Summary

Canister Pressure / Vacuum

<u>Laboratory Sample Number:</u>	<u>Sample Description:</u>	<u>START</u>	<u>START</u>	<u>End Date</u>	<u>End Time</u>	<u>Date</u>	<u>Time</u>	<u>Initial Field</u>	<u>Final Field</u>	<u>Lab</u>
		<u>Date</u>	<u>Time</u>							
20-1327	6492-SVE-1-EX	A	5/13/20 13:10	5/13/20	13:16	5/18/20	14:45	-26	0	0



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Client Name: ENVIROFORENSICS
Project ID: 6492 BADGER CLEANERS
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-288

Analytical Method: TO-15
Analytical Batch: 051820AIR

Client Sample ID: 6492-SVE-1-EX
EnvisionAir Sample Number: 20-1327
Sample Matrix: AIR

Sample Collection START Date/Time: 5/13/20 13:10
Sample Collection END Date/Time: 5/13/20 13:16
Sample Received Date/Time: 5/18/20 14:45

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
4-Ethyltoluene	< 4920	4920	
4-Methyl-2-pentanone (MIBK)	< 20500	20500	
1,1,1-Trichloroethane	< 5460	5460	
1,1,1,2-Tetrachloroethane	< 3.36	3.36	1
1,1,2-Trichloroethane	< 2.10	2.10	1
1,1-Dichloroethane	< 40.5	40.5	
1,1-Dichloroethene	< 1980	1980	
1,2,4-Trichlorobenzene	< 7.42	7.42	
1,2,4-Trimethylbenzene	< 49.2	49.2	
1,2-dibromoethane (EDB)	< 0.32	0.32	1
1,2-Dichlorobenzene	< 601	601	
1,2-Dichloroethane	< 4.05	4.05	
1,2-Dichloropropane	< 4.62	4.62	
1,3,5-Trimethylbenzene	< 49.2	49.2	
1,3-Butadiene	< 2.21	2.21	
1,3-Dichlorobenzene	< 601	601	
1,4-Dichlorobenzene	< 6.01	6.01	
1,4-Dioxane	< 18.0	18.0	
2-Butanone (MEK)	< 29500	29500	
2-Hexanone	< 205	205	
Acetone	< 23800	23800	
Benzene	< 16.0	16.0	
Benzyl Chloride	< 4.14	4.14	1
Bromodichloromethane	< 5.36	5.36	1
Bromoform	< 103	103	
Bromomethane	< 38.8	38.8	
Carbon Disulfide	< 3110	3110	
Carbon Tetrachloride	< 6.29	6.29	
Chlorobenzene	< 230	230	
Chloroethane	< 132	132	



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<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
Chloroform	< 8.30	8.30	
Chloromethane	< 206	206	
cis-1,2-Dichloroethene	< 198	198	
cis-1,3-Dichloropropene	< 45.4	45.4	
Cyclohexane	< 55100	55100	
Dibromochloromethane	< 8.52	8.52	
Dichlorodifluoromethane	< 495	495	
Ethyl Acetate	< 541	541	
Ethylbenzene	< 86.8	86.8	
Hexachloro-1,3-butadiene	< 10.7	10.7	
Isooctane	< 4670	4670	
m,p-Xylene	< 434	434	
Methylene Chloride	< 417	417	
Methyl-tert-butyl ether	< 361	361	
N-Heptane	< 4100	4100	
N-Hexane	< 1760	1760	
o-Xylene	< 434	434	
Propylene	< 1720	1720	
Styrene	< 4260	4260	
Tetrachloroethene	1,300	128	1
Tetrahydrofuran	< 2950	2950	
Toluene	< 37700	37700	
trans-1,2-Dichloroethene	< 396	396	
trans-1,3-Dichloropropene	< 45.4	45.4	
Trichloroethene	< 10.7	10.7	
Trichlorofluoromethane	< 5620	5620	
Vinyl Acetate	< 1760	1760	
Vinyl Bromide	< 4.37	4.37	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	101%		
Analysis Date/Time:	5-21-20/01:32		
Analyst Initials	tjg		

TO-15 Quality Control Data

EnvisionAir Batch Number: 051820AIR

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
4-Ethyltoluene	< 100	100	
4-Methyl-2-pentanone (MIBK)	< 500	500	
1,1,1-Trichloroethane	< 100	100	
1,1,2,2-Tetrachloroethane	< 0.049	0.049	1
1,1,2-Trichloroethane	< 0.038	0.038	1
1,1-Dichloroethane	< 1	1	
1,1-Dichloroethene	< 50	50	
1,2,4-Trichlorobenzene	< 0.1	0.1	
1,2,4-Trimethylbenzene	< 1	1	
1,2-dibromoethane (EDB)	< 0.0041	0.0041	1
1,2-Dichlorobenzene	< 10	10	
1,2-Dichloroethane	< 0.1	0.1	
1,2-Dichloropropane	< 0.1	0.1	
1,3,5-Trimethylbenzene	< 1	1	
1,3-Butadiene	< 0.1	0.1	
1,3-Dichlorobenzene	< 10	10	
1,4-Dichlorobenzene	< 0.1	0.1	
1,4-Dioxane	< 0.5	0.5	
2-Butanone (MEK)	< 1000	1000	
2-Hexanone	< 5	5	
Acetone	< 1000	1000	
Benzene	< 0.5	0.5	
Benzyl Chloride	< 0.08	0.08	1
Bromodichloromethane	< 0.08	0.08	1
Bromoform	< 1	1	
Bromomethane	< 1	1	
Carbon Disulfide	< 100	100	
Carbon Tetrachloride	< 0.1	0.1	
Chlorobenzene	< 5	5	
Chloroethane	< 5	5	
Chloroform	< 0.17	0.17	
Chloromethane	< 10	10	
cis-1,2-Dichloroethene	< 5	5	
cis-1,3-Dichloropropene	< 1	1	
Cyclohexane	< 1600	1600	
Dibromochloromethane	< 0.1	0.1	
Dichlorodifluoromethane	< 10	10	
Ethyl Acetate	< 15	15	
Ethylbenzene	< 2	2	
Hexachloro-1,3-butadiene	< 0.1	0.1	
Isooctane	< 100	100	
m,p-Xylene	< 10	10	
Methylene Chloride	< 12	12	
Methyl-tert-butyl ether	< 10	10	
N-Heptane	< 100	100	
N-Hexane	< 50	50	
o-Xylene	< 10	10	
Propylene	< 100	100	
Styrene	< 100	100	
Tetrachloroethene	< 0.47	0.47	
Tetrahydrofuran	< 100	100	

Analytical Report

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
Toluene	< 1000	1000	
trans-1,2-Dichloroethene	< 10	10	
trans-1,3-Dichloropropene	< 1	1	
Trichloroethene	< 0.2	0.2	
Trichlorofluoromethane	< 100	100	
Vinyl Acetate	< 50	50	
Vinyl Bromide	< 0.1	0.1	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	99%		
Analysis Date/Time:	5-20-20/11:57		
Analyst Initials	tjg		

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D Conc(ppbv)</u>	<u>LCS Rec.</u>	<u>LCSD Rec.</u>	<u>RPD</u>	<u>Flag</u>
Propylene	10.4	10.7	10	104%	107%	2.8%	
Dichlorodifluoromethane	9.58	8.67	10	96%	87%	10.0%	
Chloromethane	9.17	8.27	10	92%	83%	10.3%	
Vinyl Chloride	9.79	9.95	10	98%	100%	1.6%	
1,3-Butadiene	10.3	10.9	10	103%	109%	5.7%	
Bromomethane	9.5	9.81	10	95%	98%	3.2%	
Chloroethane	9.01	8.92	10	90%	89%	1.0%	
Vinyl Bromide	9.63	9.93	10	96%	99%	3.1%	
Trichlorofluoromethane	8.54	8.63	10	85%	86%	1.0%	
Acetone	10.5	11.5	10	105%	115%	9.1%	
1,1-Dichloroethene	10.1	10.3	10	101%	103%	2.0%	
Methylene Chloride	9.63	10.1	10	96%	101%	4.8%	
Carbon Disulfide	9.22	9.5	10	92%	95%	3.0%	
trans-1,2-Dichloroethene	8.55	10.1	10	86%	101%	16.6%	
Methyl-tert-butyl ether	8.83	9.2	10	88%	92%	4.1%	
1,1-Dichloroethane	9.07	9.31	10	91%	93%	2.6%	
Vinyl Acetate	11.5	10.2	10	115%	102%	12.0%	
N-Hexane	9.04	9.62	10	90%	96%	6.2%	
2-Butanone (MEK)	10.5	10.1	10	105%	101%	3.9%	
cis-1,2-Dichloroethene	9.26	9.83	10	93%	98%	6.0%	
Ethyl Acetate	11.1	10.3	10	111%	103%	7.5%	
Chloroform	8.56	9.29	10	86%	93%	8.2%	
Tetrahydrofuran	10.6	11.4	10	106%	114%	7.3%	
1,2-Dichloroethane	10.2	11.1	10	102%	111%	8.5%	
1,1,1-Trichloroethane	9.4	9.91	10	94%	99%	5.3%	
Carbon Tetrachloride	8.82	9.36	10	88%	94%	5.9%	
Benzene	9.15	9.62	10	92%	96%	5.0%	
Cyclohexane	9.59	10.1	10	96%	101%	5.2%	
1,2-Dichloropropane	9.08	9.54	10	91%	95%	4.9%	
Trichloroethene	9.42	10	10	94%	100%	6.0%	
Bromodichloromethane	9.02	9.63	10	90%	96%	6.5%	
1,4-Dioxane	10.4	11.1	10	104%	111%	6.5%	
Isooctane	10.7	11.3	10	107%	113%	5.5%	
N-Heptane	11.3	10.3	10	113%	103%	9.3%	
cis-1,3-Dichloropropene	9.35	9.31	10	94%	93%	0.4%	
4-Methyl-2-pentanone (MIBK)	11.2	10.1	10	112%	101%	10.3%	
trans-1,3-Dichloropropene	9.15	9.37	10	92%	94%	2.4%	
1,1,2-Trichloroethane	9.52	9.58	10	95%	96%	0.6%	
Toluene	9.44	10.1	10	94%	101%	6.8%	
2-Hexanone	9.62	11.2	10	96%	112%	15.2%	
Dibromochloromethane	9.94	9.54	10	99%	95%	4.1%	
1,2-dibromoethane (EDB)	9.84	9.61	10	98%	96%	2.4%	
Tetrachloroethene	9.26	8.98	10	93%	90%	3.1%	
Chlorobenzene	10.2	9.94	10	102%	99%	2.6%	
Ethylbenzene	10.6	10.3	10	106%	103%	2.9%	
m,p-Xylene	20.1	19.6	20	101%	98%	2.5%	
Bromoform	8.96	8.23	10	90%	82%	8.5%	

Analytical Report

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D</u> <u>Conc(ppbv)</u>	<u>LCS</u> <u>Rec.</u>	<u>LCSD</u> <u>Rec.</u>	<u>RPD</u>	<u>Flag</u>
Styrene	10.5	10.1	10	105%	101%	3.9%	
1,1,2,2-Tetrachloroethane	8.72	8.5	10	87%	85%	2.6%	
o-Xylene	10.9	10.8	10	109%	108%	0.9%	
4-Ethyltoluene	10.3	10.3	10	103%	103%	0.0%	
1,3,5-Trimethylbenzene	10	9.69	10	100%	97%	3.1%	
1,2,4-Trimethylbenzene	11	10.6	10	110%	106%	3.7%	
1,3-Dichlorobenzene	10.7	10.3	10	107%	103%	3.8%	
Benzyl Chloride	10.5	10.4	10	105%	104%	1.0%	
1,4-Dichlorobenzene	9.4	8.77	10	94%	88%	6.9%	
1,2-Dichlorobenzene	8.93	8.76	10	89%	88%	1.9%	
1,2,4-Trichlorobenzene	10.2	9.8	10	102%	98%	4.0%	
Hexachloro-1,3-butadiene	9.19	8.7	10	92%	87%	5.5%	
4-bromofluorobenzene (surrogate)	112%	90%					
Analysis Date/Time:	5-20-20/09:59	5-20-20/10:46					
Analyst Initials	tjg	tjg					



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Flag Number

1

Comments

Reported value is from a 40x dilution. TJG 5/22/20



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Mr. Rob Hoverman
Enviroforensics
N16 W. 23390 Stone Ridge Dr
Suite G
Waukesha, WI 53188

July 1, 2020

EnvisionAir Project Number: 2020-335
Client Project Name: 6492 – Badger Cleaners

Dear Mr. Hoverman,

Please find the attached analytical report for the samples received June 25, 2020. All test methods performed were fully compliant with local, state, and federal EPA methods unless otherwise noted. The project was analyzed as requested on the enclosed chain of custody record. Please review the comments section for additional information about your results or Quality Control data.

Feel free to contact me if you have any questions or comments regarding your analytical report or service.

Thank you for your business. EnvisionAir looks forward to working with you on your next project.

Yours Sincerely,

A handwritten signature in black ink that reads "Stanley A. Hunnicutt".

Stanley A Hunnicutt

Project Manager
EnvisionAir, LLC



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Client Name: ENVIROFORENSICS
Project ID: 6492 - BADGER CLEANERS
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-335

Sample Summary

Canister Pressure / Vacuum

<u>Laboratory Sample Number:</u>	<u>Sample Description:</u>	<u>Matrix:</u>	<u>START</u>	<u>START</u>	<u>End Date</u>	<u>End Time</u>	<u>Date</u>	<u>Time</u>	<u>Canister Pressure / Vacuum</u>		<u>Lab</u>
			<u>Date</u>	<u>Time</u>					<u>Initial Field</u>	<u>Final Field</u>	
			<u>Collected:</u>	<u>Collected:</u>	<u>Collected:</u>	<u>Collected:</u>	<u>Received:</u>	<u>Received:</u>	<u>(in. Hg)</u>	<u>(in. Hg)</u>	<u>(in. Hg)</u>
20-1527	6492-SVE-EX	A	6/22/20	13:25	6/22/20	13:30	6/25/20	8:45	-28	-4	-4
20-1528	6492-SVE-1S	A	6/22/20	13:34	6/22/20	13:40	6/25/20	8:45	-27	-7	-7
20-1529	6492-SVE-1D	A	6/22/20	13:43	6/22/20	13:53	6/25/20	8:45	-30	-11	-11



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Client Name: ENVIROFORENSICS
Project ID: 6492 - BADGER CLEANERS
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-335

Analytical Method: TO-15
Analytical Batch: 062720AIR

Client Sample ID: 6492-SVE-EX **Sample Collection START Date/Time:** 6/22/20 13:25
EnvisionAir Sample Number: 20-1527 **Sample Collection END Date/Time:** 6/22/20 13:30
Sample Matrix: AIR **Sample Received Date/Time:** 6/25/20 8:45

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
cis-1,2-Dichloroethene	< 198	198	
Tetrachloroethene	3,750	128	1
trans-1,2-Dichloroethene	< 396	396	
Trichloroethene	16.1	10.7	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	92%		
Analysis Date/Time:	6-28-20/18:17		
Analyst Initials	tjg		



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Client Name: ENVIROFORENSICS
Project ID: 6492 - BADGER CLEANERS
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-335

Analytical Method: TO-15
Analytical Batch: 062720AIR

Client Sample ID: 6492-SVE-1S
EnvisionAir Sample Number: 20-1528
Sample Matrix: AIR

Sample Collection START Date/Time: 6/22/20 13:34
Sample Collection END Date/Time: 6/22/20 13:40
Sample Received Date/Time: 6/25/20 8:45

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
cis-1,2-Dichloroethene	< 198	198	
Tetrachloroethene	3,590	128	1
trans-1,2-Dichloroethene	< 396	396	
Trichloroethene	< 10.7	10.7	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	88%		
Analysis Date/Time:	6-28-20/18:55		
Analyst Initials	tjg		



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Client Name: ENVIROFORENSICS
Project ID: 6492 - BADGER CLEANERS
Client Project Manager: ROB HOVERMAN
EnvisionAir Project Number: 2020-335

Analytical Method: TO-15
Analytical Batch: 062720AIR

Client Sample ID: 6492-SVE-1D
EnvisionAir Sample Number: 20-1529
Sample Matrix: AIR

Sample Collection START Date/Time: 6/22/20 13:43
Sample Collection END Date/Time: 6/22/20 13:53
Sample Received Date/Time: 6/25/20 8:45

<u>Compounds</u>	<u>Sample Results ug/m³</u>	<u>Reporting Limit ug/m³</u>	<u>Flag</u>
cis-1,2-Dichloroethene	< 198	198	
Tetrachloroethene	2,970	128	1
trans-1,2-Dichloroethene	< 396	396	
Trichloroethene	< 10.7	10.7	
Vinyl Chloride	< 12.8	12.8	
4-bromofluorobenzene (surrogate)	104%		
Analysis Date/Time:	6-28-20/19:33		
Analyst Initials	tjg		

TO-15 Quality Control Data

EnvisionAir Batch Number: 062720AIR

<u>Method Blank (MB):</u>	<u>MB Results (ppbv)</u>	<u>Reporting Limit (ppbv)</u>	<u>Flags</u>
cis-1,2-Dichloroethene	< 5	5	
Tetrachloroethene	< 0.47	0.47	
trans-1,2-Dichloroethene	< 10	10	
Trichloroethene	< 0.2	0.2	
Vinyl Chloride	< 0.5	0.5	
4-bromofluorobenzene (surrogate)	106%		
Analysis Date/Time:	6-28-20/14:57		
Analyst Initials	tjg		

<u>LCS/LCSD</u>	<u>LCS Results (ppbv)</u>	<u>LCSD Results (ppbv)</u>	<u>LCS/D Conc(ppbv)</u>	<u>LCS Rec.</u>	<u>LCSD Rec.</u>	<u>RPD</u>	<u>Flag</u>
Vinyl Chloride	9.71	8.68	10	97%	87%	11.2%	
trans-1,2-Dichloroethene	10.4	10.9	10	104%	109%	4.7%	
cis-1,2-Dichloroethene	11.6	9.37	10	116%	94%	21.3%	2
Trichloroethene	9.62	11.3	10	96%	113%	16.1%	
Tetrachloroethene	11.4	11.5	10	114%	115%	0.9%	
4-bromofluorobenzene (surrogate)	97%	96%					
Analysis Date/Time:	6-28-20/12:54	6-28-20/13:38					
Analyst Initials	tjg	tjg					



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Comments

- | | |
|---|--|
| 1 | Reported value is from a 40x dilution. TJG 6/30/20 |
| 2 | RPD is biased high, but recoveries are within control. TJG 6/30/20 |

APPENDIX D

Mass Removal Graphs

Chart 1
SVE Effluent VOC Concentration Trend
Badger Cleaners -616 Oak St, Baraboo, Wisconsin

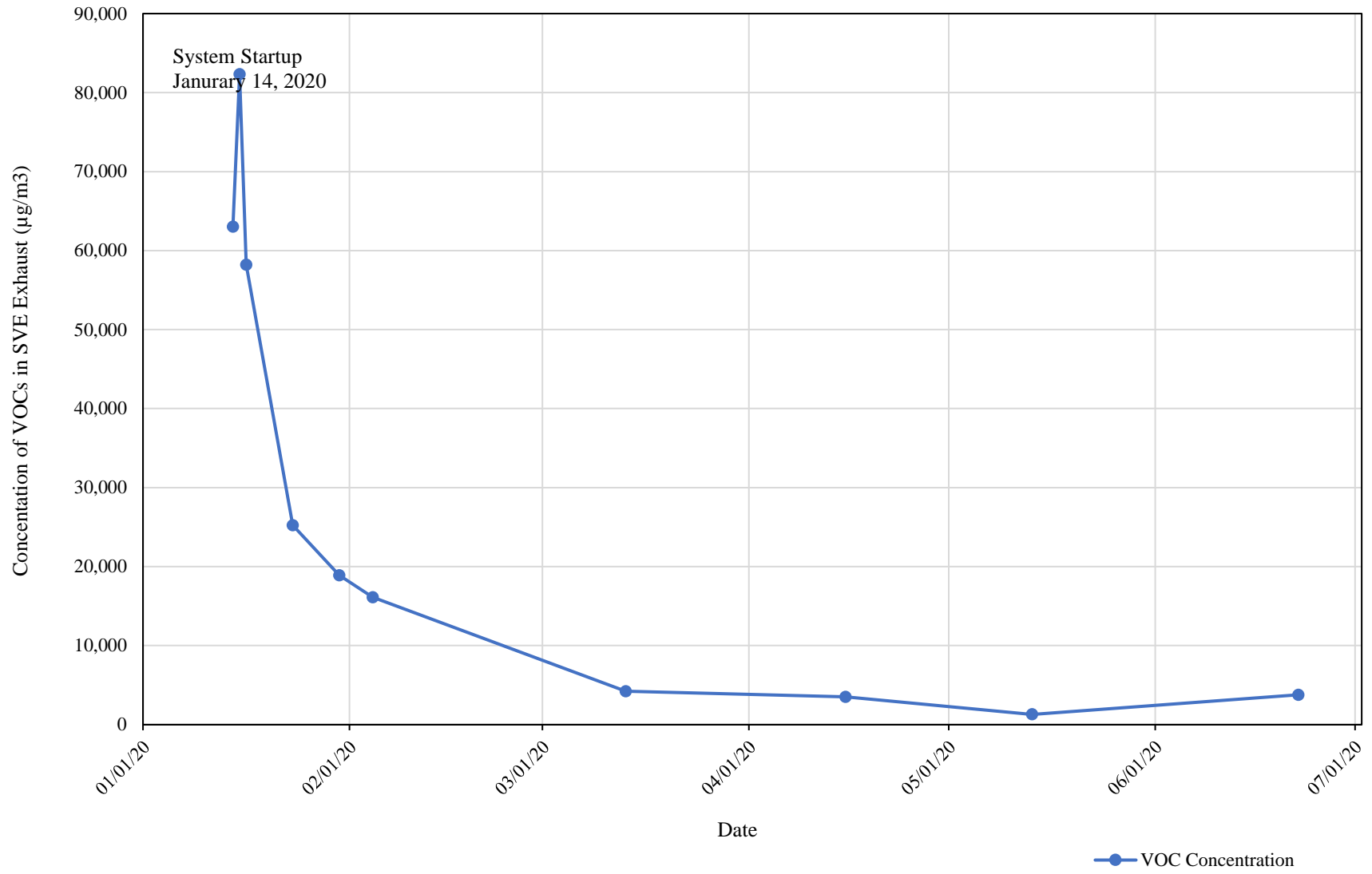


Chart 2
Cumulative VOC Mass Removed
Badger Cleaners -616 Oak St, Baraboo, Wisconsin

