Full-Scale Soil Vapor Extraction System Design and Installation Workplan

P-Building at 100 East Patterson Street
Tecumseh, Michigan

May 2012

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Prepared For
Tecumseh Products Company

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Section 1
Introduction

This Full-Scale Soil Vapor Extraction (SVE) System Design and Installation Workplan (SVE Workplan) was prepared following the implementation of the April 2012 *Workplan to Conduct a Pilot Study to Facilitate the Design and Installation of a Full-Scale Soil Vapor Extraction System* (Pilot Study Workplan) in P-Building at 100 East Patterson Street (TRC 2012d). This SVE Workplan was prepared to document the results of the soil vapor extraction system pilot study conducted in April and May 2012, and to describe the proposed full-scale SVE system design for the portion of the former TPC site known as P-Building (also known as Orbitec). The former TPC site is located at 100 East Patterson Street in Tecumseh, Michigan (Figure 1).

1.1 Site Description

The former TPC site has a series of interconnected buildings/building additions that occupy approximately 750,000 square feet (main building). Letter designations, i.e., Area K, Q-Building, etc., for each building/building addition are shown on Figure 2. The proposed SVE system will be installed at P-Building located along the northern perimeter of the former TPC site. P-Building occupies approximately 162,000 square feet.

1.2 Site Operations and Future Use

TPC began manufacturing and storage operations at the site in the 1930s. TPC operations focused on the production and reconditioning of compressors and condensing units for refrigeration and air conditioning units. Manufacturing operations ceased at the site in June 2008. The site was purchased by Tecumseh Bakery, LLC, a holding company for Consolidated Biscuit Company (CBC), in December 2009. When CBC was purchased by Healthside Food Solutions in April 2010, Tecumseh Bakery, LLC, became an independent entity, and plans to occupy the site for bakery operations were terminated. In February 2012, the site was purchased by Tecumseh Food Machinery and Engineering, LLC. Current plans for the facility include separation of P-Building and S-Building from the remainder of the plant, so that portion of the facility can be leased or sold as a separate parcel, and to facilitate demolition of the remainder of the facility.

1.3 Summary of Investigation Activities

Investigation activities conducted at the former TPC site indicate that on-site soil, shallow groundwater, and soil gas are affected by chlorinated volatile organic compounds (CVOCs). In particular, at the five sub-slab vapor sample locations in P-Building, sub-slab soil gas

concentrations of trichloroethene (TCE) ranged from <290 parts per billion by volume (ppbv) to 13,400 ppbv over two sample events, compared to a non-residential sub-slab soil gas screening level (SGSL) of 84 ppbv. Indoor air concentrations of TCE at five co-located samples ranged from 8.7 ppbv to 19.8 ppbv compared to a non-residential indoor air criterion of 1.7 ppbv. At the time indoor air sampling was conducted the non-residential indoor air criterion was 7.8 ppbv. In September 2011, updated final TCE toxicity values were published by the USEPA on the Integrated Risk Information System (IRIS). Updated TCE toxicity values resulted in a reduction in the TCE indoor air criterion (RMT, 2010b).

1.4 Purpose and Scope

TPC proposed the installation of a SVE system in P-Building during a meeting with USEPA on March 5-6, 2012. As discussed during that meeting, the proposed SVE system was designed for the following:

- To render incomplete the potential vapor intrusion exposure pathway for the occupied area;
- To reduce or eliminate the potential for lateral migration of affected soil gas from the site; and
- To extract residual CVOCs from the on-site soil matrix reducing the long-term potential for migration of CVOCS into soil gas and groundwater, i.e., source control.

This SVE Workplan was prepared to provide design and installation details for the proposed full-scale SVE system design and to document results of the SVE pilot study conducted in April and May 2012.

Section 2
Site Conditions

2.1 Site Topography

The site slopes at a grade of approximately 2-percent to the east. The surface elevation along the western boundary of P-Building is approximately 800 feet above mean sea level (ft MSL), and the surface elevation along the eastern boundary of P-Building is approximately 796 ft MSL.

2.2 Geology

TRC evaluated the unconsolidated materials underlying the site through a review of logs from soil borings advanced at the site during field activities conducted by TRC from April 2009 through August 2011. Logs of soil borings and monitoring wells installed during the investigation activities were provided to USEPA in previous investigation reports.

A geologic cross section was developed from these boring logs to illustrate the geology underlying the former TPC site near the proposed SVE system location. Figure 3 shows the orientation of the cross-section transect, while Figure 4 provides the cross section.

As shown on the cross section, the site geology generally consists of a surficial silty/sandy clay interval ranging from 3 to 7 feet thick, underlain by unconsolidated fine to coarse sand and gravel. A deep clay layer is present beneath the sand and gravel layer. Soil boring data suggests that this second clay layer is continuous across the study area. The elevation of the top of the clay confining unit ranges from approximately 750 ft MSL to 760 ft MSL beneath the northern portion of the site.

The unconsolidated fine to coarse sand and gravel is an unconfined aquifer beneath the site. Data collected from the soil borings and monitoring wells installed during subsurface investigation activities indicate that shallow groundwater typically ranges in depth from approximately 22 to 24 feet below ground surface (ft bgs) (approximately 780 ft MSL) along the western perimeter of the site to approximately 5 to 8 ft bgs (approximately 778 ft MSL) along the eastern perimeter of the site. The aquifer has saturated thickness ranging from approximately 20 to 30 feet. Groundwater flow is typically to the east-northeast toward the River Raisin, the nearest body of water, which is located 1,500 to 2,500 feet east of the site.

The proposed SVE system will target the unsaturated portion of the permeable sand and gravel unit beneath the site. The thickness of the unsaturated portion of this unit decreases from west to east. Beneath P-Building the thickness of the unsaturated sand and gravel unit ranges from approximately 17 feet in the west to 13 feet in the east. The thickness of this permeable unsaturated zone continues to decreases to the east, and in some areas the water table intersects the overlying silty/sandy clay layer.

Section 3
Conceptual SVE System Design

3.1 Building Description

The proposed SVE system will be installed at P-Building located along the northern perimeter of the former TPC site. The former TPC site is located at 100 East Patterson Street in Tecumseh, Michigan. P-Building occupies approximately 162,000 square feet. The western wall of P-Building is shared with S-Building in the north. At present, the western wall of P-Building is also shared with the remainder of the facility in the south (Figure 2). However, the current owner intends to separate P-Building from the remainder of the former manufacturing area, in order to make P-Building more marketable to potential buyers and/or lessees.

Currently there are no doors or windows from P-Building directly into S-Building. A sub-slab depressurization system was installed to mitigate the potential for volatilization to indoor air in S-Building in October 2011 (TRC 2011b, TRC 2012b). Once the remainder of the former TPC manufacturing facility has been separated from P-Building, P-Building will be physically isolated from the remainder of the facility, preventing the lateral migration of affected indoor air from the remainder of the facility into P-Building.

A portion of P-Building was originally constructed in 1948. The original building footprint was approximately 44,000 square feet. This portion of P-Building was historically used for machining operations, and is an area of potentially-affected soils. In 1994, well after use of TCE had been discontinued at the site, P-Building was expanded approximately 200 feet to the east and 130 feet to the south into areas that had historically been used for employee parking and building access. The expansion included renovation of the existing portions of the building. In particular, the existing slab was removed and replaced. The new slab was constructed of 8-inch thick concrete over clean fill. As noted above, surface topography slopes to the east. In order to maintain a level floor, the depth of clean fill beneath the slab increases from several inches in the west to more than 2 feet in the east.

At present P-Building is unoccupied. In general the layout is separated into two main areas. The northern portion of P-Building is a large open area separated from the southern portion of P-Building by a row of smaller rooms including restrooms and a control room. The southern portion of P-Building is sub-divided into several large areas including loading docks along the southern wall.

3.2 Conceptual Pilot System Design

Indoor air sampling conducted in 2010 indicates that concentrations of TCE measured in P-Building have exceeded the long-term non-residential indoor air criterion of 1.7 ppbv (calculated using TCE toxicity values which were updated in September 2011).

When CBC was purchased by Healthside Food Solutions in April 2010, Tecumseh Bakery, LLC, became an independent entity, and plans to occupy the site for bakery operations were terminated. In February 2012, the site was purchased by Tecumseh Food Machinery and Engineering, LLC. Current plans for the facility include separation of P-Building and S-Building from the remainder of the plant, so that portion of the facility can be leased or sold as a separate parcel, and to facilitate demolition of the remainder of the facility.

TPC proposed the installation of SVE system in P-Building during a meeting with USEPA on March 5-6, 2012. As discussed during that meeting, the proposed SVE system was designed to control the potential on-site volatilization to indoor air migration pathway, to reduce or eliminate the potential for lateral migration of affected soil gas, and as a mechanism for source control.

The *Workplan to Conduct a Pilot Study to Facilitate the Design and Installation of a Full-Scale Soil Vapor Extraction System* was prepared and implemented with three primary objectives 1) to provide data that can be used to design and optimize the full-scale SVE system, 2) to be expandable, i.e., the pilot system components can be maintained and included in the full-scale system design, and 3) to reduce the potential for on-site volatilization to indoor air and lateral migration until the full-scale system is designed and installed (TRC 2012d).

The construction of the pilot SVE system and pilot test data are summarized in Sections 4 and 5. The full-scale SVE system design and installation details are described in Section 6. Full-scale SVE system performance evaluation details are described in Section 7.

Section 4
Pilot System Construction Documentation

The pilot SVE system was installed in general accordance with the Pilot Study Workplan (TRC 2012d). Construction details and results of the pilot study performance evaluation are described below. Engineering design drawings for the full-scale SVE system, including as-built details for the pilot system, are provided in Appendix A. Data gathered during the pilot test were used to support full-scale system design, as described in Sections 5 and 6.

4.1 Extraction Point Design Details

Four extraction wells (SVE-1 thru SVE-4) were installed along the northern wall of P-Building at the locations shown on Sheet 3 of 7 (Appendix A). Soil boring logs and well construction forms for these extraction wells are provided in Appendix B. These wells were used to evaluate whether the soil vapor extraction process is a viable alternative to reduce vapor intrusion into indoor air within P-Building and to reduce the potential for lateral migration of impacted soil vapors beyond the site boundaries. The effectiveness of these wells in extracting soil vapors from the surrounding soils was evaluated using installed multi-depth soil gas vacuum monitoring points equipped with vacuum monitoring gages. Details of a typical extraction well are illustrated in Detail 1 on Sheet 9 of 9 (Appendix A).

The concrete slab at each extraction well location was saw-cut to expose the underlying sub-slab soils. After removing the concrete, each extraction well was installed by drilling an 18-inch diameter hole to a depth of approximately 18 ft bgs (2 to 4 feet above the typical depth to groundwater) using 12.25-inch inside diameter hollow stem augers. The well was constructed using a 4-inch diameter 30-slot (0.030-in) stainless steel well screen, installed from 8 to 18 ft below grade (10-foot long section). The annular space surrounding the well screen was backfilled with uniform washed pea gravel. Bentonite chips/granular bentonite (hydrated in place) were placed above the pea gravel well screen pack to provide an effective surface seal and to minimize the potential for drawing air from the surface at each extraction well point. A non-shrinking concrete-bentonite grout was used to fill the remaining annular space.

The below-grade portion of the extraction well riser pipes consists of 4-inch diameter Schedule 40 PVC pipe that extends from the top of the well screen to approximately 6 inches below the surface. A pipe tee (capped in the direction of the surface) was installed at the top of the riser pipe, with the horizontal leg of the tee extending the riser pipe toward the northern wall of P-Building. The horizontal portion of the riser pipe was bedded in sand, and a reinforced concrete surface seal covers the pipe and the remaining void within the floor slab. Two

45-degree elbows were used to route the riser pipe up through the slab, behind the steel guard rail, and vertically up the wall to the extraction pipe header which runs east-west along the northern wall of P-Building as described in Section 4.2. As-built riser pipe connection diagrams are provided on Sheet 7 of 9 in Appendix A.

4.2 Extraction Piping Design Details

The above-grade riser pipe at each soil vapor extraction well is constructed of 4-inch diameter Schedule 80 PVC. Each riser pipe is equipped with a butterfly valve to control air flow from each well. The riser pipe is also equipped with a sample tap for collection of photoionization detector (PID) readings, for vapor flow measurements, and vacuum monitoring.

Each extraction well riser pipe connects to an approximately 380-foot long 4-inch diameter Schedule 80 header pipeline. The header pipeline is secured to the roof support structures as shown on Sheets 4 and 7 of 9 (Appendix A). The header pipeline is sloped 0.1 to 0.2 feet per 100 feet of pipe run to allow condensation to drain toward the extraction wells or toward the air-water separation tank (see Section 4.3). The permanent header pipe terminates approximately 2 feet outside the western wall of P-Building at 10-feet above grade. A 4-inch cam-lock fitting was installed at the end of the header pipe to facilitate connection to the temporary SVE pilot system vacuum header via flexible 4-inch diameter hose.

4.3 SVE Pilot System Blower Details

The SVE vacuum blower and appurtenances which are currently in use are housed in a ventilated 8-ft wide by 18-ft long insulated trailer, located outside P Building as shown on Sheet 3 of 9 (Appendix A). The 4-inch diameter manifold pipe penetrates the western wall of P-Building (see Detail 4; Sheet 9 of 9; Appendix A), and connects to the vacuum header of the SVE blower within the SVE trailer. The vacuum header within the trailer contains the following components:

- Inlet vacuum gauge and air by-pass valve
- Air-water separation tank
- Inlet air filter
- Air flow meter

The pilot SVE blower is a Roots 59 positive displacement-type vacuum blower capable of extracting up to 450 actual cubic feet per minute (acfm) at 8-inches Hg (vacuum). The blower is powered with a 10 horsepower motor. The blower exhaust manifold is equipped with the following components:

- Thermometer and thermostat (to shut the blower down on high temp condition caused by low air flow)
- Discharge silencer
- Sample port
- Exhaust stack vented above the roof line.

See Appendix C for a fan curve and blower system component details.

For the pilot test, the electrical power to the SVE blower is supplied using a diesel-powered electrical generator.

4.4 Temporary Multi-Level Subsurface Vacuum Monitoring Point Details

Temporary subsurface vacuum monitoring points (TVP-XX) were installed at 14 locations as shown on Sheet 3 of 9 (Appendix A). Locations were selected to provide the required data for preparation of distance-drawdown plots to evaluate well efficiency and radius of vacuum influence for each well during the stepped-rate tests and the long-term constant rate test. Additional consideration for probe placement was given to evaluating the effect of the sewer line located approximately 8-feet south and running parallel to the north wall (as shown on Sheet 4 of 9 in Appendix A).

At each location, a nested pair of vacuum monitoring points was installed; the deep point was installed at a depth of 15.5 to 16 ft bgs (approx.) and the shallow point was installed at a depth of 10 to 10.5 ft bgs (approx.). The multi-level vacuum monitoring point design allows for an assessment of flow patterns within the subsurface soils, specifically as it relates to depth within the vadose zone soils. Monitoring point construction forms are provided in Appendix B.

Each nested pair was constructed in a single borehole. The 2.25-inch borehole was installed to 16 ft bgs (approx.) using Geoprobe® direct-push technology. Each vacuum monitoring point is constructed with a 6-inch long stainless steel monitoring implant (Geoprobe® Vapor Implant AT8617S) and a length of ¼-inch diameter tubing necessary to extend from the top of the Implant to the ground surface. Each nested pair was constructed as illustrated in Details 2 and 3 on Sheet 9 of 9 (Appendix A), and as described below:

- The deep monitoring point was installed at the bottom of the borehole.
- The annular space surrounding the deep monitoring point screen was backfilled with clean sand to approximately 1 foot above the top of the screen.
- Granular bentonite chips were placed above the sand well screen in 6- to 8-inch lifts to approximately 11.5 ft bgs (1 foot below the bottom of the shallow monitoring point screen).

Each lift was hydrated in place prior to the addition of the next lift to help ensure an effective seal between the shallow and deep monitoring point.

- An approximately 1-foot thick sand pack (10.5 to 11.5 ft bgs) was installed above the bentonite seal to ensure that the bentonite did not swell plugging the shallow monitoring point.
- The shallow monitoring point was installed above the sand at 10 to 10.5 ft bgs.
- The annular space surrounding the shallow monitoring point screen was then backfilled with clean sand to approximately 0.5 foot above the top of the screen (9.5 to 10 ft bgs).
- Granular bentonite was placed above the sand well screen in 6- to 8-inch lifts to approximately 1 ft bgs. Each lift was hydrated in place prior to the addition of the next lift to help ensure an effective seal between the shallow monitoring point and the ground surface.
- Tubing from each nested pair extends at least 12-inches above the top of the bentonite. Colored electrical tape was used to label each monitoring point so that the shallow and deep monitoring points are easy to distinguish. Shallow points are labeled with yellow tape and deep points are labeled with red tape.
- Tubing from each monitoring point is capped with a ball valve and equipped with a barbed hose fitting.
- The majority of the temporary vacuum monitoring points are located inside P-Building which is currently not in use. Therefore, a protective monitoring point cover and concrete surface seal were not required. Interior monitoring locations are identified and protected from traffic associated with incidental building use by traffic cones. Exterior monitoring points (TVP-01 and TVP-02) are located in the City of Tecumseh right-of-way. These monitoring points are each finished with a flush-mount protective cover to protect them from inclement weather and right-of-way users.
- Temporary vacuum monitoring points will be abandoned following installation and evaluation of the full-scale SVE system.

During pilot testing, a portable vacuum gauge was connected to each probe, and the ball valve was opened to measure vacuum propagation away from the extraction wells in order to assess zone of vacuum influence. Vacuum measurements were taken at both shallow and deep probes to assess the distribution of subsurface flow vertically throughout the vadose zone soils.

Section 5
Pilot Test Data Evaluation and Calculations

Pilot study performance evaluation as outlined in Section 5 of the Pilot Study Workplan was performed to support full-scale SVE system design. Key parameters evaluated include:

- Air flow rates achievable from each pilot study extraction well under given vacuum conditions.
- Measurable vacuum at specified distances from each extraction well (zone of vacuum influence).
- Quantitative determination of VOC emissions in order to ensure air permit exemption compliance during the pilot study and to assess the need for future air emission control devices and/or an air permit.

The pilot study performance evaluation included short-term stepped-rate tests for estimating individual extraction well capacities/system curves as well as a long-term (on-going) constant rate test utilizing all four extraction wells to evaluate the overall area of influence and extraction system performance. Testing and monitoring locations are shown on Sheet 3 of 9 of the Soil Vapor Extraction System Design drawings contained in Appendix A.

5.1 Stepped-Rate Test and Constant-Rate Test Evaluation

As described in the Workplan, stepped-rate tests were conducted on the installed pilot SVE system to evaluate vapor recovery rates obtainable at various applied vacuum conditions. These data were evaluated to determine the relationship between vacuum, flow, head loss, and radius of influence as described below.

5.1.1 Field Data

Each extraction well was isolated and tested separately by closing the valves at each of the other extraction points. Extraction wells were highly conductive to flow such that relatively low (< 2 inches Hg) applied vacuum was necessary to achieve relatively high air flow from each extraction well. Each extraction well was tested at three vacuum conditions, 14 -18 inches water, 9.2-12 inches water, and 4.6-7.5 inches of water, to achieve three different air flow rates from each tested well. The different vacuum conditions were achieved by opening dilution (make-up) air valve(s) located immediately upstream of the SVE blower. With no dilution air (14-18 inches water vacuum), the total air flow from each well ranged from 481-516 cubic feet per minute (cfm). With one of two dilution valves partially open, the total air flow from each well

ranged from 327-390 cfm. With both dilution valves partially open, the total flow from each well ranged from 180-242 cfm. During each stepped-rate test, flow and vacuum were measured at the target extraction well, and vacuum was measured at temporary vacuum monitoring points and closed extraction wells to evaluate radius of influence. Stepped-rate test field data for extraction wells SVE-1 thru SVE-4 are presented in Tables 1 thru 4. A minimum of two rounds of readings were collected during each test to confirm stable conditions. Data were averaged for use in vacuum, flow, loss and radius of influence calculations.

Once stepped-rate tests were complete, the total system flow was adjusted to approximately 240 cfm to ensure compliance with air permit exemption requirements (as described in the Pilot Study Workplan), and the system was balanced such that flow at each extraction well was approximately the same (60-64 cfm).

As described below (Section 5.2), the air permit compliance evaluation indicated that make-up air was not needed to reduce the total flow from the system to maintain less than 20 lbs of carcinogenic VOCs extracted per month, as required for an air permit exemption. On May 10, 2012, the make-up air was reduced from approximately 220 CFM to 0 CFM, and the system was re-balanced such that flow at each extraction well is approximately the same (105 to 124 SCFM). In conjunction with routine blower maintenance, flow and pressure readings are collected on a weekly basis at each extraction well.

5.1.2 Vacuum Versus Flow

The average observed vacuum at each extraction well was plotted as a function of flow using Microsoft® Excel, and fitted with a second order polynomial function. Charts 1 thru 4 illustrate flow as a function of applied vacuum for extraction wells SVE-1 thru SVE-4, respectively. None of the wells were air-flow limited within the range of applied vacuums tested.

5.1.3 Piping Loss

During stepped-rate tests, vacuum was measured at the target extraction well and at the piping inlet to the blower trailer. Field data are provided in Table 5. Differential pressure between the extraction well and the trailer was divided by the total length of SVE system piping (133 ft, 224 ft, 330 ft and 421 ft for extraction wells SVE-1 thru SVE-4 respectively). The average head loss per 100 feet of SVE pilot system piping was plotted as a function of average flow using Microsoft® Excel, and fitted with a second order polynomial function. Chart 5 illustrates head loss per 100 feet of piping as a function of

flow for extraction wells SVE-1 thru SVE-4. Equations for the best fit lines were then used to normalize data collected at each extraction well, by calculating head loss for three specified flow rates (200 cfm, 350 cfm and 500 cfm).

Calculated Vacuum Loss

Extraction Well	Calculated Vacuum Loss (inches water per 100 ft)		
	200 cfm	350 cfm	500 cfm
SVE-1	2.64	6.52	12.0
SVE-2	2.05	5.04	9.27
SVE-3	1.71	4.63	8.95
SVE-4	1.71	4.05	7.30
Average	**2.03**	**5.06**	**9.39**

Overall the pilot system has a greater number of fittings resulting in minor losses near the building outlet and blower inlet. When averaged over total piping length those minor losses are more significant for the extraction wells closer to the system blower. However, total loss is greatest for the extraction point furthest from the blower along any pipe run. Therefore, for system design, loss is calculated for the extraction point furthest from the blower where minor losses are less significant. In order to estimate piping loss for final system design, the average head loss per 100 feet of SVE pilot system piping was plotted as a function of flow using Microsoft® Excel, and fitted with a second order polynomial function (Chart 5). The following equation can be used to conservatively estimate piping head loss for full-scale system design:

$$y = 2.87 \times 10^{-5}x^2 + 0.0044x$$

Where *y* is the head loss per 100 feet of SVE system piping and *x* is the flow rate in cfm.

5.1.4 Radius of Influence

For each stepped-rate test, vacuum pressure readings were collected at vacuum monitoring points and nearby extraction wells (Tables 1 thru 4). A comparison of field data for shallow and deep monitoring points found little, if any, difference in vacuum pressure between paired shallow and deep monitoring points, indicating a uniform vertical vacuum/flow field, i.e., extraction well radius of influence is consistent through the extraction zone (10 to 18 ft bgs).

Average vacuum at each vacuum monitoring location (shallow and deep points are plotted as separate points) was plotted as a function of distance from the extraction well (Charts 6 thru 17). As illustrated in Charts 6 thru 17, observed vacuum decreases exponentially with increasing distance from the extraction well. Using the observed exponential decrease in vacuum and the assumption that radius of influence beneath the building may differ from radius of influence outside the building, data were separated and transformed. The log transformed vacuum pressure measurements at interior and exterior monitoring points were plotted as a function of distance from the extraction well using Microsoft® Excel, and fitted with linear regression line(s) (Chart 18 thru 29).

Linear regression lines were used to calculate the radius of influence for each test condition, assuming a threshold vacuum condition of 0.1 inches of water. Results are summarized below.

For interior measurement points, radius of influence was plotted as a function of flow rate using Microsoft® Excel, and fitted with a linear regression line (Chart 30).

Radius of Influence (ROI) at Interior Measurement Points

Extraction Well	Calculated Radius of Influence (Min. Vacuum 0.1" Water)					
	Flow (cfm)	ROI (ft)	Flow (cfm)	ROI (ft)	Flow (cfm)	ROI (ft)
SVE-1	201	96.6	327	116	501	144
SVE-2	207	102	390	136	516	151
SVE-3	242	122	358	140	481	159
SVE-4	180	104	333	122	485	131

The following equation can be used to estimate **interior** radius of influence for full scale system design:

$$y = 0.1437x + 76.435$$

Where y is the interior radius of influence in feet and x is the well flow rate in cfm.

For exterior measurement points, radius of influence was plotted as a function of flow rate using Microsoft® Excel, and fitted with a linear regression line (Chart 31).

Radius of Influence (ROI) at Exterior Measurement Points

Extraction Well	Calculated Radius of Influence (Min. Vacuum 0.1" Water)					
	Flow (cfm)	ROI (ft)	Flow (cfm)	ROI (ft)	Flow (cfm)	ROI (ft)
SVE-1	201	<65	327	>65	501	86.5
SVE-2	207	44.5	390	66.4	516	82.5
SVE-3	242	<72	358	>72	481	91.0
SVE-4	180	NM	333	NM	485	NM

The following equation can be used to estimate **exterior** radius of influence for full scale system design:

$$y = 0.092x + 38.711$$

Where y is the exterior radius of influence in feet and x is the well flow rate in cfm.

5.2 Air Permit Exemption Compliance Evaluation

An air permit evaluation was prepared to determine if an air permit would be required for operation of the pilot SVE system. The evaluation is presented in the Pilot Study Workplan. Using available sub-slab soil gas data, TRC conservatively estimated a maximum concentration of carcinogenic VOCs in the SVE exhaust. This concentration was then used to calculate a maximum allowable air flow rate for the constant-rate test (up to 270 standard cubic feet per minute [SCFM]).

As noted above, extraction wells were highly conductive to flow such that relatively low (<5 inches water) vacuum was observed at each extraction well even with the blower dilution value completely closed (i.e., no make-up air). With no make-up air, the blower capacity (approximately 460 SCFM) exceeded the calculated maximum allowable air flow rate (270 SCFM). On April 20, 2012, following completion of stepped-rate tests, the parameters for the constant-rate test were established:

- Make-up air was used to reduce the total system flow to less than 270 SCFM, and
- The butterfly values at each extraction well were used to balance the system such that flow at each extraction well was approximately the same (60-64 cfm).

On April 23, 2012, the constant-rate test was initiated. During the constant-rate test flow rate and gas samples were collected for VOCs analysis to confirm compliance with MDEQ air permit exemption requirements.

Total VOC emissions were determined by measuring flow rate and VOC concentration at each emission source, including the pilot SVE system, the S-Building sub-slab depressurization/ ventilation system, and the methane ventilation system. The three emissions sources were combined to determine the cumulative monthly facility emissions.

5.2.1 Flow Rates

Flow rates were measured at each of the three emission sources on April 25, 2012, approximately 48-hours after initiation of the constant-rate test. Measured flow rates area tabulated below:

Emission Source Flow Rates

Emission Source	Measured Flow (SCFM)
Pilot SVE Exhaust	460 (including 220 CFM make-up air)
S-Building SSDV System Exhaust	43
CH_4 Control System: V-01	4
CH_4 Control System: V-01	2
CH_4 Control System: V-01	2
Total	**491**

5.2.2 Sample Collection

Air samples were collected at each of the three emission sources on April 25, 2012. A second, confirmation, air sample was collected from the SVE system exhaust on May 2, 2012. Sample collection was conducted in general accordance with the Pilot Study Workplan as described below:

- Each sample was collected in a laboratory supplied certified-clean 1-liter SUMMA® sample canister equipped with a flow controller set to a nominal 100 milliliters per minute. The canister was evacuated to a nominal 26 to 30 inches of mercury and shipped to the field under Chain-of-Custody documentation.
- The sampling apparatus was assembled, and a vacuum shut-in test was performed to confirm that there were no significant leaks in the sample train prior to use.
- The sample information, including canister number, flow controller number, and initial canister vacuum were recorded on TRC standard air sampling forms.
- The valve on the sample canister was then opened to begin sample collection. The initial canister vacuum and starting sample collection time will be recorded.

– Once the vacuum gage indicated that sample collection was complete, the valve on the sample canister was closed. The final canister vacuum and ending sample collection time were recorded.

Field procedures for sample documentation, handling, storage, shipment, preservation, and Chain-of-Custody were conducted in accordance with the procedures outlined in the Quality Assurance Project Plan (QAPP) (RMT, 2010d). Samples were analyzed by H&P Mobile Geochemistry using USEPA Method TO-15 for the site constituents of concern (COCs), specifically 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, trichloroethene, and vinyl chloride. Field personnel documented sample collection procedures on field data forms.

5.2.3 Data Evaluation

The analytical reports for the emission samples are included in Appendix D. Chemistry data for the three emission sources are summarized in Table 6. The ratio of make-up air to total flow from the pilot SVE system was used to estimate the SVE system exhaust concentration prior to the addition of make-up air. Measured emission concentrations were approximately an order of magnitude lower than those predicted using sub-slab soil gas data. The maximum concentration for each constituent (Table 6) was used to recalculate the maximum allowable undiluted air flow for continued operation of pilot test and for full-scale SVE system design (Table 7). The calculated maximum total allowable air flow is 2,400 SCFM, including the S-Building sub-slab depressurization/ ventilation system and the methane ventilation system. Therefore the maximum allowable undiluted air flow for the full-scale SVE system is 2,300 SCFM.

Given the calculated maximum allowable undiluted air flow of 2,300 SCFM for the SVE system, make-up air is not needed to reduce the total mass extraction rate from the pilot SVE system and ensure compliance with air permit exemption requirements. On May 10, 2012, the make-up air flow in the pilot SVE system was reduced from 220 CFM to 0 CFM, and the system was re-balanced such that flow at each extraction well is approximately the same (105 to 124 SCFM).

Section 6
Full-Scale SVE System Design and Installation

Full-scale SVE system design details and proposed installation methods are described below. Engineering design drawings for the full-scale SVE system are provided in Appendix A. Data gathered during the pilot test (see Section 5) were used to support full-scale system design and operation.

6.1 Extraction Point Design Details

Three additional extraction wells (SVE-5 thru SVE-7) will be installed along the western half of P-Building at the approximate locations shown on Sheet 3 of 7 (Appendix A). In conjunction with extraction wells SVE-1 thru SVE-4 which were installed for the pilot study, these wells will be used to control the volatilization to indoor air migration pathway in P-Building. Secondarily, the full-scale system will reduce the potential for lateral migration of impacted soil vapors beyond the site boundaries, and may extract residual CVOCs from the source area soils. Details of a typical extraction well are illustrated in Detail 1 on Sheet 9 of 9 (Appendix A).

Extraction points will be constructed in accordance with the pilot study design, as described in Section 4.1 above. For SVE-5, SVE-6 and SVE-7 the horizontal leg of the tee will extend the riser pipe toward the nearest wall or I-beam. Two 45-degree elbows will extend the riser pipe through the slab and vertically up the nearest wall or I-beam. From the wall/I-beam the riser pipe two 45-degree elbows will be used to route the riser pipe horizontally to the header pipeline (see Sheet 8 of 9; Appendix A).

6.2 Extraction Piping Design Details

The above-grade riser pipe and header pipe will be constructed in accordance with the pilot study design, as described in Section 4.2 above. Each extraction well riser pipe will connect to an approximately 340-foot long 4-inch diameter Schedule 80 header pipeline. The proposed layout of extraction piping is shown on Sheets 3 and 5 of 9 (Appendix A). The entire length of the header pipe will be secured to the ceiling using pipe hangers and supports (see Sheet 9 of 9; Appendix A). The header pipeline will penetrate two interior cinder block walls at the approximate locations shown on Sheet 5 of 9 (Appendix A). Pipe size, consistent with that used in the pilot study, was confirmed using piping loss calculations as described in Section 5.1.3 above.

6.3 SVE System Blower Details

The full-scale soil vapor extraction vacuum blower and appurtenances will be housed in a ventilated 8-ft wide by 20-ft long insulated conex box-style enclosure (or equivalent). The enclosure will be located outside P-Building as shown on Sheet 4 of 9 (Appendix A). Two 4-inch diameter manifold pipes (one from SVE-1 thru SVE-4, and one for SVE-5 thru SVE-7) will penetrate the western wall of P Building (see Detail 4; Sheet 9 of 9; Appendix A), and will connect to the vacuum header of the SVE blower housed within the SVE enclosure. The vacuum header within the enclosure will contain the following components:

- A three leg intake manifold constructed of 4-inch diameter Schedule 80 PVC (one leg for SVE-1 thru 4, one leg for SVE-5 thru SVE-7, and one leg for make-up air or system expansion). Each leg of the intake manifold will be equipped with a sample port, a flow control valve, a vacuum gage, and an air flow metering device with transmitter.
- A 220-gallon (approximate) air-water separation tank, i.e., a water knock-out tank, to prevent fluids from entering the blower. The knock-out tank will be equipped with a vacuum gage, a relief valve, site tube to monitor the accumulation of fluids, a high level float switch to automatically shut-down the blower if water in the tank reaches that level, a high-high float back-up switch to provide a failsafe in the event that the high level switch fails, a manual bottom drain to remove fluids from the tank, and a manway for cleaning purposes.
- An inlet air filter to prevent particulates from entering the blower. A differential pressure switch/transmitter will automatically shut down the blower in the event that the filter excessively restricts air flow to the blower. The air filter unit will also be equipped with direct-read inlet and outlet vacuum gages to allow personnel to record and monitor the pressure drop across the filter during typical O&M inspections.
- A totalized air flow meter with transmitter between the knock out tank and the air filter.

The SVE blower will be a DR P13 Rotron (or equivalent) regenerative-type vacuum blower capable of extracting up to 1000 actual cubic feet per minute (acfm) at 40-inches water (vacuum). See Appendix E for a fan curve.

The blower will be powered with a 20 horsepower motor equipped with a variable speed drive unit that will allow manual motor speed adjustments to be made in order to optimize soil vapor extraction rate and energy demand. The blower exhaust manifold will be constructed of carbon steel pipe and equipped with the following components:

- Thermometer and thermostat (to shut the blower down on high temp condition caused by low air flow)
- Discharge silencer
- Exhaust stack vented above the roof line.

Construction of the permanent full-scale blower enclosure is expected to take 4 to 6 weeks. Until the full-scale blower enclosure is constructed and installed, the SVE system may be operated using the pilot system blower as described in Section 4.3 above.

Currently, electrical power to the pilot SVE blower is supplied using a diesel-powered electrical generator. For long-term operation, a separate metered power drop will be installed to provide power for the full-scale system. Until a permanent power supply is installed, power will continue to be supplied using the diesel-powered generator.

Section 7
SVE System Performance Evaluation

Full-scale SVE system performance evaluation will be conducted to confirm that the system is operating as designed. Key parameters to be evaluated include:

- Air flow rates achievable from each new extraction well under given vacuum conditions.
- Quantitative determination of VOC emissions from the extraction system to ensure air permit exemption compliance.
- Indoor air sampling to confirm that the system has reduced indoor air CVOC concentrations to less than non-residential indoor air criteria.
- Overall SVE system performance.

The proposed performance evaluation will include short-term stepped-rate tests for estimating individual extraction well capacities/system curves as well as collection of both SVE system exhaust samples and indoor air samples. Testing and monitoring locations are shown on Sheets 4 and 5 of 9 of the Soil Vapor Extraction System Design drawings contained in Appendix A.

7.1 Equipment Requirements

Equipment requirements for performance testing include:

- Vacuum Gauge(s) – Magnehelic® Differential Pressure Gages (or equivalent) with sensitivity to 0.01 inch of water
- Flow Measuring Device – Hot wire anemometer
- Portable Temperature Probe
- Photoionization Detector (PID)
- Barometer/Thermometer

7.2 Stepped-Rate Test Evaluation

The purpose of the stepped-rate test is to evaluate vapor recovery rates obtainable at various applied vacuum rates. Data collected will be used to evaluate the relationship between flow, applied vacuum, and head loss. Approximately one day will be dedicated to performing stepped-rate tests at extraction points SVE-5, SVE-6, and SVE-7.

7.2.1 Field Procedures and Data Collection

The following sequence describes the procedures and data collection requirements for performing a single stepped-rate test. Following the completion of this sequence, a different extraction well will be isolated and the sequence will be repeated.

1. Isolate flow to one extraction well by closing all wellhead butterfly valves except for the well to be tested.
2. With the butterfly valve on the extraction valve completely open, turn on the blower, allow the system to stabilize (approximately 10 to 15 minutes) and record:
    a. Time
    b. Pressure, temperature, and PID reading at the blower (i.e., exhaust stack).
    c. Flow rate, pressure, and temperature at test extraction well.
    d. Pressure at adjacent monitoring locations, including closed extraction wells and vacuum monitoring points, if any. If pressure influences are observed at adjacent locations, additional locations moving radially away from the test well should be monitored until no influences are observed.
3. Open the system dilution valve(s) to decrease the vacuum/flow at the test extraction well. The dilution valve should be adjusted so that the vacuum pressure is reduced by approximately 5 inches water. Allow the system to stabilize (approximately 10 to 15 minutes) and follow the data recording requirements outlined in Step 2:
4. Repeat Step 3, opening the dilution valve further and decreasing the vacuum applied to the test extraction well by an additional 5 inches water. Follow the data recording requirements outlined in Step 2.
5. Repeat Step 4 in a series of equal 5 inches water decreases in the applied vacuum at the test extraction well until the applied vacuum is zero.
6. Once the stepped-rate test is complete at a given well, turn off the blower and allow the system to stabilize back to a level where initial background conditions are observed (i.e., zero pressure measured at the test well and adjacent monitoring locations).
7. Repeat the stepped-rate testing at a new test extraction well beginning with Step 1 of this procedure.

7.2.2 Data Evaluation

Following the completion of the stepped-rate tests, data evaluation will include:

- Preparation of system curves for the three wells tested. System curves will consist of plotting observed wellhead flow versus vacuum applied for each well tested, and comparison to pilot test data.
- Determination of differential pressure between the extraction well and the SVE enclosure and comparison to piping loss calculations from the SVE pilot study.
- Evaluation of radius of vacuum influence, and comparison to radius of influence calculations from the SVE pilot study.

7.3 Full-Scale System Start-Up

Following the conclusion of individual stepped-rate tests, the SVE system will be configured to operate all seven extraction wells. Valves at the SVE enclosure and at individual extraction wells will be used to balance flow between each extraction well. The system will be considered balanced if the flow at all extraction wells is within 20-percent of the average extraction well flow rate. Once the system is balanced, the following data will be collected:

- Time
- Pressure and temperature at the blower (i.e., exhaust stack).
- Flow rate, pressure, and temperature at each extraction well.
- Pressure at vacuum monitoring points.

As described in Section 6.3, the full-scale system will be operated temporarily using the pilot system blower. When the permanent blower is installed, the system will be re-balanced and field data collected as described above.

7.4 Air Permit Exemption Compliance Evaluation

An air permit evaluation was prepared to determine if an air permit would be required for operation of the proposed full-scale SVE system. As described in Section 5.2, total VOC emissions were determined by measuring flow rate and VOC concentration at each emission source, including the pilot SVE system, the S-Building sub-slab depressurization/ ventilation system, and the methane ventilation system. The three emissions sources were combined to determine the cumulative monthly facility emissions.

In order to comply with Michigan DEQ air permit exemption requirements, TRC calculated maximum allowable air flow of 2,300 SCFM for the SVE system (allowing 100 SCFM for other emission sources). The SVE blower has a flow rate of 1000 ACFM at 40 inches water, which is

well below the calculated maximum allowable air flow. However, because additional extraction locations will be added to the system, the actual SVE exhaust concentration may change. Therefore, a SVE system exhaust sample will be collected to confirm air permit exemption compliance, following installation of the permanent SVE blower. At a minimum, SVE system exhaust samples will be collected annually to document continued compliance with air permit exemption requirements. Actual emissions will be determined as described below.

7.4.1 Flow Rate

Flow rates will be measured at each of the extraction wells and at the SVE blower exhaust within one week of the permanent blower installation and start-up.

7.4.2 Sample Collection

An air emission sample will be collected from the exhaust sample port in the SVE enclosure within one week of the permanent blower installation and start-up. Samples will be collected as described below:

- The grab sample will be collected in a laboratory-supplied certified-clean 1-liter SUMMA® sample canister. The canister will be evacuated to a nominal 26 to 30 inches of mercury and shipped to the field under Chain-of-Custody documentation.
- The sampling apparatus will be assembled, and a vacuum shut-in test will be performed to confirm that there are no significant leaks in the sample train prior to use.
- The sample information, including canister number, flow controller number, and initial canister vacuum will be recorded on TRC standard air sampling forms.
- The valve on the sample canister will then be opened to begin sample collection. The initial canister vacuum and starting sample collection time will be recorded.
- Once the vacuum gage indicates that sample collection is complete, the valve on the sample canister will be closed. The final canister vacuum and ending sample collection time will be recorded.

Field procedures for sample documentation, handling, storage, shipment, preservation, and Chain-of-Custody will be conducted in accordance with the procedures outlined in the Quality Assurance Project Plan (QAPP) (RMT, 2010d). Samples will be analyzed by H&P Mobile Geochemistry using USEPA Method TO-15 for the site COCs, specifically 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, trichloroethene, and vinyl

chloride. Field personnel will document sample collection procedures on field data forms or in field notebooks.

7.4.3 Data Evaluation

Data evaluation during and following system exhaust sampling may include:

- System flow rates and concentrations of site COCs will be used to determine the cumulative monthly facility emissions and to verify compliance with PTI exemption requirements.
- Based on the cumulative facility emissions, the maximum allowable SVE system flow rate will be recalculated. If cumulative monthly VOC-emissions exceed the 20 pound per month limit (i.e., measured concentrations are higher than predicted), the SVE system flow will be reduced to meet PTI exemption requirements. If appropriate, an emission treatment system may be installed and/or an air permit may be obtained.

7.5 Indoor Air Sampling

Indoor air sampling to confirm that the volatilization to indoor air migration pathway is under control will be completed following one of the trigger events listed below, whichever occurs first:

- P-building is separated from the remainder of the facility (so that lateral migration from portions of the building targeted for demolition does not confound indoor air sample results); or
- Within 30 days of the start of regular building use by long-term, regular (approximately 40 hours per week) employees.

7.5.1 Sample Locations

A minimum of four samples will be collected for P-building at the approximate locations shown on Sheet 3 of 9 (Appendix A). Actual sample locations may be modified to accommodate building use.

7.5.2 Sample Frequency

An initial indoor air sample event will be conducted as described above. A regular indoor air monitoring program will be developed and implemented if/when plans to occupy the building are realized.

7.5.3 Sample Collection

Indoor air samples will be collected at designated indoor air sample locations as described below:

- Composite indoor air samples will be collected in a laboratory supplied certified-clean 1-liter SUMMA® sample canisters. The flow controller will be set to a nominal 2 mL/min (8-hour sample). The canister will be evacuated to a nominal 26 to 30 inches of mercury and shipped to the field under Chain-of-Custody documentation.
- The sampling apparatus will be assembled, and a vacuum shut-in test will be performed to confirm that there are no significant leaks in the sample train prior to use.
- The sample information, including canister number, flow controller number, and initial canister vacuum will be recorded on TRC standard air sampling forms.
- The sample apparatus will be placed at the designated sample location and elevated with buckets or other materials so that the sample is collected from the breathing zone.
- The valve on the sample canister will then be opened to begin sample collection. The initial canister vacuum and starting sample collection time will be recorded.
- Approximately 8-hours after sample collection is initiated, the field technician will return to the site to terminate sample collection.
- Once the vacuum gage indicates that sample collection is complete, the valve on the sample canister will be closed. The final canister vacuum and ending sample collection time will be recorded.

Field procedures for sample documentation, handling, storage, shipment, preservation, and Chain-of-Custody will be conducted in accordance with the procedures outlined in the Quality Assurance Project Plan (QAPP) (RMT, 2010d). Samples will be analyzed by H&P Mobile Geochemistry using USEPA Method TO-15 for the site COCs, specifically 1,1-dichloroethane, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, trichloroethene, and vinyl chloride. Field personnel will document sample collection procedures on field data forms or in field notebooks.

7.5.4 Data Evaluation

Concentrations of COCs will be compared to non-residential indoor air criteria. If concentrations of COCs are below non-residential indoor air criteria, the system is operating as expected and no further action is required. If the concentration of one or

more COC is above the applicable indoor air criterion, an evaluation will be conducted to determine the source of the COC (i.e., soil gas migration to indoor air, lateral migration of affected indoor air from the portion of the building without an SVE system, background indoor air sources, or some combination thereof). If the COC(s) above the applicable indoor air criterion can be attributed to soil gas migration to indoor air, system improvements will be made as needed to reduce indoor air concentrations.

7.6 Long-Term Operation and Maintenance

The SVE system will be equipped a remote sensing devise and alarm system (telemetry). Flow and pressure data will be downloaded and reviewed regularly. Data available remotely will include:

- Flow rate for each of the three 4-inch manifold pipes (one for SVE-1 thru SVE-4, one for SVE-5 thru SVE-7, and one for make-up air or system expansion) into the SVE blower enclosure
- Total system flow rate (measured between the knock out tank and blower)
- Differential pressure across the air filter

In addition to the ability to monitor routine system data remotely, the system will notify designated staff via email if deactivation of the blower occurs due to any of the following alarm conditions:

- Motor overload
- High temperature at the exhaust stack
- High or low vacuum
- High or high-high water level reached in the knock out tank

Following notification of an alarm condition, TRC will work to correct the problem as soon as possible either remotely or in person, as appropriate.

Quarterly on-site system inspections will be conducted to verify that the system is operating as expected. An operation and maintenance checklist will be completed by the field technician. At a minimum, the inspection will include the following:

- Flow and pressure readings at each extraction well;
- Differential pressure between the air filter inlet and outlet;
- Pressure and temperature at the blower (i.e., exhaust stack);

- Inspection of the blower and motor; and
- Inspection of system piping, fittings and supports.

Deficiencies identified during system inspections will be corrected as soon as possible, typically within 30 days of discovery.

7.7 Reporting

A construction documentation and system performance evaluation report will be prepared following installation of the permanent blower enclosure. Letter reports will be prepared as appropriate to document the results of indoor air sampling, air permit compliance sampling, and quarterly system inspections.

Section 8
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Tables

Table 1
Pilot Stepped-Rate Test Data Sheet – SVE-1
Soil Vapor Extraction System – Former Tecumseh Products Site
Tecumseh, Michigan

Pressure Monitoring Location	Depth	Distance (ft)	**Total Flow ~501 CFM**				**Total Flow ~327 CFM**				**Total Flow ~201 CFM**			
			Pressure (in. H_20)				Pressure (in. H_20)				Pressure (in. H_20)			
			Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average
SVE-1	--	0	16	16	16	16.0	9.2	9.2	9.2	9.20	5.1	5.2	5.3	5.20
SVE-2	--	91	0.27	0.26	--	0.3	0.17	0.17	--	0.17	0.11	0.10	--	0.105
SVE-3	--	196	0.03	0.02	--	0.025	0.00	0.02	--	0.010	0.00	0.00	--	--
TVP-01	Shallow	177	0.01	0.00	--	0.005	0.00	0.00	--	--	0.00	0.00	--	--
	Deep	177	0.01	0.01	--	0.010	0.00	0.00	--	--	0.00	0.00	--	--
TVP-02	Shallow	65	0.18	0.18	--	0.180	0.11	0.11	--	0.110	0.06	0.07	--	0.065
	Deep	65	0.20	0.20	--	0.200	0.12	0.12	--	0.120	0.07	0.07	--	0.070
TVP-03	Shallow	164	0.06	0.05	--	0.055	0.04	0.04	--	0.040	0.00	0.00	--	--
	Deep	164	0.06	0.05	--	0.055	0.04	0.04	--	0.040	0.00	0.00	--	--
TVP-04	Shallow	130	0.10	0.09	--	0.10	0.05	0.06	--	0.055	0.03	0.03	--	0.030
	Deep	130	0.11	0.10	--	0.11	0.06	0.07	--	0.065	0.04	0.04	--	0.040
TVP-05	Shallow	62	0.58	0.57	--	0.58	0.36	0.37	--	0.37	0.23	0.22	--	0.225
	Deep	62	0.59	0.58	--	0.59	0.37	0.37	--	0.37	0.24	0.23	--	0.235
TVP-06	Shallow	31	1.3	1.3	--	1.30	0.85	0.85	--	0.850	0.54	0.53	--	0.535
	Deep	31	1.3	1.3	--	1.30	0.84	0.84	--	0.840	0.54	0.53	--	0.535
TVP-07	Shallow	201	0.05	0.03	--	0.040	0.00	0.00	--	--	0.00	0.00	--	--
	Deep	201	0.05	0.03	--	0.040	0.00	0.00	--	--	0.00	0.00	--	--
TVP-08	Shallow	97	0.38	0.37	--	0.38	0.24	0.24	--	0.24	0.15	0.14	--	0.145
	Deep	97	0.38	0.37	--	0.38	0.24	0.24	--	0.24	0.15	0.14	--	0.145
TVP-09	Shallow	35	1.1	1.1	--	1.10	0.73	0.72	--	0.725	0.47	0.45	--	0.460
	Deep	35	1.1	1.1	--	1.10	0.73	0.73	--	0.730	0.47	0.46	--	0.465
TVP-10	Shallow	209	0.05	0.03	--	0.040	0.00	0.00	--	--	0.00	0.00	--	--
	Deep	209	0.05	0.03	--	0.040	0.00	0.00	--	--	0.00	0.00	--	--
TVP-11	Shallow	114	0.29	0.28	--	0.285	0.17	0.18	--	0.175	0.11	0.10	--	0.105
	Deep	114	0.30	0.28	--	0.290	0.17	0.19	--	0.180	0.12	0.10	--	0.110
TVP-12	Shallow	70	0.55	0.55	--	0.550	0.35	0.35	--	0.350	0.22	0.22	--	0.220
	Deep	70	0.56	0.56	--	0.560	0.35	0.35	--	0.350	0.22	0.22	--	0.220
TVP-13	Shallow	164	0.04	0.03	--	0.035	0.02	0.03	--	0.025	0.00	0.00	--	--
	Deep	164	0.05	0.04	--	0.045	0.02	0.03	--	0.025	0.00	0.00	--	--
TVP-14	Shallow	130	0.06	0.06	--	0.060	0.03	0.04	--	0.035	0.02	0.02	--	0.020
	Deep	130	0.08	0.08	--	0.080	0.04	0.05	--	0.045	0.03	0.03	--	0.030

Table 2
Pilot Stepped-Rate Test Data Sheet – SVE-2
Soil Vapor Extraction System – Former Tecumseh Products Site
Tecumseh, Michigan

Pressure Monitoring Location	Depth	Distance (ft)	**Total Flow ~516 CFM**				**Total Flow ~390 CFM**				**Total Flow ~207 CFM**			
			Pressure (in. H_20)				Pressure (in. H_20)				Pressure (in. H_20)			
			Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average
SVE-1	--	91	0.29	--	--	0.290	0.21	0.21	--	0.210	0.11	0.10	--	0.105
SVE-2	--	0	14	14	14	14.0	9.7	9.7	9.6	9.67	4.6	4.6	4.5	4.57
SVE-3	--	105	0.17	0.18	--	0.175	0.13	0.13	--	0.130	0.06	0.06	--	0.060
SVE-4	--	200	0.02	0.02	--	0.020	0.02	0.01	--	0.015	0.00	0.01	--	0.005
TVP-01	Shallow	95	0.07	0.07	--	0.070	0.05	0.05	--	0.050	0.02	0.02	--	0.020
	Deep	95	0.09	0.09	--	0.090	0.06	0.06	--	0.060	0.03	0.03	--	0.030
TVP-02	Shallow	85	0.09	0.09	--	0.090	0.06	0.07	--	0.065	0.03	0.03	--	0.030
	Deep	85	0.10	0.10	--	0.100	0.07	0.07	--	0.070	0.03	0.04	--	0.035
TVP-03	Shallow	74	0.46	0.46	--	0.460	0.34	0.35	--	0.345	0.17	0.17	--	0.170
	Deep	74	0.46	0.47	--	0.465	0.35	0.35	--	0.350	0.18	0.17	--	0.175
TVP-04	Shallow	40	1.0	1.0	--	1.00	0.74	0.74	--	0.740	0.38	0.38	--	0.380
	Deep	40	1.1	1.1	--	1.08	0.79	0.79	--	0.790	0.40	0.41	--	0.405
TVP-05	Shallow	29	1.6	1.6	--	1.60	1.2	1.2	--	1.20	0.63	0.62	--	0.625
	Deep	29	1.6	1.6	--	1.60	1.2	1.2	--	1.20	0.65	0.64	--	0.645
TVP-06	Shallow	60	0.63	0.61	--	0.620	0.47	0.46	--	0.465	0.24	0.24	--	0.240
	Deep	60	0.66	0.65	--	0.655	0.5	0.49	--	0.495	0.26	0.25	--	0.255
TVP-07	Shallow	114	0.25	0.25	--	0.250	0.18	0.19	--	0.185	0.08	0.09	--	0.085
	Deep	114	0.25	0.25	--	0.250	0.18	0.19	--	0.185	0.08	0.09	--	0.085
TVP-08	Shallow	35	1.5	1.5	--	1.50	1.2	1.2	--	1.20	0.62	0.61	--	0.615
	Deep	35	1.6	1.6	--	1.60	1.2	1.2	--	1.20	0.65	0.63	--	0.640
TVP-09	Shallow	98	0.36	0.35	--	0.355	0.26	0.26	--	0.260	0.14	0.13	--	0.135
	Deep	98	0.36	0.35	--	0.355	0.26	0.26	--	0.260	0.14	0.13	--	0.135
TVP-10	Shallow	127	0.22	0.23	--	0.225	0.16	0.17	--	0.165	0.07	0.08	--	0.075
	Deep	127	0.24	0.24	--	0.240	0.17	0.17	--	0.170	0.07	0.09	--	0.080
TVP-11	Shallow	70	0.70	0.70	--	0.700	0.52	0.52	--	0.520	0.29	0.26	--	0.275
	Deep	70	0.71	0.72	--	0.715	0.54	0.54	--	0.540	0.29	0.27	--	0.280
TVP-12	Shallow	117	0.32	0.31	--	0.315	0.22	0.23	--	0.225	0.13	0.12	--	0.125
	Deep	117	0.32	0.31	--	0.315	0.22	0.23	--	0.225	0.13	0.12	--	0.125
TVP-13	Shallow	73	0.37	0.38	--	0.375	0.27	0.28	--	0.275	0.14	0.14	--	0.140
	Deep	73	0.39	0.39	--	0.390	0.28	0.29	--	0.285	0.15	0.14	--	0.145
TVP-14	Shallow	39	0.73	0.73	--	0.730	0.54	0.54	--	0.540	0.28	0.28	--	0.280
	Deep	39	0.91	0.91	--	0.910	0.68	0.67	--	0.675	0.35	0.35	--	0.350

Table 3
Pilot Stepped-Rate Test Data Sheet – SVE-3
Soil Vapor Extraction System – Former Tecumseh Products Site
Tecumseh, Michigan

Pressure Monitoring Location	Depth	Distance (ft)	Total Flow ~481 CFM				Total Flow ~357 CFM				Total Flow ~242 CFM			
			Pressure (in. H_20)				Pressure (in. H_20)				Pressure (in. H_20)			
			Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average
SVE-1	--	196	0.04	0.04	--	0.040	0.02	0.03	--	0.025	0.03	0.03	--	0.03
SVE-2	--	105	0.14	0.15	--	0.145	0.11	0.13	--	0.120	0.08	0.08	--	0.08
SVE-3	--	0	17	17	17	17.0	12	12	--	12.0	7.5	7.5	--	7.50
SVE-4	--	95	0.33	0.30	--	0.315	0.25	0.25	--	0.250	0.18	0.18	--	0.18
TVP-01	Shallow	72	0.18	0.17	--	0.175	0.11	0.12	--	0.115	0.08	0.08	--	0.08
	Deep	72	0.21	0.21	--	0.210	0.15	0.15	--	0.150	0.09	0.09	--	0.09
TVP-02	Shallow	180	0.01	0.00	--	0.005	0.00	0.00	--	0.000	0.00	0.00	--	0.00
	Deep	180	0.01	0.00	--	0.005	0.00	0.00	--	0.000	0.00	0.00	--	0.00
TVP-03	Shallow	31	1.5	1.5	--	1.50	1.1	1.1	--	1.10	0.76	0.76	--	0.76
	Deep	31	1.5	1.5	--	1.50	1.1	1.1	--	1.10	0.77	0.77	--	0.77
TVP-04	Shallow	65	0.42	0.42	--	0.420	0.31	0.31	--	0.310	0.21	0.21	--	0.21
	Deep	65	0.49	0.49	--	0.490	0.36	0.36	--	0.360	0.25	0.25	--	0.25
TVP-05	Shallow	134	0.09	0.06	--	0.075	0.02	0.04	--	0.030	0.03	0.02	--	0.03
	Deep	134	0.09	0.06	--	0.075	0.02	0.04	--	0.030	0.03	0.03	--	0.03
TVP-06	Shallow	165	0.10	0.09	--	0.095	0.04	0.07	--	0.055	0.05	0.04	--	0.05
	Deep	165	0.10	0.09	--	0.095	0.05	0.07	--	0.060	0.05	0.04	--	0.05
TVP-07	Shallow	34	1.9	1.9	--	1.90	1.4	1.4	--	1.40	1.0	1.1	--	1.05
	Deep	34	1.9	1.9	--	1.90	1.4	1.4	--	1.40	1.0	1.1	--	1.05
TVP-08	Shallow	108	0.25	0.23	--	0.240	0.16	0.17	--	0.165	0.10	0.11	--	0.11
	Deep	108	0.25	0.23	--	0.240	0.16	0.18	--	0.170	0.10	0.11	--	0.11
TVP-09	Shallow	198	0.07	0.06	--	0.065	0.05	0.06	--	0.055	0.04	0.04	--	0.04
	Deep	198	0.07	0.07	--	0.070	0.05	0.06	--	0.055	0.04	0.04	--	0.04
TVP-10	Shallow	62	0.96	0.95	--	0.955	0.69	0.72	--	0.705	0.52	0.52	--	0.52
	Deep	62	1.00	1.00	--	1.000	0.73	0.76	--	0.745	0.54	0.54	--	0.54
TVP-11	Shallow	122	0.22	0.22	--	0.220	0.15	0.16	--	0.155	0.08	0.10	--	0.09
	Deep	122	0.24	0.22	--	0.230	0.15	0.17	--	0.160	0.09	0.10	--	0.10
TVP-12	Shallow	207	0.06	0.06	--	0.060	0.05	0.06	--	0.055	0.03	0.03	--	0.03
	Deep	207	0.06	0.06	--	0.060	0.05	0.06	--	0.055	0.03	0.03	--	0.03
TVP-13	Shallow	33	1.2	1.2	--	1.20	0.86	0.87	--	0.865	0.64	0.60	--	0.62
	Deep	33	1.2	1.2	--	1.20	0.91	0.92	--	0.915	0.66	0.63	--	0.65
TVP-14	Shallow	67	0.24	0.26	--	0.250	0.19	0.19	--	0.190	0.13	0.12	--	0.13
	Deep	67	0.36	0.37	--	0.365	0.27	0.27	--	0.270	0.18	0.18	--	0.18

Table 4
Pilot Stepped-Rate Test Data Sheet – SVE-4
Soil Vapor Extraction System – Former Tecumseh Products Site
Tecumseh, Michigan

Pressure Monitoring Location	Depth	Distance (ft)	**Total Flow ~485 CFM**				**Total Flow ~333 CFM**				**Total Flow ~180 CFM**			
			Pressure (in. H_20)				Pressure (in. H_20)				Pressure (in. H_20)			
			Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average
SVE-3	--	95	0.30	0.30	--	0.300	0.20	0.21	--	0.21	0.10	0.11	--	0.105
SVE-4	--	0	17	18	18	17.7	12	12	12	12.00	5.4	5.4	5.4	5.40
TVP-01	Shallow	137	0.02	0.01	--	0.015	0	--	--	0.00	0	--	--	0.000
	Deep	137	0.02	0.02	--	0.020	0	--	--	0.00	0	--	--	0.000
TVP-03	Shallow	127	0.12	0.11	--	0.115	0.08	0.09	--	0.09	0.05	0.04	--	0.045
	Deep	127	0.12	0.11	--	0.115	0.08	0.09	--	0.09	0.04	0.04	--	0.040
TVP-04	Shallow	161	0.03	0.03	--	0.030	0	--	--	0.00	0.0	--	--	0.000
	Deep	161	0.04	0.03	--	0.035	0	--	--	0.00	0.0	--	--	0.000
TVP-07	Shallow	103	0.33	0.32	--	0.325	0.22	0.23	--	0.23	0.11	0.12	--	0.115
	Deep	103	0.33	0.33	--	0.330	0.22	0.23	--	0.23	0.11	0.12	--	0.115
TVP-08	Shallow	203	0.01	0.01	--	0.010	0	--	--	0.00	0	--	--	0.000
	Deep	203	0.01	0.01	--	0.010	0	--	--	0.00	0	--	--	0.000
TVP-10	Shallow	117	0.24	0.23	--	0.235	0.15	0.16	--	0.16	0.07	0.09	--	0.080
	Deep	117	0.25	0.24	--	0.245	0.16	0.17	--	0.17	0.08	0.09	--	0.085
TVP-11	Shallow	212	0.02	0.02	--	0.020	0	--	--	0.00	0	--	--	0.000
	Deep	212	0.02	0.01	--	0.015	0	--	--	0.00	0	--	--	0.000
TVP-13	Shallow	126	0.09	0.08	--	0.085	0.06	0.07	--	0.07	0.03	0.03	--	0.030
	Deep	126	0.10	0.09	--	0.095	0.06	0.07	--	0.07	0.03	0.03	--	0.030
TVP-14	Shallow	160	0.02	0.01	--	0.015	0	--	--	0.00	0	--	--	0.000
	Deep	160	0.03	0.02	--	0.025	0	--	--	0.00	0	--	--	0.000

Table 5
Pilot Stepped-Rate Test Data Sheet – Flow and Vacuum Loss Data
Soil Vapor Extraction System – Former Tecumseh Products Site
Tecumseh, Michigan

Total Flow (CFM)				**Observed Vacuum at Extraction Well (in. H_20)**				**Observed Vacuum at Trailer Inlet (in. H_20)**				**Average Piping Loss (in. H20 per 100 ft pipe)**
Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average	Round 1	Round 2	Round 3	Average	
SVE-1	Pipe length =	133										
0	--	--	0	0	--	--	0	0	--	--	0	0
62	63	61	62	1.5	1.5	1.5	1.5	--	--	--	--	--
202	202	200	201	5.1	5.2	5.3	5.2	9	9	--	9.0	2.86
320	325	336	327	9.2	9.2	9.2	9.2	17	17	--	17	5.86
501	503	500	501	16	16	16	16	32	32	--	32	12.03
SVE-2	Pipe length =	224										
0	--	--	0	0			0	0		--	0	0
61	59	61	60	1.2	1.2	1.2	1.2	--	--	--	--	--
210	208	202	207	4.6	4.6	4.5	4.6	10	10	--	10	2.41
392	388	390	390	9.7	9.7	9.6	9.7	23	23	--	23	5.94
530	507	512	516	14	14	14	14	36	36	--	36	9.82
SVE-3	Pipe length =	330										
0	--	--	0	0			0	0	--	--	0	0
63	64	64	64	1.8	1.8	1.8	1.8	--	--	--	--	--
243	241		242	7.5	7.5		7.5	14	14	17	15	2.27
355	360		358	12	12		12	28	30		29	5.15
481			481	17	17	17	17	46	42	45	44	8.18
SVE-4	Pipe length =	421										
0	--	--	0	0	--	--	0	0	--	--	0	0
61	60	61	61	1.9	1.9	1.9	1.9	--	--	--	--	--
184	175	180	180	5.4	5.4	5.4	5.4	12	12	--	12	1.57
330	333	335	333	12	12	12	12	28	28	--	28	3.80
480	488	486	485	17	18	18	18	47	47	--	47	6.89

Table 6
Summary of Constituents of Concern in On-Site mitigation System Exhaust Samples
Soil Vapor Extraction System – Former Tecusmeh Products Site
Tecumseh, Michigan

Analyte	Units	S-Building SSDV Exhaust	Methane Ventilation System Exhaust (V-02)	Pilot SVE Exhaust (48% Make-Up Air)		Calculated SVE Exhaust (No Make-Up Air)		Maximum Concentration
		4/25/2012	4/25/2012	4/25/2012	5/2/2012	4/25/2012	5/2/2012	--
1,1-Dichloroethane	ppbv	**3.2**	**15**	**0.95**	**2.5**	**1.8**	**4.8**	**15**
1,2-Dichloroethane	ppbv	<0.40	<0.40	<0.40	<0.40	<0.77	<0.77	<0.77
1,1-Dichloroethene	ppbv	<0.40	**0.64**	<0.40	<0.40	<0.77	<0.77	**0.64**
cis-1,2-Dichloroethene	ppbv	**16**	**100**	**9.7**	**9.5**	**19**	**18**	**100**
trans-1,2-Dichloroethene	ppbv	**1.4**	**2.3**	**1.1**	**0.97**	**2.1**	**1.9**	**2.3**
Tetrachloroethene	ppbv	**2.7**	<0.40	**3.2**	**3.2**	**6.2**	**6.2**	**6.2**
1,1,1-Trichloroethane	ppbv	**18**	<0.40	**6.9**	**7.3**	**13**	**14**	**18**
Trichloroethene	ppbv	**350**	**6.4**	**160**	**290**	**310**	**560**	**560**
Vinyl Chloride	ppbv	<0.40	**2.4**	<0.40	<0.40	<0.77	<0.77	**2.4**

Notes:
ppbv - parts per billion by volume

Table 7
VOC and Toxic Air Contaminants Allowable Emission Calculations
Soil Vapor Extraction System – Former Tecusmeh Products Site
Tecumseh, Michigan

Exemption Requirements

- Total Uncontrolled Carcinogenic VOCs	20	lbs/month	0.000456621 lbs/min[1]
- Total Uncontrolled Air Contaminants	1000	lbs/month	0.02283105 lbs/min[1]
- Total Hazardous Air Pollutants	20,000	lbs/year	0.03805175 lbs/min

- Initial Risk Screening Level (IRSL) must be equal to or greater than 0.04 ug/m^3

Contaminant	Molecular Weight	HAP	IRSL	Carcinogenic	Maximum Exhaust Concentration			Maximum Allowable Uncontrolled Flow	Uncontrolled Emission Rate		
	g/g-mol		(ug/m3)		(ppbv)	(mg/m^3)	(lbs/scf)	(scfm)[2]	(lbs/hr)	(lbs/mo)[3]	(tpy)[4]
Total Carcinogenic VOC	--	--	--	--	5.84E+02	3.09E+03	1.93E-07	**2,400**	2.78E-02	20.28	**0.12**
Total Air Contaminants	--	--	--	--	7.02E+02	3.58E+03	2.23E-07	**100,000**	3.22E-02	23.49	**0.14**
Total HAP	--	--	--	--	5.69E+02	3.03E+03	1.89E-07	**200,000**	2.72E-02	19.86	**0.12**
Trichloroethylene	131.39	Yes	0.2	Yes	560	2.98E+03	1.86E-07	--	2.68E-02	19.55	**0.12**
1,1-Dichloroethane	98.96	No	None	Yes	15.0	6.01E+01	3.75E-09	--	5.40E-04	0.39	**0.00**
1,2-Dichloroethane	98.96	No	0.04	Yes	0.8	3.09E+00	1.93E-10	--	2.77E-05	0.02	**1.21E-04**
1,1,1-Trichloroethane	133.42	No	None	No	18	9.72E+01	6.07E-09	--	8.74E-04	0.64	**3.83E-03**
Tetrachloroethylene	165.83	Yes	1.7	Yes	6.2	4.16E+01	2.60E-09	--	3.74E-04	0.27	**1.64E-03**
cis-1,2-dichloroethene	96.94	No	None	No	100	3.93E+02	2.45E-08	--	3.53E-03	2.58	**1.55E-02**
Vinyl Chloride	62.50	Yes	0.11	Yes	2.4	6.07E+00	3.79E-10	--	5.46E-05	0.04	**2.39E-04**

Notes:
1. Assumes 8,760 hr/yr and 730 hr/mo.
2. SCFM = standard cubic feet per minute (at 68°F and 1 atm)
3. Potential emissions based on operation at avg. soil gas conc. (lb/scf) x max. flow rate (scfm) x 60 min/hr x 8,760 hr/yr x yr/12 months.
4. Potential emissions based on operation at avg. soil gas conc. (lb/scf) x max. flow rate (scfm) x 60 min/hr x 8,760 hr/yr x ton/2000 lb.

Figures

CITY OF TECUMSEH MUNICIPAL WELL FIELD (SOUTH)

FORMER TECUMSEH PRODUCTS COMPANY SITE

CHICAGO BLVD
POTTAWATAMIE ST.
KILBUCK ST.
CUMMINS ST.
CUMMINS ST.
PATTERSON ST.
HIAWATHA ST.
MUSCODY ST.
RUSSELL ROAD
INDUSTRIAL DRIVE
BLOOD ROAD
MOHAWK ST.
WYANDOTTE ST.
OTTAWA ST.
PEARL ST
SOUTH EVANS ST
SOUTH ALGER ST
MILL HWY
RIVER RAISIN

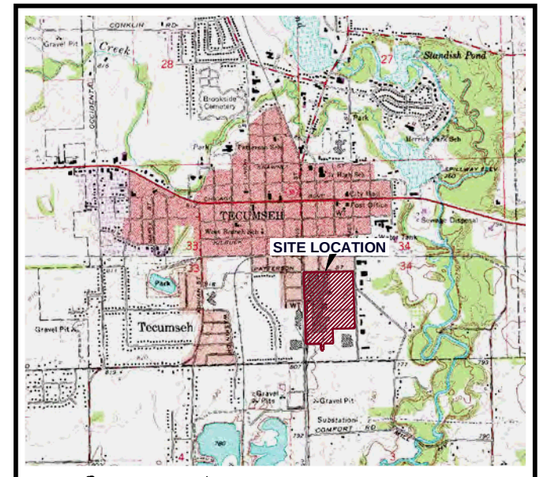
LEGEND

- CITY OF TECUMSEH PROPERTY BOUNDARIES
- FORMER TECUMSEH PRODUCTS SITE BOUNDARY
- PARCEL BOUNDARIES
- GROUNDWATER FLOW DIRECTION

NOTE

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY THE CITY OF TECUMSEH, DRAWING NO. CITY.DWG, MARCH 2009, AERIAL PHOTOGRAPH PROVIDED FROM REMOTE SENSING & GIS RESEARCH AND OUTREACH SERVICES (RS&GIS), *PUBLICATION_DATE:* 06-29-2007, File:TECUMSEHSOUTH_NE.ECW.

SITE TOPOGRAPHY INSET MAP



APPROXIMATE HORIZONTAL SCALE

0 600 1200

PROJECT:
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

TITLE:
SITE LOCATION PLAN AND VICINITY

DRAWN BY:	SJL/DGS	SCALE:		PROJ. NO.	187156.0001.02
CHECKED BY:	SEM		AS INDICATED	FILE NO.	187156.0001.02.01.dwg
APPROVED BY:	GC	DATE PRINTED:		FIGURE 1	
DATE:	MARCH 2012				

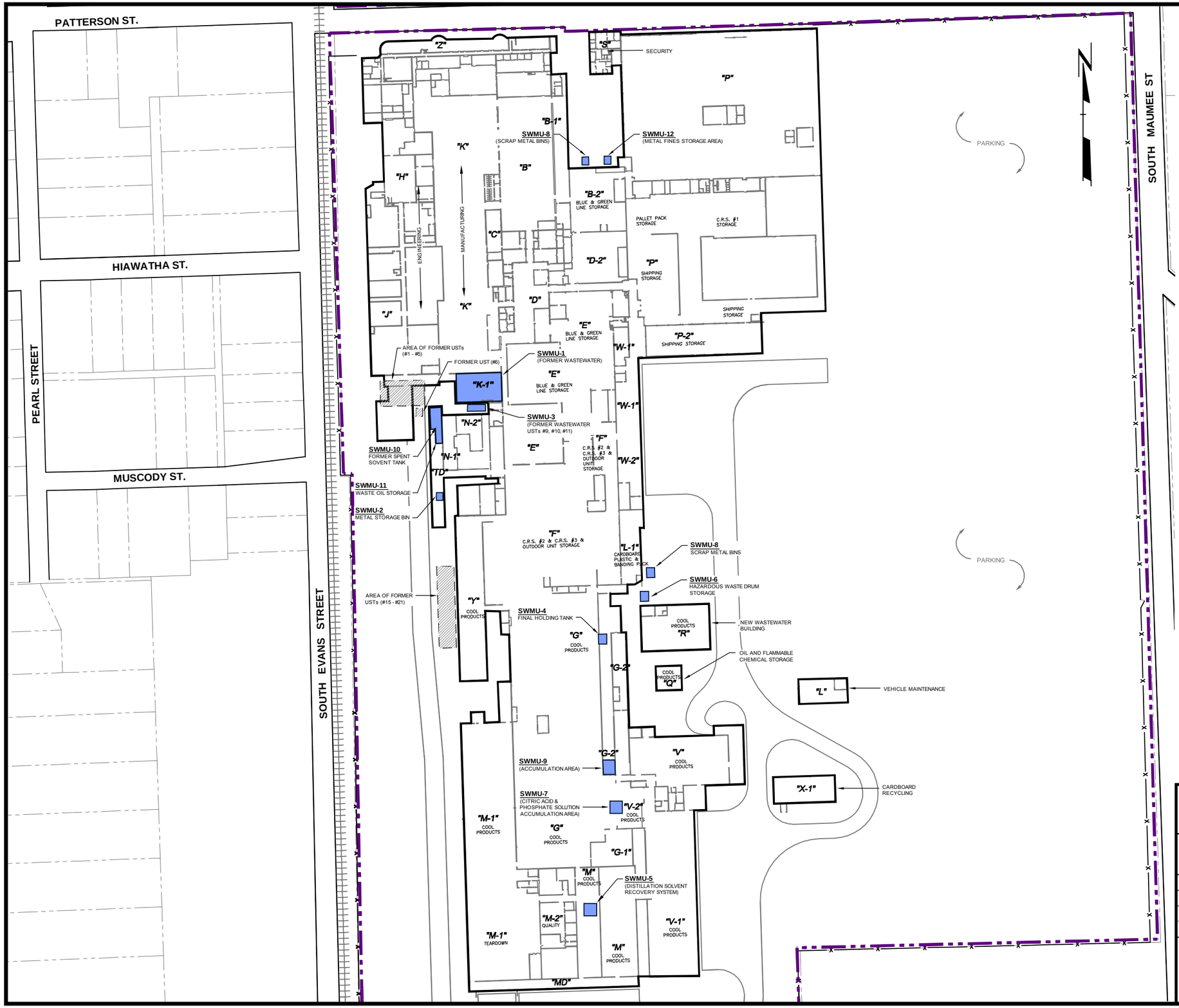
TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
Fax: 734.971.9022

Attached Xref's:
Attached Images:
Layout: FIG01 Site Location Plan & Vicinity

Dwg Size: 2.55 Mb
Plot Date: March 29, 2012
Plot Time: 8:50 AM

J:_TRC\Tecumseh Products\Tecumseh MI\187156\0001\02\Pilot Workplan\187156.0001.02.01.dwg

PLOT DATA
Drawing Name: J:_TRC\Tecumseh Products\Tecumseh MI\187156\0001\02\Pilot Workplan\187156.0001.02.01.dwg
Operator Name: STEHLE, DIANAH
Drawing Plot Scale: 0.386863



LEGEND

- FORMER TECUMSEH PRODUCTS SITE BOUNDARY
- TECUMSEH PRODUCTS BUILDING OUTLINE
- PARCEL BOUNDARY
- RAILROAD TRACKS (APPROXIMATE LOCATION)
- APPROXIMATE LOCATION OF FORMER SWMUs

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY THE CITY OF TECUMSEH, DRAWING NO. CITY.DWG, MARCH 2009.
2. SEE APPENDIX C OF THE CURRENT CONDITION REPORT FOR UST CONTENTS AND OTHER RELEVANT DATA.

APPROXIMATE HORIZONTAL SCALE

0 160 320

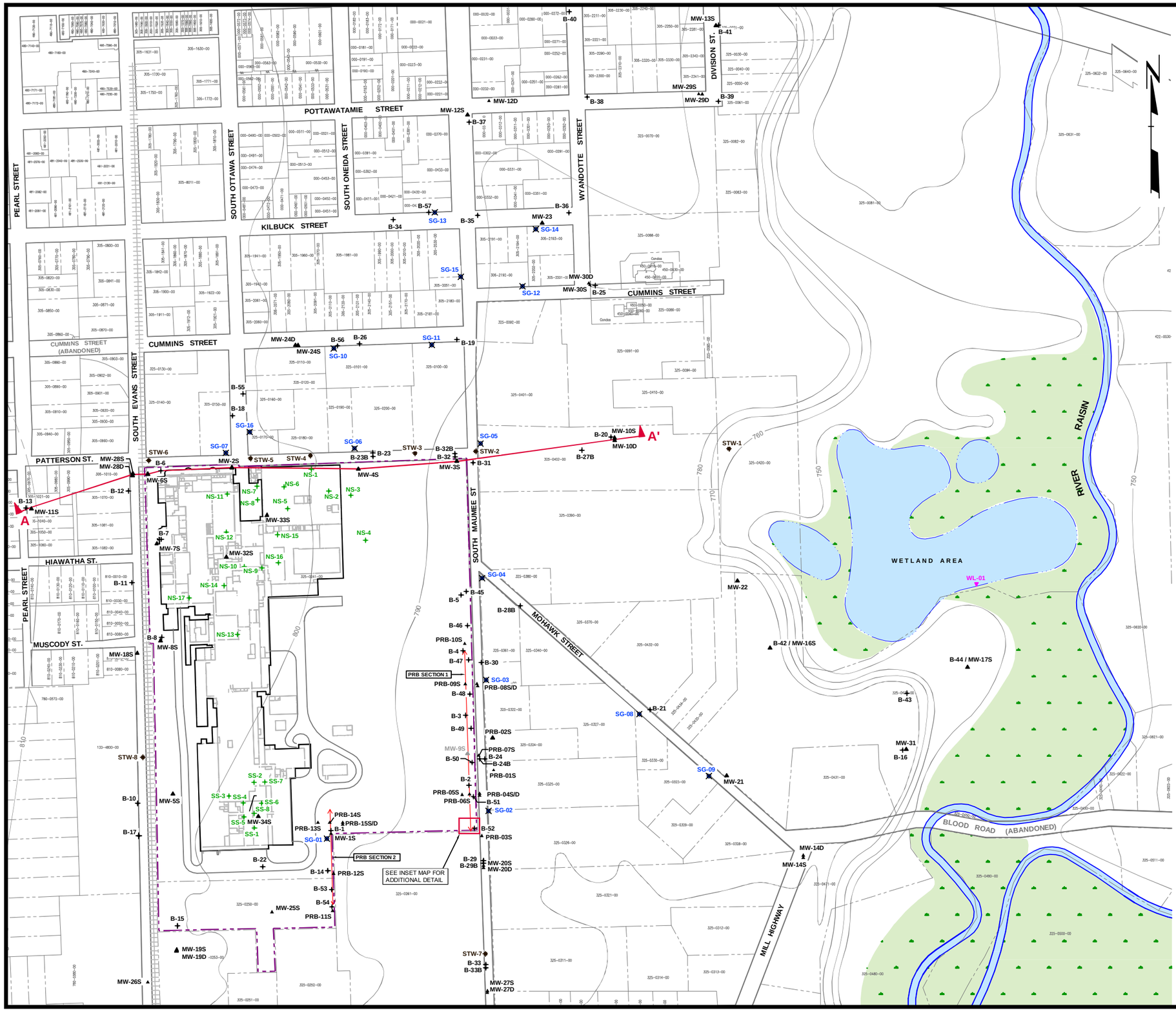
PROJECT:
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

TITLE:
SITE FEATURES

DRAWN BY:	SJL/DGS	SCALE:		PROJ. NO.	187156.0001.02
CHECKED BY:	SEM		AS INDICATED	FILE NO.	187156.0001.02.02.dwg
APPROVED BY:	GC	DATE PRINTED:			FIGURE 2
DATE:	MARCH 2012				

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
Fax: 734.971.9022

PLOT DATA
Drawing Name: J:_TRC\Tecumseh Products\Tecumseh MI\187156\0001\02\Plot Workplan\187156.0001.02.02.dwg
Operator Name: STEHLE, DIANAH
Drawing Plot Scale: 0.386863
Dwg Size: 2.05 Mb
Plot Date: March 28, 2012
Plot Time: 3:20 PM
Attached Xref's: bm033109
Attached Images:
Layout: FIG02 Site Features

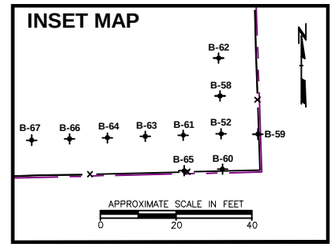


LEGEND

- FORMER TECUMSEH PRODUCTS SITE BOUNDARY
- PARCEL BOUNDARY
- RAILROAD TRACKS (APPROXIMATE LOCATION)
- 750 — APPROXIMATE GROUND TOPOGRAPHY BASED OFF 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP
- B-2 + PERIMETER / OFF-SITE INVESTIGATION SOIL BORING LOCATION AND NUMBER
- MW-4S ▲ MONITORING WELL LOCATION AND NUMBER
- MW-9s ▲ DECOMMISSIONED MONITORING WELL LOCATION AND NUMBER
- SS-2 + SOURCE AREA INVESTIGATION BORING LOCATION AND NUMBER
- SG-02 SOIL GAS SAMPLE LOCATION AND NUMBER
- STW-2 STORM WATER SEWER SAMPLE LOCATION AND NUMBER
- WL-01 ▼ WETLAND SURFACE WATER SAMPLE LOCATION
- FLOODPLAIN / WOODED WETLAND AREA
- PRB LOCATION
- FENCE LINE
- CROSS-SECTION LOCATION

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY THE CITY OF TECUMSEH, DRAWING NO. CITY.DWG, MARCH 2009.
2. GROUND TOPOGRAPHY BASED OFF 7.5 MINUTE U.S.G.S TOPOGRAPHIC QUADRANGLE MAP AND GROUND SURVEY DATA.



APPROXIMATE HORIZONTAL SCALE

0 400' 800'

PROJECT:

FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

SHEET TITLE:

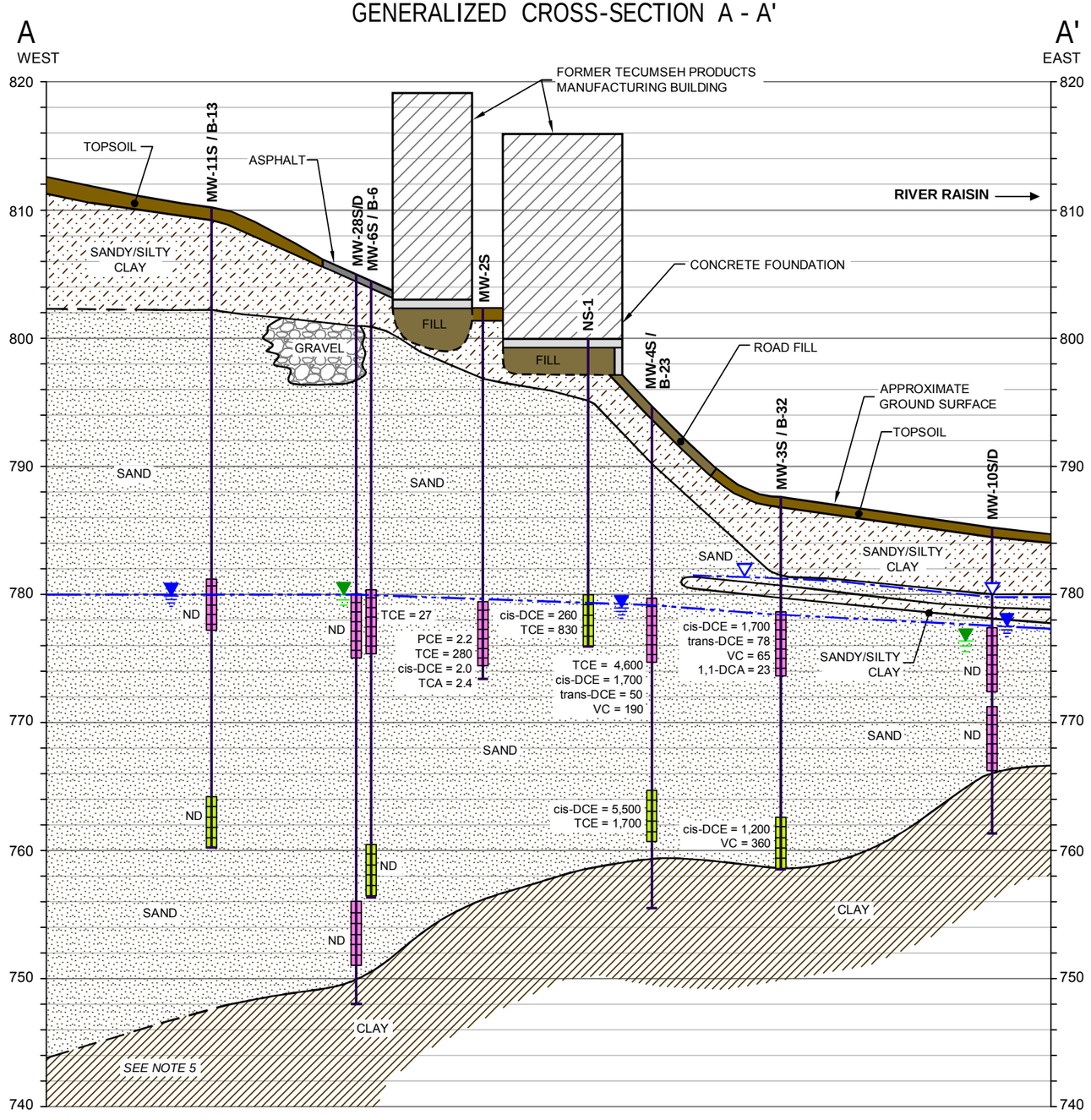
CROSS-SECTION LOCATION MAP

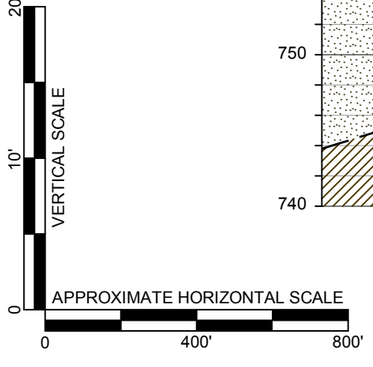
DRAWN BY:	SJL/DGS	SCALE:	PROJ. NO. 004311.0001.02
CHECKED BY:	SEM	AS INDICATED	FILE NO. 187156.0001.02.03.dwg
APPROVED BY:	GC	DATE PRINTED:	FIGURE 3
DATE:	MARCH 2012		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
Fax: 734.971.9022

PLOT DATA
Drawing Name: J:_TRC\Tecumseh Products\Tecumseh MI\187156\0001\02\Plot Workplan\187156.0001.02.03.dwg
Operator Name: STEHLE, DIANAH
Drawing Plot Scale: 0.386663
Dwg Size: 2.11 Mb
Plot Date: March 29, 2012
Plot Time: 9:24 AM
Attached Xrefs: bm033109
Attached Images:
Layout: FIG03 XS Locations

GENERALIZED CROSS-SECTION A - A'





LEGEND

- TOPSOIL
- SAND
- CLAY
- SANDY / SILTY CLAY
- SILT
- CONCRETE
- FILL
- GRAVEL

STRATIGRAPHIC BOUNDARY BASED ON NEAREST SOIL BORING OR MONITORING WELL (DASHED WHERE INFERRED)

APPROXIMATE GROUNDWATER ELEVATION

PERCHED GROUNDWATER ELEVATION

PIEZOMETRIC WATER LEVEL INDICATOR

TEMPORARY WELL SCREEN

WELL SCREEN

PCE	=	TETRACHLOROETHENE
TCE	=	TRICHLOROETHENE
TCA	=	1,1,1-TRICHLOROETHANE
1,1-DCE	=	1,1-DICHLOROETHENE
1,1-DCA	=	1,1-DICHLOROETHANE
cis-DCE	=	1,2-cis-DICHLOROETHENE
trans-DCE	=	1,2-trans-DICHLOROETHENE
VC	=	VINYL CHLORIDE
ND	=	NOT DETECTED

NOTES

1. GROUND SURFACE AND STRATIGRAPHIC CONTACTS ARE APPROXIMATE AND EXTRAPOLATED FROM NEAREST SOIL BORING DATA.
2. SEE FIGURE 3 FOR LOCATION / ORIENTATION OF THIS GEOLOGIC CROSS SECTION.
3. GROUNDWATER ANALYTICAL DATA REFLECTS MOST RECENT SAMPLE EVENT AS OF SEPTEMBER 2011.
4. DETECTED GROUNDWATER CONCENTRATIONS FOR CONSTITUENTS OF HIGHEST CONCERN ARE PROVIDED IN MICROGRAMS PER LITER.
5. THE ELEVATION OF THE TOP OF CLAY NEAR MW-11S IS ESTIMATED BASED ON WELL LOGS FROM THE CITY OF TECUMSEH WELL FIELD, WHICH IS LOCATED APPROXIMATELY 1,000 FEET WEST OF MW-11S. TOP OF CLAY AT THE CITY WELL FIELD IS AT APPROXIMATELY 740 FEET MSL.

PROJECT:
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

TITLE:
GEOLOGIC CROSS-SECTION A - A'

DRAWN BY:	SJL/DGS	SCALE:	PROJ. NO. 004311.0001.02
CHECKED BY:	SEM	AS INDICATED	FILE NO. 187156.0001.02.04.dwg
APPROVED BY:	GC	DATE PRINTED:	FIGURE 4
DATE:	MARCH 2012		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
Fax: 734.971.9022

Charts

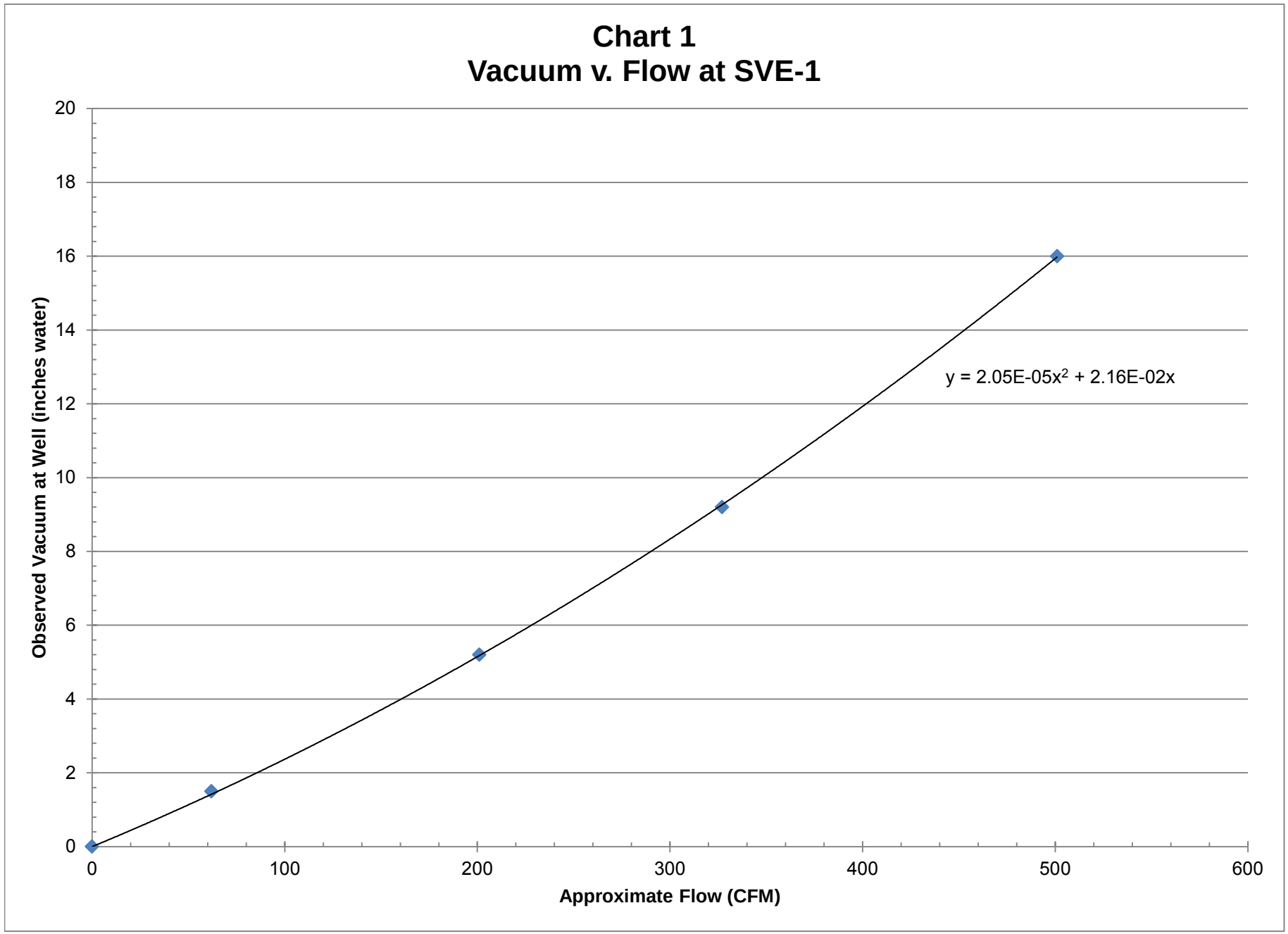
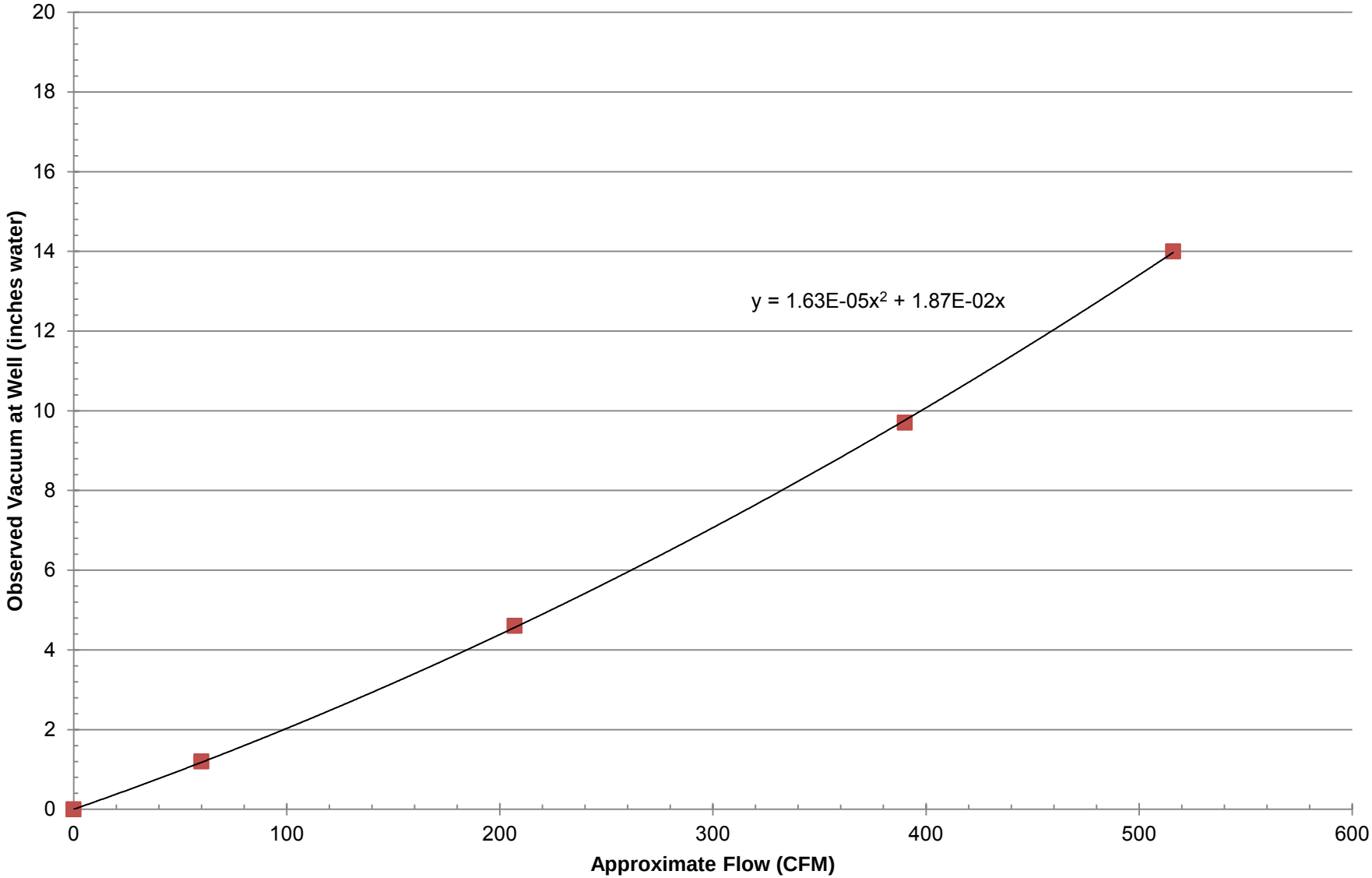


Chart 1
Vacuum v. Flow at SVE-1
Observed Vacuum at Well (inches water)
Approximate Flow (CFM)
y = 2.05E-05x² + 2.16E-02x
0
2
4
6
8
10
12
14
16
18
20
0
100
200
300
400
500
600

Chart 2
Vacuum v. Flow at SVE-2



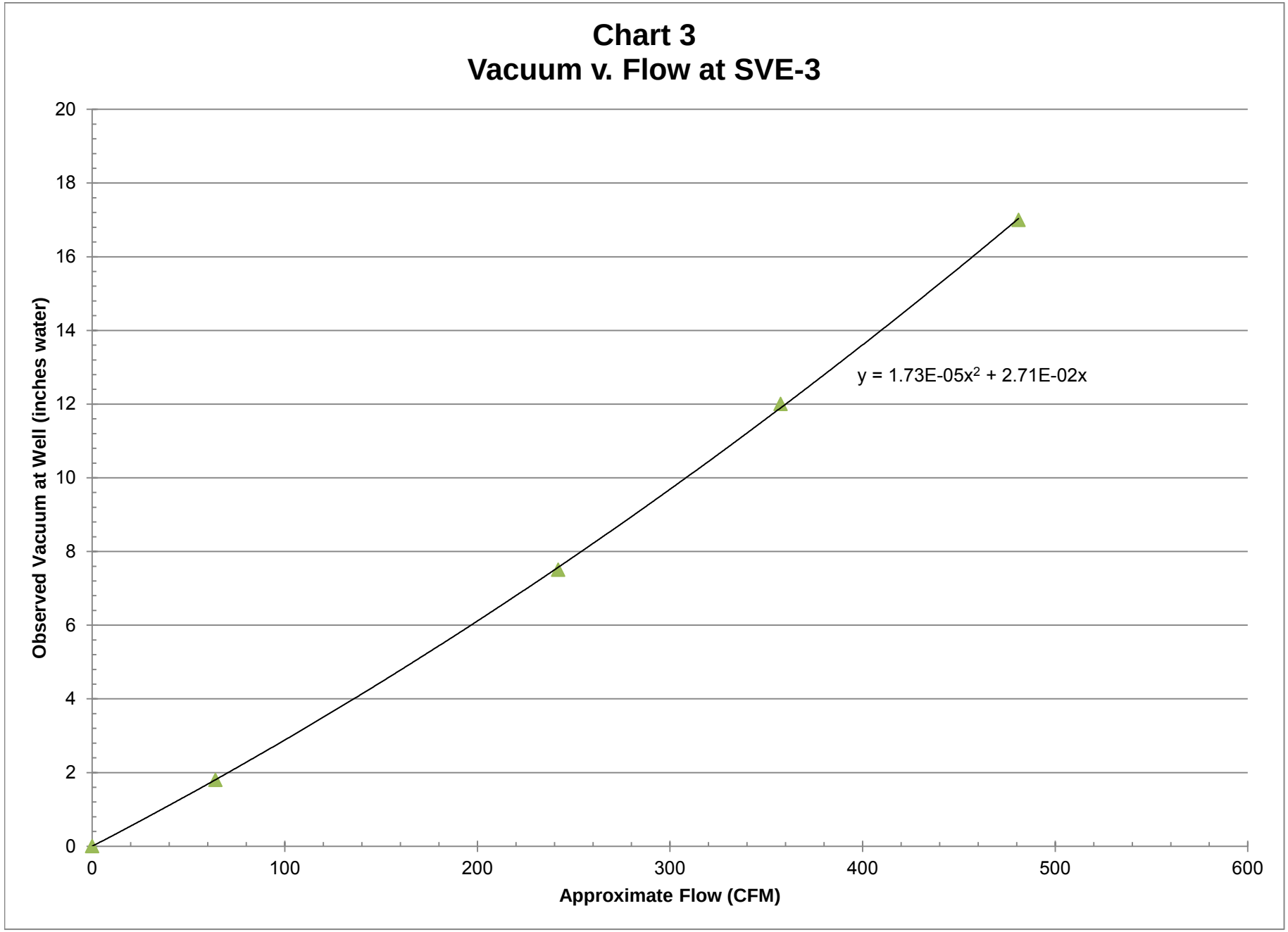


Chart 3
Vacuum v. Flow at SVE-3
Observed Vacuum at Well (inches water)
20
18
16
14
12
10
8
6
4
2
0
y = 1.73E-05x² + 2.71E-02x
0
100
200
300
400
500
600
Approximate Flow (CFM)

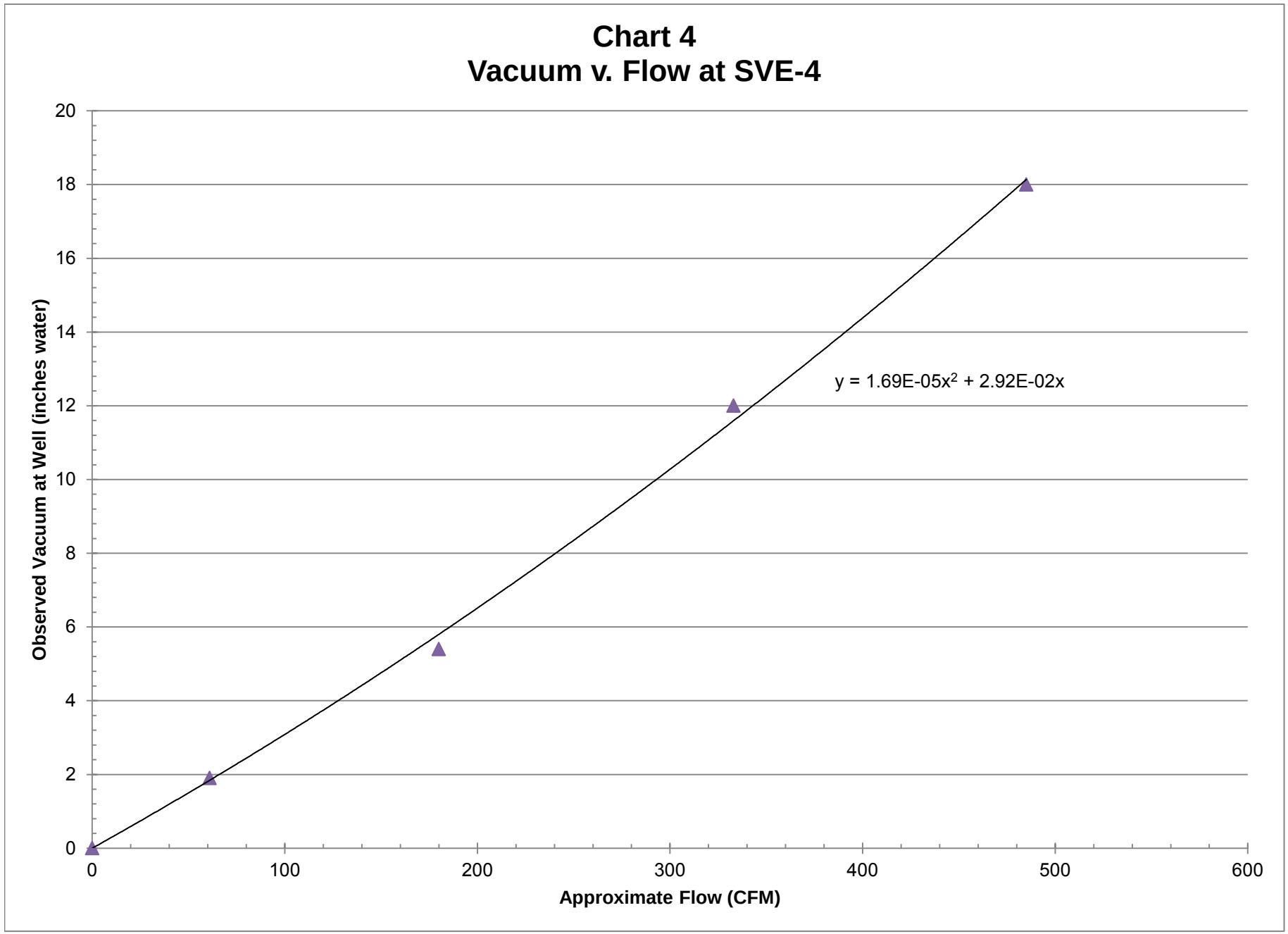
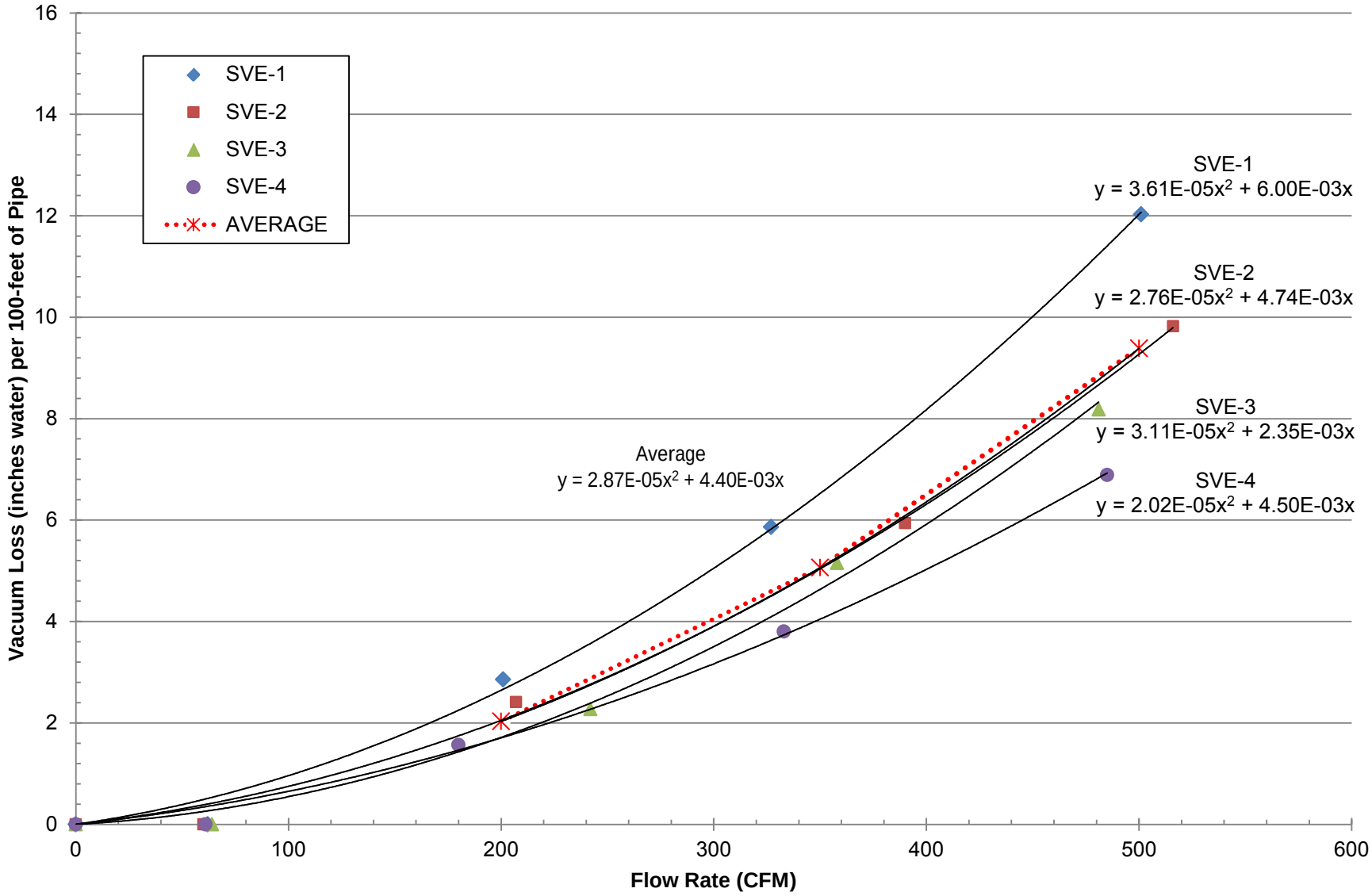


Chart 4
Vacuum v. Flow at SVE-4
Observed Vacuum at Well (inches water)
Approximate Flow (CFM)
y = 1.69E-05x2 + 2.92E-02x
0
2
4
6
8
10
12
14
16
18
20
0
100
200
300
400
500
600

Chart 5
Piping Loss per 100-feet of Pipe



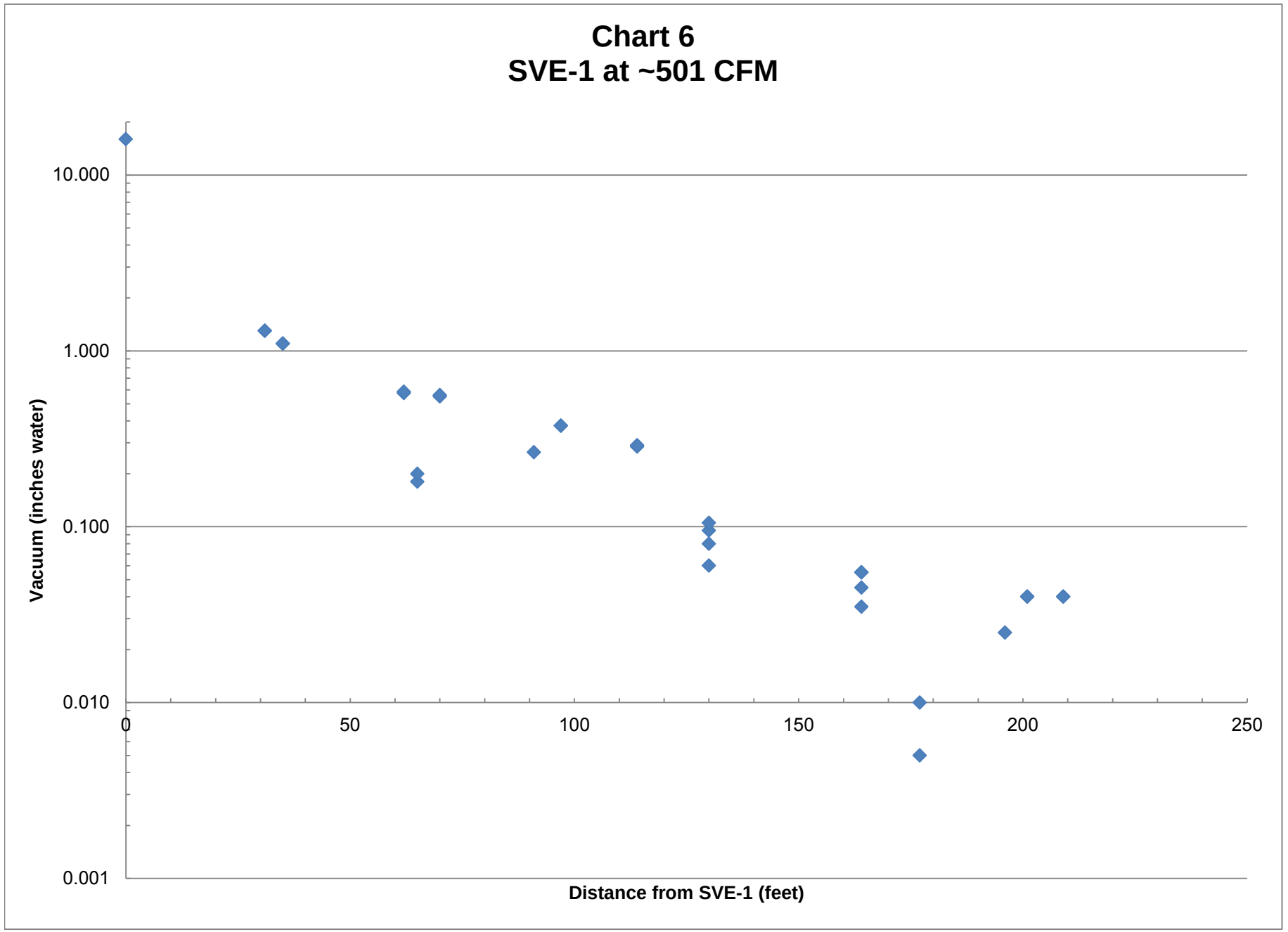


Chart 6
SVE-1 at ~501 CFM
Vacuum (inches water)
10.000
1.000
0.100
0.010
0.001
0
50
100
150
200
250
Distance from SVE-1 (feet)

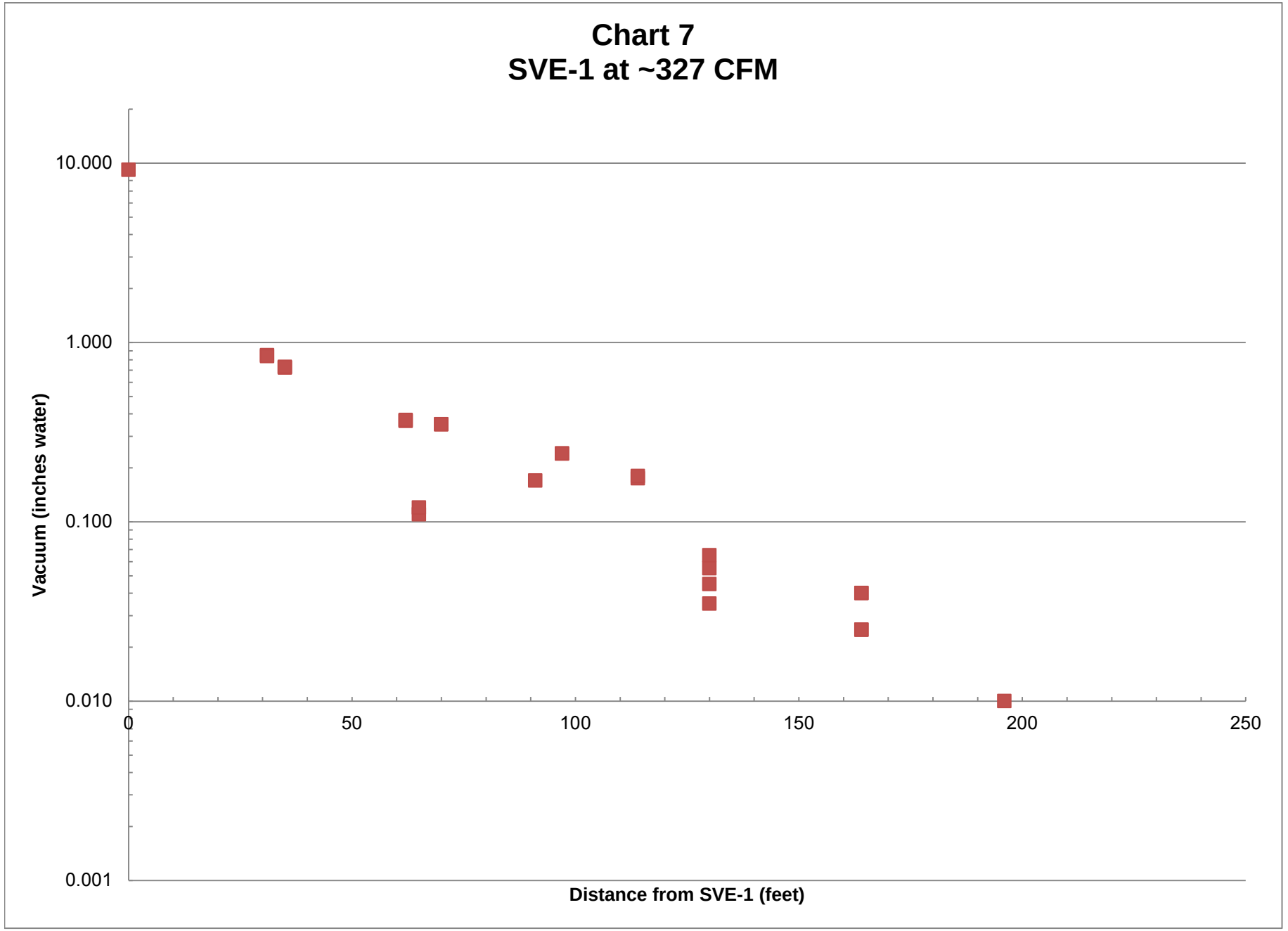


Chart 7
SVE-1 at ~327 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-1 (feet)

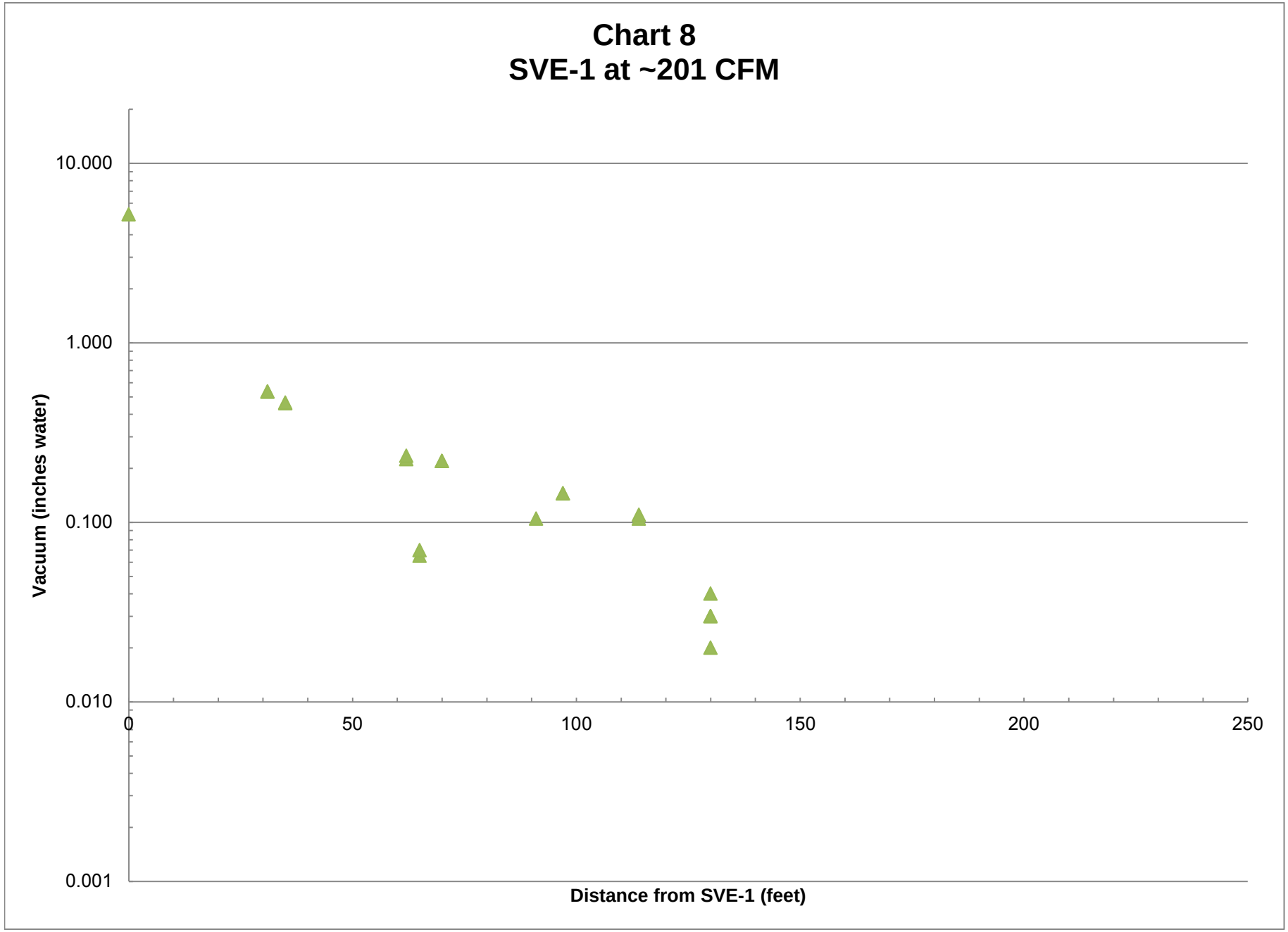


Chart 8
SVE-1 at ~201 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-1 (feet)

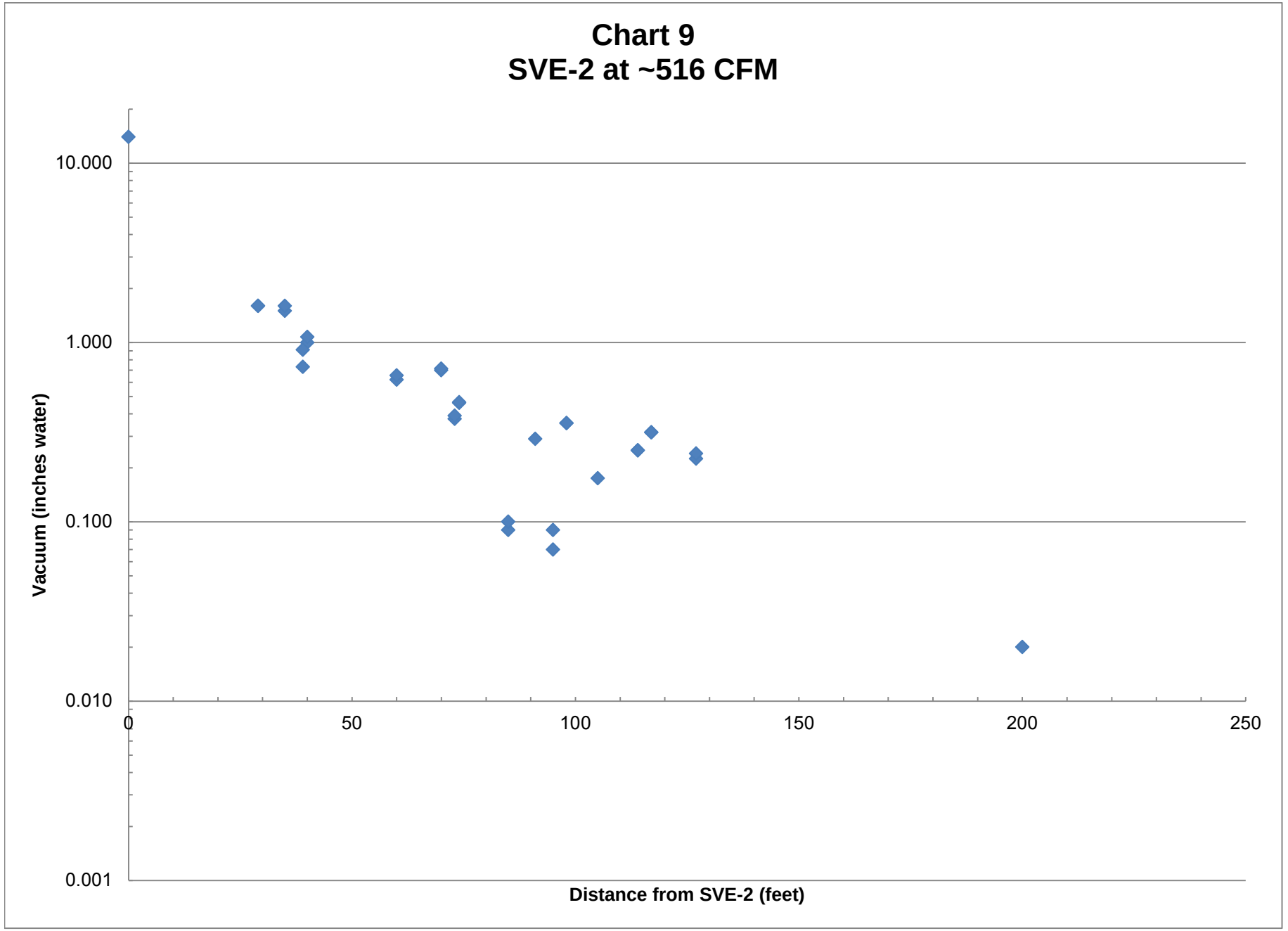


Chart 9
SVE-2 at ~516 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-2 (feet)

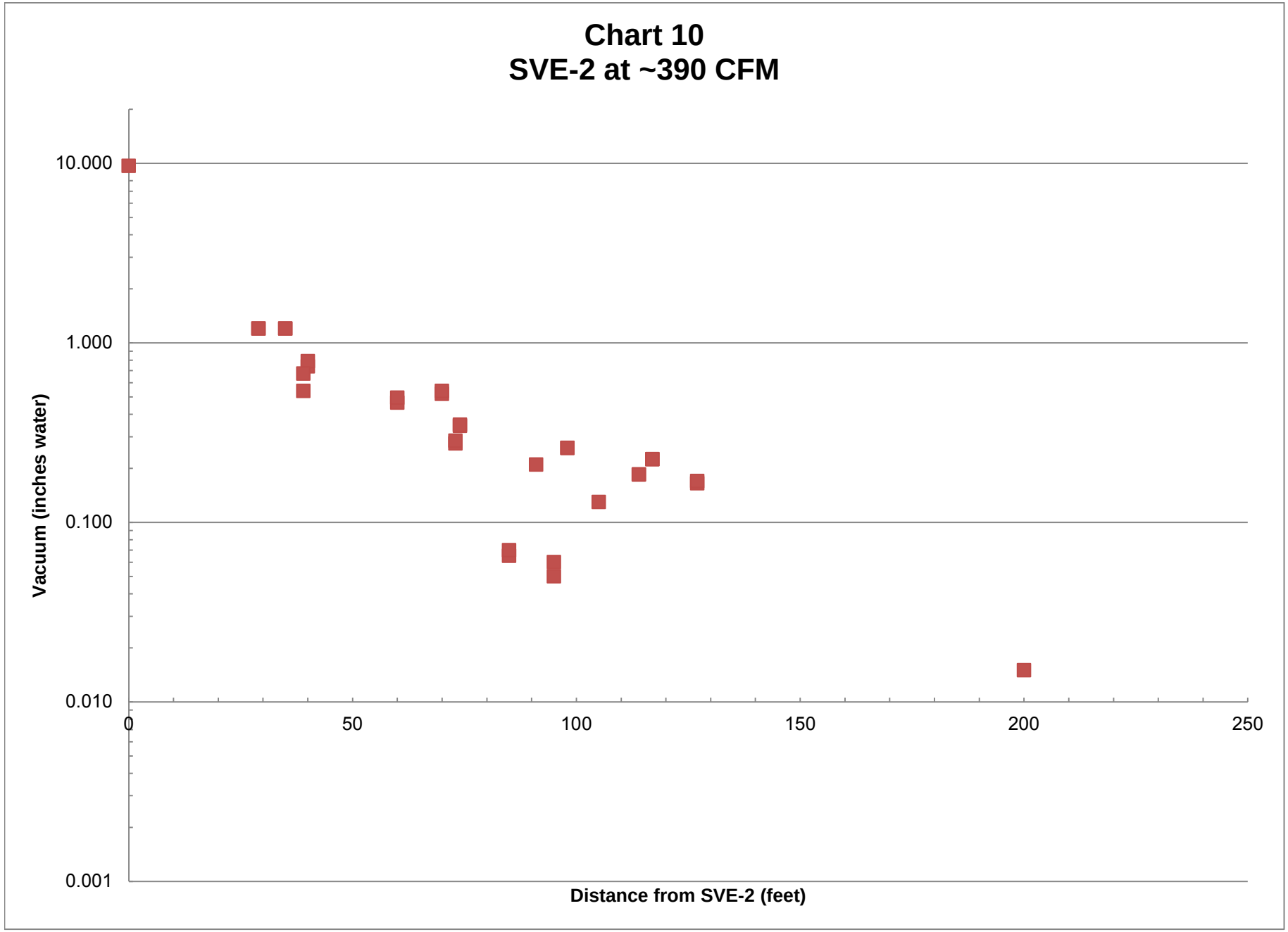


Chart 10
SVE-2 at ~390 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-2 (feet)

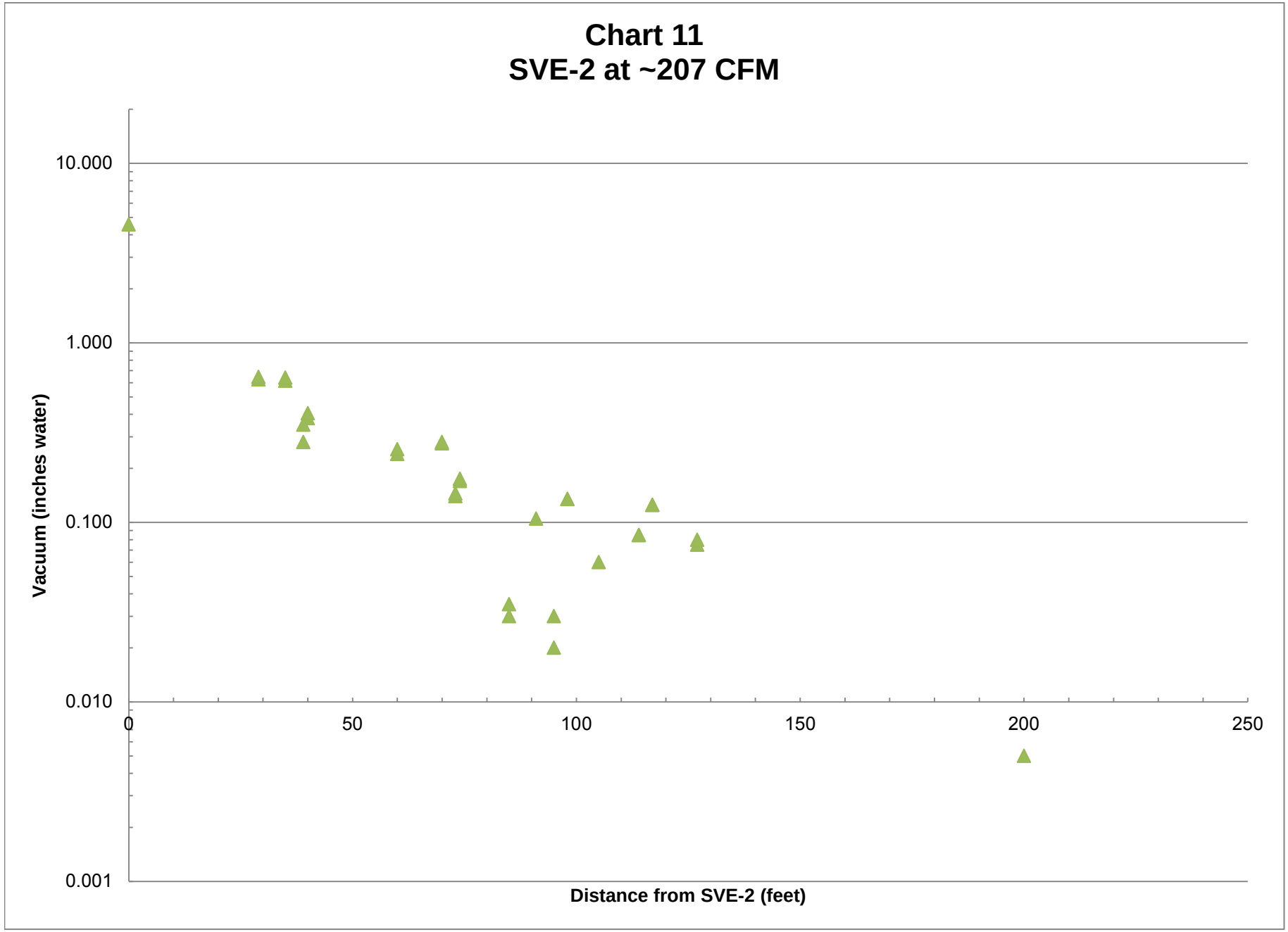


Chart 11
SVE-2 at ~207 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-2 (feet)

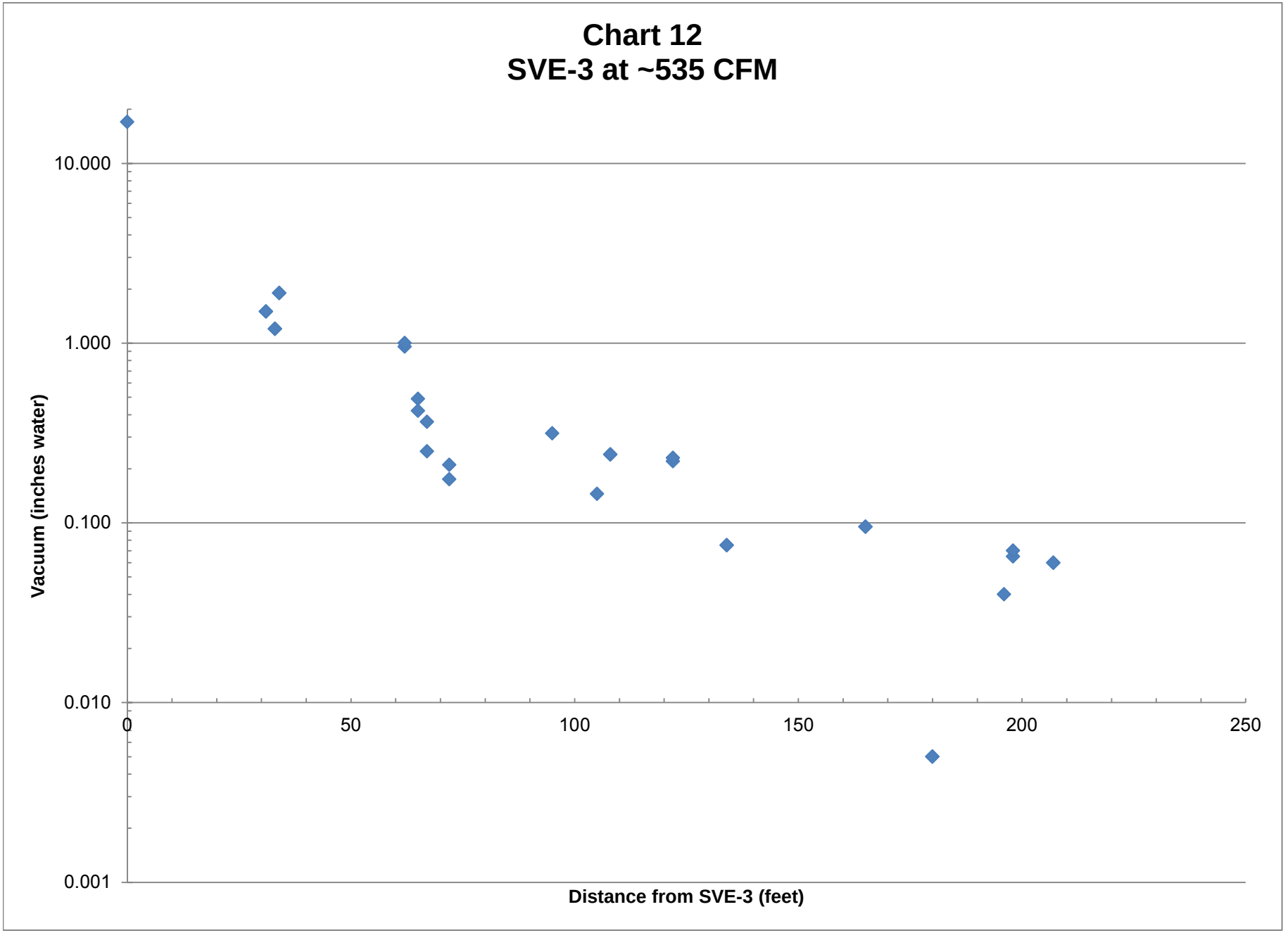


Chart 12
SVE-3 at ~535 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-3 (feet)

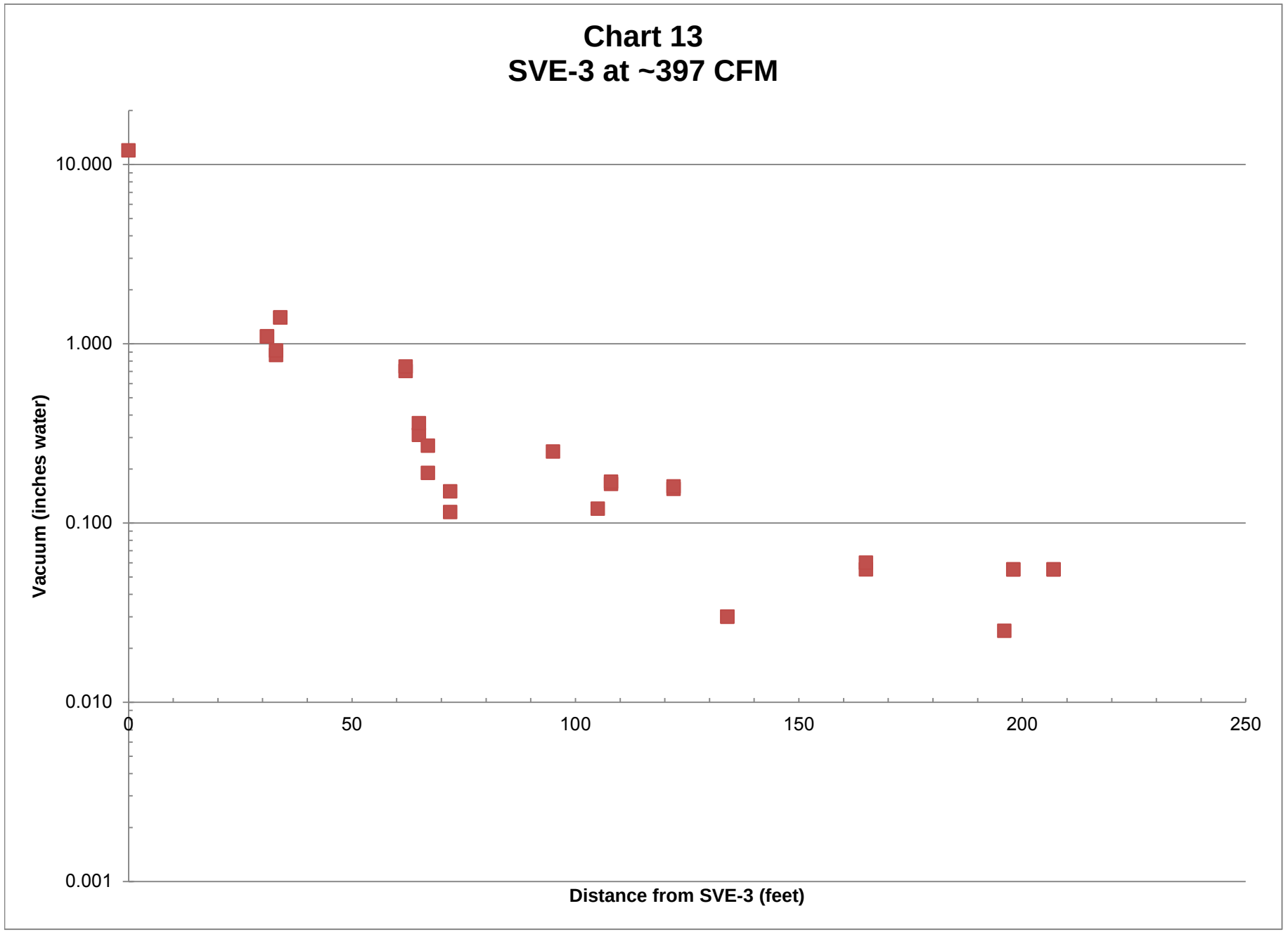


Chart 13
SVE-3 at ~397 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-3 (feet)

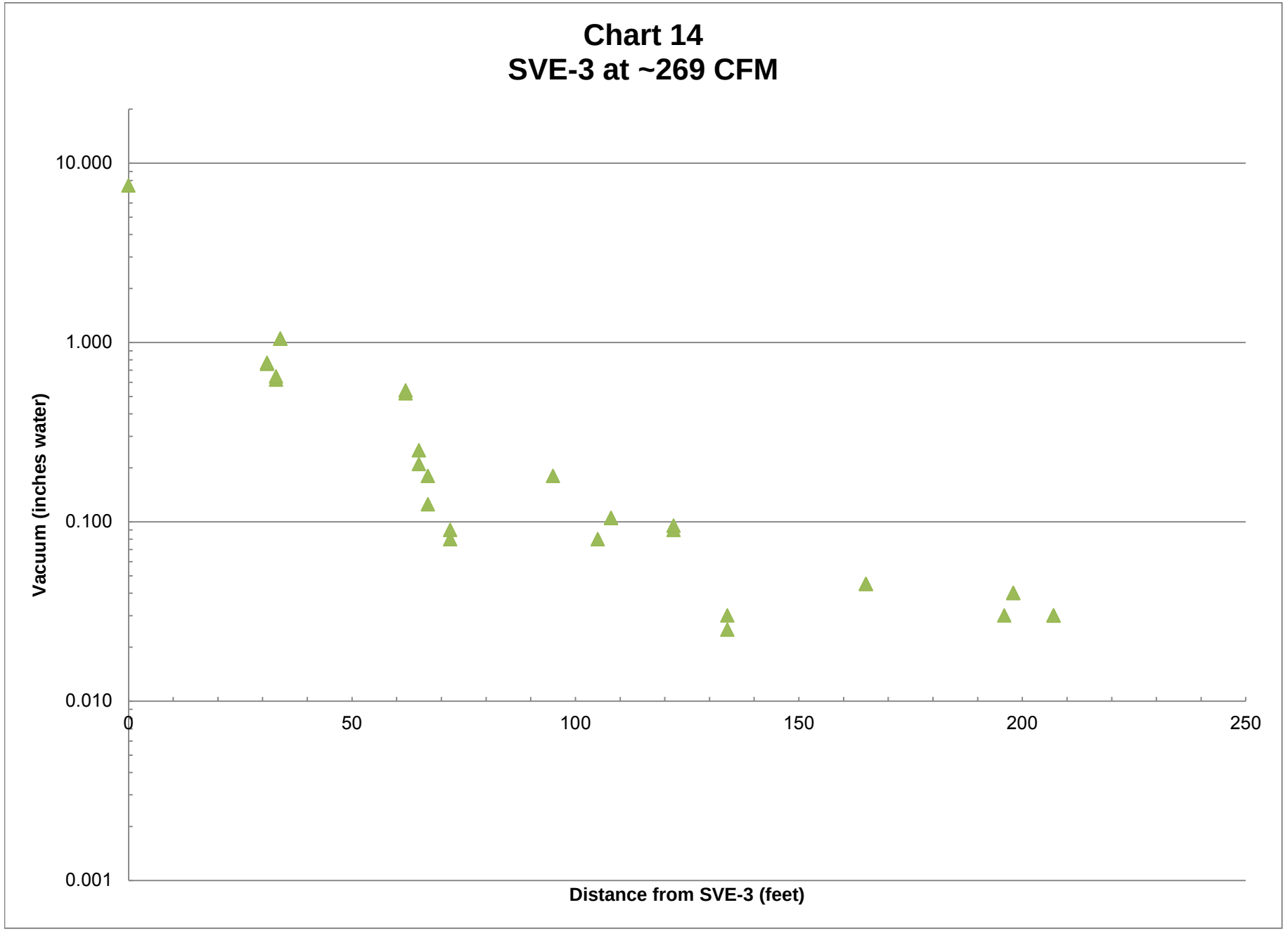


Chart 14
SVE-3 at ~269 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-3 (feet)

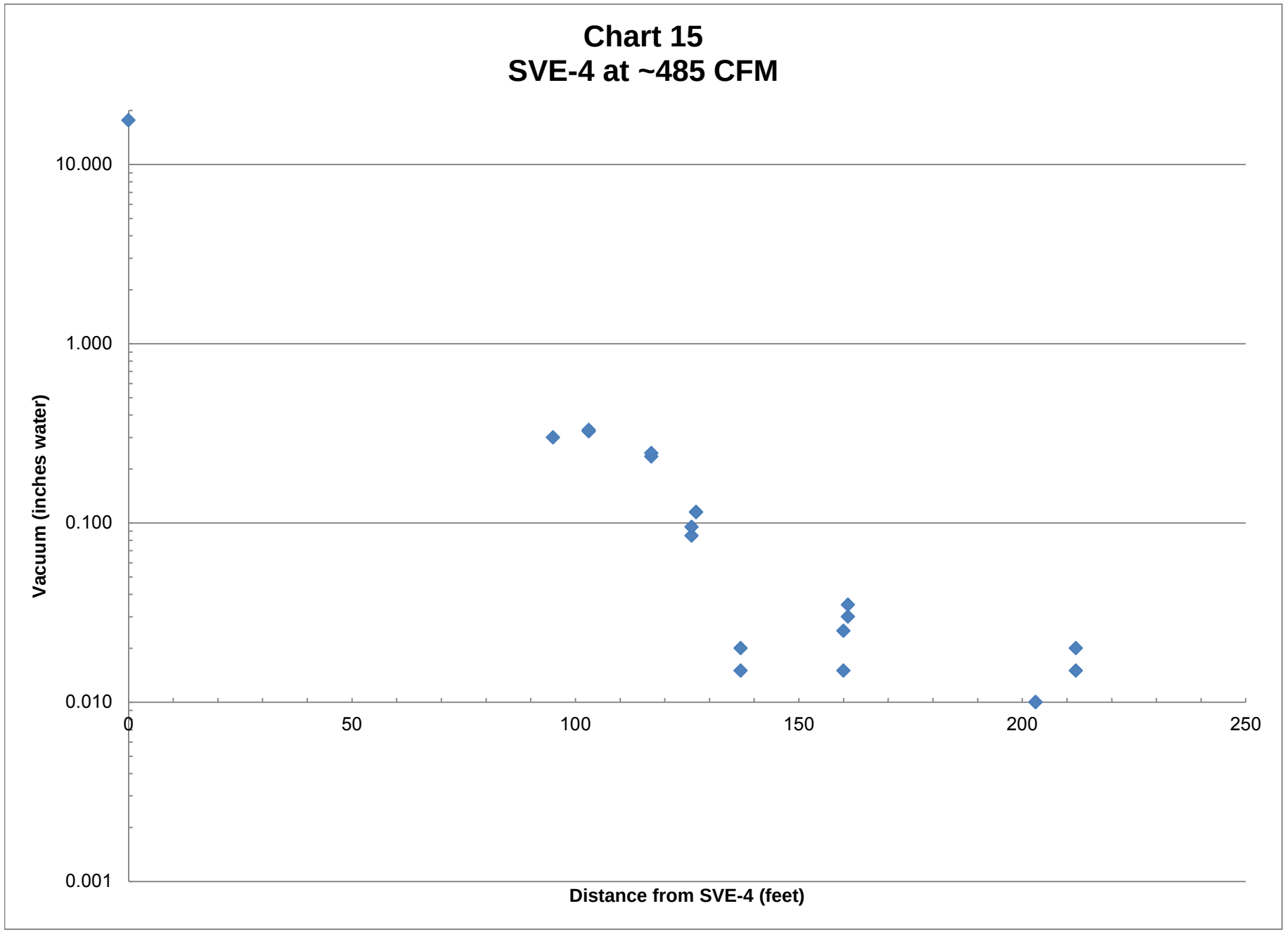


Chart 15
SVE-4 at ~485 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-4 (feet)

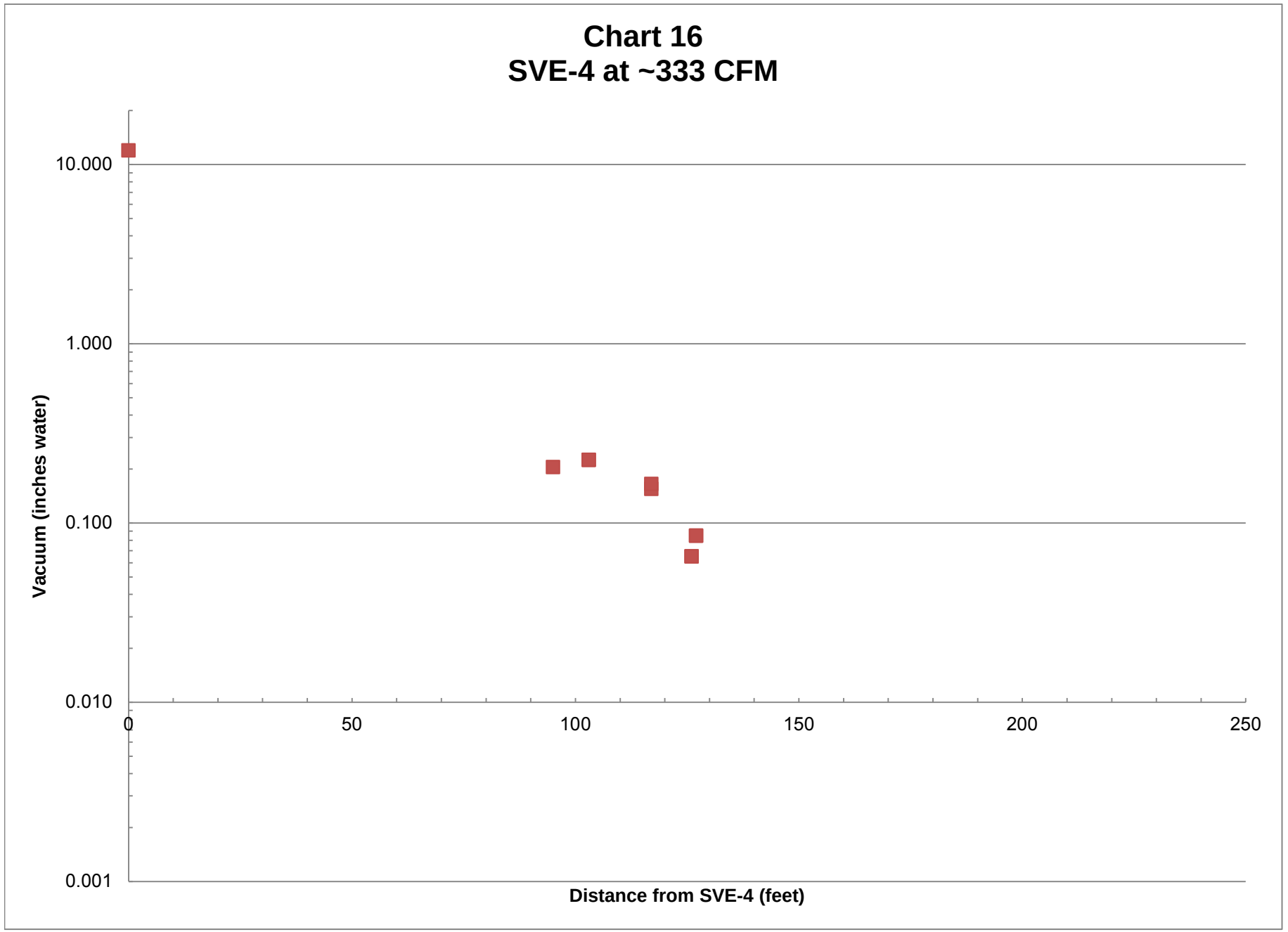


Chart 16
SVE-4 at ~333 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-4 (feet)

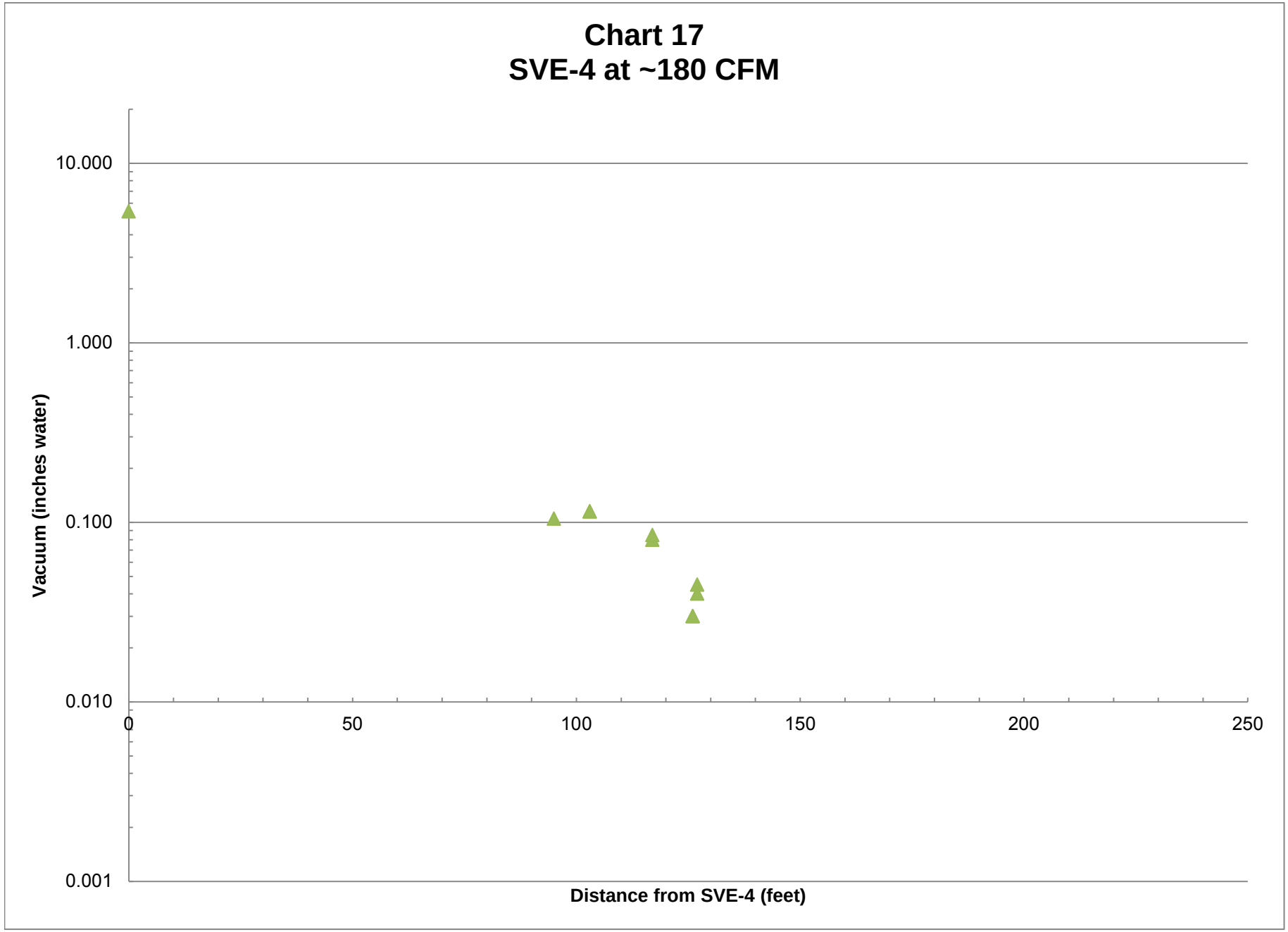


Chart 17
SVE-4 at ~180 CFM
10.000
1.000
0.100
0.010
0.001
Vacuum (inches water)
0
50
100
150
200
250
Distance from SVE-4 (feet)

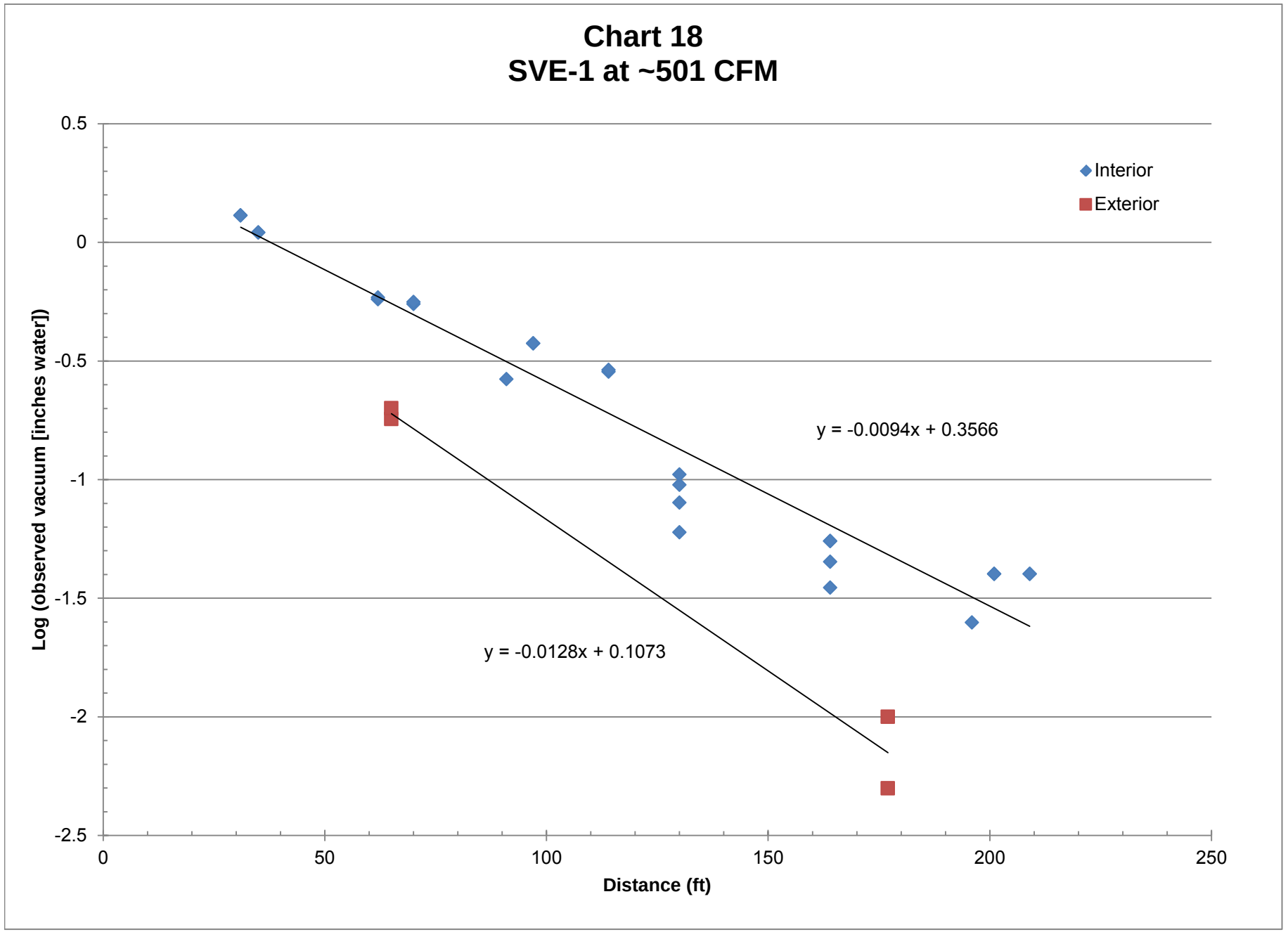


Chart 18
SVE-1 at ~501 CFM
Interior
Exterior
y = -0.0094x + 0.3566
y = -0.0128x + 0.1073
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

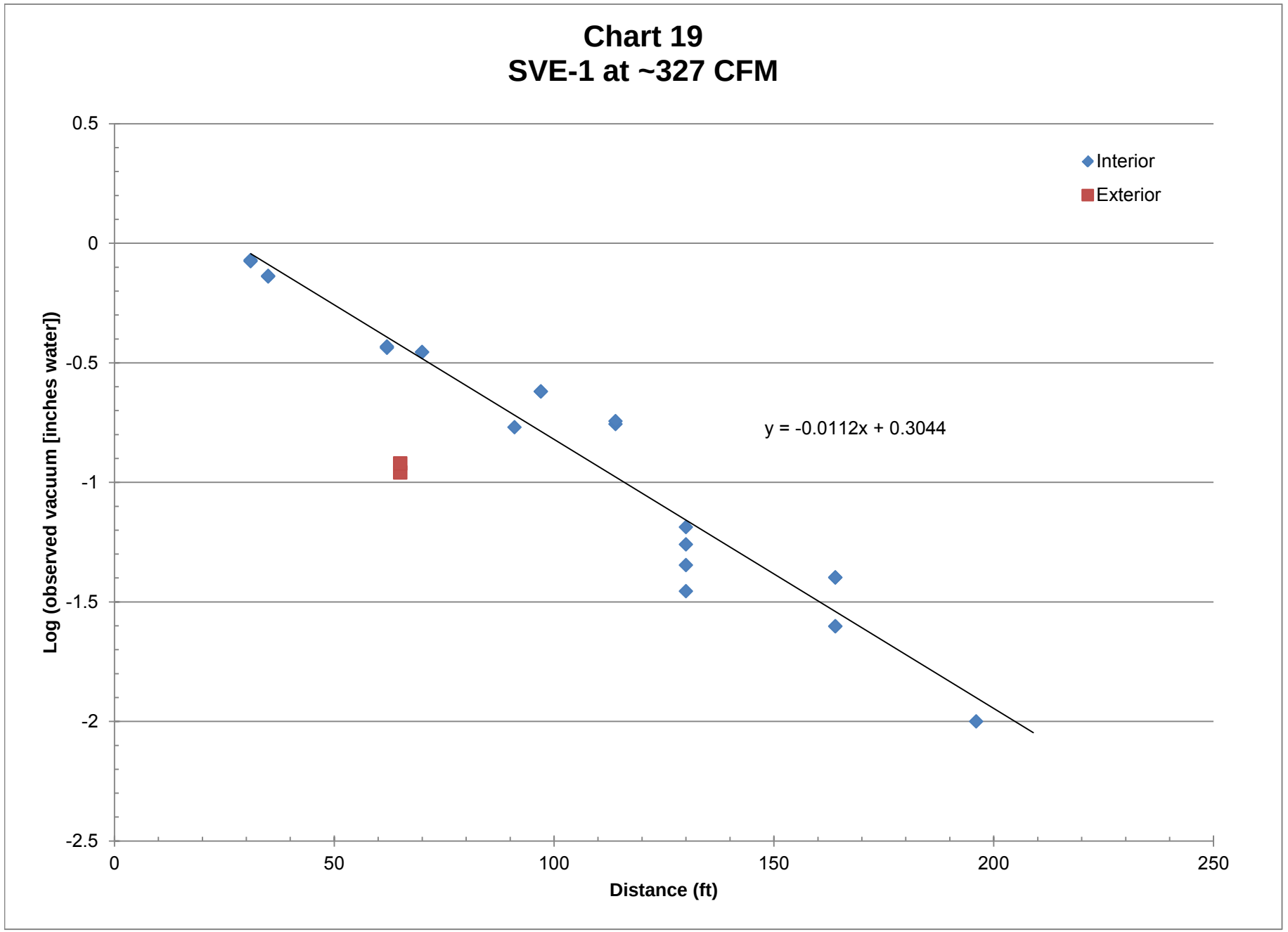


Chart 19
SVE-1 at ~327 CFM
Interior
Exterior
y = -0.0112x + 0.3044
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

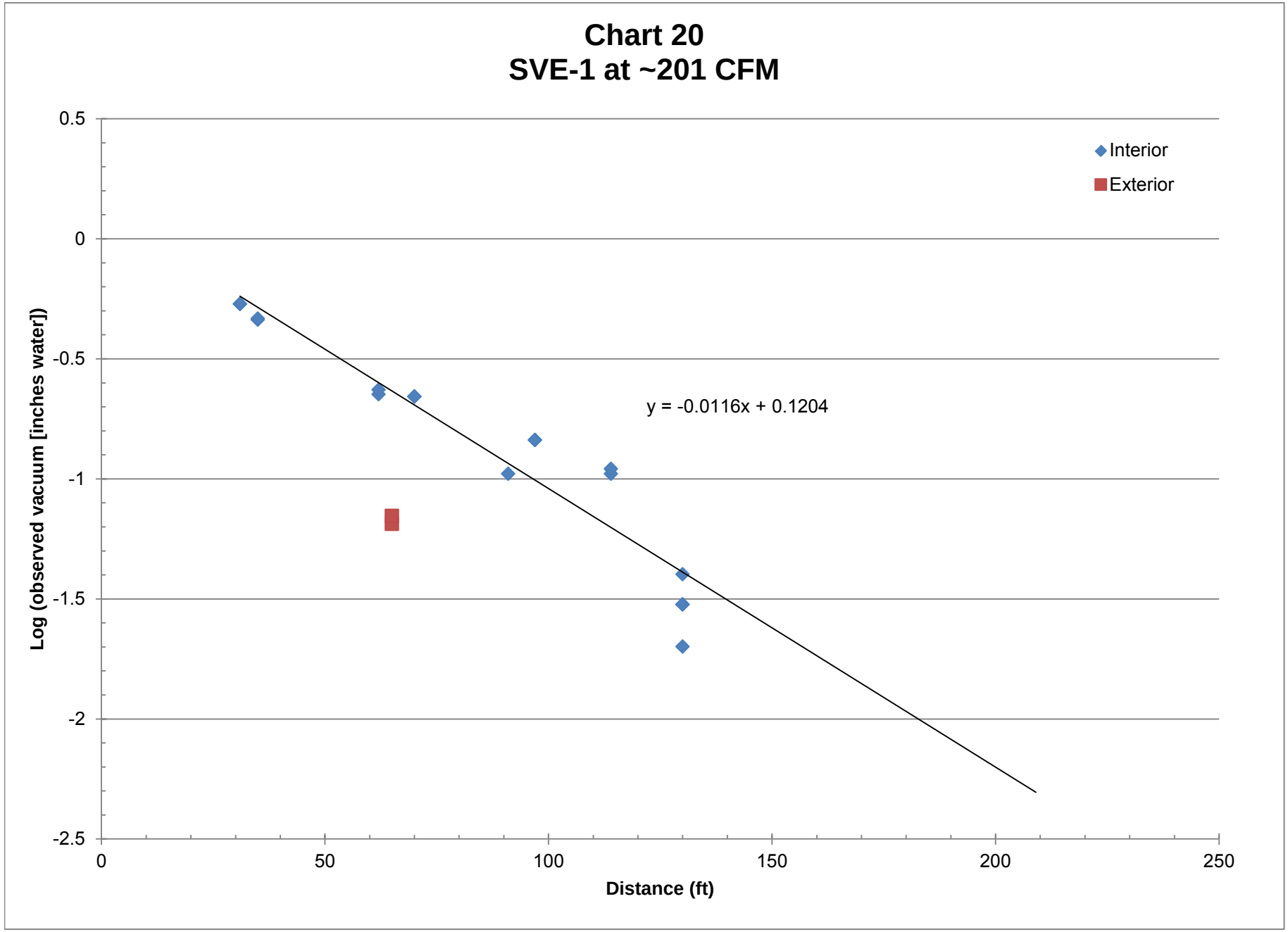


Chart 20
SVE-1 at ~201 CFM
Interior
Exterior
y = -0.0116x + 0.1204
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

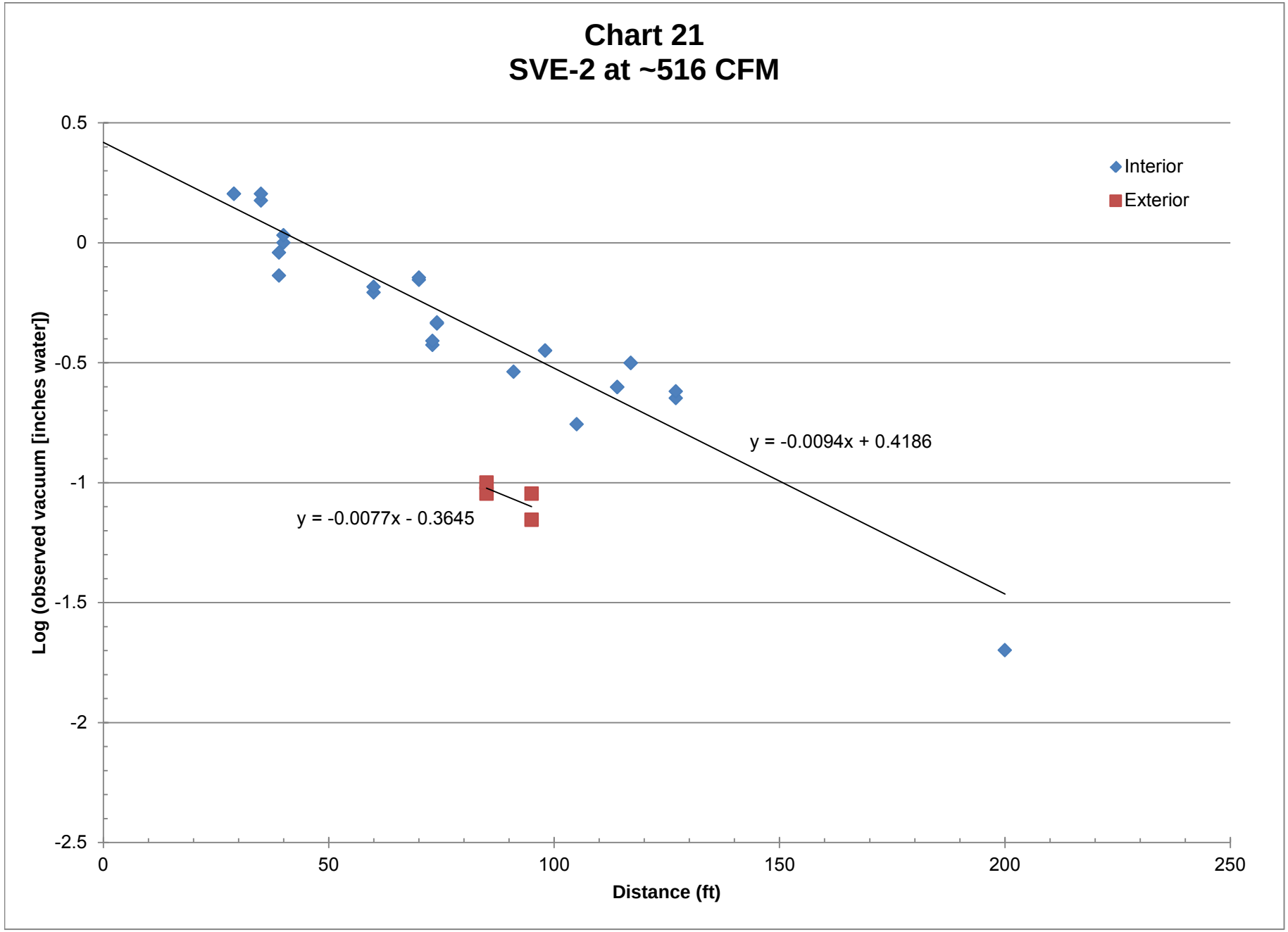


Chart 21
SVE-2 at ~516 CFM
Interior
Exterior
y = -0.0094x + 0.4186
y = -0.0077x - 0.3645
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

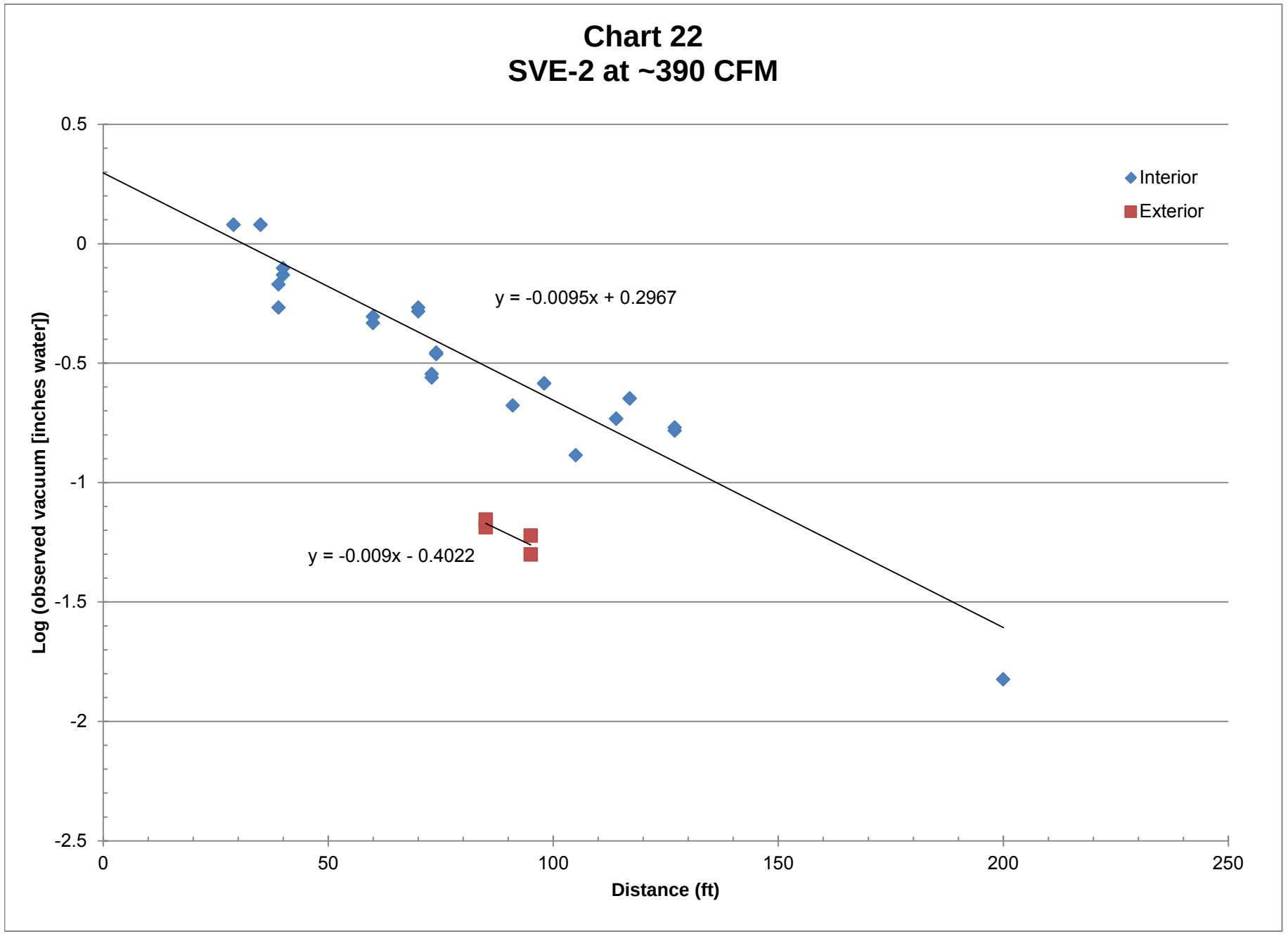


Chart 22
SVE-2 at ~390 CFM
Interior
Exterior
y = -0.0095x + 0.2967
y = -0.009x - 0.4022
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

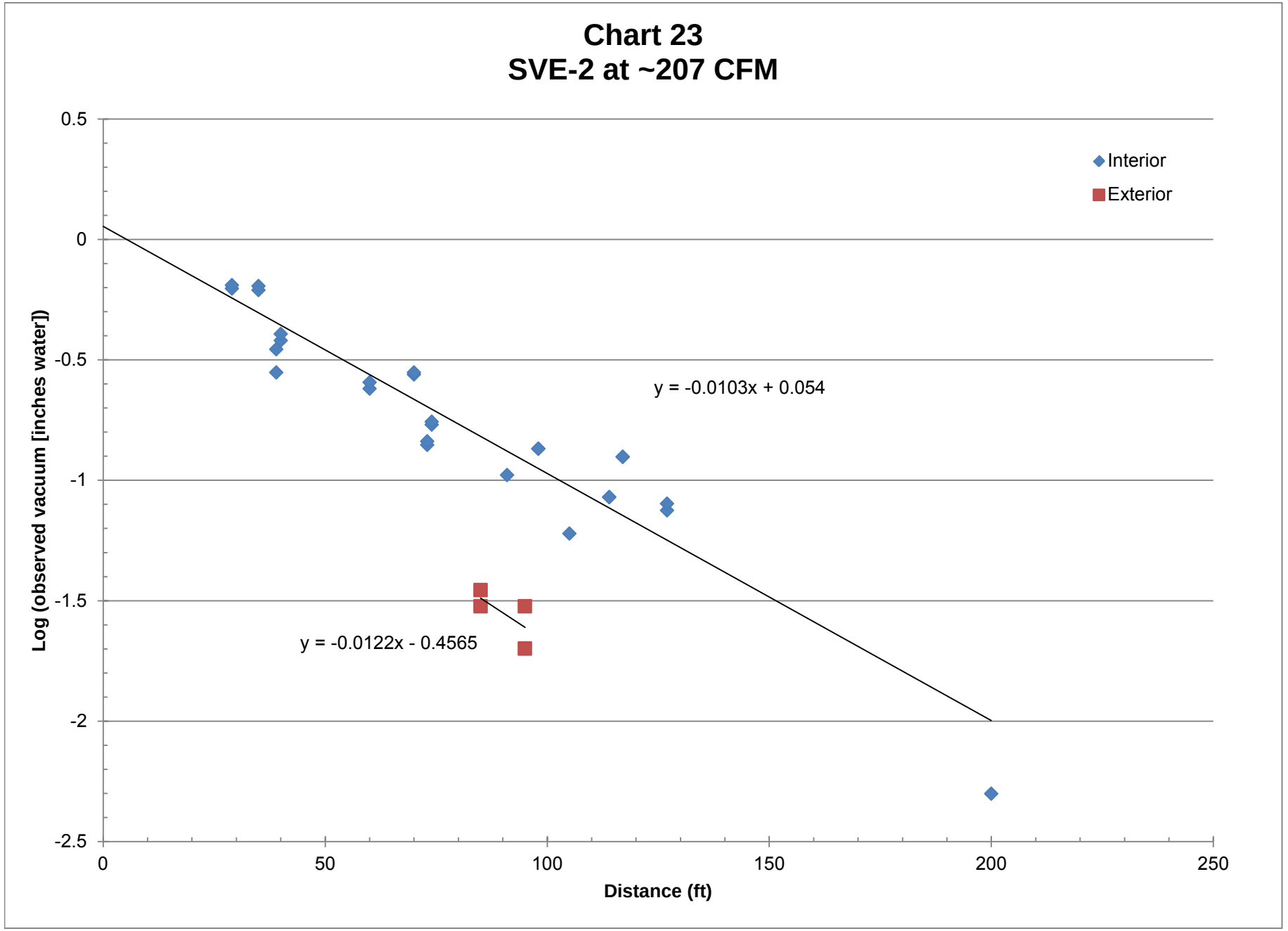


Chart 23
SVE-2 at ~207 CFM
Interior
Exterior
y = -0.0103x + 0.054
y = -0.0122x - 0.4565
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

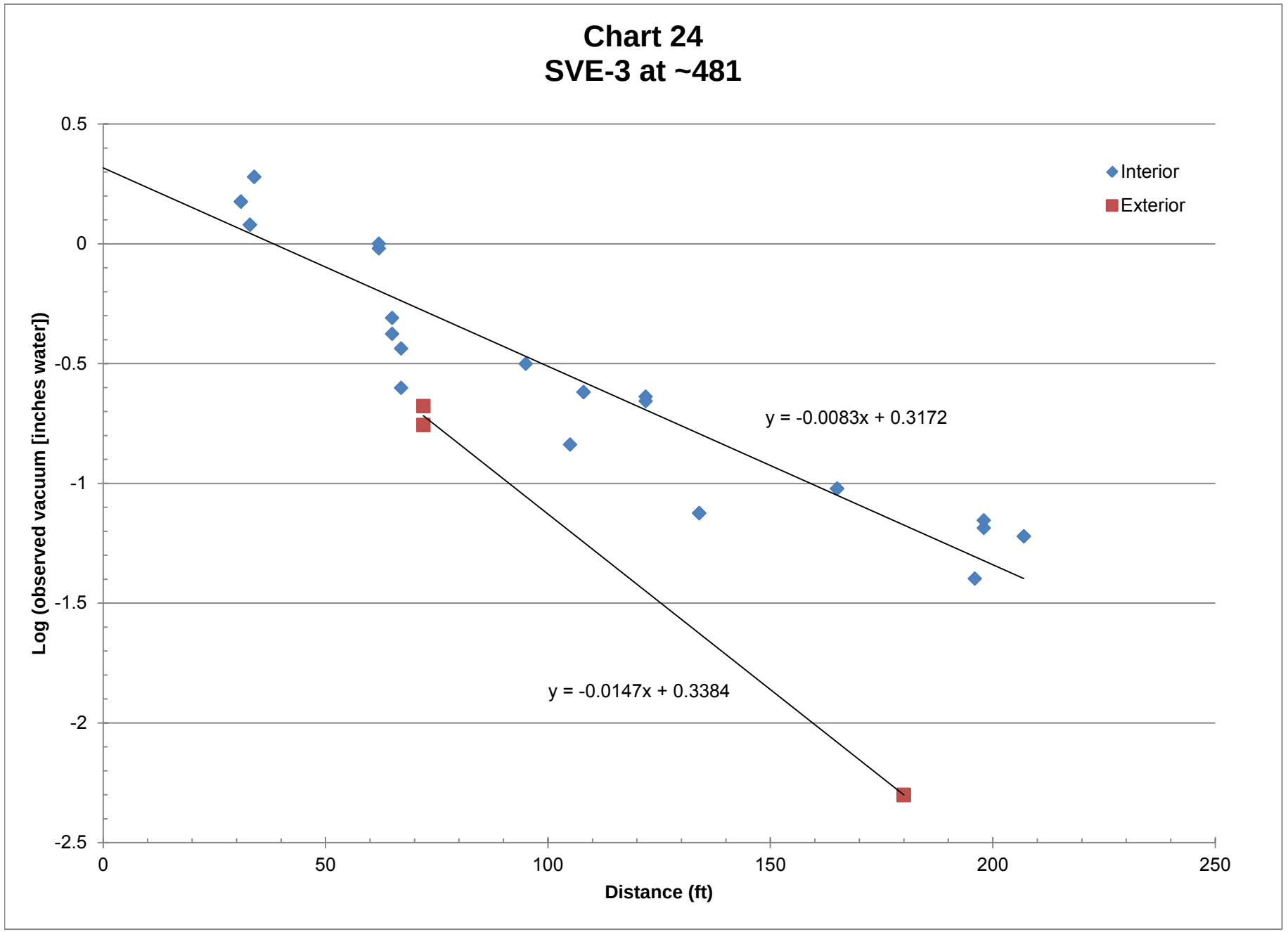


Chart 24
SVE-3 at ~481
Interior
Exterior
y = -0.0083x + 0.3172
y = -0.0147x + 0.3384
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

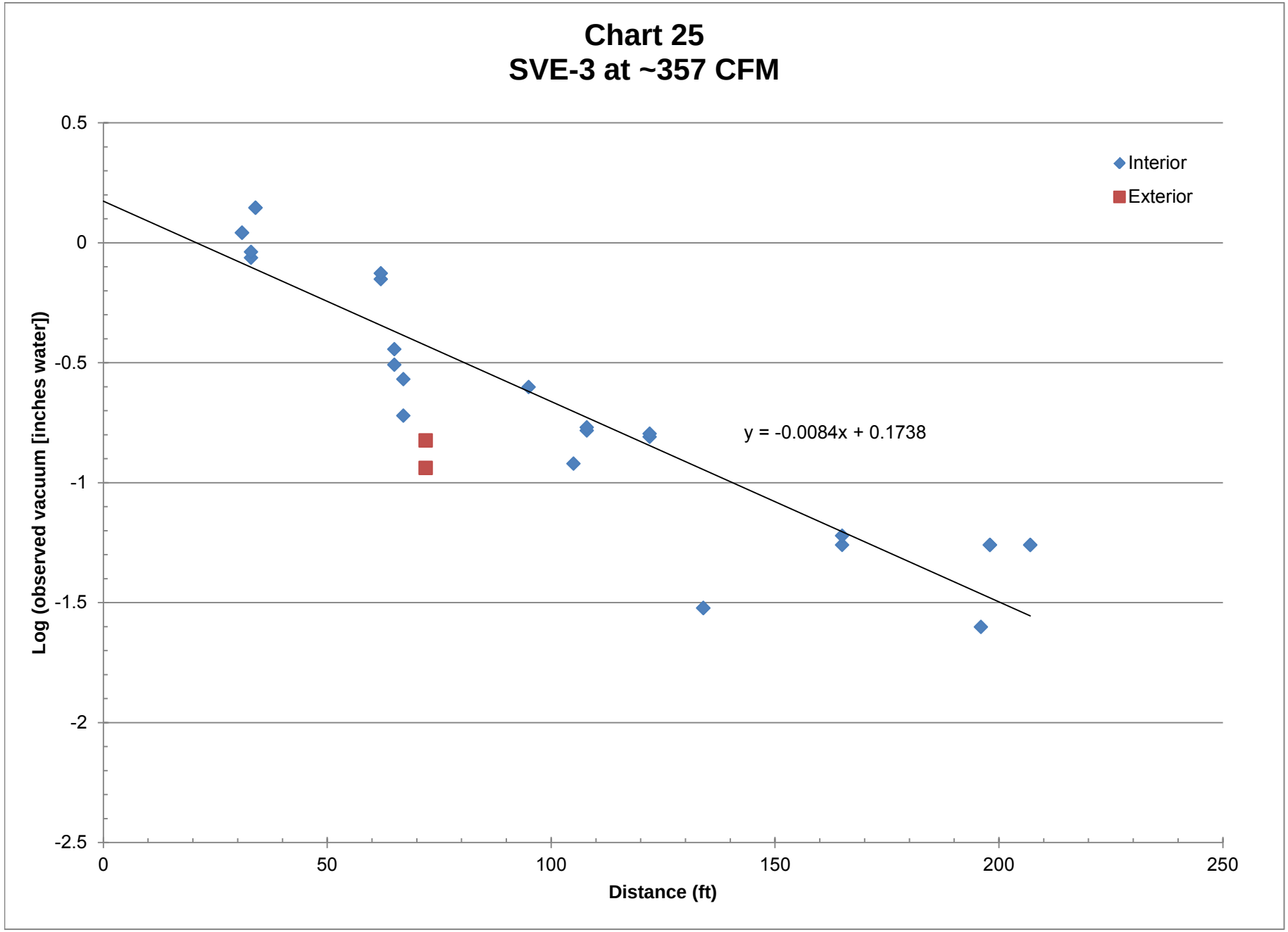


Chart 25
SVE-3 at ~357 CFM
Interior
Exterior
y = -0.0084x + 0.1738
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

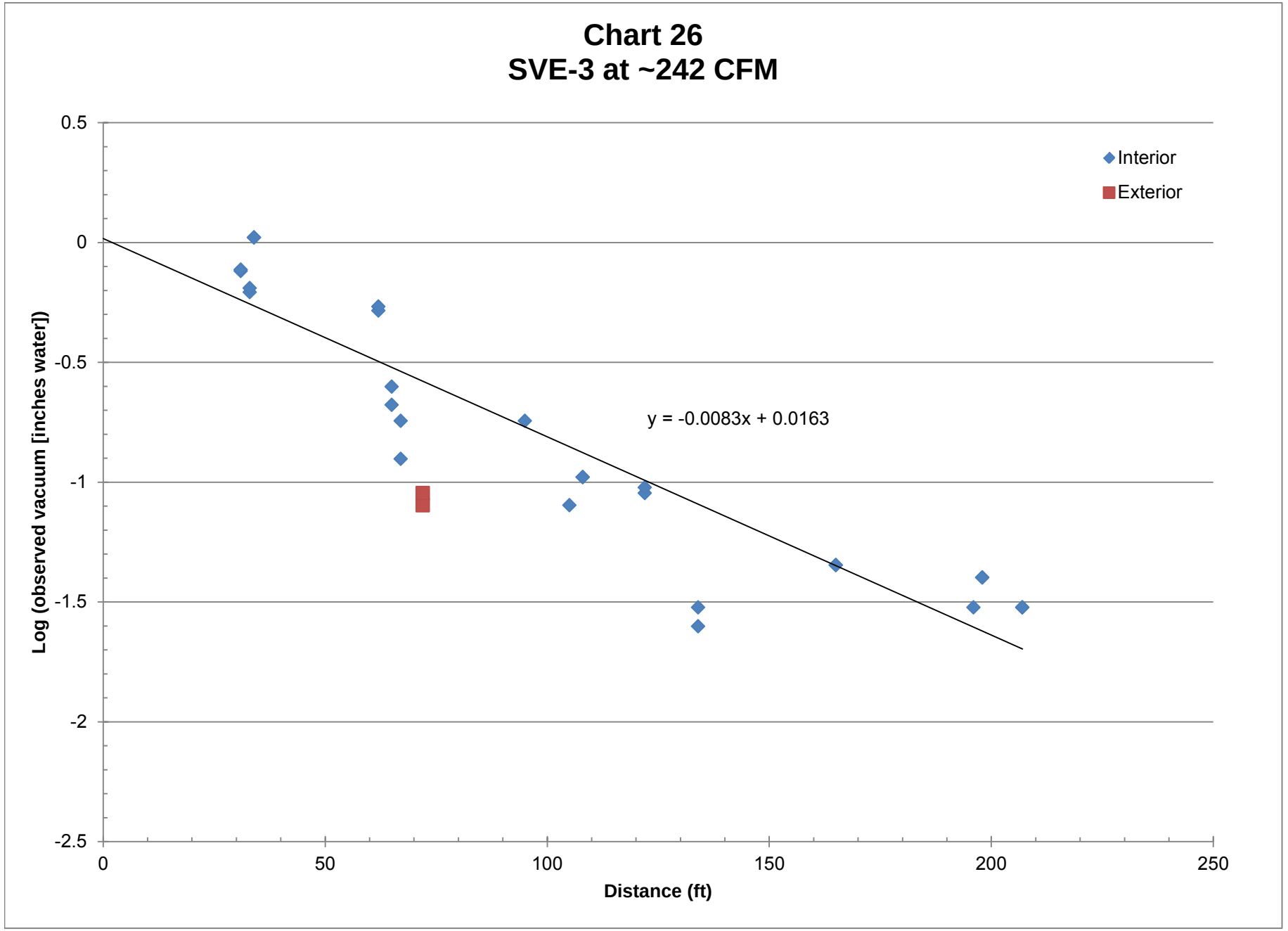


Chart 26
SVE-3 at ~242 CFM
Interior
Exterior
y = -0.0083x + 0.0163
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

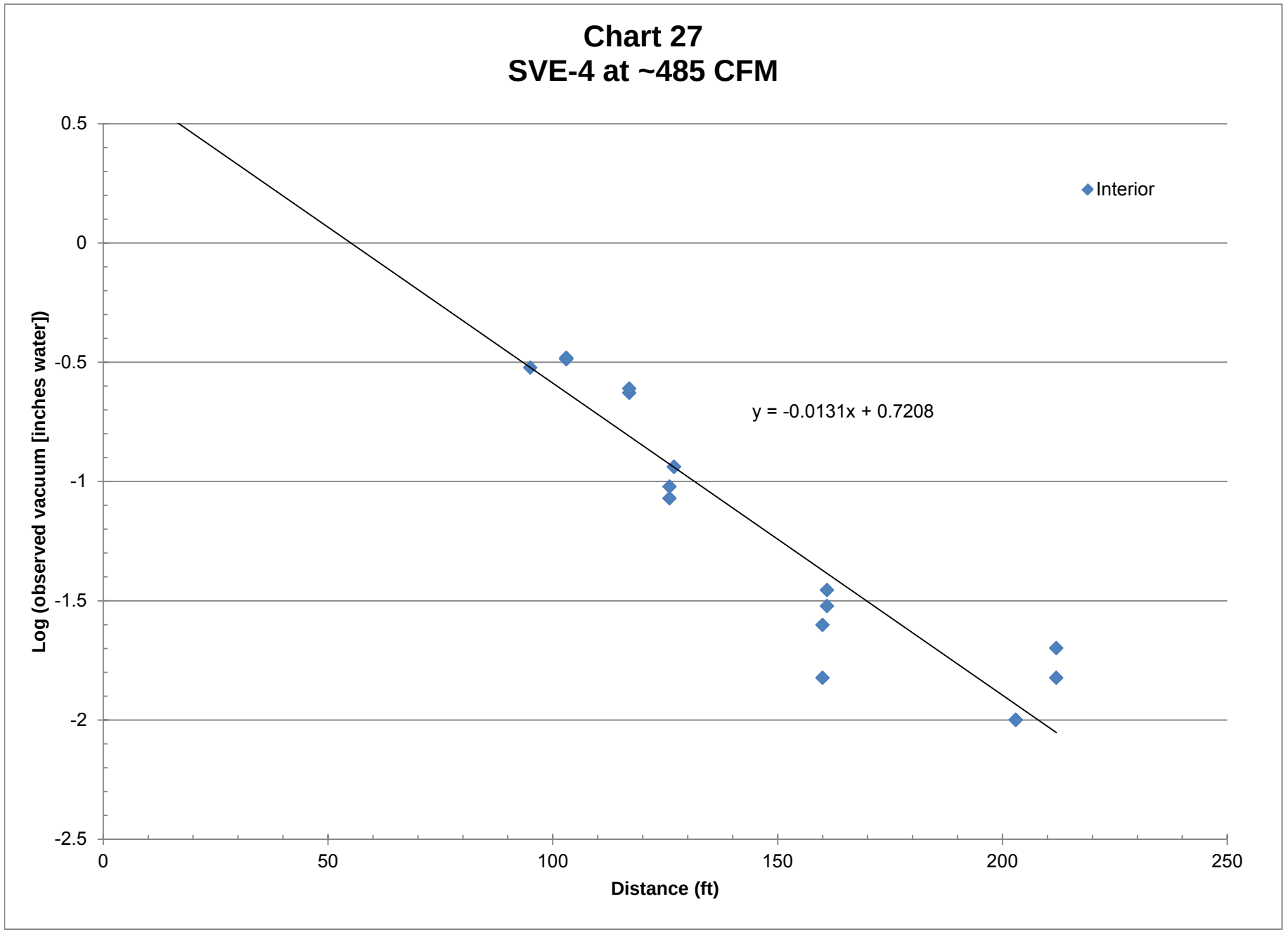


Chart 27
SVE-4 at ~485 CFM
Interior
y = -0.0131x + 0.7208
Log (observed vacuum [inches water])
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250
Distance (ft)

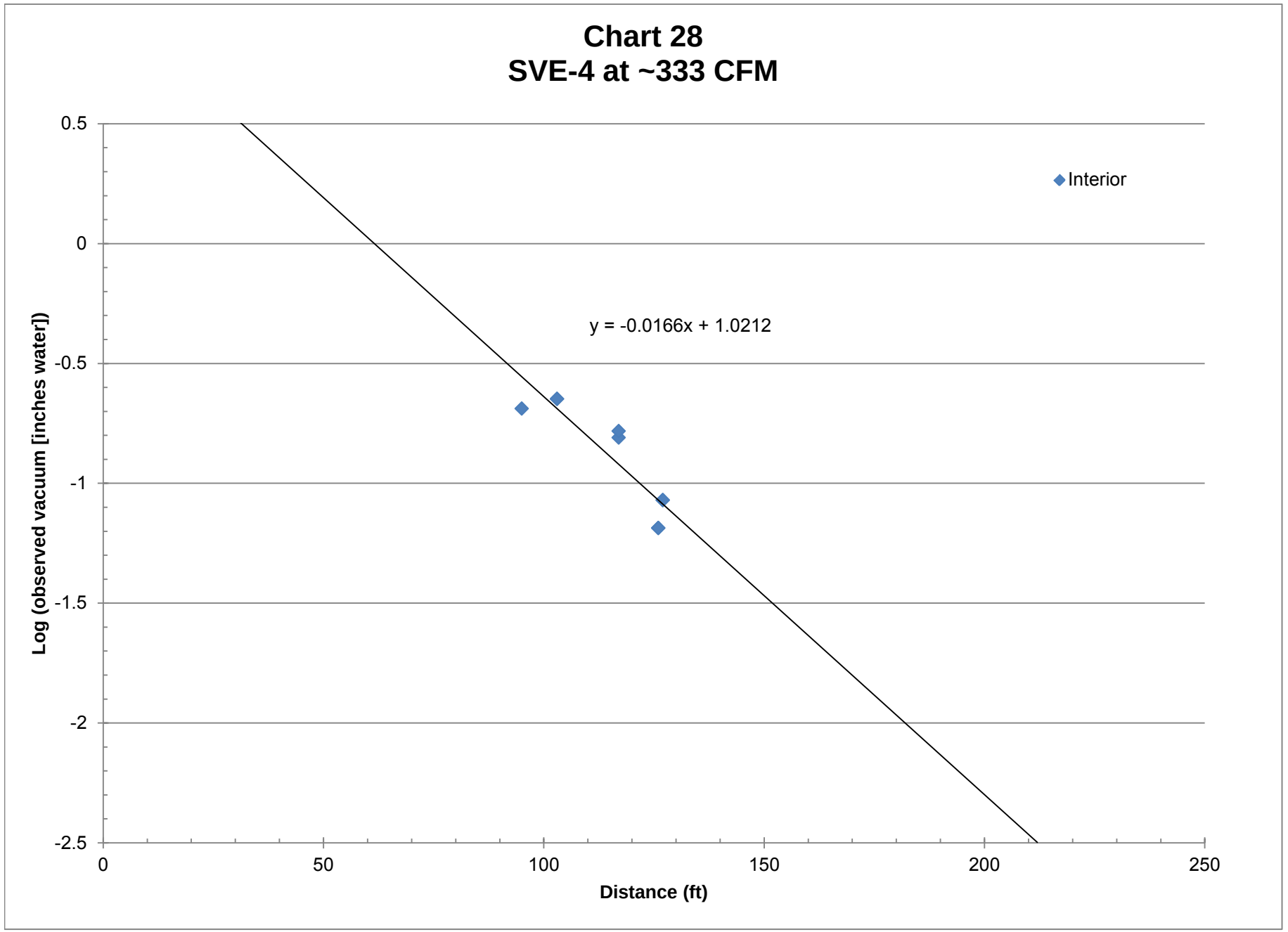


Chart 28
SVE-4 at ~333 CFM
Interior
y = -0.0166x + 1.0212
Log (observed vacuum [inches water])
Distance (ft)
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250

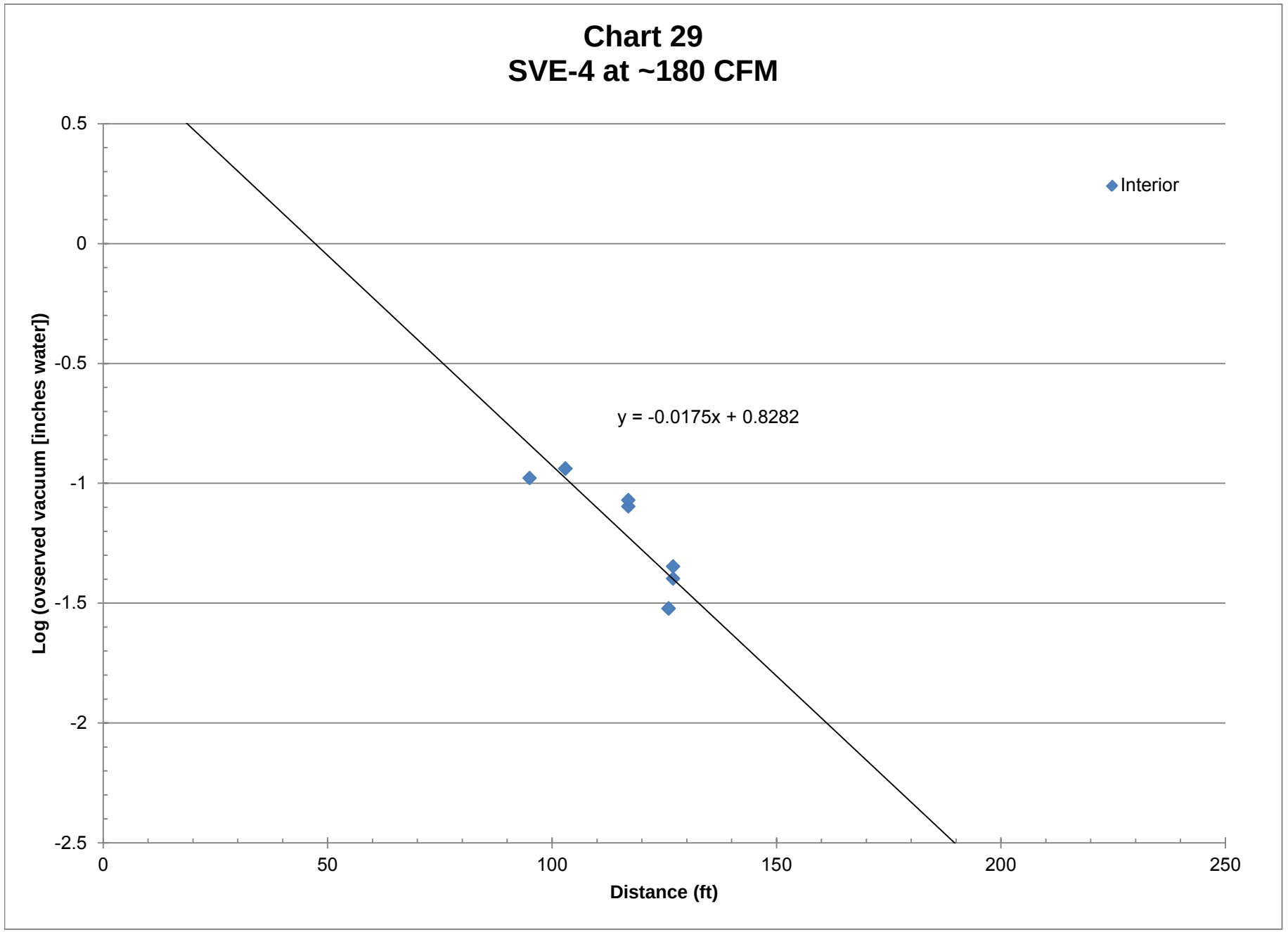


Chart 29
SVE-4 at ~180 CFM
Interior
y = -0.0175x + 0.8282
Log (ovserved vacuum [inches water])
0.5
0
-0.5
-1
-1.5
-2
-2.5
0
50
100
150
200
250
Distance (ft)

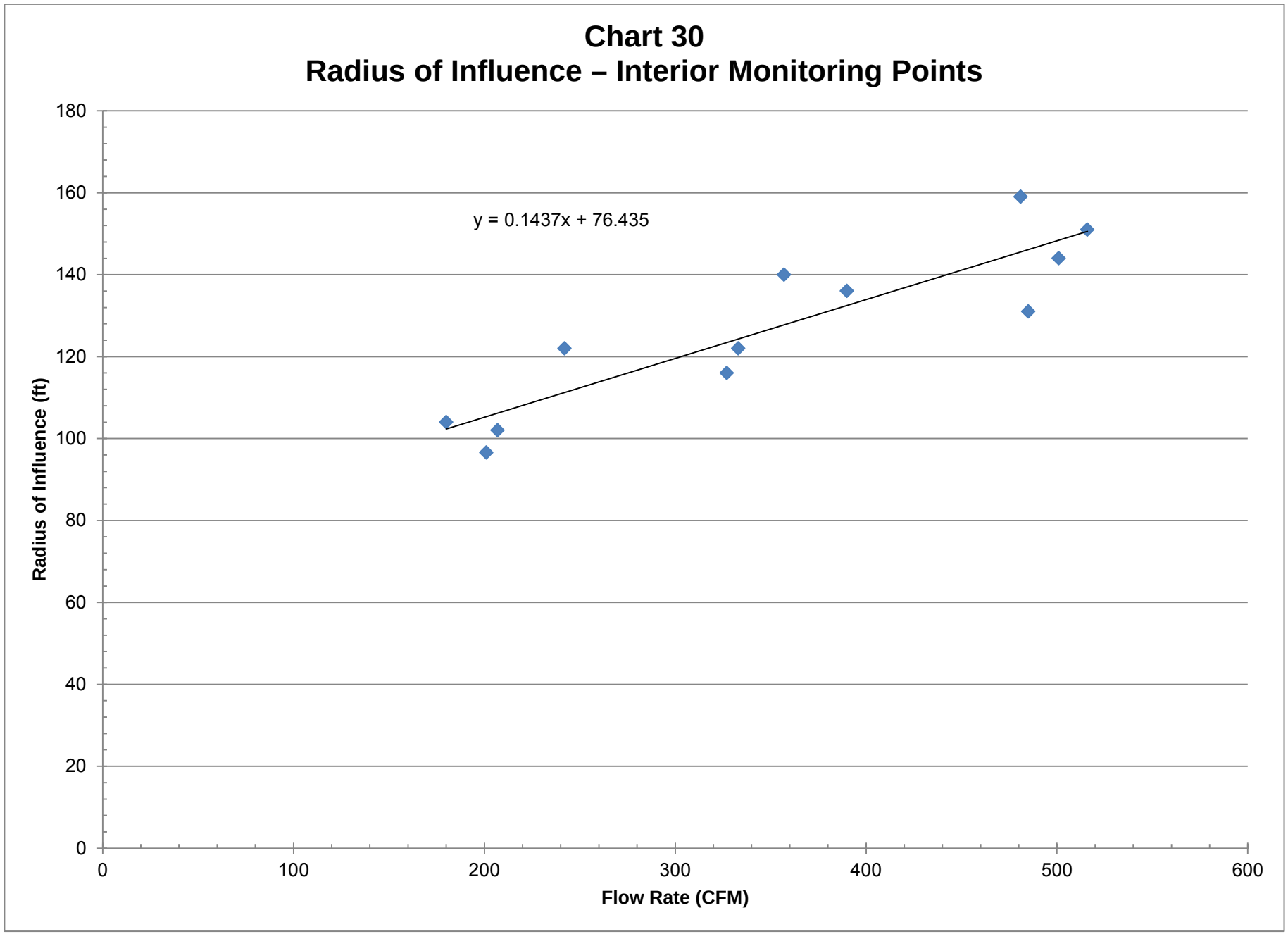
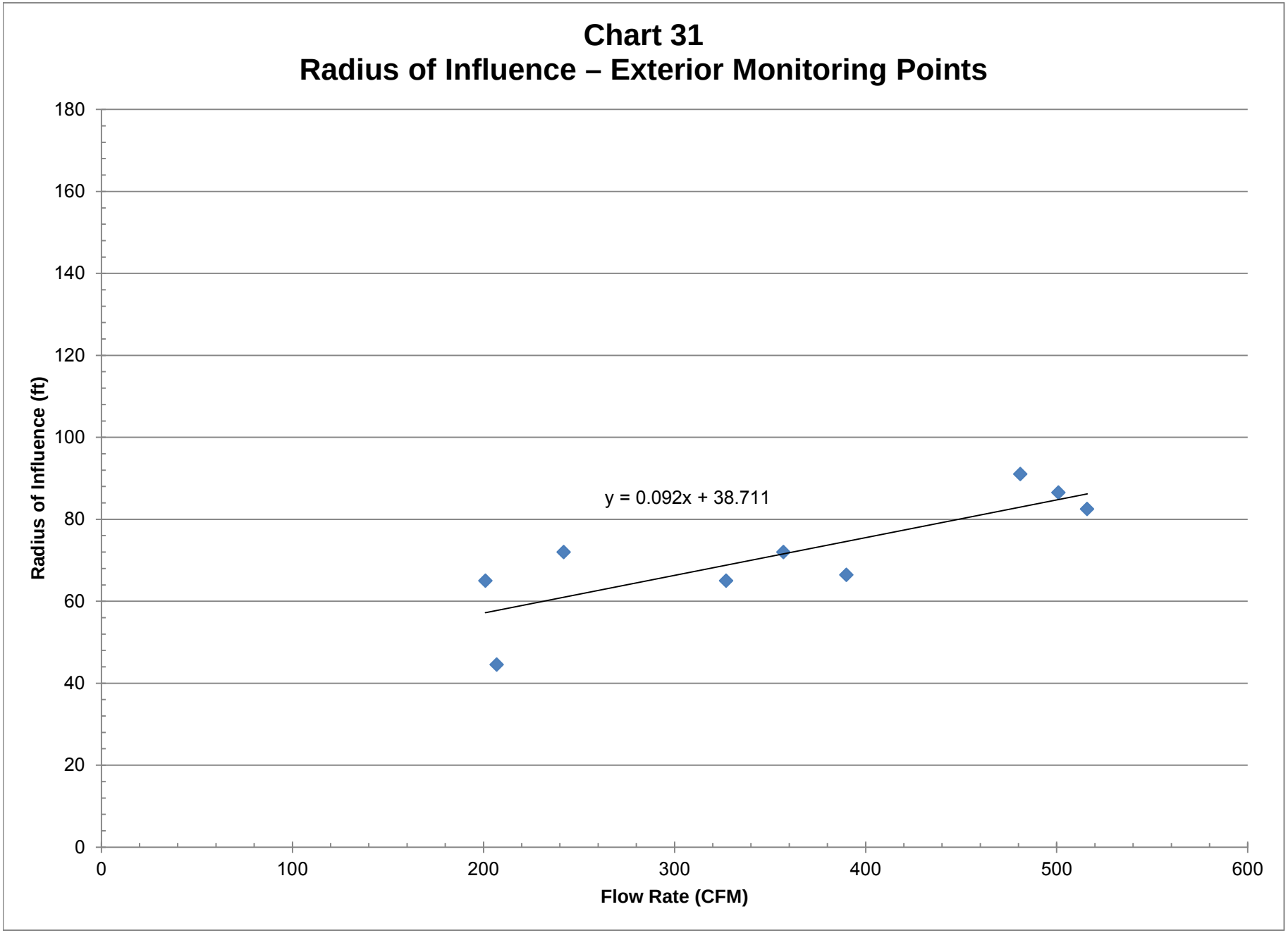


Chart 30
Radius of Influence – Interior Monitoring Points
y = 0.1437x + 76.435
Radius of Influence (ft)
Flow Rate (CFM)
0
20
40
60
80
100
120
140
160
180
0
100
200
300
400
500
600

Chart 31
Radius of Influence – Exterior Monitoring Points



Appendix A
Design Drawings

Tecumseh Products Company

Former Tecumseh Products Site

Tecumseh, Michigan

SOIL VAPOR EXTRACTION SYSTEM DESIGN

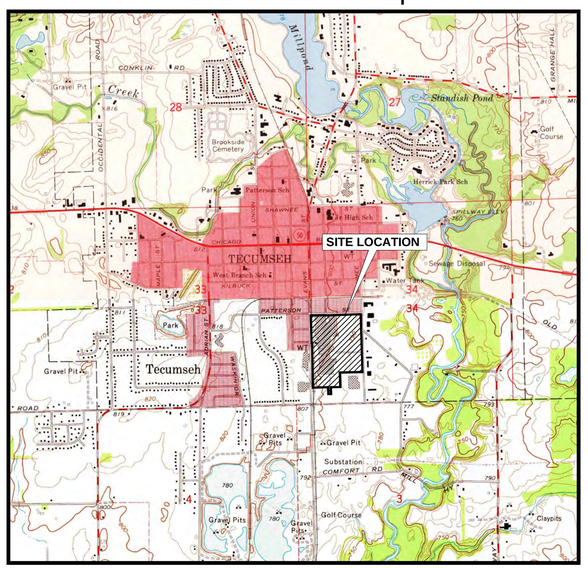
PREPARED FOR: Tecumseh Products Company
Ann Arbor, Michigan

PREPARED BY: TRC Engineers Michigan, Inc.
Ann Arbor, Michigan

DATE: May 2012

QUADRANGLE LOCATION

Site Location Map



BASE MAP DEVELOPED FROM THE TECUMSEH NORTH AND TECUMSEH SOUTH, MICHIGAN, 7.5 MINUTE U.S.G.S. TOPOGRAPHIC MAPS, DATED 1967 AND 1972.

0 2000' 4000' 6000' 8000'

APPROXIMATE SCALE IN FEET

Drawing Index

SHEET NUMBER	SHEET TITLE
1	Title Sheet
2	Piping and Instrumentation Diagram Symbol Sheet
3	Site Plan
4	SVE System Layout (Northern Perimeter)
5	SVE System Layout (Western Perimeter)
6	Piping and Instrumentation Diagram
7	As-Built Riser Pipe Connection Diagrams (SVE-1 through SVE-4)
8	Riser Pipe Connection Diagrams (SVE-5 through SVE-7)
9	Civil Details

TRC
1540 EISENHOWER PLACE
ANN ARBOR, MICHIGAN 48108
PHONE: 734-971-7080 FAX: 734-971-9022

PLOT DATA
Drawing Name: J:_TRC\Tecumseh Products\Tecumseh MI\157195\000\102\SV Extraction Plan Set_Full Scale SVE Plan Set\157195.000.102.01.dwg
Operator Name: STEHLE, GIANAH
Device Type: T11

Dwg Size: d.43 Mb
Plot Date: May 24, 2012
Plot Time: 10:24 AM

Attached Xref's:
Attached Images:

SHT 01 of 9 Title Sheet

PIPING SYMBOLS (1)

- PIPING
- JACKETED PIPING
- HW — HOT WATER HEAT TRACED AND INSULATED PIPING
- S — STEAM HEAT TRACED AND INSULATED PIPING
- E — ELECTRIC HEAT TRACED AND INSULATED PIPING
- I — INSULATED PIPING
- FLANGED OR UNION CONNECTION
- THREADED OR WELDED CONNECTION
- FLANGE OR UNION
- 1/2 OF FLANGED OR UNION CONNECTION
- PIPE ENDED IN BLIND FLANGE
- PIPE ENDED IN THREADED CAP OR PLUG
- PIPE ENDED IN WELDED CAP OR PLUG
- HOSEBIB
- CONCENTRIC REDUCER OR REDUCING BUSHING
- ECCENTRIC REDUCER OR REDUCING BUSHING WITH FLAT SIDE UP
- ECCENTRIC REDUCER OR REDUCING BUSHING WITH FLAT SIDE DOWN
- VENT
- VENT WITH SCREEN
- T — PIPE TRAP
- PIPE WITH SPRAY NOZZLES
- PIPE WITH DIFFUSERS
- DRAIN
- SPEC XXXXX / SPEC YYYYY — PIPING SPECIFICATION CHANGE
- A — PIPING CONTINUATION THIS DRAWING
- B SHEET 2 OF 2 — PIPING CONTINUATION ANOTHER DRAWING

VALVE SYMBOLS (2)

- GATE VALVE
- GLOBE VALVE
- ANGLE VALVE
- BALL VALVE
- BUTTERFLY VALVE
- PLUG VALVE
- DIAPHRAGM VALVE
- PINCH VALVE
- NEEDLE VALVE
- CHECK VALVE
- FLOAT OPERATED VALVE WITH FLOAT
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE
- PRESSURE REDUCING VALVE (SELF-CONTAINED)
- BACKPRESSURE VALVE (SELF-CONTAINED)
- S — 2-WAY SOLENOID VALVE
- S — 3-WAY SOLENOID VALVE
- QUICK-OPENING VALVE
- STOP CHECK VALVE
- HOSE BIBB
- BACK FLOW PREVENTER
- 3-WAY MANUAL VALVE

SPECIALTY SYMBOLS

- Y-TYPE STRAINER
- TEMPORARY STRAINER
- DIAPHRAGM SEAL
- FLEXIBLE CONNECTOR
- SILENCER
- BAG FILTER
- CARTRIDGE FILTER
- EDUCTOR
- STATIC MIXER
- STATIC MIXER WITH INTEGRAL INJECTION PORT
- PITLESS ADAPTER
- AIR OR GAS FILTER
- SPECTACLE BLIND
- BLIND FLANGE
- RING SPACER
- BLEED RING
- RESTRICTION ORIFICE
- WATER HAMMER ARRESTOR
- PULSATION DAMPENER
- RUPTURE DISC
- MIXING TEE WITH INJECTION QUILL
- QUICK-CONNECT HOSE CONNECTION
- HOSE BARB
- S.S. 304 FLEXIBLE HOSE
- S.S. 304 FLEXIBLE HOSE WITH QUICK-CONNECT FITTINGS
- S.S. 304 FLEXIBLE HOSE WITH THREADED ENDS
- CLAMPED CONNECTION (PIPE-TO-HOSE)
- CLAMPED CONNECTION (HOSE-TO-HOSE)

EQUIPMENT SYMBOLS

- HORIZONTAL CENTRIFUGAL PUMP
- SUMP PUMP
- VERTICAL CENTRIFUGAL PUMP
- SUBMERGED VERTICAL TURBINE PUMP WITH INTEGRAL MOTOR
- CENTRIFUGAL FAN
- CENTRIFUGAL BLOWER
- ROTARY BLOWER OR COMPRESSOR
- ELECTRIC MOTOR
- POSITIVE DISPLACEMENT PROGRESSING CAVITY PUMP

INSTRUMENT LINE SYMBOLS (3)

- INSTRUMENT OR ELECTRIC MOTOR CONNECTION TO PROCESS
- ELECTRIC SIGNAL (ANALOG)
- ELECTRIC BINARY (ON-OFF) SIGNAL
- PNEUMATIC SIGNAL
- PNEUMATIC BINARY (ON-OFF) SIGNAL
- HYDRAULIC SIGNAL
- CAPILLARY TUBE
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (NOT GUIDED)
- INTERNAL SYSTEM LINK (SOFTWARE OR DATA LINK)
- MECHANICAL LINK
- A — INSTRUMENT LINE CONTINUATION THIS DRAWING
- B SHEET 2 OF 2 — INSTRUMENT LINE CONTINUATION ANOTHER DRAWING
- BUBBLE (SINGLE) WITH LEADER
- BUBBLE (DOUBLE) WITH LEADER

TAGGING SYMBOLS

- L-200 — LINE TAG (DEFAULT STYLE)
- L-AAAAB CCC* — LINE TAG - STYLE A
- L-AAAB CC* — LINE TAG - STYLE B
- CC* — LINE TAG - STYLE C
- SL-AAAB CCC* — LINE TAG - STYLE D
- S-200 — SPECIALTY TAG
- V-200 — VALVE TAG

INSTRUMENT PRIMARY ELEMENT SYMBOLS

FLOW ELEMENTS

- FLOW METER
- TURBINE OR PROPELLER TYPE
- MAG — MAGNETIC TYPE
- POSITIVE DISPLACEMENT TYPE
- SONIC (IN-LINE) TYPE
- VORTEX TYPE
- TARGET TYPE (INSERTABLE PITOT TUBE OR HOT WIRE ANEMOMETER)
- ANNUBAR OR AVERAGING PITOT TUBE
- ROTAMETER
- FT
- SONIC TYPE (OUTSIDE PIPE)
- FX
- FE
- ORIFICE FLANGE
- S — ELECTRIC SOLENOID VALVE ACTUATOR

TEMPERATURE ELEMENTS

- TW — THERMOWELL

GENERAL SYMBOLS

- AAA — TIE-IN NEW TO EXISTING
- LINE OF SLOPE

INSTRUMENT IDENTIFICATION CHART (3)

	FIRST LETTER		SUCCEEDING LETTERS		
	MEASURED OR INITIATING VARIABLE	MODIFIER TO FIRST LETTER	READOUT OR PASSIVE FUNCTION	OUTPUT FUNCTION	MODIFIER
A	ANALYSIS		ALARM		
B	BURNER, COMBUSTION				
C	USER'S CHOICE			CONTROL	
D	USER'S CHOICE	DIFFERENTIAL			
E	VOLTAGE		SENSOR (PRIMARY ELEMENT)		
F	FLOW RATE	RATIO (FRACTION)			
G	USER'S CHOICE		GLASS, VIEWING DEVICE		
H	HAND				HIGH, OPEN
I	CURRENT (ELECTRICAL)		INDICATE		
J	POWER	SCAN			
K	TIME, TIME SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION	
L	LEVEL		LIGHT		LOW, CLOSED
M	USER'S CHOICE	MOMENTARY			MIDDLE, INTERMEDIATE
N	USER'S CHOICE				
O	USER'S CHOICE		ORIFICE, RESTRICTION		
P	PRESSURE, VACUUM		POINT (TEST) CONNECTION		
Q	QUANTITY	INTEGRATE, TOTALIZE			
R	RADIATION		RECORD		
S	SPEED, FREQUENCY	SAFETY		SWITCH	
T	TEMPERATURE			TRANSMITER OR TRANSDUCER	
U	MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION	MULTIFUNCTION
V	VIBRATION, MECHANICAL ANALYSIS			VALVE, DAMPER, LOUVER	
W	WEIGHT, FORCE		WELL		
X	UNCLASSIFIED	X-AXIS	UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED
Y	EVENT, STATE OR PRESENCE	Y-AXIS		RELAY, COMPUTE, CONVERT	
Z	POSITION, DIMENSION	Z-AXIS		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT	

INSTRUMENT AND FUNCTION SYMBOLS (3)

	LOCALLY MOUNTED	MOUNTED ON PRIMARY CONTROL PANEL (PCP)		MOUNTED ON AUXILIARY CONTROL PANEL (ACP)	
		NORMALLY ACCESSIBLE TO OPERATOR	NORMALLY INACCESSIBLE TO OPERATOR	NORMALLY ACCESSIBLE TO OPERATOR	NORMALLY INACCESSIBLE TO OPERATOR
DISCRETE INSTRUMENTS	○	⊖	⊖	⊖	⊖
SHARED DISPLAY AND/OR SHARED CONTROL	○	⊖	⊖	⊖	⊖
COMPUTER FUNCTION	⬡	⬡	⬡	⬡	⬡
PROGRAMMABLE OR RELAY LOGIC CONTROL	◇	◇	◇	◇	◇

TANK SYMBOLS

- VERTICAL TANK CONE TOP-FLAT BOTTOM
- VERTICAL TANK DISHED TOP-DISHED BOTTOM
- VERTICAL TANK DISHED TOP-FLAT BOTTOM
- VERTICAL TANK DISHED TOP-SLOPED BOTTOM
- VERTICAL TANK FLAT TOP-CONE BOTTOM
- VERTICAL TANK FLAT TOP-DISHED BOTTOM
- VERTICAL TANK FLAT TOP-FLAT BOTTOM
- VERTICAL TANK FLAT TOP-SLOPED BOTTOM
- VERTICAL TANK OPEN TOP-CONE BOTTOM
- VERTICAL TANK OPEN TOP-DISHED BOTTOM
- VERTICAL TANK OPEN TOP-FLAT BOTTOM
- VERTICAL TANK OPEN TOP-SLOPED BOTTOM

MISCELLANEOUS INSTRUMENT SYMBOLS

DEFINITIONS OF ABBREVIATIONS

H-O-A	HAND-OFF-AUTOMATIC
ON-OFF	ON-OFF
O-A	OFF-AUTOMATIC

INSTRUMENT DESIGNATION

- AAA / XXX — INSTRUMENT IDENTIFICATION; LOOP NUMBER (3 DIGITS)
- I — GENERAL INTERLOCK LOGIC

NOTES:

(1) INCLUDES PIPING, TUBING, AND DUCTING.

(2) VALVE SYMBOLS ARE FOR VALVES WITH MANUAL OPERATOR, EXCEPT WHERE A VALVE IS SHOWN WITH A HANDWHEEL EXTENTION OR WITH AN AUTOMATIC OPERATOR.

(3) ADAPTED FROM INSTRUMENT SOCIETY OF AMERICA STANDARD ISA-S5.1-1984 "INSTRUMENT SYMBOLS AND IDENTIFICATION".

NO.	BY	DATE	REVISION	APP'D
3				
2				
1				

PROJ: **SOIL VAPOR EXTRACTION SYSTEM DESIGN**
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

TITLE: **PIPING AND INSTRUMENTATION DIAGRAM SYMBOL SHEET**

DRAWN BY:	DGS	SCALE:	PROJ.NO. 187156.0001.02
CHECKED BY:	SP/SM	AS INDICATED	FILE NO. 187156.0001.02.02.dwg
APPROVED BY:	DM	DATE PRINTED:	SHEET 2 of 9
DATE:	MAY 2012		

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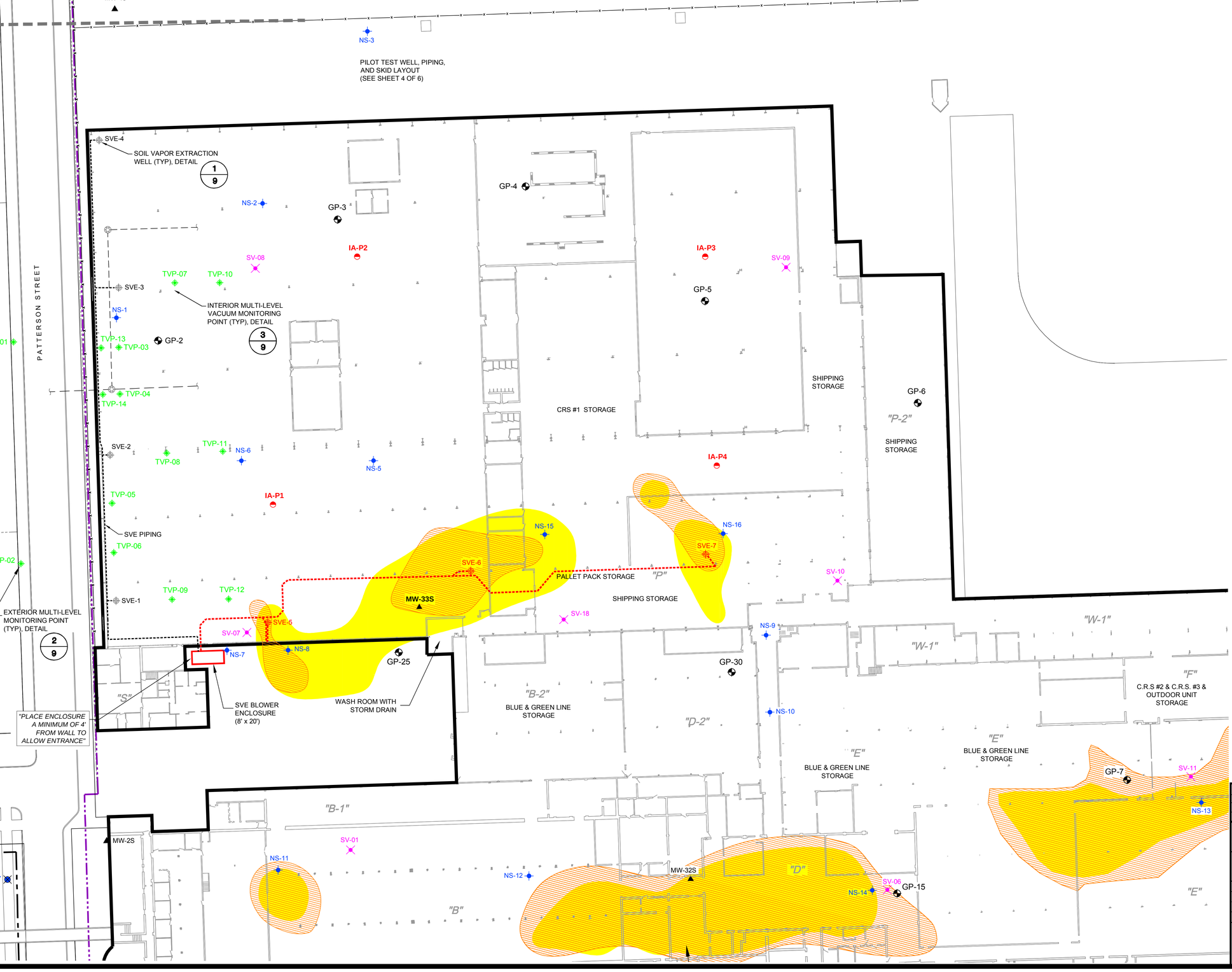

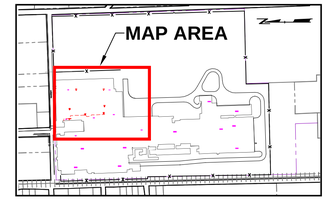

LEGEND

- FORMER TECUMSEH PRODUCTS SITE BOUNDARY
- GP-24 — ATC GEOPROBE BORING LOCATION AND NUMBER
- SV-08 — SUB-SLAB VAPOR SAMPLING LOCATION AND NUMBER
- IA-P1 — PROPOSED INDOOR AIR SAMPLE LOCATION AND NUMBER
- NS-6 — NORTHERN SOURCE AREA INVESTIGATION BORING LOCATION AND NUMBER
- MW-4S — MONITORING WELL LOCATION AND NUMBER
- SG-07 — SOIL GAS SAMPLE LOCATION AND NUMBER
- SVE-4 — SOIL VAPOR EXTRACTION WELL
- SVE-5 — PROPOSED SOIL VAPOR EXTRACTION WELL
- SVE CONVEYANCE PIPING
- PROPOSED SVE CONVEYANCE PIPING
- TVP-02 — TEMPORARY VACUUM MONITORING POINT LOCATION
- SANITARY SEWER MANHOLE AND SEWER LINE
- POTENTIAL SOURCE AREAS (2)

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY TECUMSEH PRODUCTS COMPANY, DRAWING NO. 09039STK.DWG.
2. POTENTIAL SOURCE AREAS IDENTIFIED WITH A PASSIVE SOIL GAS SURVEY CONDUCTED IN 2010.
3. DETAIL NUMBER IDENTIFICATION

3 / 9 — 3 = DETAIL NUMBER; 9 = SHEET NUMBER CROSS REFERENCE

0 30 60 90 120
APPROXIMATE SCALE IN FEET

NO.	BY	DATE	REVISION	APP'D
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2				
1				

PROJ: SOIL VAPOR EXTRACTION SYSTEM DESIGN
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

TITLE: SITE PLAN

DRAWN BY:	DGS	SCALE: AS INDICATED	PROJ. NO. 187156.0001.02
CHECKED BY:	SPISM		FILE NO. 187156.0001.02.03.dwg
APPROVED BY:	DM	DATE PRINTED:	SHEET 3 OF 9
DATE:	MAY 2012		

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PLOT DATA:
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Operator Name: STEHLE, DANAH
Drawing Plot Date: 5/30/2012

Attached Xref: Bldg Columns
Attached Images: Beacon TOE-Color Scale; Beacon TOE Contour Image; Beacon TOE-Britsh Colour Scale; Beacon TOE Contour Image;
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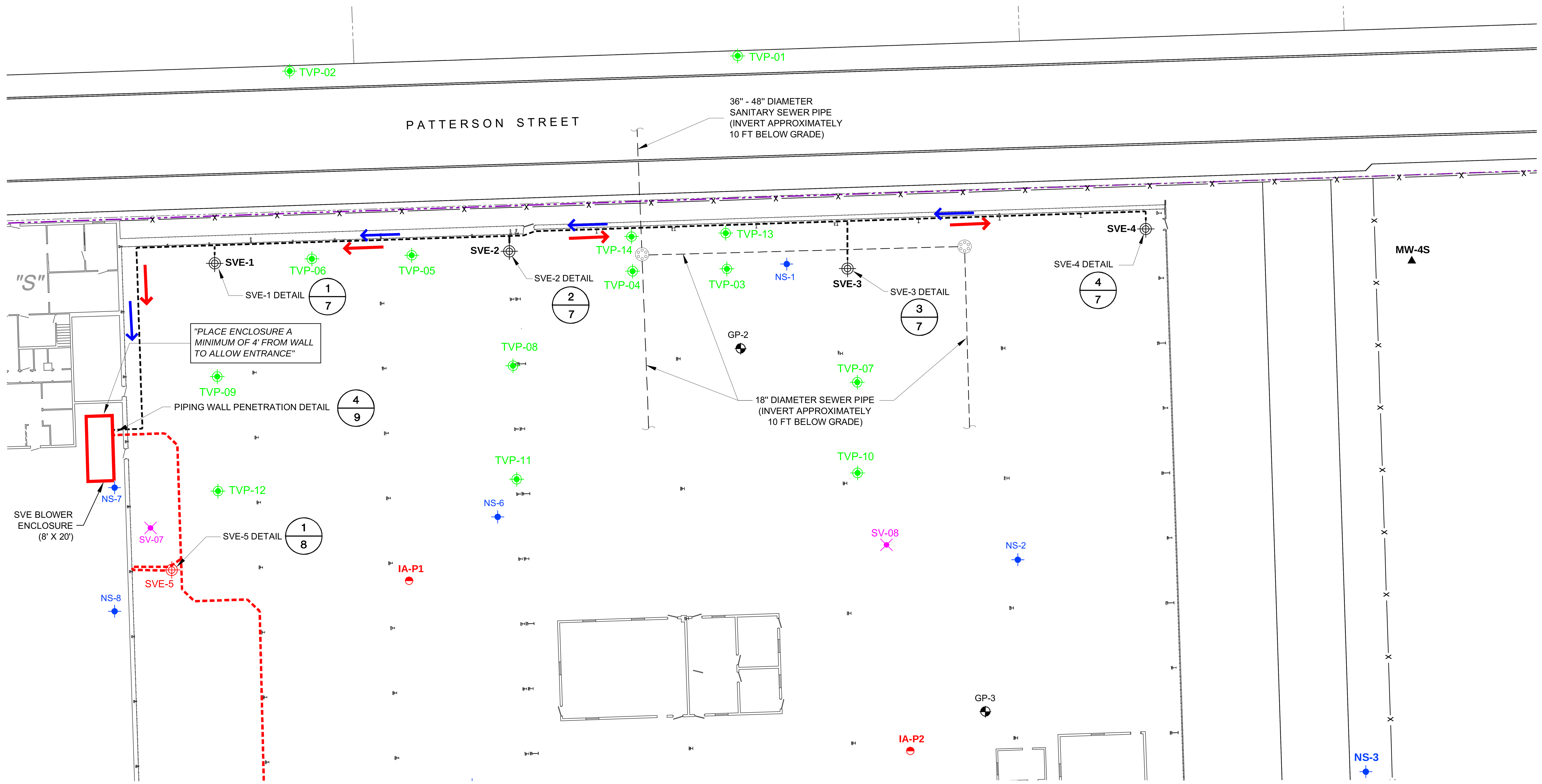
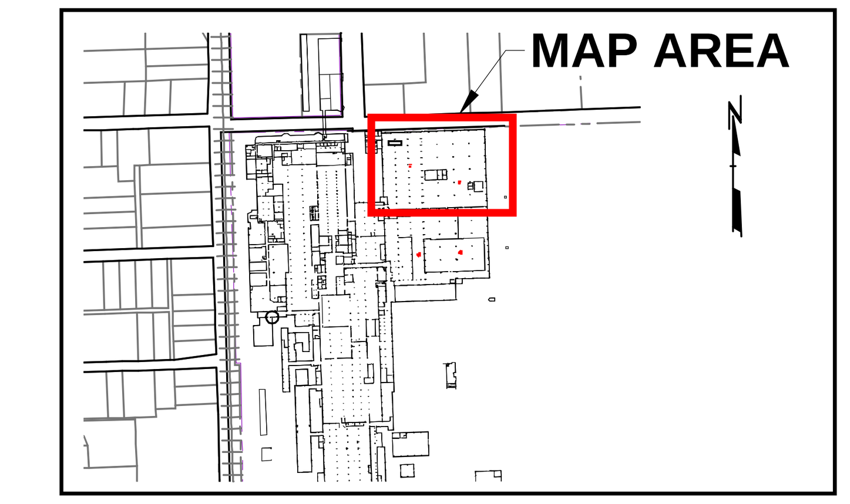




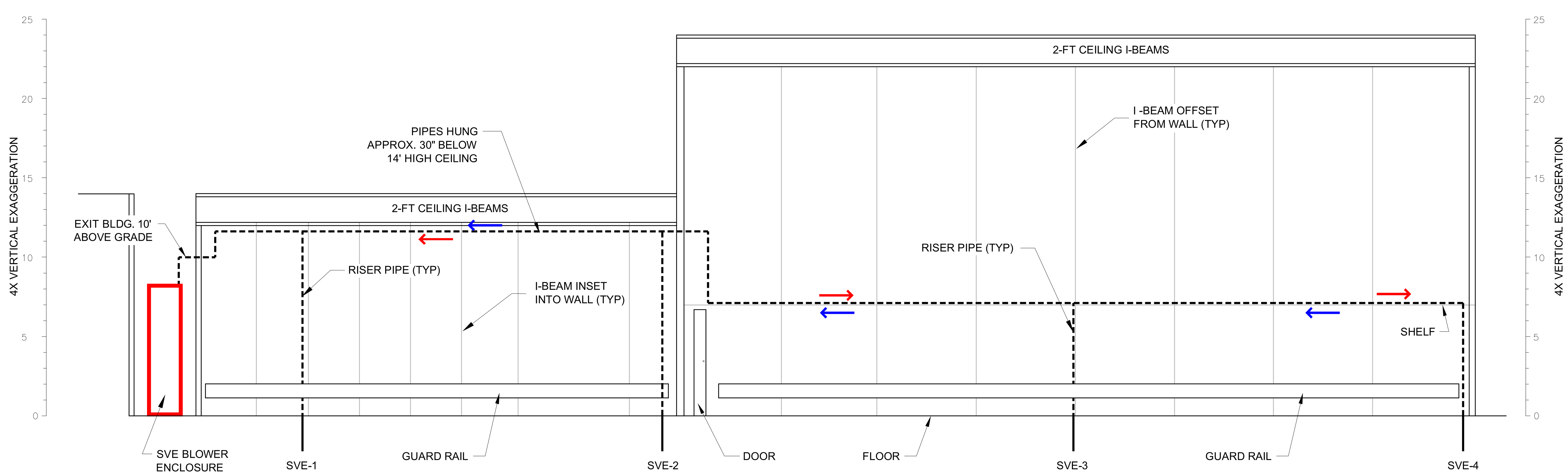
LEGEND

	FORMER TECUMSEH PRODUCTS SITE BOUNDARY
GP-24	ATC GEOPROBE BORING LOCATION AND NUMBER
SV-08	SUB-SLAB VAPOR SAMPLING LOCATION AND NUMBER
IA-P2	PROPOSED INDOOR AIR SAMPLE LOCATION AND NUMBER
NS-6	NORTHERN SOURCE AREA INVESTIGATION BORING LOCATION AND NUMBER
MW-4S	MONITORING WELL LOCATION AND NUMBER
SG-07	SOIL GAS SAMPLE LOCATION AND NUMBER
SVE-4	SOIL VAPOR EXTRACTION WELL
SVE-5	PROPOSED SOIL VAPOR EXTRACTION WELL
TVP-1	TEMPORARY VACUUM MONITORING POINT LOCATION
	SVE CONVEYANCE PIPING
	PROPOSED SVE CONVEYANCE PIPING
	AIR FLOW DIRECTION
	PIPE SLOPE DIRECTION
	SANITARY SEWER MANHOLE AND SEWER LINE

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY TECUMSEH PRODUCTS COMPANY, DRAWING NO. 09039stk.DWG
2. ABOVE GRADE PIPING WILL BE CONSTRUCTED OF 4" SCHEDULE 80 PVC MATERIAL.
3. CONTRACTOR SHALL PROVIDE PIPE SUPPORTS A MINIMUM OF EVERY 12 FEET AND WITHIN 12 INCHES OF EVERY DIRECTIONAL CHANGE.
4. CONTRACTOR SHALL SLOPE PIPING SO THERE IS CONTINUOUS SLOPE DIRECTION FROM ONE HIGH POINT LOCATION (IN EACH RUN FROM EXTRACTION WELL TO MANIFOLD) EITHER BACK TOWARDS EXTRACTION WELL OR TOWARD THE BLOWER SKID.
5. CONTRACTOR SHALL PLACE TWO- TO EIGHT-INCH THICK (WHERE FEASIBLE DUE TO THE DEPTH OF THE FLOOR CUT/EXCAVATION) NEW 3,500 PSI CONTRETE WITH 4-6% AIR ENTRAINMENT, REINFORCED WITH ONE LAYER OF 00 GAUGE 6" MESH DOWELED INTO EXISTING CONCRETE AT A MINIMUM OF 24" INTERVALS.
6. ABOVE GROUND PIPING ROUTES SHOWN ARE APPROXIMATE. ACTUAL PIPING ROUTES MAY BE ALTERED IN THE FIELD BY TRC AND OWNER.
7. DETAIL NUMBER IDENTIFICATION

3 — DETAIL NUMBER
9 — SHEET NUMBER CROSS REFERENCE



NORTH WALL PROFILE VIEW

0 20 40 60 80
APPROXIMATE SCALE IN FEET

NO.	BY	DATE	REVISION	APP'D
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2				
1				

PROJ: **SOIL VAPOR EXTRACTION SYSTEM DESIGN
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN**

TITLE: **SVE SYSTEM LAYOUT (NORTHERN PERIMETER)**

DRAWN BY: DGS/WAB	SCALE: AS INDICATED	PROJ. NO.	187156.0001.02
CHECKED BY: SP/SM		FILE NO.	187156.0001.02.04.dwg
APPROVED BY: DM	DATE PRINTED:	SHEET 4 OF 9	
DATE: MAY 2012			

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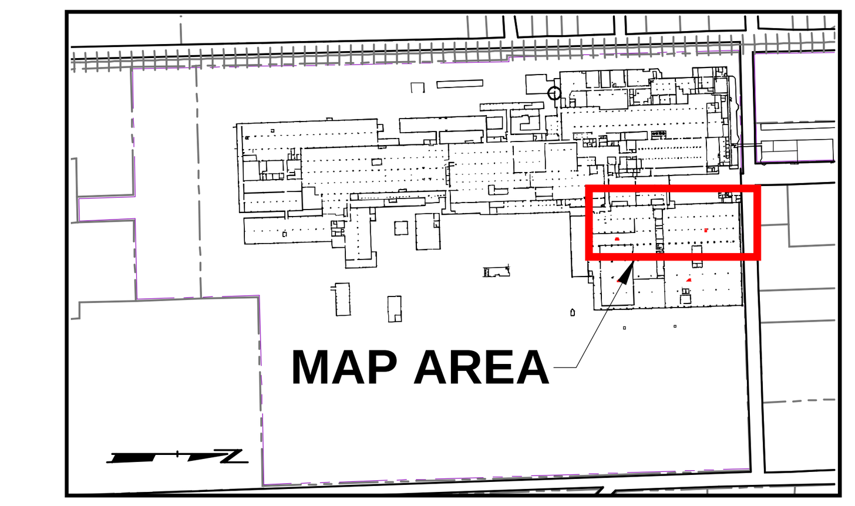

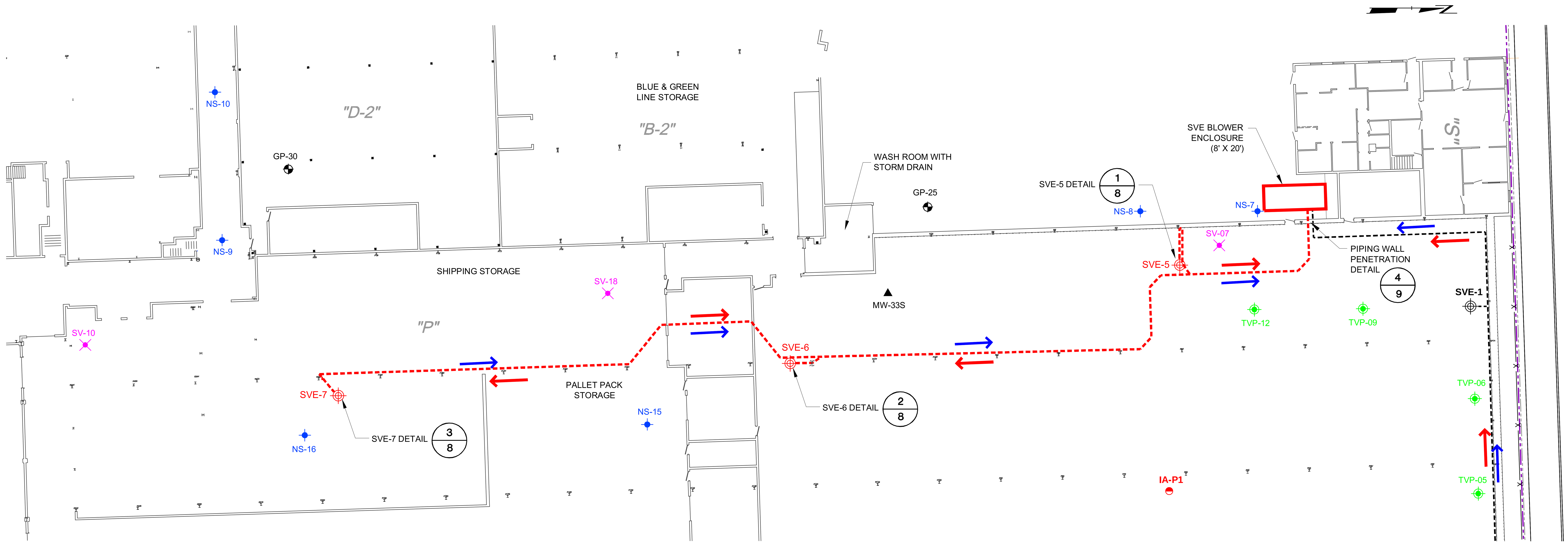

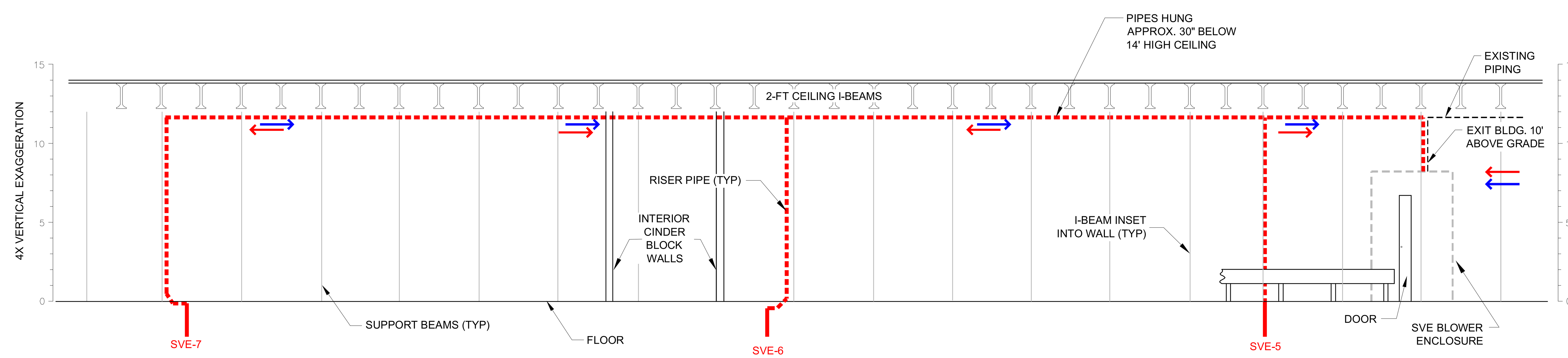

NORTH-SOUTH PROFILE VIEW

LEGEND

- FORMER TECUMSEH PRODUCTS SITE BOUNDARY
- GP-24 — ATC GEOPROBE BORING LOCATION AND NUMBER
- SV-08 — SUB-SLAB VAPOR SAMPLING LOCATION AND NUMBER
- IA-P2 — PROPOSED INDOOR AIR SAMPLE LOCATION AND NUMBER
- NS-6 — NORTHERN SOURCE AREA INVESTIGATION BORING LOCATION AND NUMBER
- MW-4S — MONITORING WELL LOCATION AND NUMBER
- SG-07 — SOIL GAS SAMPLE LOCATION AND NUMBER
- SVE-4 — SOIL VAPOR EXTRACTION WELL
- SVE-5 — PROPOSED SOIL VAPOR EXTRACTION WELL
- TVP-1 — TEMPORARY VACUUM MONITORING POINT LOCATION
- SVE CONVEYANCE PIPING
- PROPOSED SVE CONVEYANCE PIPING
- AIR FLOW DIRECTION
- PIPE SLOPE DIRECTION
- SANITARY SEWER MANHOLE AND SEWER LINE

NOTES

1. BASE MAP DEVELOPED FROM SITE PLAN PROVIDED BY TECUMSEH PRODUCTS COMPANY, DRAWING NO. 09039stk.DWG
2. ABOVE GRADE PIPING WILL BE CONSTRUCTED OF 4" SCHEDULE 80 PVC MATERIAL.
3. CONTRACTOR SHALL PROVIDE PIPE SUPPORTS A MINIMUM OF EVERY 12 FEET AND WITHIN 12 INCHES OF EVERY DIRECTIONAL CHANGE.
4. CONTRACTOR SHALL SLOPE PIPING SO THERE IS CONTINUOUS SLOPE DIRECTION FROM ONE HIGH POINT LOCATION (IN EACH RUN FROM EXTRACTION WELL TO MANIFOLD) EITHER BACK TOWARDS EXTRACTION WELL OR TOWARD THE BLOWER SKID.
5. CONTRACTOR SHALL PLACE TWO- TO EIGHT-INCH THICK (WHERE FEASIBLE DUE TO THE DEPTH OF THE FLOOR CUT/EXCAVATION) NEW 3,500 PSI CONTRETE WITH 4-6% AIR ENTRAINMENT, REINFORCED WITH ONE LAYER OF 00 GAUGE 6" MESH DOWELED INTO EXISTING CONCRETE AT A MINIMUM OF 24" INTERVALS.
6. ABOVE GROUND PIPING ROUTES SHOWN ARE APPROXIMATE. ACTUAL PIPING ROUTES MAY BE ALTERED IN THE FIELD BY TRC AND OWNER.
7. DETAIL NUMBER IDENTIFICATION

3 — DETAIL NUMBER
8 — SHEET NUMBER CROSS REFERENCE

0 20 40 60 80
APPROXIMATE SCALE IN FEET

NO.	BY	DATE	REVISION	APP'D
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2				
1				

PROJ: **SOIL VAPOR EXTRACTION SYSTEM DESIGN**
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

TITLE: **SVE SYSTEM LAYOUT (WESTERN PERIMETER)**

DRAWN BY: DGS/WAB	SCALE: AS INDICATED	PROJ. NO. 187156.0001.02	
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DATE: MAY 2012			

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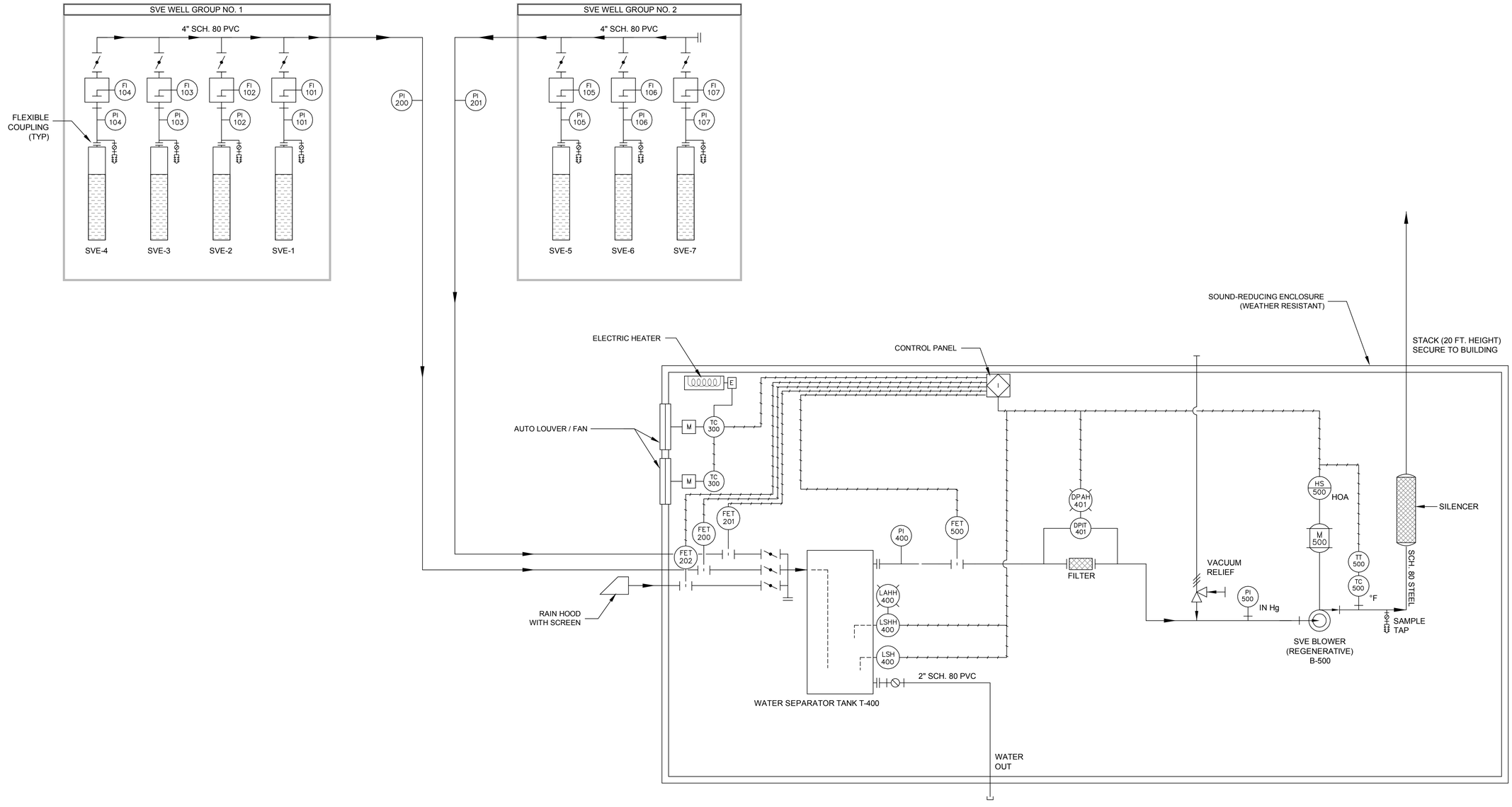

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PROJ: **SOIL VAPOR EXTRACTION SYSTEM DESIGN**
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

TITLE: **PIPING AND INSTRUMENTATION DIAGRAM**

DRAWN BY:	STEHLE D	SCALE:	PROJ.NO. 187156.0001.02
CHECKED BY:	SP/SM	AS INDICATED	FILE NO. 187156.0001.02.06.dwg
APPROVED BY:	DM	DATE PRINTED:	SHEET 6 OF 9
DATE:	MAY 2012		

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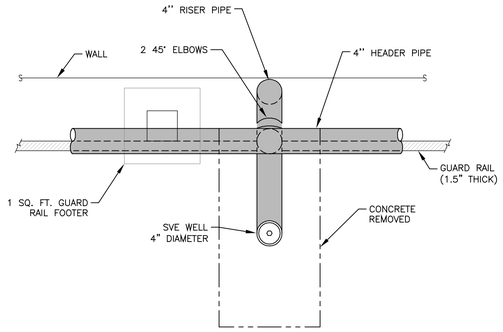
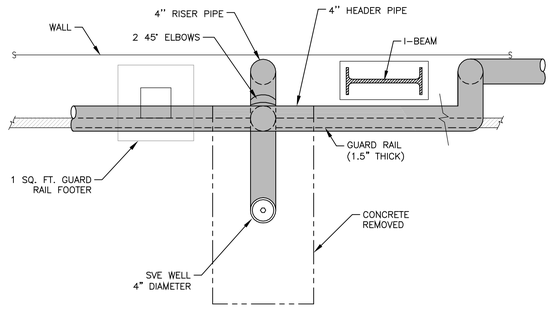
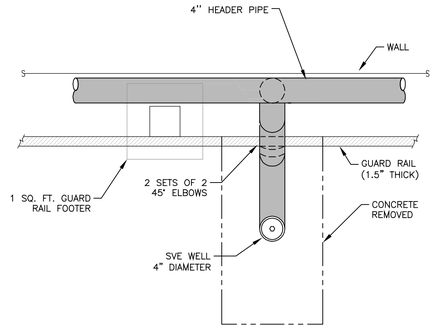
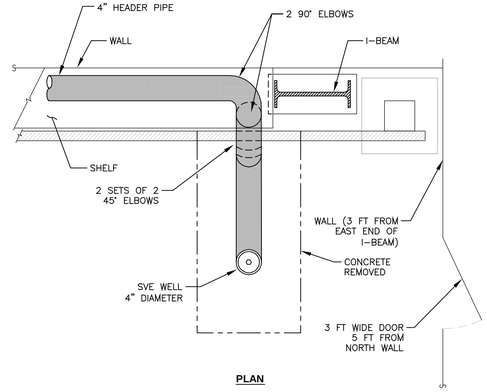
Phone: 734.971.7080
Fax: 734.971.9022

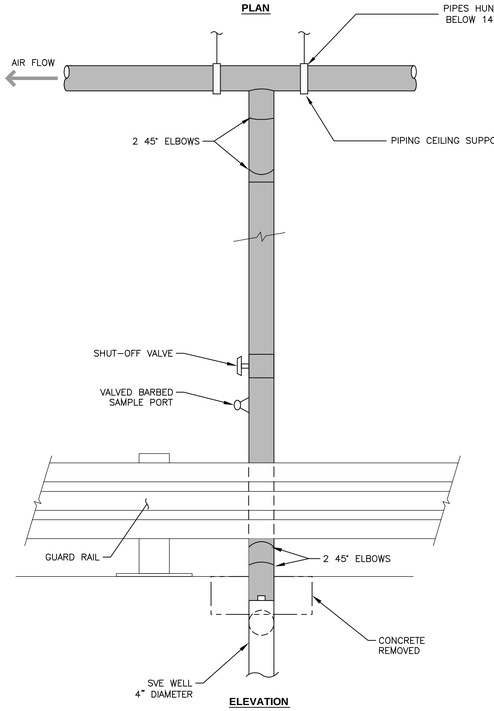








PLAN

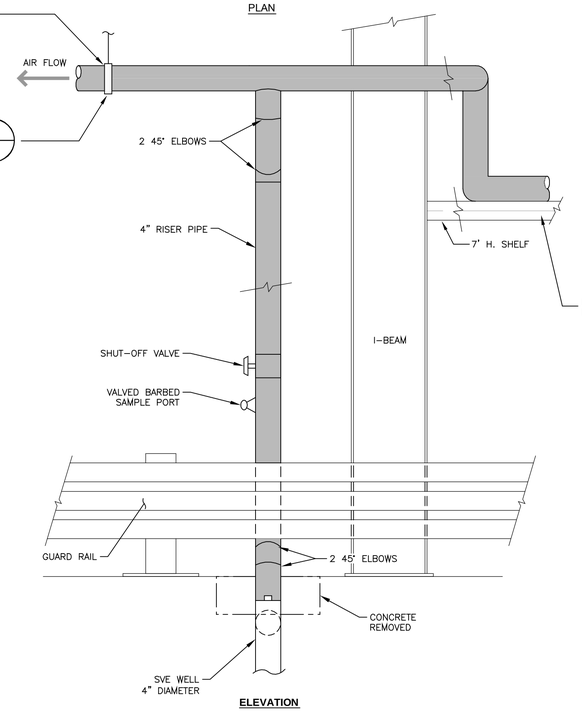


ELEVATION

1/4 **SVE 1**

(NOT TO SCALE)

PLAN

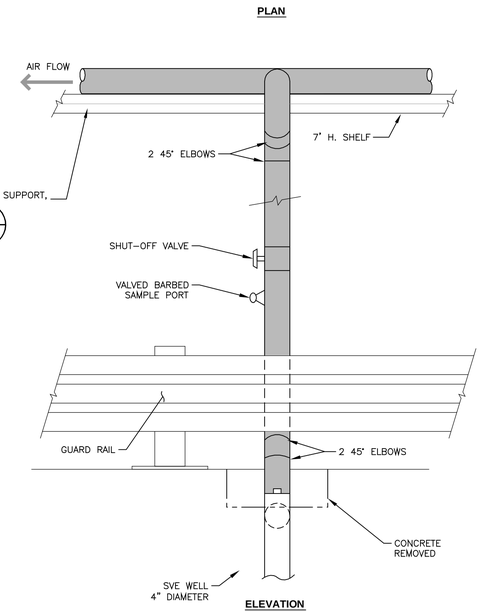


ELEVATION

2/4 **SVE 2**

(NOT TO SCALE)

PLAN

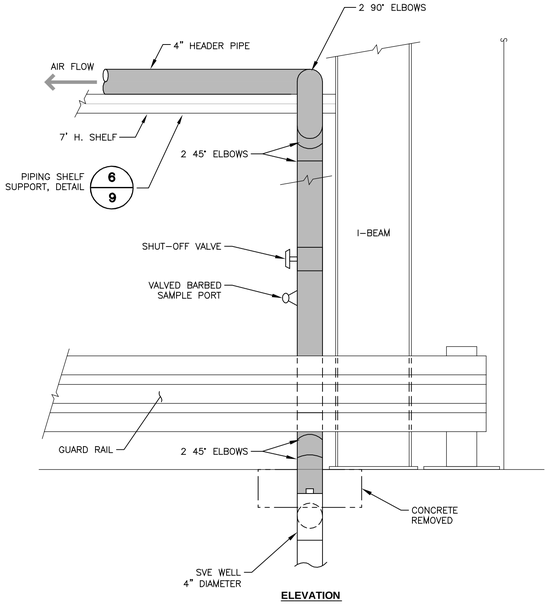


ELEVATION

3/4 **SVE 3**

(NOT TO SCALE)

PLAN



ELEVATION

4/4 **SVE 4**

(NOT TO SCALE)

NOTES:

1. FOR TYPICAL WELL HEAD COMPLETION DETAILS FOR ALL SVE WELLS, SEE DETAIL 1/6

NO.	BY	DATE	REVISION	APP'D
3				
2				
1				

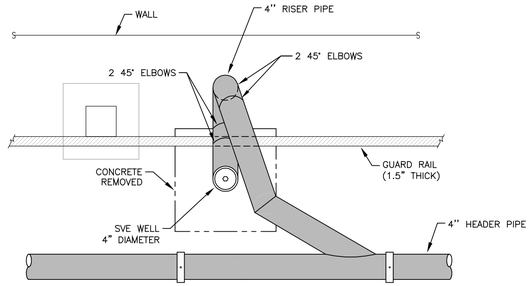
PROJ: **SOIL VAPOR EXTRACTION SYSTEM DESIGN**
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

TITLE: **AS-BUILT RISER PIPE CONNECTION DIAGRAMS**

DRAWN BY:	WAB/DGS	SCALE:	PROJ. NO. 187156.0001.02
CHECKED BY:	SP/SM	AS INDICATED	FILE NO. 187156.0001.02.07.dwg
APPROVED BY:	DM	DATE PRINTED:	**SHEET 7 OF 9**
DATE:	MAY 2012		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
Fax: 734.971.9022

PLOT DATA
Drawing Name: J:\...\TRC\Tecumseh Products\Tecumseh MI\187156\0001\02\SV Extraction Plan Set_Full Scale SVE Plan Set\187156.0001.02.07.dwg
Operator Name: STEHLE, DANAH
Drawing Plot Scale: 0.000000
Dwg Size: D (43 in)
Plot Date: May 24, 2012
Plot Time: 9:59 AM
Attached Xref:
Attached Images:
Layout: SHT 07 of 9 Cvil Details



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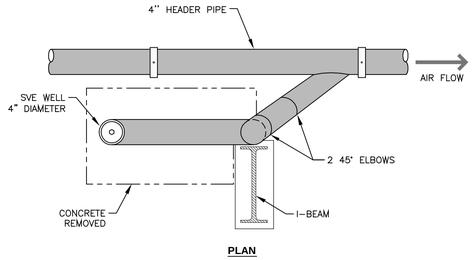

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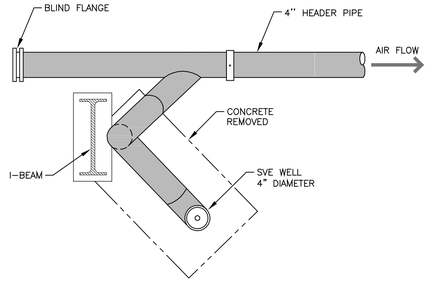

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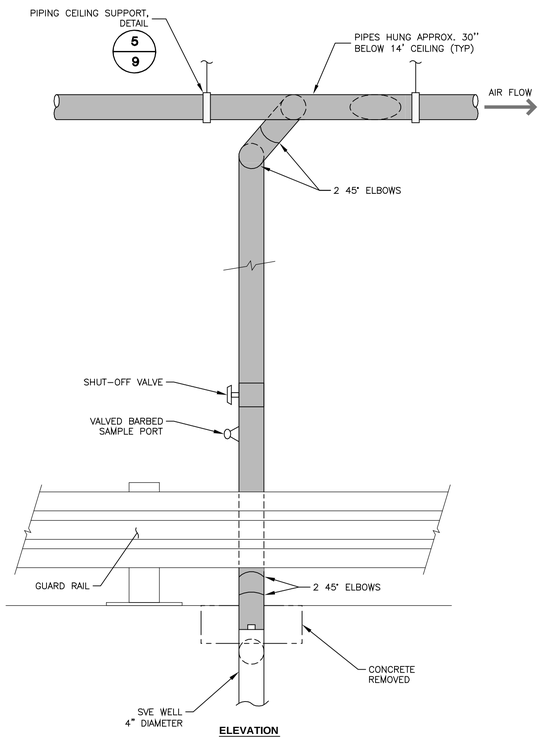
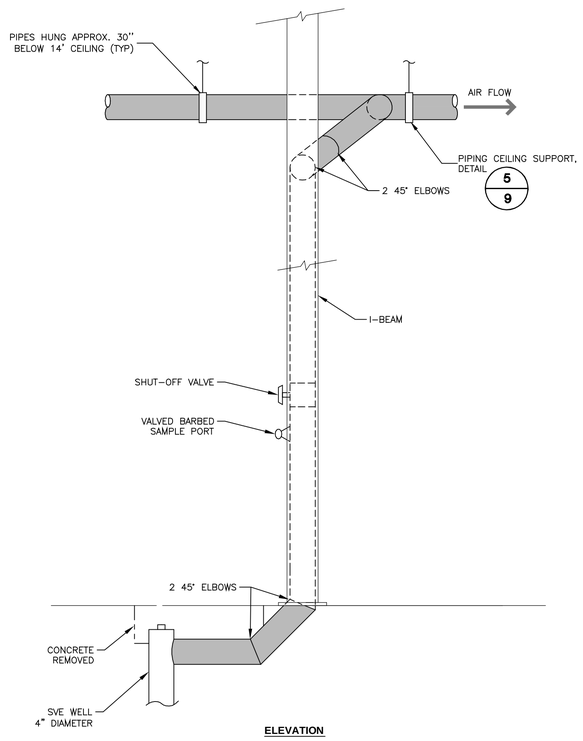


ELEVATION

1/4,5 SVE 5

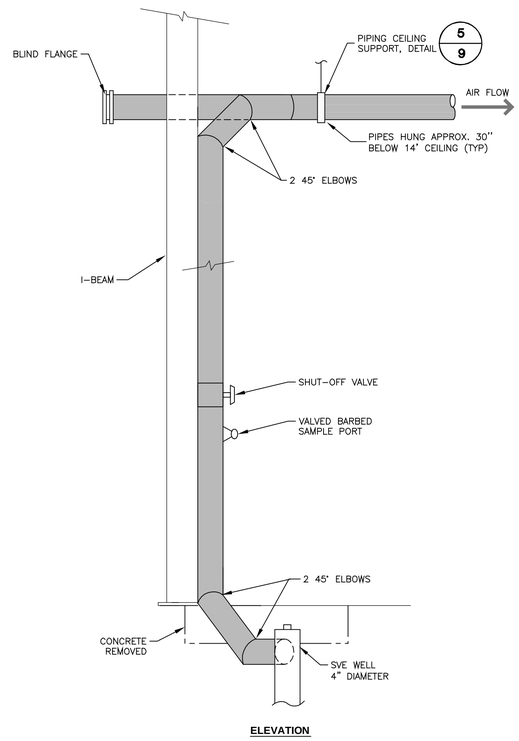
(NOT TO SCALE)



ELEVATION

2/5 SVE 6

(NOT TO SCALE)



ELEVATION

3/5 SVE 7

(NOT TO SCALE)

NOTES:

1. FOR TYPICAL WELL HEAD COMPLETION DETAILS FOR ALL SVE WELLS, SEE DETAIL 1/6

NO.	BY	DATE	REVISION	APP'D
3				
2				
1				

PROJ. SOIL VAPOR EXTRACTION SYSTEM DESIGN
FORMER TECUMSEH PRODUCTS SITE
TECUMSEH, MICHIGAN

TITLE: RISER PIPE CONNECTION DIAGRAMS

DRAWN BY:	WAB/DGS	SCALE:	PROJ. NO. 187156.0001.02
CHECKED BY:	SP/SM	AS INDICATED	FILE NO. 187156.0001.02.08.dwg
APPROVED BY:	DM	DATE PRINTED:	SHEET 8 OF 9
DATE:	MAY 2012		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
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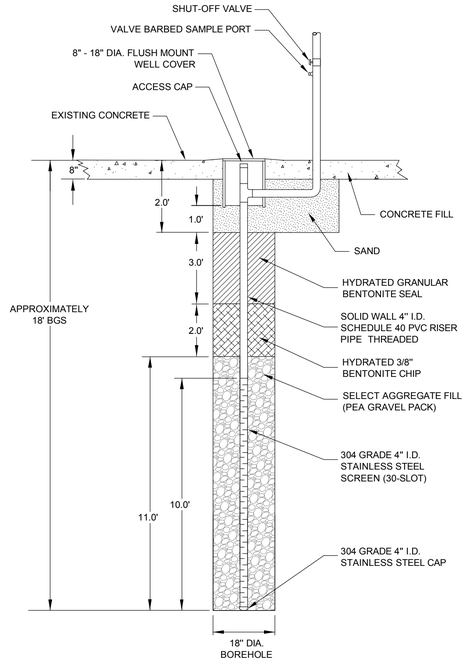
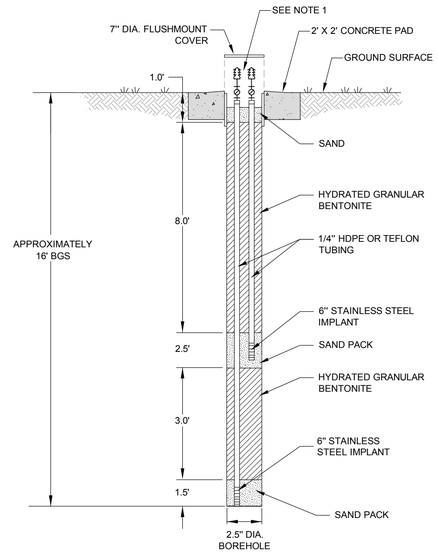


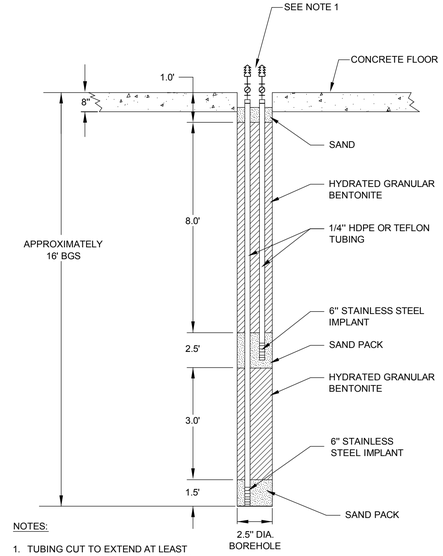
SOIL VAPOR EXTRACTION WELL (TYPICAL)

1/3 (NOT TO SCALE)



EXTERIOR MULTI-LEVEL VACUUM MONITORING POINT (TYPICAL)

2/3 (NOT TO SCALE)

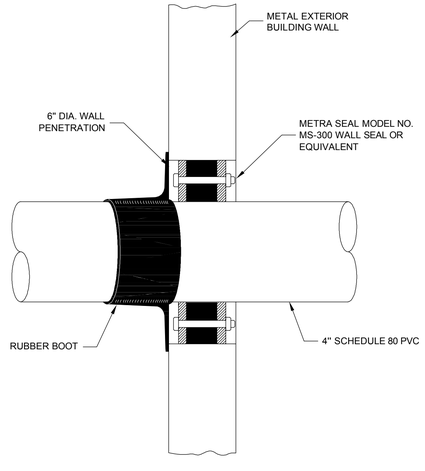


NOTES:

1. TUBING CUT TO EXTEND AT LEAST 1-FOOT ABOVE THE BENTONITE SEAL AND EQUIPPED WITH A BALL VALVE AND BARBED FITTING.

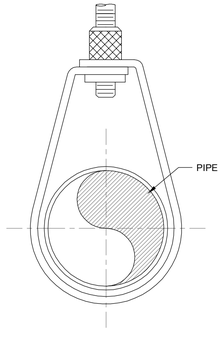
INTERIOR MULTI-LEVEL VACUUM MONITORING POINT (TYPICAL)

3/3 (NOT TO SCALE)



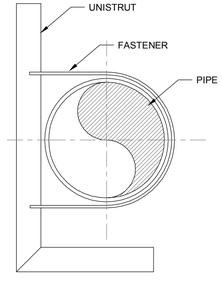
PIPING WALL PENETRATION

4/4,5 (NOT TO SCALE)



PIPING CEILING HANGER SUPPORT (TYPICAL)

5/7,8 (NOT TO SCALE)



PIPING SHELF SUPPORT (TYPICAL)

6/7 (NOT TO SCALE)

NO.	BY	DATE	REVISION	APP'D
3				
2				
1				

PROJ: **SOIL VAPOR EXTRACTION SYSTEM DESIGN FORMER TECUMSEH PRODUCTS SITE TECUMSEH, MICHIGAN**

TITLE: **CIVIL DETAILS**

DRAWN BY:	STEHLE D	SCALE:	PROJ. NO. 187156.0001.02
CHECKED BY:	SP/SM	AS INDICATED	FILE NO. 187156.0001.02.09.dwg
APPROVED BY:	DM	DATE PRINTED:	SHEET 9 OF 9
DATE:	MAY 2012		

TRC
1540 Eisenhower Place
Ann Arbor, MI 48108
Phone: 734.971.7080
Fax: 734.971.9022

PLOT DATA
Drawing Name: J:_TRC\Tecumseh Products\Tecumseh MI\187156\0001\02\SVI Extraction Plan Set_Full Scale SVE Plan Set\187156.0001.02.09.dwg
Operator Name: STEHLE, DIANAH
Drawing Plot Scale: 1:1
Dwg Size: 0.25 Mb
Plot Date: May 24, 2012
Plot Time: 10:19 AM
Attached Xref's:
Attached Images:
Layout: SHT 09 of 9 Civil Details

Appendix B
Soil Boring and Well Construction Logs

WELL CONSTRUCTION LOG

WELL NO. SVE-01

Page 1 of 1

Facility/Project Name	Date Drilling Started	Date Drilling Completed	Project Number
Tecumseh Products Company - SVE System	3/30/12	4/4/12	187156.0001.0000

Drilling Firm	Drilling Method	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Terra Probe/Stearns Drilling	Direct Push/HSA	---	---	20.0	18.25

Boring Location: 28 feet east and 7 feet south of the northwest corner of P-Building

Personnel
Logged By - J.A. Bacon
Driller - Fojtik/Heffernan

Drilling Equipment: Geoprobe 6620DT/CME LC60

Civil Town/City/or Village	County	State
Tecumseh	Lenawee	Michigan

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time
▽ Depth (ft bgs) 20
Depth (ft bgs)

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	PID (PPM)	COMMENTS
				CONCRETE		///			Soil logged to a depth of 20 ft bgs with using Geoprobe direct push methods. Extraction well installed to a depth of 18 ft bgs using 18-inch hollow-stem augers.
				SILT	ML				
1 GP	25			**FILL** mostly fine to medium sand, slight organic odor.				34.0	
								33.8	
2 GP	50		5	**WELL-GRADED SAND WITH GRAVEL** Mostly fine to coarse sand, some gravel, trace silt, dark brown (10YR 3/3) to very dark grayish brown (10YR 3/2), slight organic odor, damp, loose.				25.8	Soil sample collected from 3 to 5 ft bgs.
				Same as above.				29.0	
3 GP	75		10					25.2	
				Same as above.	SW			26.3	
4 GP	75		15					25.3	
				Same as above.				26.1	
5 GP	90							20.9	Soil sample collected from 16 to 18 ft bgs.
			20	▽ Change to moist.				21.6	
				Change to no odor, saturated.					
				End of boring at 20.0 feet below ground surface.					

SOIL BORING WELL CONSTRUCTION LOG 187156.0001.0000_2012.GPJ TRC_CORP.GDT 187156.0001.0000 5/23/12

Signature:

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, MI 48108
(734) 971-7080
Fax (734) 971-9022

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**SVE-01**
PROJ. NO: 187156.00	DATE INSTALLED: 4/4/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
799.9	0.0 GROUND SURFACE
799.4	0.5 TOP OF CASING
798.9	2.0 CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
7.5	RISER PIPE LENGTH
	5.2 GROUT
	BENTONITE SEAL MATERIAL: MEDIUM CHIPS
	6.9 BENTONITE SEAL
791.9	8.0 TOP OF SCREEN
10.0	SCREEN LENGTH
	FILTER PACK MATERIAL: PEA GRAVEL
781.9	18.0 BOTTOM OF SCREEN
	18.0 BOTTOM OF FILTER PACK
	NA BENTONITE PLUG
	BACKFILL MATERIAL: NATURAL COLLAPSE
779.9	20.0 HOLE BOTTOM

NOTES:

Ground elevation taken from survey data for monitoring well MW-33s which is also located in P-Building.

CASING AND SCREEN DETAILS

TYPE OF RISER: 4-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SOLVENT USED? NO

SCREEN TYPE: 4-INCH STAINLESS STEEL

SCR. SLOT SIZE: 30-Slot

BOREHOLE DIAMETER: 18 IN. FROM 0 TO 18 FT.
2.25 IN. FROM 18 TO 20 FT.

SURF. CASING DIAMETER: 18 IN. FROM 0 TO 1 FT.
IN. FROM TO FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

REVISED 06/2011

WELL CONSTRUCTION LOG

WELL NO. SVE-02

Page 1 of 1

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
Tecumseh Products Company - SVE System	3/30/12	4/5/12	187156.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Terra Probe/Stearns Drilling	Direct Push/HSA	---	---	20.0	18.25

Boring Location: 119 feet east and 7.5 feet south of the northwest corner of P-Building

Personnel
Logged By - J.A. Bacon
Driller - Fojtik/Heffernan

Drilling Equipment:
Geoprobe 6620DT/CME LC60

Civil Town/City/or Village:	County:	State:
Tecumseh	Lenawee	Michigan

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time
▽ Depth (ft bgs) 20
Depth (ft bgs)

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	PID (PPM)	COMMENTS
			0	**CONCRETE**				10.0	Soil logged to a depth of 20 ft bgs with using Geoprobe direct push methods. Extraction well installed to a depth of 18 ft bgs using 18-inch hollow-stem augers.
1 GP	50			**FILL** mostly fine to medium sand, trace silt, trace clay, brown (10YR 4/3), slight organic odor, damp, loose.				21.5	
				ASPHALT or asphalt-like material.				25.3	
				FILL mostly fine to medium sand, trace silt, trace clay, brown (10YR 4/3), slight organic odor, damp, loose.				26.3	
2 GP	0		5						No recovery on direct push sample due to obstruction. Soil sample collected from 4 to 6 ft bgs.
3 GP	25		10	**WELL-GRADED SAND WITH GRAVEL** Mostly fine to coarse sand, some gravel, trace silt, dark brown (10YR 3/3) to very dark grayish brown (10YR 3/2), slight organic odor, damp, loose.	SW			10.3	
								11.6	
								16.1	
								16.6	
4 GP	75		15	Same as above.				5.7	
								6.3	
								12.4	
								13.4	
5 GP	75			Same as above.				34.9	Soil sample collected from 16 to 18 ft bgs.
								34.7	
								34.5	
			20	▽ Change to no odor, saturated.				21.9	
				End of boring at 20.0 feet below ground surface.					

SOIL BORING WELL CONSTRUCTION LOG 187156.0001.0000_2012.GPJ TRC_CORP.GDT 187156.0001.0000 5/23/12

Signature:

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, MI 48108
(734) 971-7080
Fax (734) 971-9022

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**SVE-02**
PROJ. NO: 187156.00	DATE INSTALLED: 4/5/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
799.9	0.0 GROUND SURFACE
799.4	0.5 TOP OF CASING
798.9	2.0 CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
7.5	RISER PIPE LENGTH
	5.0 GROUT
	BENTONITE SEAL MATERIAL: MEDIUM CHIPS
	6.8 BENTONITE SEAL
791.9	8.0 TOP OF SCREEN
10.0	SCREEN LENGTH
	FILTER PACK MATERIAL: PEA GRAVEL
781.9	18.0 BOTTOM OF SCREEN
	18.0 BOTTOM OF FILTER PACK
	NA BENTONITE PLUG
	BACKFILL MATERIAL: NATURAL COLLAPSE
779.9	20.0 HOLE BOTTOM

NOTES:

Ground elevation taken from survey data for monitoring well MW-33s which is also located in P-Building.

CASING AND SCREEN DETAILS

TYPE OF RISER: 4-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SOLVENT USED? NO

SCREEN TYPE: 4-INCH STAINLESS STEEL

SCR. SLOT SIZE: 30-Slot

BOREHOLE DIAMETER: 18 IN. FROM 0 TO 18 FT.
2.25 IN. FROM 18 TO 20 FT.

SURF. CASING DIAMETER: 18 IN. FROM 0 TO 1 FT.
IN. FROM TO FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION LOG

TRC

WELL NO. SVE-03

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
Tecumseh Products Company - SVE System	3/30/12	4/4/12	187156.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Terra Probe/Stearns Drilling	Direct Push/HSA	---	---	24.0	18.25

Boring Location: 99 feet west and 14 feet south of the northeast corner of P-Building

Personnel
Logged By - J.A. Bacon
Driller - Fojtik/Heffernan

Drilling Equipment:
Geoprobe 6620DT/CME LC60

Civil Town/City/or Village:	County:	State:
Tecumseh	Lenawee	Michigan

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time
▽ Depth (ft bgs) 20.2
Depth (ft bgs)

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	PID (PPM)	COMMENTS
			0	**CONCRETE**				4.3	Soil logged to a depth of 24 ft bgs with using Geoprobe direct push methods. Extraction well installed to a depth of 18 ft bgs using 18-inch hollow-stem augers.
1 GP	50			**FILL** mostly fine to medium sand, trace silt, trace clay, brown (10YR 5/3), slight organic odor, dry to damp, loose.				9.7	
								17.6	
				ASPHALT or asphalt-like material.				18.7	
				SANDY SILT mostly silt, little sand, little clay, cohesive, low plasticity, dark brown (7.5YR 3/4), damp.	ML			20.3	
2 GP	25		5	**WELL-GRADED SAND WITH GRAVEL** Mostly fine to coarse sand, some gravel, trace silt, dark brown (10YR 3/3) to very dark grayish brown (10YR 3/2), slight organic odor, damp, loose.				19.8	Soil sample collected from 4 to 6 ft bgs.
								19.5	
				Same as above.				20.9	
3 GP	60		10					20.3	
								21.7	
								32.2	
				Same as above.				35.1	
								38.7	
4 GP	75				SW			27.2	
			15					23.4	
				Same as above.				23.1	
								19.5	
5 GP	75							22.3	Soil sample collected from 16 to 18 ft bgs.
								23.3	
			20	▽ Change to no odor, saturated at 20.2 feet.				21.6	
6 GP	90								
				End of boring at 24.0 feet below ground surface.					

SOIL BORING WELL CONSTRUCTION LOG 187156.0001.0000 2012.GPJ TRC_CORP.GDT 187156.0001.0000 5/23/12

Signature:

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, MI 48108
(734) 971-7080
Fax (734) 971-9022

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**SVE-03**
PROJ. NO: 187156.00	DATE INSTALLED: 4/4/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
799.9	0.0 GROUND SURFACE
799.4	0.5 TOP OF CASING
798.9	2.0 CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
7.5	5.0 GROUT
	BENTONITE SEAL MATERIAL: MEDIUM CHIPS
	6.8 BENTONITE SEAL
791.9	8.0 TOP OF SCREEN
	FILTER PACK MATERIAL: PEA GRAVEL
10.0	
781.9	18.0 BOTTOM OF SCREEN
	18.0 BOTTOM OF FILTER PACK
	NA BENTONITE PLUG
	BACKFILL MATERIAL: NATURAL COLLAPSE
775.9	24.0 HOLE BOTTOM

RISER PIPE LENGTH

SCREEN LENGTH

NOTES:

Ground elevation taken from survey data for monitoring well MW-33s which is also located in P-Building.

CASING AND SCREEN DETAILS

TYPE OF RISER: 4-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SOLVENT USED? NO

SCREEN TYPE: 4-INCH STAINLESS STEEL

SCR. SLOT SIZE: 30-Slot

BOREHOLE DIAMETER: 18 IN. FROM 0 TO 18 FT.
2.25 IN. FROM 18 TO 24 FT.

SURF. CASING DIAMETER: 18 IN. FROM 0 TO 1 FT.
__ IN. FROM __ TO __ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION LOG

TRC

WELL NO. SVE-04

Facility/Project Name:	Date Drilling Started:	Date Drilling Completed:	Project Number:
Tecumseh Products Company - SVE System	3/30/12	4/3/12	187156.0001.0000

Drilling Firm:	Drilling Method:	Surface Elev. (ft)	TOC Elevation (ft)	Total Depth (ft bgs)	Borehole Dia. (in)
Terra Probe/Stearns Drilling	Direct Push/HSA	---	---	24.0	18.25

Boring Location: 8 feet west and 7 feet south of the northeast corner of P-Building

Personnel
Logged By - J.A. Bacon
Driller - Fojtik/Heffernan

Drilling Equipment:
Geoprobe 6620DT/CME LC60

Civil Town/City/or Village:	County:	State:
Tecumseh	Lenawee	Michigan

Water Level Observations:
While Drilling: Date/Time
After Drilling: Date/Time
▽ Depth (ft bgs) 20
Depth (ft bgs)

SAMPLE NUMBER AND TYPE	SAMPLE RECOVERY (%)	BLOW COUNTS	DEPTH IN FEET	LITHOLOGIC DESCRIPTION	USCS	GRAPHIC LOG	WELL DIAGRAM	PID (PPM)	COMMENTS
				CONCRETE				41.7	Soil logged to a depth of 24 ft bgs with using Geoprobe direct push methods. Extraction well installed to a depth of 18 ft bgs using 18-inch hollow-stem augers.
1 GP	35			**FILL** mostly fine to medium sand, trace silt, trace clay, brown (10YR 5/3), moderate organic odor, dry to damp, loose.				53.2	
				Black staining at approximately 4 feet.				59.5	
								62.1	
2 GP	25		5	**SANDY SILT** mostly silt, little sand, little clay, cohesive, low plasticity, dark brown (7.5YR 3/4), damp.	ML			16.9	Soil sample collected from 4 to 6 ft bgs.
								11.6	
								8.3	
3 GP	55		10	**WELL-GRADED SAND WITH GRAVEL** Mostly fine to coarse sand, some gravel, trace silt, dark brown (10YR 3/3) to very dark grayish brown (10YR 3/2), organic odor, damp, loose.	SW			13.6	
								24.6	
				Same as above.				15.6	
								23.6	
4 GP	60		15					20.4	
				Same as above.				32.2	
								41.6	
								42.8	
5 GP	50							36.9	Soil sample collected from 16 to 18 ft bgs.
								37.4	
			20	▽ Change to moist. Change to no odor, saturated.				36.5	
								36.8	
6 GP	50							37.4	
				End of boring at 24.0 feet below ground surface.					

SOIL BORING WELL CONSTRUCTION LOG 187156.0001.0000_2012.GPJ TRC_CORP.GDT 187156.0001.0000 5/23/12

Signature:

Firm: TRC Environmental Corporation
1540 Eisenhower Place Ann Arbor, MI 48108
(734) 971-7080
Fax (734) 971-9022

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System			WELL ID: **SVE-04**
PROJ. NO: 187156.00	DATE INSTALLED: 4/3/2012	INSTALLED BY: John A. Bacon	CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
799.9	0.0 GROUND SURFACE
799.4	0.5 TOP OF CASING
798.9	2.0 CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
7.5	RISER PIPE LENGTH
	5.0 GROUT
	BENTONITE SEAL MATERIAL: MEDIUM CHIPS
	7.0 BENTONITE SEAL
791.9	8.0 TOP OF SCREEN
10.0	SCREEN LENGTH
	FILTER PACK MATERIAL: PEA GRAVEL
781.9	18.0 BOTTOM OF SCREEN
	18.0 BOTTOM OF FILTER PACK
	NA BENTONITE PLUG
	BACKFILL MATERIAL: NATURAL COLLAPSE
775.9	24.0 HOLE BOTTOM

NOTES:

Ground elevation taken from survey data for monitoring well MW-33s which is also located in P-Building.

CASING AND SCREEN DETAILS

TYPE OF RISER: 4-INCH PVC

PIPE SCHEDULE: 40

PIPE JOINTS: THREADED O-RINGS

SOLVENT USED? NO

SCREEN TYPE: 4-INCH STAINLESS STEEL

SCR. SLOT SIZE: 30-Slot

BOREHOLE DIAMETER: 18 IN. FROM 0 TO 18 FT.
2.25 IN. FROM 18 TO 24 FT.

SURF. CASING DIAMETER: 18 IN. FROM 0 TO 1 FT.
____ IN. FROM ____ TO ____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☑ YES ☐ NO

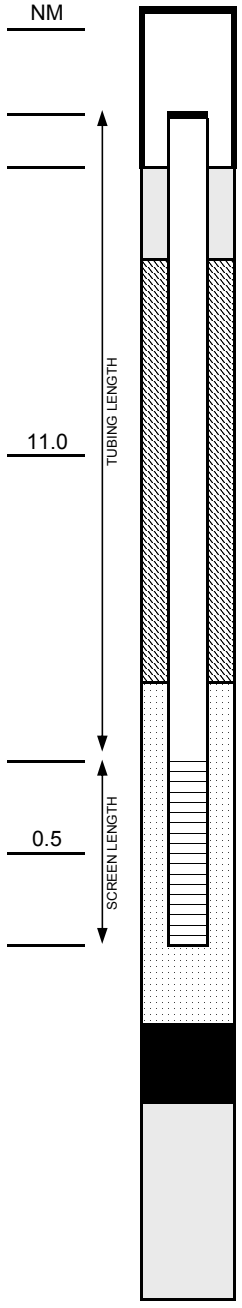
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-01s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF CASING
	1.0 CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM



NOTES:

TVP-01s and TVP-01d installed in same borehole. TVP-01s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points in ROW protected with flush-mount cover.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" Teflon-Lined HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER:	12	IN. FROM	0	TO	1	FT.
	2.25	IN. FROM	1	TO	16	FT.
SURF. CASING DIAMETER:	7	IN. FROM	0	TO	1	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

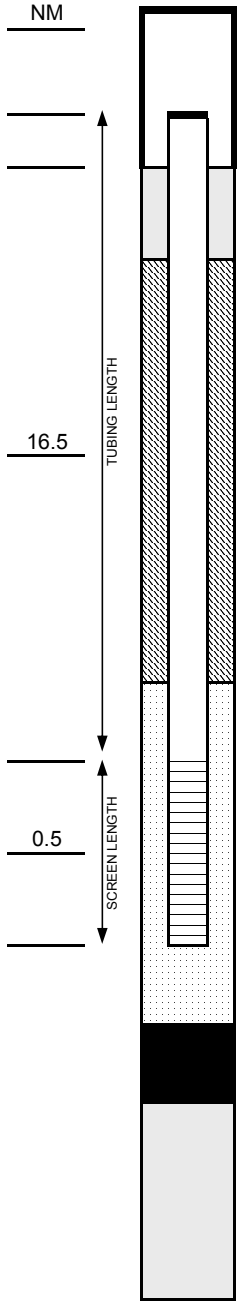
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-01d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF CASING
	1.0 CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



NOTES:

TVP-01s and TVP-01d installed in same borehole. TVP-01d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points in ROW protected with flush-mount cover.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" Teflon-Lined HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER:	12	IN. FROM	0	TO	1	FT.
	2.25	IN. FROM	1	TO	16	FT.
SURF. CASING DIAMETER:	7	IN. FROM	0	TO	1	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

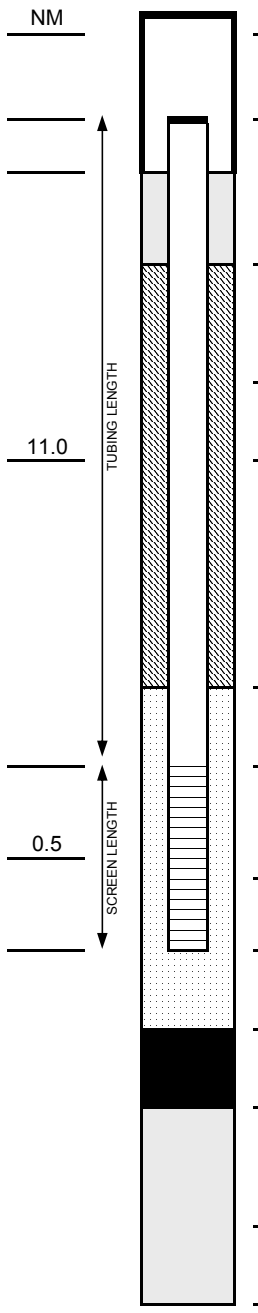
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	Tecumseh Products Company - SVE System	WELL ID:	**TVP-02s**
PROJ. NO:	187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon	CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)



0.0	GROUND SURFACE
+1.0	TOP OF CASING
1.0	CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL
	HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD
	FILL FROM ABOVE
9.5	BOTTOM OF SEAL
10.0	TOP OF SCREEN
	FILTER PACK MATERIAL
	MEDIUM, WASHED SAND
10.5	BOTTOM OF SCREEN
11.5	BOTTOM OF FILTER PACK
14.5	BENTONITE PLUG
	BACKFILL MATERIAL
	WASHED SAND
16.0	HOLE BOTTOM

NOTES:

TVP-02s and TVP-02d installed in same borehole. TVP-02s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points in ROW protected with flush-mount cover.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" Teflon-Lined HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER:	12	IN. FROM	0	TO	1	FT.
	2.25	IN. FROM	1	TO	16	FT.
SURF. CASING DIAMETER:	7	IN. FROM	0	TO	1	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

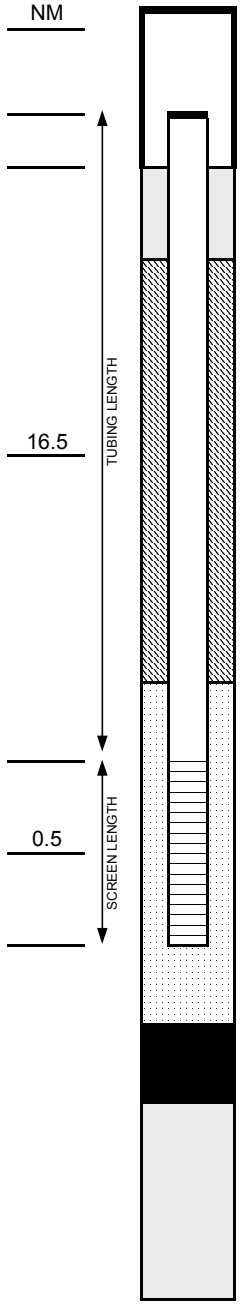
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-02d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF CASING
	1.0 CEMENT SURFACE PLUG
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



NOTES:

TVP-02s and TVP-02d installed in same borehole. TVP-02d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points in ROW protected with flush-mount cover.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" Teflon-Lined HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER:	12	IN. FROM	0	TO	1	FT.
	2.25	IN. FROM	1	TO	16	FT.
SURF. CASING DIAMETER:	7	IN. FROM	0	TO	1	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

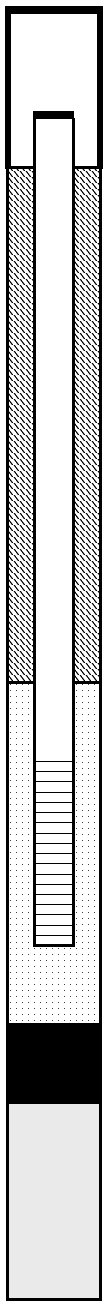
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System			WELL ID: **TVP-03s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012	INSTALLED BY: John A. Bacon	CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM



NOTES:

TVP-03s and TVP-03d installed in same borehole. TVP-03s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

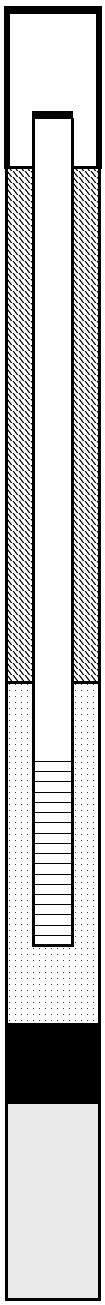
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System			WELL ID: **TVP-03d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012	INSTALLED BY: John A. Bacon	CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



NOTES:

TVP-03s and TVP-03d installed in same borehole. TVP-03d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-04s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
0.5	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM

TUBING LENGTH

SCREEN LENGTH

NOTES:

TVP-04s and TVP-04d installed in same borehole. TVP-04s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

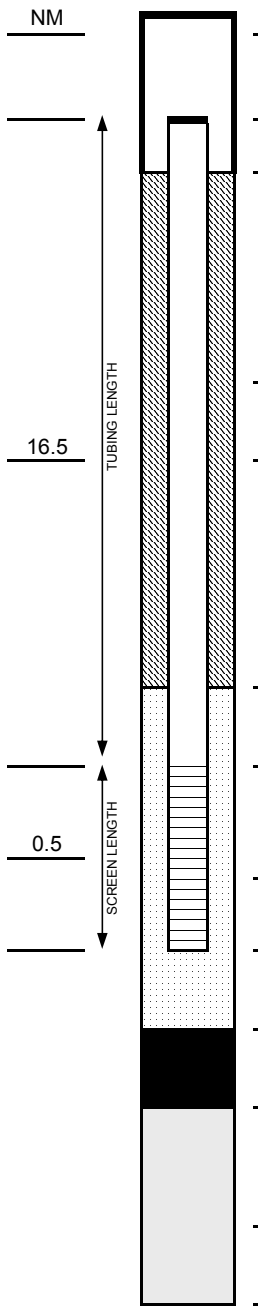
PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-04d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz



ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM

NOTES:

TVP-04s and TVP-04d installed in same borehole. TVP-04d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System			WELL ID: **TVP-05s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012	INSTALLED BY: John A. Bacon	CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM

NOTES:

TVP-05s and TVP-05d installed in same borehole. TVP-05s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER:	2.25	IN. FROM	0	TO	16	FT.
		IN. FROM		TO		FT.
SURF. CASING DIAMETER:	NA	IN. FROM	--	TO	--	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

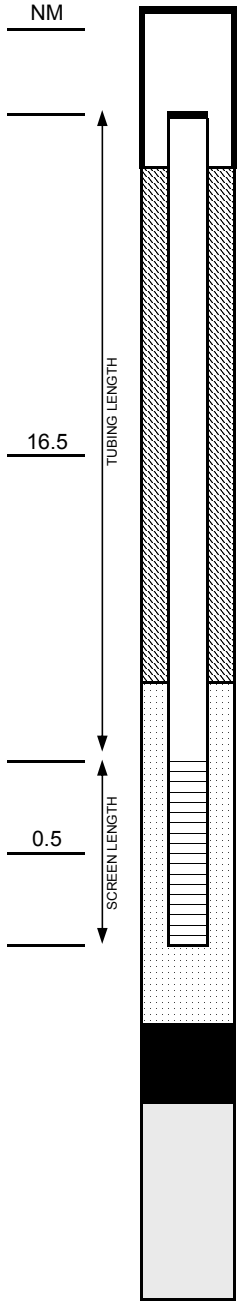
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-05d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



NOTES:

TVP-05s and TVP-05d installed in same borehole. TVP-05d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

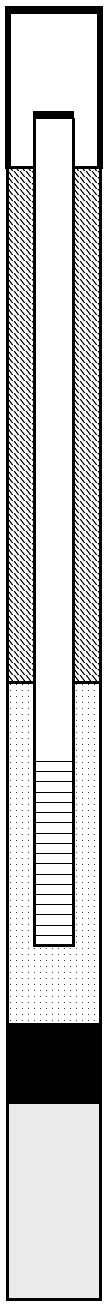
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-06s**
PROJ. NO: 187156.00	DATE INSTALLED: 3/30/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM



NOTES:

TVP-06s and TVP-06d installed in same borehole. TVP-06s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-06d**
PROJ. NO: 187156.00	DATE INSTALLED: 3/30/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
0.5	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM

TUBING LENGTH

SCREEN LENGTH

NOTES:

TVP-06s and TVP-06d installed in same borehole. TVP-06d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

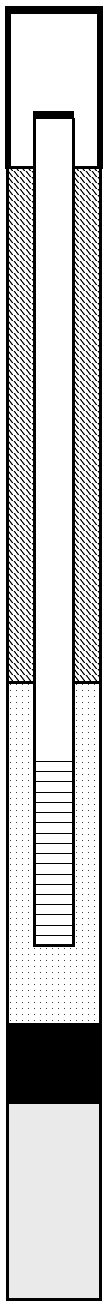
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-07s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM



NOTES:

TVP-07s and TVP-07d installed in same borehole. TVP-07s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER:	2.25	IN. FROM	0	TO	16	FT.
		IN. FROM		TO		FT.
SURF. CASING DIAMETER:	NA	IN. FROM	--	TO	--	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

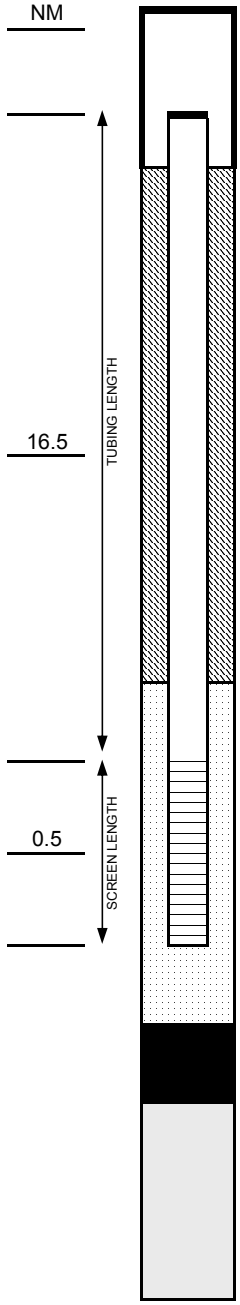
LOCK KEY NUMBER: NA

REVISED 06/2011

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-07d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



NOTES:

TVP-07s and TVP-07d installed in same borehole. TVP-07d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

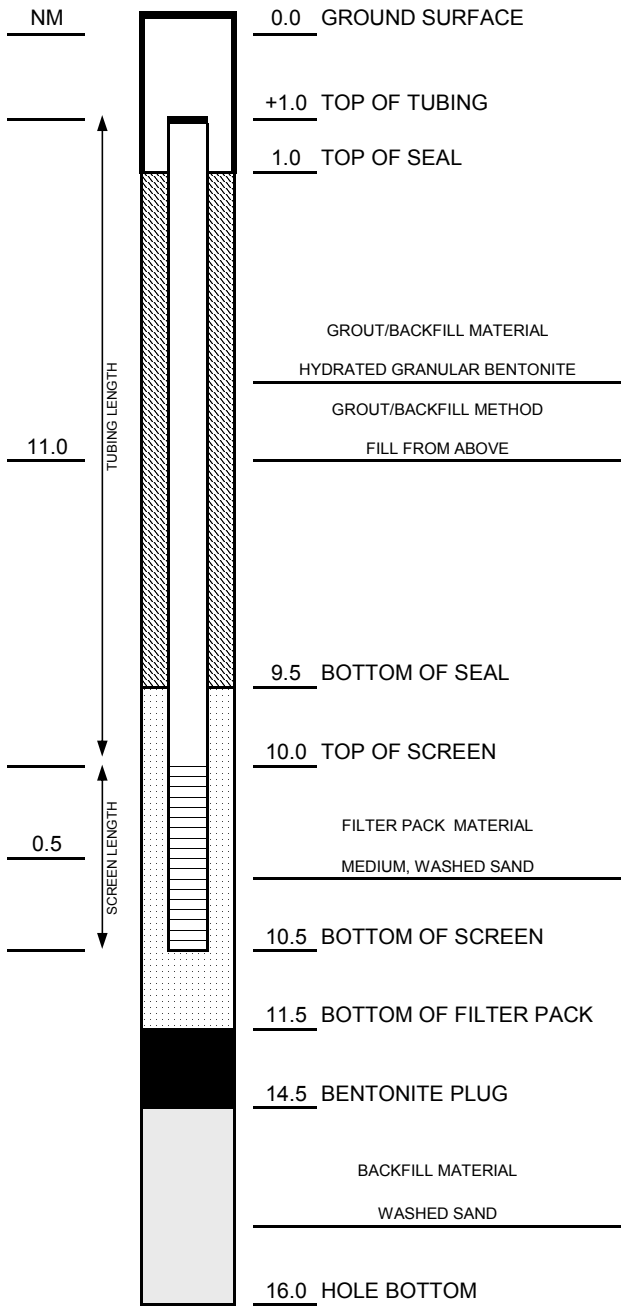
PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-08s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz



NOTES:

TVP-08s and TVP-08d installed in same borehole. TVP-08s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

REVISED 06/2011

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-08d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
0.5	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM

TUBING LENGTH

SCREEN LENGTH

NOTES:

TVP-08s and TVP-08d installed in same borehole. TVP-08d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

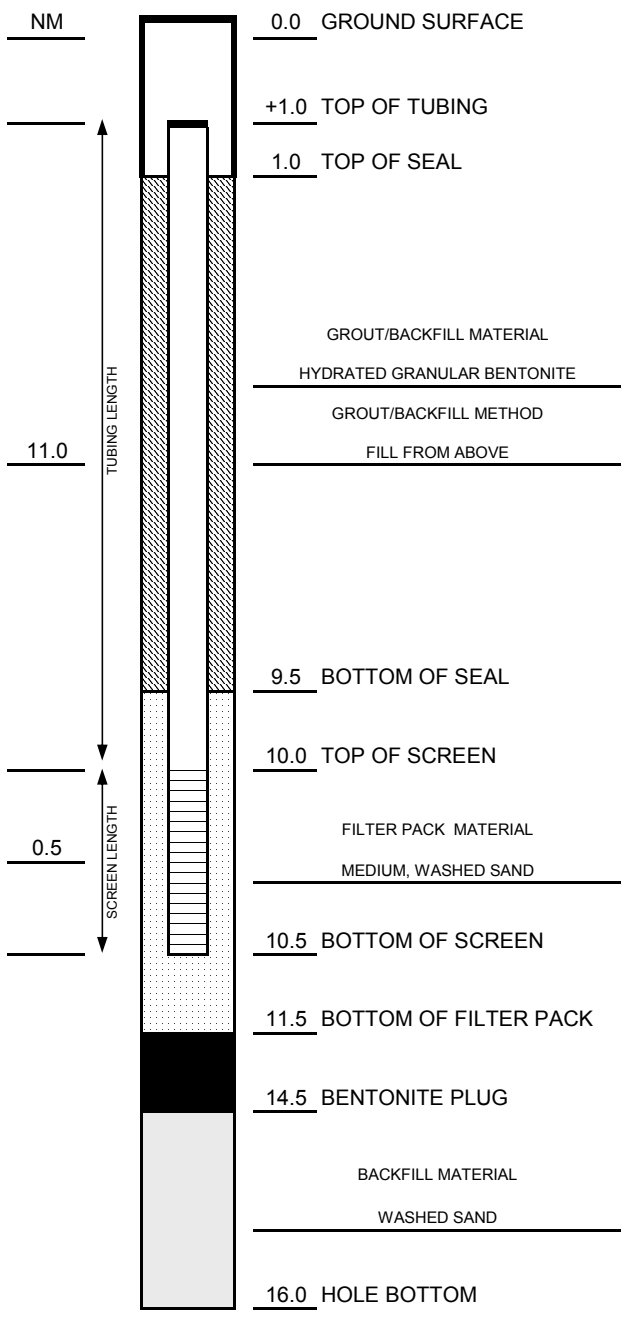
PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System			WELL ID: **TVP-09s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012	INSTALLED BY: John A. Bacon	CHECKED BY: S. Metz



NOTES:

TVP-09s and TVP-09d installed in same borehole. TVP-09s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

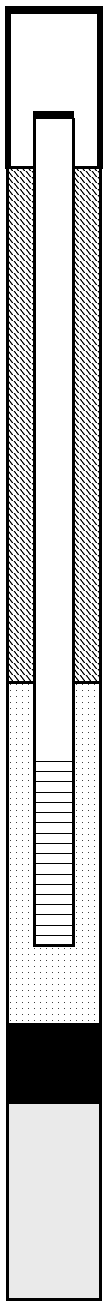
LOCK KEY NUMBER: NA

REVISED 06/2011

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-09d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



NOTES:

TVP-09s and TVP-09d installed in same borehole. TVP-09d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

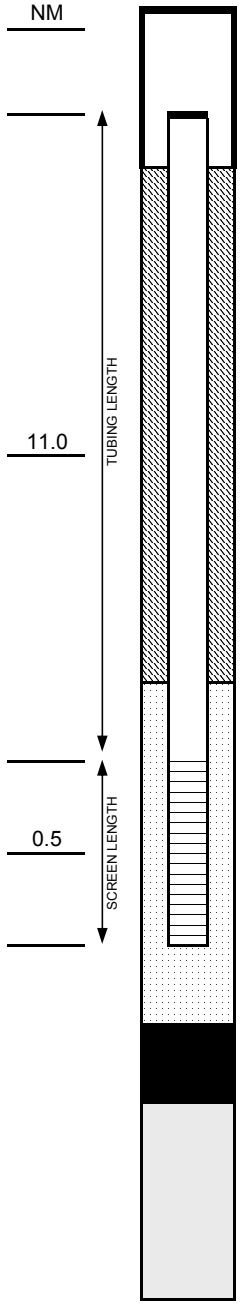
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-10s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM



NOTES:

TVP-10s and TVP-10d installed in same borehole. TVP-10s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER:	2.25	IN. FROM	0	TO	16	FT.
		IN. FROM		TO		FT.
SURF. CASING DIAMETER:	NA	IN. FROM	--	TO	--	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

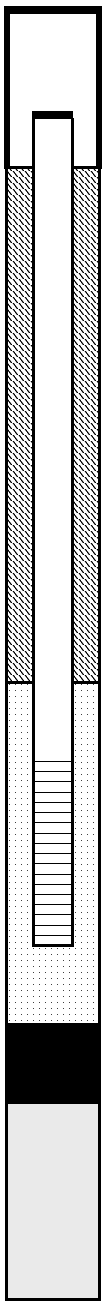
LOCK KEY NUMBER: NA

REVISED 06/2011

WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	Tecumseh Products Company - SVE System	WELL ID:	**TVP-10d**
PROJ. NO:	187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon	CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.
_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.
_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

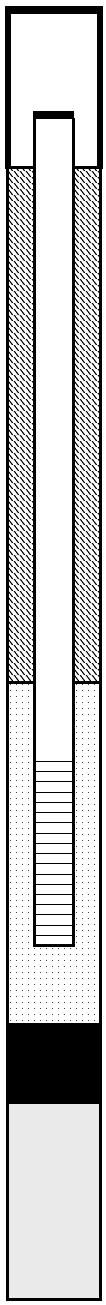
NOTES:

TVP-10s and TVP-10d installed in same borehole. TVP-10d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-11s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM



NOTES:

TVP-11s and TVP-11d installed in same borehole. TVP-11s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

REVISED 06/2011

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-11d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/9/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
0.5	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM

TUBING LENGTH

SCREEN LENGTH

NOTES:

TVP-11s and TVP-11d installed in same borehole. TVP-11d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

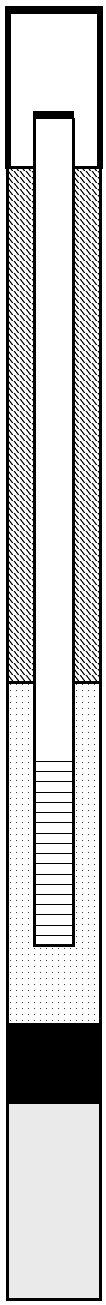
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-12s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM



NOTES:

TVP-12s and TVP-12d installed in same borehole. TVP-12s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

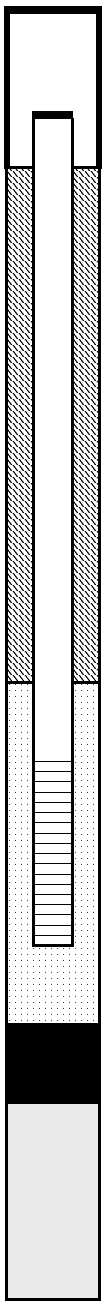
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME:	Tecumseh Products Company - SVE System	WELL ID:	**TVP-12d**
PROJ. NO:	187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon	CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



NOTES:

TVP-12s and TVP-12d installed in same borehole. TVP-12d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-13s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM

NOTES:

TVP-13s and TVP-13d installed in same borehole. TVP-13s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER:	2.25	IN. FROM	0	TO	16	FT.
		IN. FROM		TO		FT.
SURF. CASING DIAMETER:	NA	IN. FROM	--	TO	--	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

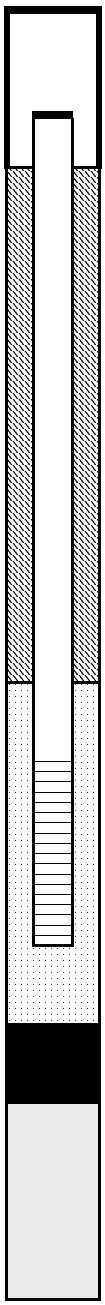
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-13d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



NOTES:

TVP-13s and TVP-13d installed in same borehole. TVP-13d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-14s**
PROJ. NO: 187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon		CHECKED BY: S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
11.0	TUBING LENGTH
	9.5 BOTTOM OF SEAL
	10.0 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	10.5 BOTTOM OF SCREEN
	11.5 BOTTOM OF FILTER PACK
	14.5 BENTONITE PLUG
	BACKFILL MATERIAL: WASHED SAND
	16.0 HOLE BOTTOM

NOTES:

TVP-14s and TVP-14d installed in same borehole. TVP-14s designated with yellow tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER:	2.25	IN. FROM	0	TO	16	FT.
		IN. FROM		TO		FT.
SURF. CASING DIAMETER:	NA	IN. FROM	--	TO	--	FT.
		IN. FROM		TO		FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

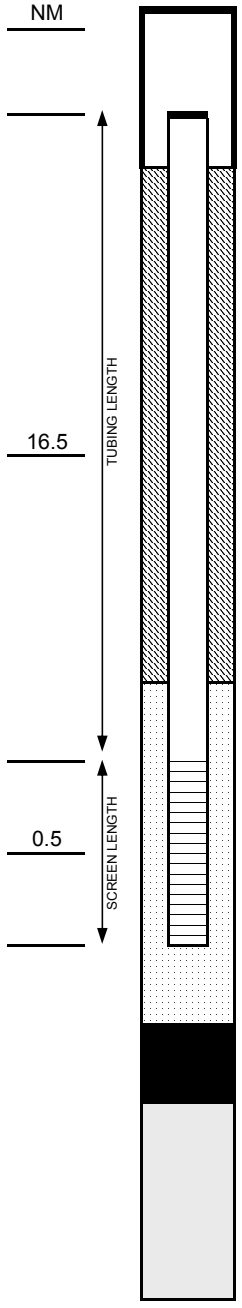
PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

WELL CONSTRUCTION DIAGRAM

PROJ. NAME: Tecumseh Products Company - SVE System		WELL ID:	**TVP-14d**
PROJ. NO: 187156.00	DATE INSTALLED: 4/10/2012 INSTALLED BY: John A. Bacon	CHECKED BY:	S. Metz

ELEVATION (BENCHMARK: USGS)	DEPTH BELOW OR ABOVE GROUND SURFACE (FEET)
NM	0.0 GROUND SURFACE
	+1.0 TOP OF TUBING
	1.0 TOP OF SEAL
	GROUT/BACKFILL MATERIAL: HYDRATED GRANULAR BENTONITE
	GROUT/BACKFILL METHOD: FILL FROM ABOVE
16.5	TUBING LENGTH
	14.5 BOTTOM OF SEAL
	15.5 TOP OF SCREEN
0.5	SCREEN LENGTH
	FILTER PACK MATERIAL: MEDIUM, WASHED SAND
	16.0 BOTTOM OF SCREEN
	16.0 BOTTOM OF FILTER PACK
	-- BENTONITE PLUG
	BACKFILL MATERIAL: NA
	16.0 HOLE BOTTOM



NOTES:

TVP-14s and TVP-14d installed in same borehole. TVP-14d designated with red tape. Pressure monitoring points finished with a stop-cock and barbed fitting. Temporary points protected with traffic cone.

CASING AND SCREEN DETAILS

TYPE OF RISER: 1/4" HDPE Tubing

PIPE SCHEDULE: NA

PIPE JOINTS: NA

SOLVENT USED? NO

SCREEN TYPE: 6" Geoprobe Vapor Implant (304 SS)

SCR. SLOT SIZE: Wire Mesh

BOREHOLE DIAMETER: 2.25 IN. FROM 0 TO 16 FT.

_____ IN. FROM _____ TO _____ FT.

SURF. CASING DIAMETER: NA IN. FROM -- TO -- FT.

_____ IN. FROM _____ TO _____ FT.

WELL DEVELOPMENT

DEVELOPMENT METHOD: NA

TIME DEVELOPING: -- HOURS

WATER REMOVED: -- GALLONS

WATER ADDED: -- GALLONS

WATER CLARITY BEFORE / AFTER DEVELOPMENT

CLARITY BEFORE: NA

COLOR BEFORE: NA

CLARITY AFTER: NA

COLOR AFTER: NA

ODOR (IF PRESENT): NA

WATER LEVEL SUMMARY

MEASUREMENT (FEET)			DATE	TIME
DTB BEFORE DEVELOPING:	--	T/PVC	--	--
DTB AFTER DEVELOPING:	--	T/PVC	--	--
SWE BEFORE DEVELOPING:	--	T/PVC	--	--
SWE AFTER DEVELOPING:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--
OTHER SWE:	--	T/PVC	--	--

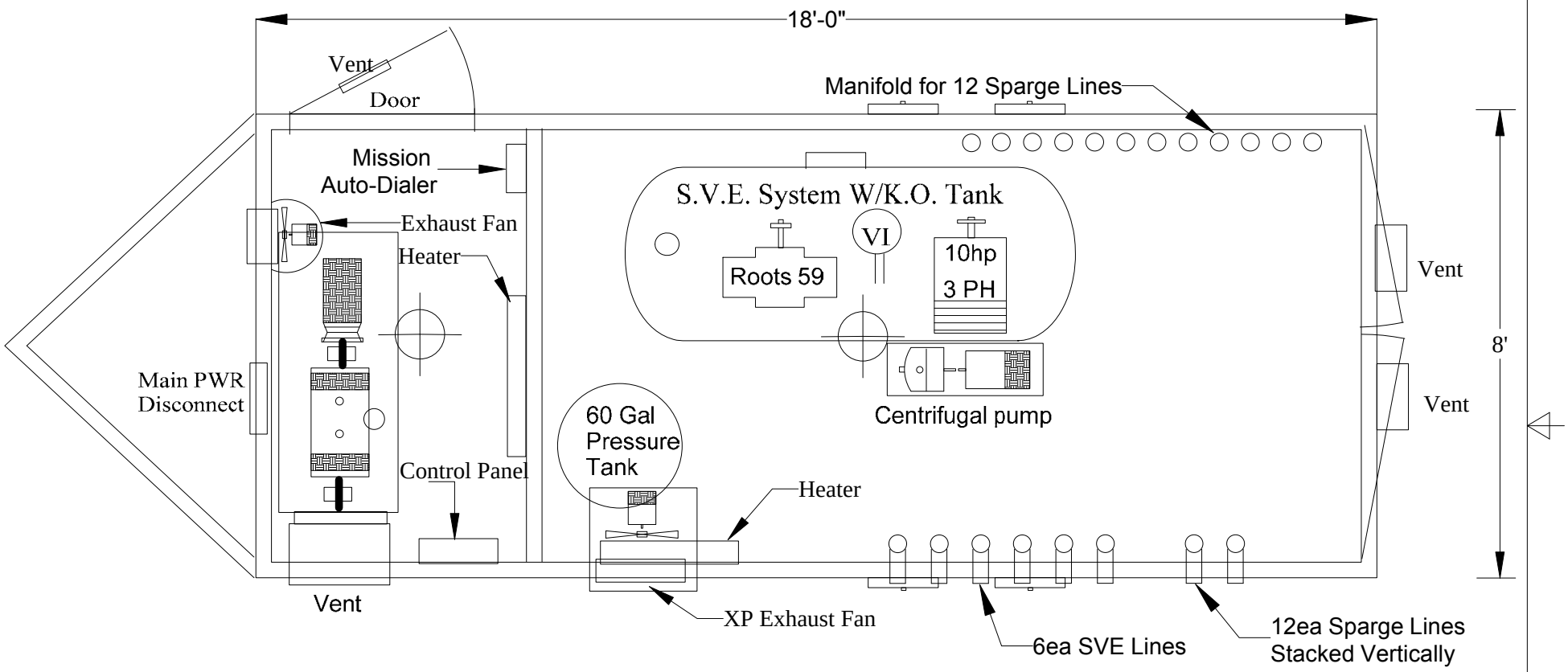
PROTECTIVE CASING DETAILS

PERMANENT, LEGIBLE WELL LABEL ADDED? ☐ YES ☑ NO

PROTECTIVE COVER AND LOCK INSTALLED? ☐ YES ☑ NO

LOCK KEY NUMBER: NA

Appendix C
Pilot System Blower Specifications

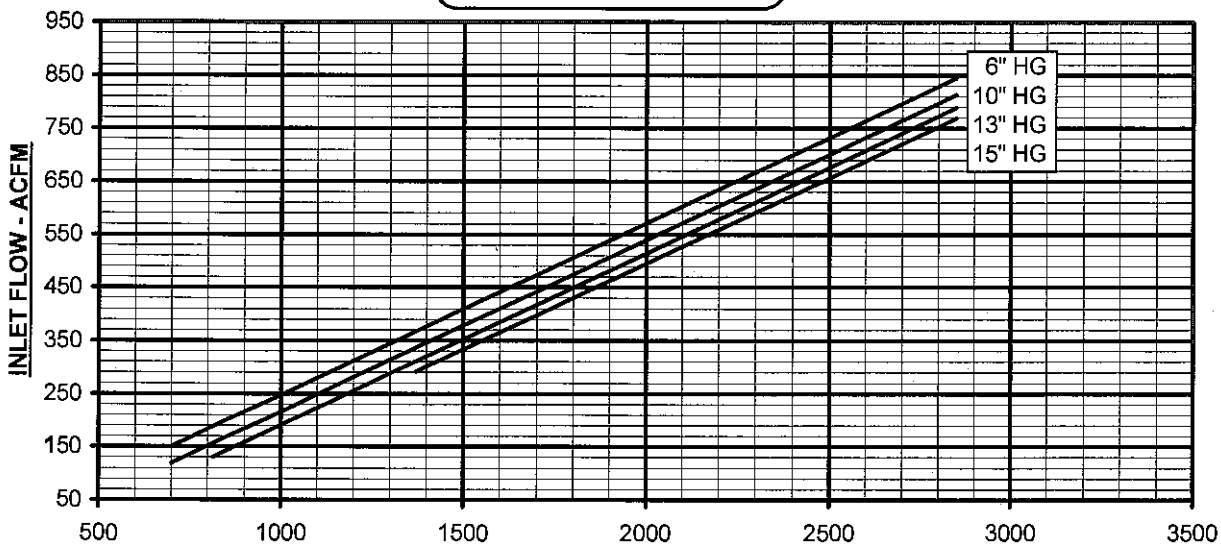


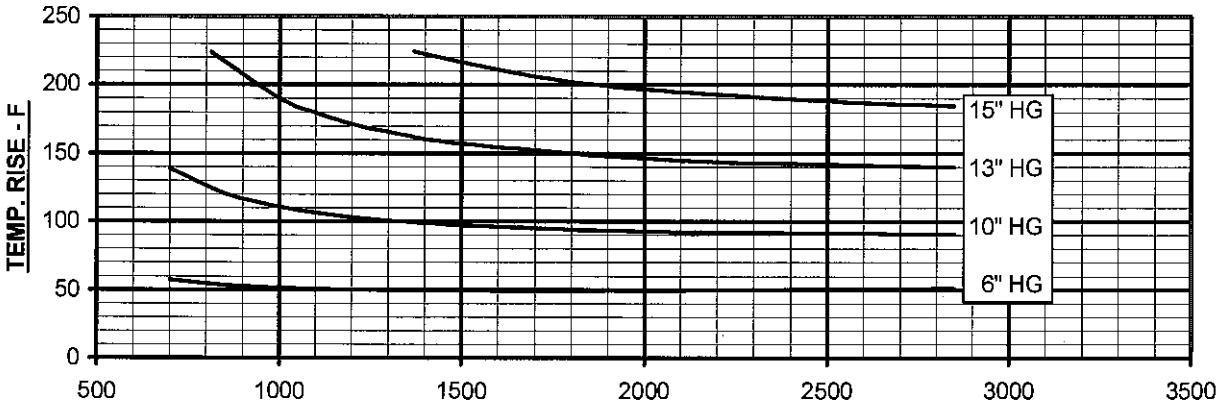
Plan View	SIZE A	SHEET 1	DRAWING BY GERARD SMIDDY		REV 1
TITLE SVE / Air Sparge	SCALE NTS	UNIT NUMBER 14	JOB NUMBER 929	DATE 4/10/08	PROACT SERVICES CORPORATION
	FOR PROACT USE ONLY				

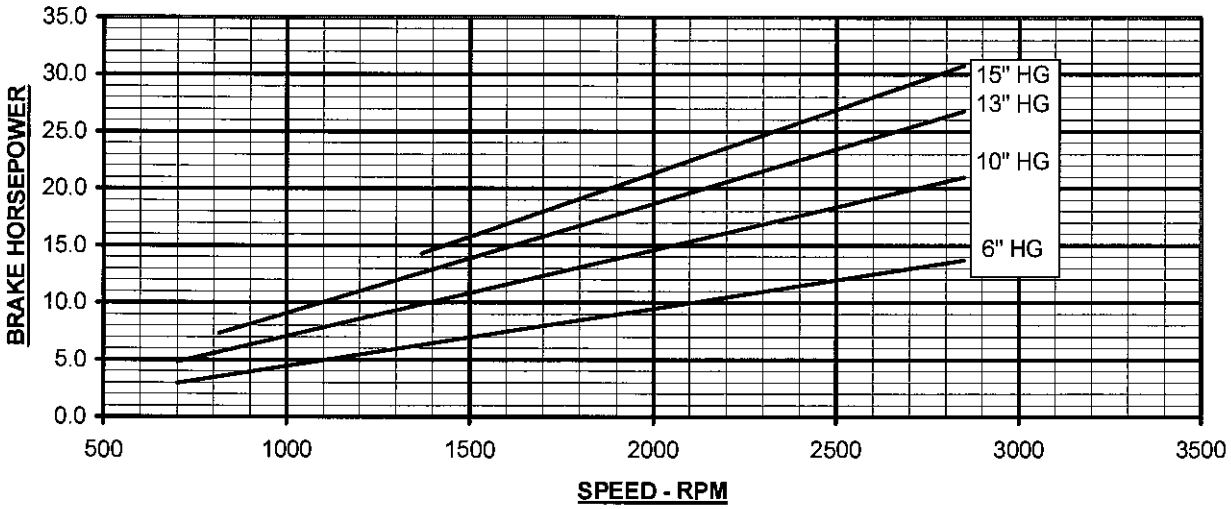
800-536-9933
www.pdblowers.com

PERFORMANCE BASED ON AIR,
INLET AT 68°F
DISCHARGE PRESSURE = 30" HG ABS.
DECEMBER 2004

VACUUM PERFORMANCE
FRAME 59 U-RAI
MAX. VACUUM = 15" HG
MAX. SPEED = 2850 RPM







VC-12-59

Appendix D
Laboratory Data – System Exhaust Samples

Mobile Geochemistry Inc.

10 May 2012

Ms. Stacy Metz
TRC Environmental - MI
1540 Eisenhower Place
Ann Arbor, MI 48108

H&P Project: TRC042712-10
Client Project: 187156 / Former TPC Site

Dear Ms. Stacy Metz:

Enclosed is the analytical report for the above referenced project. The data herein applies to samples as received by H&P Mobile Geochemistry, Inc. on 27-Apr-12 which were analyzed in accordance with the attached Chain of Custody record(s).

The results for all sample analyses and required QA/QC analyses are presented in the following sections and summarized in the documents:

- Sample Summary
- Case Narrative (if applicable)
- Sample Results
- Quality Control Summary
- Notes and Definitions / Appendix
- Chain of Custody

Unless otherwise noted, all analyses were performed and reviewed in compliance with our Quality Systems Manual and Standard Operating Procedures. This report shall not be reproduced, except in full, without the written approval of H&P Mobile Geochemistry, Inc.

We at H&P Mobile Geochemistry, Inc. sincerely appreciate the opportunity to provide analytical services to you on this project. If you have any questions or concerns regarding this analytical report, please contact me at your convenience at 760-804-9678.

Sincerely,

Janis Villarreal

Janis Villarreal
Laboratory Director

H&P Mobile Geochemistry, Inc. operates under CA Environmental Lab Accreditation Program Numbers 2579, 2740, 2741, 2742, 2743, 2745 and 2754. National Environmental Laboratory Accreditation Conference (NELAC) Standards Lab #11845

H&P Mobile
Geochemistry Inc.

2470 Impala Drive
Carlsbad, CA 92010
760-804-9678 Phone
760-804-9159 Fax

TRC Environmental - MI	Project: TRC042712-10	
1540 Eisenhower Place	Project Number: 187156 / Former TPC Site	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	10-May-12 12:56

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SVE Exhaust	E204142-01	Vapor	25-Apr-12	27-Apr-12
S-Building SVE Exhaust	E204142-02	Vapor	25-Apr-12	27-Apr-12
V-02	E204142-03	Vapor	25-Apr-12	27-Apr-12

H&P Mobile
Geochemistry Inc.

2470 Impala Drive
Carlsbad, CA 92010
760-804-9678 Phone
760-804-9159 Fax

TRC Environmental - MI	Project: TRC042712-10	
1540 Eisenhower Place	Project Number: 187156 / Former TPC Site	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	10-May-12 12:56

Volatile Organic Compounds by EPA TO-15

H&P Mobile Geochemistry, Inc.

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
SVE Exhaust (E204142-01) Vapor Sampled: 25-Apr-12 Received: 27-Apr-12									
Vinyl chloride	ND	0.40	ppbv	1	EE20112	01-May-12	01-May-12	EPA TO-15	
1,1-Dichloroethene	ND	0.40	"	"	"	"	"	"	
trans-1,2-Dichloroethene	**1.1**	0.40	"	"	"	"	"	"	
1,1-Dichloroethane	**0.95**	0.40	"	"	"	"	"	"	
cis-1,2-Dichloroethene	**9.7**	0.40	"	"	"	"	"	"	
1,1,1-Trichloroethane	**6.9**	0.40	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	0.40	"	"	"	"	"	"	
Trichloroethene	**160**	4.0	"	10	"	"	"	"	
Tetrachloroethene	**3.2**	0.40	"	1	"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4		*88.5 %*		*76-134*	"	"	"	"	
Surrogate: Toluene-d8		*102 %*		*78-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*108 %*		*77-127*	"	"	"	"	
S-Building SVE Exhaust (E204142-02) Vapor Sampled: 25-Apr-12 Received: 27-Apr-12									
Vinyl chloride	ND	0.40	ppbv	1	EE20112	01-May-12	01-May-12	EPA TO-15	
1,1-Dichloroethene	ND	0.40	"	"	"	"	"	"	
trans-1,2-Dichloroethene	**1.4**	0.40	"	"	"	"	"	"	
1,1-Dichloroethane	**3.2**	0.40	"	"	"	"	"	"	
cis-1,2-Dichloroethene	**16**	0.40	"	"	"	"	"	"	
1,1,1-Trichloroethane	**18**	0.40	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	0.40	"	"	"	"	"	"	
Trichloroethene	**350**	4.0	"	10	"	"	"	"	
Tetrachloroethene	**2.7**	0.40	"	1	"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4		*85.2 %*		*76-134*	"	"	"	"	
Surrogate: Toluene-d8		*106 %*		*78-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*98.9 %*		*77-127*	"	"	"	"	

H&P Mobile
Geochemistry Inc.

2470 Impala Drive
Carlsbad, CA 92010
760-804-9678 Phone
760-804-9159 Fax

TRC Environmental - MI	Project: TRC042712-10	
1540 Eisenhower Place	Project Number: 187156 / Former TPC Site	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	10-May-12 12:56

Volatile Organic Compounds by EPA TO-15

H&P Mobile Geochemistry, Inc.

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
V-02 (E204142-03) Vapor Sampled: 25-Apr-12 Received: 27-Apr-12									
Vinyl chloride	**2.4**	0.40	ppbv	1	EE20112	01-May-12	02-May-12	EPA TO-15	
1,1-Dichloroethene	**0.64**	0.40	"	"	"	"	"	"	
trans-1,2-Dichloroethene	**2.3**	0.40	"	"	"	"	"	"	
1,1-Dichloroethane	**15**	0.40	"	"	"	"	"	"	
cis-1,2-Dichloroethene	**100**	0.40	"	"	"	"	"	"	
1,1,1-Trichloroethane	ND	0.40	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	0.40	"	"	"	"	"	"	
Trichloroethene	**6.4**	0.40	"	"	"	"	"	"	
Tetrachloroethene	ND	0.40	"	"	"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4		*85.9 %*		*76-134*	"	"	"	"	
Surrogate: Toluene-d8		*100 %*		*78-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*97.9 %*		*77-127*	"	"	"	"	

H&P Mobile
Geochemistry Inc.

2470 Impala Drive
Carlsbad, CA 92010
760-804-9678 Phone
760-804-9159 Fax

TRC Environmental - MI	Project: TRC042712-10	
1540 Eisenhower Place	Project Number: 187156 / Former TPC Site	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	10-May-12 12:56

Volatile Organic Compounds by EPA TO-15 - Quality Control

H&P Mobile Geochemistry, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE20112 - TO-15										
Blank (EE20112-BLK1)				Prepared & Analyzed: 01-May-12						
Vinyl chloride	ND	0.40	ppbv							
1,1-Dichloroethene	ND	0.40	"							
trans-1,2-Dichloroethene	ND	0.40	"							
1,1-Dichloroethane	ND	0.40	"							
cis-1,2-Dichloroethene	ND	0.40	"							
1,1,1-Trichloroethane	ND	0.40	"							
1,2-Dichloroethane (EDC)	ND	0.40	"							
Trichloroethene	ND	0.40	"							
Tetrachloroethene	ND	0.40	"							
Surrogate: 1,2-Dichloroethane-d4	*44.4*		*"*	*50.2*		*88.4*	*76-134*			
Surrogate: Toluene-d8	*49.7*		*"*	*49.8*		*99.8*	*78-125*			
Surrogate: 4-Bromofluorobenzene	*53.4*		*"*	*50.2*		*106*	*77-127*			
LCS (EE20112-BS1)				Prepared & Analyzed: 01-May-12						
Vinyl chloride	1.61	0.40	ppbv	2.01		80.5	65-135			
1,1-Dichloroethene	1.85	0.40	"	2.01		92.1	65-135			
trans-1,2-Dichloroethene	1.90	0.40	"	2.01		94.4	65-135			
1,1-Dichloroethane	2.11	0.40	"	2.01		105	65-135			
cis-1,2-Dichloroethene	2.07	0.40	"	1.99		104	65-135			
1,1,1-Trichloroethane	1.94	0.40	"	2.02		96.2	65-135			
1,2-Dichloroethane (EDC)	1.83	0.40	"	2.01		91.0	65-135			
Trichloroethene	1.91	0.40	"	2.01		95.0	65-135			
Tetrachloroethene	2.14	0.40	"	2.01		106	65-135			
Surrogate: 1,2-Dichloroethane-d4	*43.5*		*"*	*50.2*		*86.8*	*76-134*			
Surrogate: Toluene-d8	*49.8*		*"*	*49.8*		*99.9*	*78-125*			
Surrogate: 4-Bromofluorobenzene	*56.8*		*"*	*50.2*		*113*	*77-127*			
LCS Dup (EE20112-BSD1)				Prepared & Analyzed: 01-May-12						
Vinyl chloride	1.84	0.40	ppbv	2.01		91.9	65-135	13.2	35	
1,1-Dichloroethene	1.90	0.40	"	2.01		94.8	65-135	2.88	35	
trans-1,2-Dichloroethene	1.91	0.40	"	2.01		95.0	65-135	0.578	35	

H&P Mobile
Geochemistry Inc.

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TRC Environmental - MI	Project: TRC042712-10	
1540 Eisenhower Place	Project Number: 187156 / Former TPC Site	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	10-May-12 12:56

Volatile Organic Compounds by EPA TO-15 - Quality Control

H&P Mobile Geochemistry, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE20112 - TO-15										
LCS Dup (EE20112-BSD1)				Prepared & Analyzed: 01-May-12						
1,1-Dichloroethane	2.12	0.40	ppbv	2.01		105	65-135	0.332	35	
cis-1,2-Dichloroethene	2.14	0.40	"	1.99		107	65-135	3.33	35	
1,1,1-Trichloroethane	1.92	0.40	"	2.02		95.0	65-135	1.25	35	
1,2-Dichloroethane (EDC)	1.81	0.40	"	2.01		90.0	65-135	1.10	35	
Trichloroethene	1.92	0.40	"	2.01		95.5	65-135	0.522	35	
Tetrachloroethene	2.14	0.40	"	2.01		106	65-135	0.0935	35	
Surrogate: 1,2-Dichloroethane-d4	*44.0*		*"*	*50.2*		*87.8*	*76-134*			
Surrogate: Toluene-d8	*49.7*		*"*	*49.8*		*99.7*	*78-125*			
Surrogate: 4-Bromofluorobenzene	*57.0*		*"*	*50.2*		*113*	*77-127*			

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TRC Environmental - MI	Project: TRC042712-10	
1540 Eisenhower Place	Project Number: 187156 / Former TPC Site	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	10-May-12 12:56

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Appendix

H&P Mobile Geochemistry, Inc. is approved as an Environmental Laboratory in conformance with the Environmental Laboratory Accreditation Program (CA) for the category of Volatile and Semi-Volatile Organic Chemistry of Hazardous Waste for the following methods:

Certificate# 2741, 2743, 2579, 2754 & 2740 approved for EPA 8260 and LUFT GC/MS
Certificate# 2742, 2745, & 2741 approved for LUFT
Certificate# 2745 & 2742 approved for EPA 418.1

H&P Mobile Geochemistry, Inc. is approved as an Environmental Laboratory in conformance with the National Environmental Accreditation Conference Standards for the category Environmental Analysis Air and Emissions for the following analytes and methods:

1,2,4-Trichlorobenzene by EPA TO-15 & TO-14A
Hexachlorobutadiene by EPA TO-15 & TO-14A
1,2,4-Trimethylbenzene by EPA TO -14A
1,2-Dichlorobenzene by EPA TO-15 & TO-14A
1,3,5-Trimethylbenzene by EPA TO -14A
1,4-Dichlorobenzene by EPA TO-15 & TO-14A
Benzene by EPA TO-15 & TO-14A
Chlorobenzene by EPA TO-15 & TO-14A
Ethyl benzene by EPA TO-15 & TO-14A
Styrene by EPA TO-15 & TO-14A
Toluene by EPA TO-15 & TO-14A
Total Xylenes by EPA TO-15 & TO-14A
1,1,1-Trichloroethane by EPA TO-15 & TO-14A
1,1,2,2-Tetrachloroethane by EPA TO-15 & TO-14A
1,1,2-Trichloroethane by EPA TO-15 & TO-14A
1,1-Dichloroethane by EPA TO-15 & TO-14A
1,1-Dichloroethene by EPA TO-15 & TO-14A
1,2-Dichloroethane by EPA TO-15 & TO-14A
1,2-Dichloropropane by EPA TO-15 & TO-14A
Benzyl Chloride by EPA TO-15 & TO-14A
Bromoform by EPA TO-15
Bromomethane by EPA TO-15 & TO-14A
Carbon tetrachloride by EPA TO-15 & TO-14A
Chloroethane by EPA TO-15
Chloroform by EPA TO-15 & TO-14A
Chloromethane by EPA TO-15 & TO-14A
cis-1,2-Dichloroethene by EPA TO-15
cis-1,2-Dichloropropene by EPA TO-15 & TO-14A
Methylene chloride by EPA TO -15 & TO-14A
Tetrachloroethane by EPA TO-15 & TO-14A
trans-1,2-Dichloroethene by EPA TO-15
trans-1,2-Dichloropropene by EPA TO-15 & TO-14A
Trichloroethene by EPA TO-15 & TO-14A
Vinyl chloride by EPA TO -15 & TO-14A
2-Butanone by EPA TO-15
4-Methyl-2-Pentanone by EPA TO-15
Hexane by EPA TO-15
Methyl tert-butyl ether by EPA TO-15
Vinyl acetate by EPA TO-15

Dibromochloromethane by EPA TO-15
Dichlorodifluoromethane by EPA TO-15 & TO-14A
Trichlorofluoromethane by EPA TO-15 & TO-14A
Naphthalene by EPA TO-15 & TO-14A
m&p Xylenes by EPA TO-15
o-Xylene by EPA TO-15
1,3-Butadiene by EPA TO-15
1,1,2-Trichlorotrifluoroethane by EPA TO-15 & TO-14A
Carbon disulfide by EPA TO-15
1,4-Dioxane by EPA TO-15
Cyclohexane by EPA TO-15
tert-Butyl Alcohol by EPA TO-15
1,3-Dichlorobenzene by EPA TO-15 & TO-14A
Heptane by EPA TO-15
Bromodichloromethane by EPA TO-15 & TO-14A

This certification applies to samples analyzed in summa canisters.

Chain of Custody Record

H&P Mobile Geochemistry Inc.
2470 Impala Dr., Carlsbad, CA 92010 • ph 760.804.9678 • fax 760.804.9159
1855 Coronado Ave., Signal Hill, CA 90755 • ph 800.834.9888

Date:
H&P Project # TRC042712-10
Outside Lab:

Client: TRC Environmental
Address: ~~150~~ 1540 Eisenhower Place
Ann Arbor MI 48108
Email: smetz@trcsolutions.com
Collector: S. Metz
Client Project # 187156
Location: Former TPC Site, Tecumseh MI
Phone: 734 971 7080
Page: 1 of 1
Project Contact: Stacy Metz
Fax: 734 971 9022
Turn around time: Std

Geotracker EDF: Yes ☐ No ☐
Global ID:
Excel EDD: Yes ☒ No ☐

Sample Receipt
Intact: ☑ Yes ☐ No
Seal Intact: ☑ Yes ☐ No ☐ N/A
Cold: ☐ Yes ☐ No ☑ N/A
Temperature: RT

Special Instructions: * Short List – PCE, TCE, 1,1-DCE, cis-DCE, trans-DCE, Vinyl Chloride, 1,1,1-TCA, 1,1-DCA & 1,2-DCA
Report Results in ppbv.
PO# 43810
Lab Work Order # PO# 43810 E204142
Fedex Track# 8993 4169 7452

Sample Name	Field Point Name	Purge Vol	Time	Date	Sample Type	Container Type	Total # of containers	8260B Full List	8260B ☐ BTEX/OXY ☐ TPH gas	8015M TPH ☐ g ☐ d ☐ ext	418.1 TRPH	VOC's: Full List ☐ 8260B ☐ TO-15	VOC's: Short List* ☐ OTSC ☐ 8260B ☒ TO-15	VOC's: SAM, 8260B ☐ SAM A ☐ SAM B	Naphthalene ☐ 8260B ☐ TO-15	Oxygenates ☐ 8260B ☐ TO-15	TPHv gas ☐ 8260B ☐ TO-15	Ketones ☐ 8260B ☐ TO-15	Other ☐ 8260B ☐ TO-15	Leak Check Compound ☐ 1,1 DFA ☐ OTHER	Methane	Fixed Gases ☐ CO_2 ☐ O_2 ☐ N_2	CAN#	VA#
								SOIL/GW				SOIL VAPOR/AIR ANALYSIS												
SVE Exhaust		NA	844	4/25/12	Air	1L Summa	1						X										359	-1
S-Building SVE Exhaust		NA	918	↓	↓	1L Summa	1						X										433	-1.0
V-02		NA	1328	4/25/12	↓	1L Summa	1						X										171	-1.5

Relinquished by: (Signature)	(company) TRC	Received by: (Signature) Fed Ex	(company)	Date: 1506 Time: 4/25/12
Relinquished by: (Signature)	(company)	Received by: (Signature)	(company) HOP	Date: 4-27-12 Time: 0920
Relinquished by: (Signature)	(company)	Received by: (Signature)	(company)	Date: Time:

*Signature constitutes authorization to proceed with analysis and acceptance of condition on back.

Sample disposal instruction: ☐ Disposal ☐ Return to client ☐ Pickup

Mobile Geochemistry Inc.

12 May 2012

Ms. Stacy Metz
TRC Environmental - MI
1540 Eisenhower Place
Ann Arbor, MI 48108

H&P Project: TRC050412-10
Client Project: 187156.0001.0000/ Tecumseh

Dear Ms. Stacy Metz:

Enclosed is the analytical report for the above referenced project. The data herein applies to samples as received by H&P Mobile Geochemistry, Inc. on 04-May-12 which were analyzed in accordance with the attached Chain of Custody record(s).

The results for all sample analyses and required QA/QC analyses are presented in the following sections and summarized in the documents:

- Sample Summary
- Case Narrative (if applicable)
- Sample Results
- Quality Control Summary
- Notes and Definitions / Appendix
- Chain of Custody

Unless otherwise noted, all analyses were performed and reviewed in compliance with our Quality Systems Manual and Standard Operating Procedures. This report shall not be reproduced, except in full, without the written approval of H&P Mobile Geochemistry, Inc.

We at H&P Mobile Geochemistry, Inc. sincerely appreciate the opportunity to provide analytical services to you on this project. If you have any questions or concerns regarding this analytical report, please contact me at your convenience at 760-804-9678.

Sincerely,

Lisa D Ems for

Janis Villarreal
Laboratory Director

H&P Mobile Geochemistry, Inc. operates under CA Environmental Lab Accreditation Program Numbers 2579, 2740, 2741, 2742, 2743, 2745 and 2754. National Environmental Laboratory Accreditation Conference (NELAC) Standards Lab #11845

H&P Mobile
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760-804-9159 Fax

TRC Environmental - MI	Project: TRC050412-10	
1540 Eisenhower Place	Project Number: 187156.0001.0000/ Tecumseh	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	12-May-12 15:40

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SVE Exhaust	E205020-01	Vapor	02-May-12	04-May-12
DUP-01	E205020-02	Vapor	02-May-12	04-May-12

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TRC Environmental - MI	Project: TRC050412-10	
1540 Eisenhower Place	Project Number: 187156.0001.0000/ Tecumseh	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	12-May-12 15:40

Volatile Organic Compounds by EPA TO-15

H&P Mobile Geochemistry, Inc.

Analyte	Result	Reporting Limit	Units	Dilution Factor	Batch	Prepared	Analyzed	Method	Notes
SVE Exhaust (E205020-01) Vapor Sampled: 02-May-12 Received: 04-May-12									
Vinyl chloride	ND	0.40	ppbv	1	EE20806	08-May-12	08-May-12	EPA TO-15	
1,1-Dichloroethene	ND	0.40	"	"	"	"	"	"	
trans-1,2-Dichloroethene	**0.97**	0.40	"	"	"	"	"	"	
1,1-Dichloroethane	**2.5**	0.40	"	"	"	"	"	"	
cis-1,2-Dichloroethene	**9.5**	0.40	"	"	"	"	"	"	
1,1,1-Trichloroethane	**7.3**	0.40	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	0.40	"	"	"	"	"	"	
Trichloroethene	**290**	2.0	"	5	"	"	"	"	
Tetrachloroethene	**3.2**	0.40	"	1	"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4		*92.5 %*		*76-134*	"	"	"	"	
Surrogate: Toluene-d8		*105 %*		*78-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*105 %*		*77-127*	"	"	"	"	
DUP-01 (E205020-02) Vapor Sampled: 02-May-12 Received: 04-May-12									
Vinyl chloride	ND	0.40	ppbv	1	EE20806	08-May-12	08-May-12	EPA TO-15	
1,1-Dichloroethene	ND	0.40	"	"	"	"	"	"	
trans-1,2-Dichloroethene	**0.42**	0.40	"	"	"	"	"	"	
1,1-Dichloroethane	**2.5**	0.40	"	"	"	"	"	"	
cis-1,2-Dichloroethene	**4.2**	0.40	"	"	"	"	"	"	
1,1,1-Trichloroethane	**3.5**	0.40	"	"	"	"	"	"	
1,2-Dichloroethane (EDC)	ND	0.40	"	"	"	"	"	"	
Trichloroethene	**120**	2.0	"	5	"	"	"	"	
Tetrachloroethene	**1.4**	0.40	"	1	"	"	"	"	
Surrogate: 1,2-Dichloroethane-d4		*95.6 %*		*76-134*	"	"	"	"	
Surrogate: Toluene-d8		*104 %*		*78-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*101 %*		*77-127*	"	"	"	"	

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TRC Environmental - MI
1540 Eisenhower Place
Ann Arbor, MI 48108

Project: TRC050412-10
Project Number: 187156.0001.0000/ Tecumseh
Project Manager: Ms. Stacy Metz

Reported:
12-May-12 15:40

Volatile Organic Compounds by EPA TO-15 - Quality Control

H&P Mobile Geochemistry, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE20806 - TO-15										
Blank (EE20806-BLK1)				Prepared & Analyzed: 08-May-12						
Vinyl chloride	ND	0.40	ppbv							
1,1-Dichloroethene	ND	0.40	"							
trans-1,2-Dichloroethene	ND	0.40	"							
1,1-Dichloroethane	ND	0.40	"							
cis-1,2-Dichloroethene	ND	0.40	"							
1,1,1-Trichloroethane	ND	0.40	"							
1,2-Dichloroethane (EDC)	ND	0.40	"							
Trichloroethene	ND	0.40	"							
Tetrachloroethene	ND	0.40	"							
Surrogate: 1,2-Dichloroethane-d4	*44.7*		*"*	*50.2*		*89.1*	*76-134*			
Surrogate: Toluene-d8	*50.9*		*"*	*49.8*		*102*	*78-125*			
Surrogate: 4-Bromofluorobenzene	*54.0*		*"*	*50.2*		*108*	*77-127*			
LCS (EE20806-BS1)				Prepared & Analyzed: 08-May-12						
Vinyl chloride	1.88	0.40	ppbv	2.01		93.8	65-135			
1,1-Dichloroethene	1.98	0.40	"	2.01		98.4	65-135			
trans-1,2-Dichloroethene	2.07	0.40	"	2.01		103	65-135			
1,1-Dichloroethane	2.31	0.40	"	2.01		115	65-135			
cis-1,2-Dichloroethene	2.18	0.40	"	1.99		110	65-135			
1,1,1-Trichloroethane	1.88	0.40	"	2.02		93.5	65-135			
1,2-Dichloroethane (EDC)	1.81	0.40	"	2.01		90.1	65-135			
Trichloroethene	1.91	0.40	"	2.01		95.1	65-135			
Tetrachloroethene	1.98	0.40	"	2.01		98.5	65-135			
Surrogate: 1,2-Dichloroethane-d4	*44.2*		*"*	*50.2*		*88.1*	*76-134*			
Surrogate: Toluene-d8	*50.5*		*"*	*49.8*		*101*	*78-125*			
Surrogate: 4-Bromofluorobenzene	*55.9*		*"*	*50.2*		*111*	*77-127*			
LCS Dup (EE20806-BSD1)				Prepared & Analyzed: 08-May-12						
Vinyl chloride	1.79	0.40	ppbv	2.01		89.4	65-135	4.79	35	
1,1-Dichloroethene	1.92	0.40	"	2.01		95.8	65-135	2.67	35	
trans-1,2-Dichloroethene	1.95	0.40	"	2.01		97.2	65-135	5.87	35	

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TRC Environmental - MI	Project: TRC050412-10	
1540 Eisenhower Place	Project Number: 187156.0001.0000/ Tecumseh	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	12-May-12 15:40

Volatile Organic Compounds by EPA TO-15 - Quality Control

H&P Mobile Geochemistry, Inc.

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE20806 - TO-15										
LCS Dup (EE20806-BSD1)				Prepared & Analyzed: 08-May-12						
1,1-Dichloroethane	2.14	0.40	ppbv	2.01		107	65-135	7.67	35	
cis-1,2-Dichloroethene	2.13	0.40	"	1.99		107	65-135	2.65	35	
1,1,1-Trichloroethane	1.86	0.40	"	2.02		92.3	65-135	1.23	35	
1,2-Dichloroethane (EDC)	1.80	0.40	"	2.01		89.9	65-135	0.277	35	
Trichloroethene	1.89	0.40	"	2.01		94.0	65-135	1.16	35	
Tetrachloroethene	1.98	0.40	"	2.01		98.6	65-135	0.101	35	
Surrogate: 1,2-Dichloroethane-d4	*44.5*		*"*	*50.2*		*88.7*	*76-134*			
Surrogate: Toluene-d8	*50.4*		*"*	*49.8*		*101*	*78-125*			
Surrogate: 4-Bromofluorobenzene	*55.3*		*"*	*50.2*		*110*	*77-127*			

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TRC Environmental - MI	Project: TRC050412-10	
1540 Eisenhower Place	Project Number: 187156.0001.0000/ Tecumseh	Reported:
Ann Arbor, MI 48108	Project Manager: Ms. Stacy Metz	12-May-12 15:40

Notes and Definitions

DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

Appendix

H&P Mobile Geochemistry, Inc. is approved as an Environmental Laboratory in conformance with the Environmental Laboratory Accreditation Program (CA) for the category of Volatile and Semi-Volatile Organic Chemistry of Hazardous Waste for the following methods:

Certificate# 2741, 2743, 2579, 2754 & 2740 approved for EPA 8260 and LUFT GC/MS
Certificate# 2742, 2745, & 2741 approved for LUFT
Certificate# 2745 & 2742 approved for EPA 418.1

H&P Mobile Geochemistry, Inc. is approved as an Environmental Laboratory in conformance with the National Environmental Accreditation Conference Standards for the category Environmental Analysis Air and Emissions for the following analytes and methods:

1,2,4-Trichlorobenzene by EPA TO-15 & TO-14A
Hexachlorobutadiene by EPA TO-15 & TO-14A
1,2,4-Trimethylbenzene by EPA TO -14A
1,2-Dichlorobenzene by EPA TO-15 & TO-14A
1,3,5-Trimethylbenzene by EPA TO -14A
1,4-Dichlorobenzene by EPA TO-15 & TO-14A
Benzene by EPA TO-15 & TO-14A
Chlorobenzene by EPA TO-15 & TO-14A
Ethyl benzene by EPA TO-15 & TO-14A
Styrene by EPA TO-15 & TO-14A
Toluene by EPA TO-15 & TO-14A
Total Xylenes by EPA TO-15 & TO-14A
1,1,1-Trichloroethane by EPA TO-15 & TO-14A
1,1,2,2-Tetrachloroethane by EPA TO-15 & TO-14A
1,1,2-Trichloroethane by EPA TO-15 & TO-14A
1,1-Dichloroethane by EPA TO-15 & TO-14A
1,1-Dichloroethene by EPA TO-15 & TO-14A
1,2-Dichloroethane by EPA TO-15 & TO-14A
1,2-Dichloropropane by EPA TO-15 & TO-14A
Benzyl Chloride by EPA TO-15 & TO-14A
Bromoform by EPA TO-15
Bromomethane by EPA TO-15 & TO-14A
Carbon tetrachloride by EPA TO-15 & TO-14A
Chloroethane by EPA TO-15
Chloroform by EPA TO-15 & TO-14A
Chloromethane by EPA TO-15 & TO-14A
cis-1,2-Dichloroethene by EPA TO-15
cis-1,2-Dichloropropene by EPA TO-15 & TO-14A
Methylene chloride by EPA TO -15 & TO-14A
Tetrachloroethane by EPA TO-15 & TO-14A
trans-1,2-Dichloroethene by EPA TO-15
trans-1,2-Dichloropropene by EPA TO-15 & TO-14A
Trichloroethene by EPA TO-15 & TO-14A
Vinyl chloride by EPA TO -15 & TO-14A
2-Butanone by EPA TO-15
4-Methyl-2-Pentanone by EPA TO-15
Hexane by EPA TO-15
Methyl tert-butyl ether by EPA TO-15
Vinyl acetate by EPA TO-15
Dibromochloromethane by EPA TO-15
Dichlorodifluoromethane by EPA TO-15 & TO-14A
Trichlorofluoromethane by EPA TO-15 & TO-14A
Naphthalene by EPA TO-15 & TO-14A
m&p Xylenes by EPA TO-15
o-Xylene by EPA TO-15
1,3-Butadiene by EPA TO-15
1,1,2-Trichlorotrifluoroethane by EPA TO-15 & TO-14A
Carbon disulfide by EPA TO-15
1,4-Dioxane by EPA TO-15
Cyclohexane by EPA TO-15
tert-Butyl Alcohol by EPA TO-15
1,3-Dichlorobenzene by EPA TO-15 & TO-14A
Heptane by EPA TO-15
Bromodichloromethane by EPA TO-15 & TO-14A

This certification applies to samples analyzed in summa canisters.

Chain of Custody Record

H&P Mobile Geochemistry Inc.
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☐ 1855 Coronado Ave., Signal Hill, CA 90755 • ph 800.834.9888

Date: _____
H&P Project # TRC050412-10
Outside Lab: _____

Client: TRC
Address: 1540 Eisenhower Place, Ann Arbor MI 48108
Email: smetz@trcsolutions.com
Collector: Stacy Metz
Client Project # 187156.0001.0000 Ph 2
Location: Tecumseh MI
Phone: 734-971-7080 Fax: 734-971-9022
Page: 1 of 1
Project Contact: Stacy Metz
Turn around time: 1 Week

Geotracker EDF: Yes ☐ No ☒
Global ID: _____
Excel EDD: Yes ☒ No ☐ Custom

Sample Receipt
Intact: ☑ Yes ☐ No
Seal Intact: ☑ Yes ☐ No ☐ N/A
Cold: ☐ Yes ☐ No ☑ N/A
Temperature: NT

Special Instructions:
Short List - PCE; TCE; 1,1-DCE; cis-DCE; trans-DLE; vinylchloride; 1,1,1-TCA; 1,1-DCA; 1,2-DCA
Report Results in ppbv (1L RLs)
Lab WO#: E205020
TRC PO#
Lab Work Order # 43810
FedEx Track# 7983 5231 7041

Sample Name	Field Point Name	Purge Vol	Time	Date	Sample Type	Container Type	Total # of containers	8260B Full List	BTEX/OXY TPH gas	8260B	8015M TPH g d ext	418.1 TRPH	VOC's: Full List 8260B TO-15	VOC's: Short List/DTSC 8260B TO-15	VOC's: SAM, 8260B SAM A SAM B	Naphthalene 8260B TO-15	Oxygenates 8260B TO-15	TPHv gas 8260B TO-15	Ketones 8260B TO-15	Other 8260B TO-15	Leak Check Compound 1,1 DFA OTHER	Methane	Fixed Gases N2 O2 CO2	CAN#	VA<#
								SOIL/GW					SOIL VAPOR/AIR ANALYSIS												
SVE Exhaust	—	NA	905-910	5/2/12	Air	1L Summa	1						X											400	-1.2
DUP-01	—	↓	—	↓	↓	↓	1						X											444	-1.1

Relinquished by: (Signature)	(company)	Received by: (Signature)	(company)	Date: 5/2/12 Time: 1515
Relinquished by: (Signature)	(company)	Received by: (Signature)	(company)	Date: 5/4/12 Time: 1000
Relinquished by: (Signature)	(company)	Received by: (Signature)	(company)	Date: Time:

TRC | Fed Ex | H&P

*Signature constitutes authorization to proceed with analysis and acceptance of condition on back.

Sample disposal instruction: ☐ Disposal ☐ Return to client ☐ Pickup

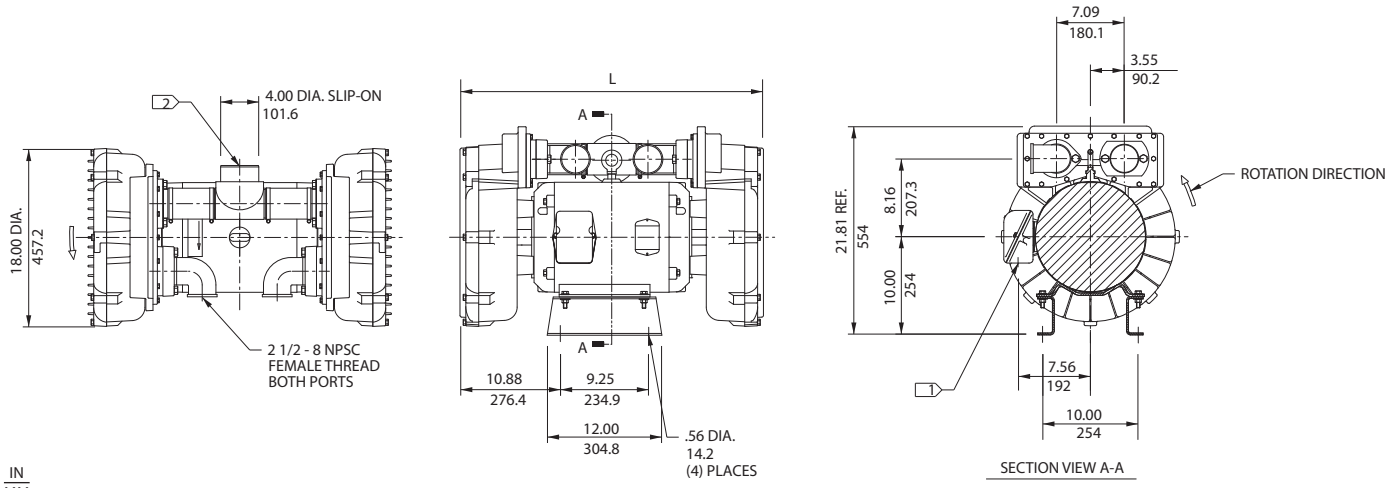
Appendix E
Permanent Full-Scale Blower Specifications

Industrial / Chemical Processing Blowers

ROTRON®

DR P9

15.0 / 20.0 HP Regenerative Blower



IN
MM

NOTES
1. TERMINAL BOX CONNECTOR HOLE 1.37 (34.8) DIA.
2. PRESSURE OUTLET CONNECTION.
2 DRAWING NOT TO SCALE, CONTACT FACTORY FOR SCALE CAD DRAWING.
3 CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

MODEL	L (IN/MM)
DRP9BM72C	31.75/806.5
DRP9BL72C	33.44/849.4

		Part/ Model Number					
		DRP9BM72C	DRP9BM72D	DRP9BM86C	DRP9BM86D	DRP9BL72C	DRP9BL72D
Specification	**Units**	**037033**	**036275**	**037040**	**036276**	**036512**	**036513**
Motor Enclosure - Shaft Mtl.	-	ODP-CS	ODP - CS	ODP-CS	ODP - CS	ODP-CS	ODP - CS
Horsepower	-	20	20	20	20	15	15
Voltage	AC	230/460	230/460	575	575	230/460	230/460
Phase - Frequency	-	Three-60 hz	Three - 60 hz	Three-60 hz	Three - 60 hz	Three-60 hz	Three - 60 hz
Insulation Class	-	F	F	F	F	F	F
NEMA Rated Motor Amps	Amps (A)	49/24.5	49/24.5	20	20	37/18.5	37/18.5
Service Factor	-	1.15	1.15	1.15	1.15	1.15	1.15
Max. Blower Amps	Amps (A)	60/30	60/30	22.2	22.2	50/25	50/25
Locked Rotor Amps	Amps (A)	306/153	306/153	115	115	256/128	256/128
NEMA Starter Size	-	3/2	3/2	2	2	2/2	2/2
Shipping Weight	Lbs	400	408	464	408	380	418
	Kg	181.4	185.1	210.5	185.1	172.4	189.6
Description	-	Pressure Mode	Suction Mode	Pressure Mode	Suction Mode	Pressure Mode	Suction Mode

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

Operating Temperatures - Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

Maximum Blower Amps - Corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

AMETEK TECHNICAL & INDUSTRIAL PRODUCTS
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Customer Service Fax: +1 215.256.1338
www.ametektip.com

AMETEK® TECHNICAL & INDUSTRIAL PRODUCTS

DR P9

ROTRON®

15.0 / 20.0 HP Regenerative Blower

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- CE compliant - Declaration of Conformity on file
- Maximum flow: 800 SCFM
- Maximum pressure: 116 IWG
- Maximum vacuum: 95 IWG
- Standard motor: 20 HP, ODP
- Cast aluminum blower housing, impeller & cover; cast iron flanges (threaded)
- UL & CSA approved motor with permanently sealed ball bearings
- Inlet & outlet internal muffling
- Quiet operation within OSHA standards when properly piped or muffled - 2 mufflers included

MOTOR OPTIONS

- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS

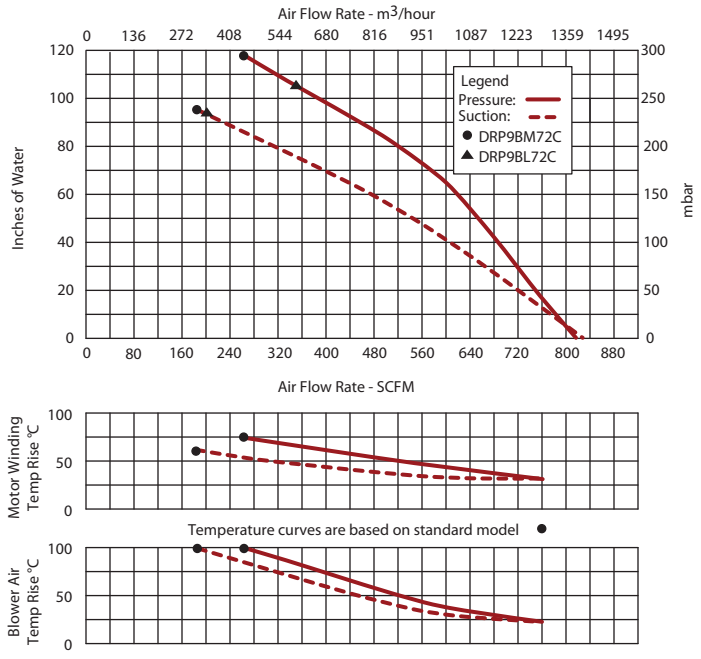
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES

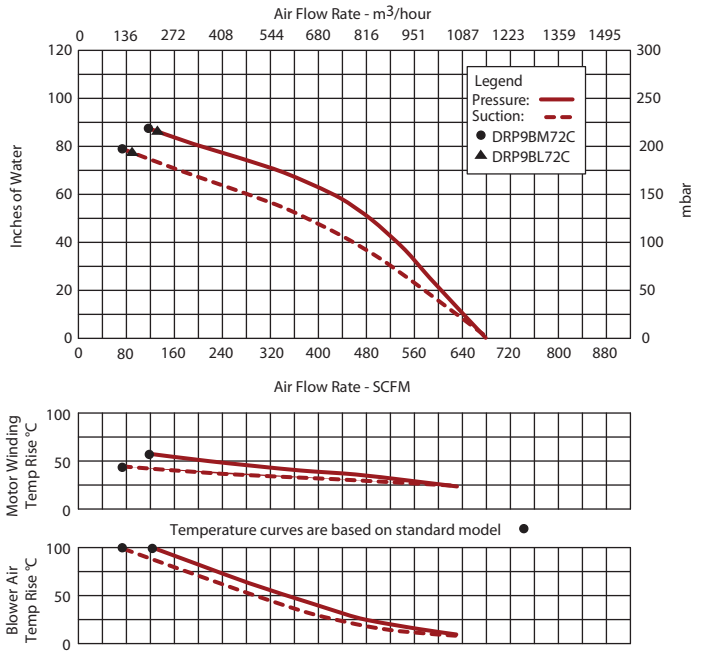
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

Blower Performance at Standard Conditions

60 Hz



50 Hz



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