INTERIM REMEDIAL MEASURE WORK PLAN FOR AIR SPARGING AND SOIL VAPOR EXTRACTION SYSTEM DESIGN AND INSTALLATION
NYSDEC SITE NO. V00171-3

Former Huck Manufacturing Facility, Kingston, New York

September 19, 2013

Professional Engineer Certification

I Kevin D. Sullivan certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this IRM Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

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Table of Contents

Figures

Appendices

1 Introduction

1.1 General

On behalf of Federal-Mogul Corporation, WSP has prepared this Interim Remedial Measure (IRM) Work Plan for the design and installation of an air sparging and soil vapor extraction (AS/SVE) system at the former Huck manufacturing facility (Site) in Kingston, New York (Figure 1). This document supersedes the Air Sparging and Soil Vapor Extraction System Design and Installation Work Plan, dated March 8, 2011, and the *Interim Remedial Measure Work Plan for Air Sparging and Soil Vapor Extraction System Design and Installation*, dated December 19, 2012. It incorporates WSP's November 14, 2011, responses to comments received from the New York State Department of Environmental Conservation (NYSDEC) in a letter, dated June 6, 2011, and in subsequent emails and telephone conversations. In addition, the system design has been modified based on the results of the November 2011 site-wide groundwater sampling event, which were presented to the NYSDEC in a letter, dated June 1, 2012.

The proposed system design is based on the results of the AS/SVE pilot test performed in the Former Degreaser Area, which are summarized in the AS/SVE Pilot Test Report, dated July 30, 2010. The purpose of the proposed system is to reduce VOC mass in groundwater in two areas of the site that exhibit the highest aqueous VOC concentrations, while addressing VOCs that may be present in vadose zone soils within these areas. Furthermore, the SVE portion of the system will create a negative pressure below the building slab within the treatment areas, which will mitigate the potential for vapor intrusion. One area with the highest VOC concentrations in groundwater is located in the Former Degreaser Area and is designated Area 1. The second area with the highest VOC concentrations in groundwater is located in the Former Metal Finish and Chemical Storage Area and is designated Area 2. Refer to Figure 2 for the locations of Areas 1 and 2 at the Site. Figure 3 illustrates the total VOC concentrations in groundwater onsite and offsite and highlights the elevated concentrations in Areas 1 and 2. Figure 4 illustrates the limits of Areas 1 and 2, which will be targeted for groundwater treatment.

In addition to the Former Degreaser Area and Former Metal Finish and Chemical Storage Area (Areas 1 and 2), WSP proposes to extend the AS/SVE system into four additional areas of the site where VOCs are present in soil at concentrations above the Restricted Use Soil Cleanup Objectives for Protection of Groundwater (SCOs) presented in Title 6, New York Code of Rules and Regulations (NYCRR) Part 375-6.8 (b). These areas are illustrated on Figure 2 and listed below:

- Area 3 – the Former 10,000-Gallon Fuel Oil Underground Storage Tank Area
- Area 4 – the southern portion of the Suspected Disposal Area
- Area 5 – the northern portion of the Suspected Disposal Area
- Area 6 – the Southern Parking Lot Area

The estimated horizontal extent of affected soil in Areas 3, 4, and 5 is illustrated in Figure 5. The estimated horizontal extent of affected soil in Area 6 is illustrated in Figure 6. In Areas 3 and 4, where elevated VOC concentrations are present in soil near, or below, the groundwater surface, the proposed system includes the installation of AS wells to address VOCs that may be present in groundwater in these areas.

In addition to the areas listed above, two localized areas of VOC-affected soil are present in the vicinity of the Former Metal Finish and Chemical Storage Area (Area 2) at soil borings SB-1 and SB-14 (Figure 7). These areas of affected soil are typically located several feet below the groundwater table and information collected to date demonstrates that VOCs in groundwater below the Former Metal Finish and Chemical Storage Area are attenuating naturally; presumably in the form of biodegradation (WSP 2007; WSP Engineering 2009). This conclusion is further supported by the results of the November 2011 groundwater sampling event, which showed a further reduction in VOC concentrations in this area (WSP Engineering, 2012). Therefore, these areas of affected soil do not appear to represent continuing sources of VOCs to groundwater and will not be targeted by the proposed system. Affected soil in these areas will continue to be addressed by the ongoing biodegradation as VOCs partition from the soil into groundwater.

The remaining area of affected soil at the site, Area 7, is currently being addressed by another remedy. As illustrated in Figure 7, Area 7 consists of VOCs in shallow soil in the parking lot east of the main manufacturing building. In March 2004, a SVE system was installed primarily along the eastern and southern property lines as an IRM to address elevated VOC concentrations within Area 7 from 1 to 3 feet below ground surface (bgs) and to prevent the offsite migration of VOCs in soil gas (ESC Engineering 2004). The SVE system operated continuously until June 2008, when WSP began pulsing the system with approval from the NYSDEC. Treatment of soils in the eastern parking lot is ongoing.

1.2 Plan Organization

The remainder of this work plan consists of five sections: Section 2.0 presents a summary of investigation results for VOCs in soil and groundwater; Section 3.0 discusses the design criteria for the AS/SVE system and outlines the key elements of the AS/SVE system installation; Section 4.0 presents the requirements for system startup, operation, maintenance and monitoring; Section 5.0 addresses health and safety and air monitoring requirements during system installation; and Section 6.0 provides the proposed schedule for system installation and startup.

2 Investigation Summary for VOCs

This section presents a brief summary of the VOC results for soil and groundwater in areas of the site that will be addressed by the proposed AS/SVE system. Detailed results of site investigation activities conducted by WSP and others from 1993 to 2008 are provided in the Final Site Investigation Report, dated December 14, 2007, and the Combined Additional Pre-Design Investigation Report, Remedial Action Selection Report, and AS/SVE Pilot Test Work Plan, dated December 7, 2009. In addition, the results from the November 2011 site-wide groundwater sampling event are presented in a letter to the NYSDEC, dated June 1, 2012.

2.1 Summary of VOCs in Onsite Soil

From 2002 to 2008, WSP collected soil samples from approximately 140 soil borings to delineate the horizontal and vertical extent of VOCs in soil. The primary VOCs detected in soil were trichloroethene (TCE), tetrachloroethene (PCE), and cis-1,2-dichloroethene (cis-1,2-DCE). Based on the results of the soil investigations, VOCs were detected at several locations in shallow and deeper soils at concentrations above the SCOs. The proposed AS/SVE system will address soils containing VOCs in the following areas of the site: Former Degreaser Area (Area 1), Former 10,000-Gallon Fuel Oil Underground Storage Tank Area (Area 3), the southern portion of the Suspected Disposal Area (Area 4), the northern portion of the Suspected Disposal Area (Area 5), and the Southern Parking Lot Area (Area 6; Figures 5 and 6). As mentioned above, Area 7 is undergoing treatment by an existing SVE system.

Area 1 (Figure 6) contains soils with elevated VOC concentrations that are normally well-below the water table (WSP 2007). A sample collected from SB-33 at 17.5 to 19.5 feet bgs contained 93,000 micrograms per kilogram (µg/kg) of PCE, 65,000 µg/kg of TCE, and 2,000 µg/kg of cis-1,2-DCE. These soils are located within the boundaries of the area targeted for treatment below the Former Degreaser Area and will be addressed by the AS and SVE wells proposed for this location.

Areas 3 and 4 (Figure 5) contain both shallow and deeper soils with VOCs above the SCOs. Area 3 contained elevated levels of acetone (260 µg/kg), methylene chloride (MC; 130 µg/kg) and TCE (3,900 µg/kg) in shallow soils at location SB-45. Elevated levels of acetone (210 µg/kg) and MC (250 µg/kg) were also detected at this location at 6 to 8 feet bgs. MC (110 µg/kg) was also detected in SB-44 at a depth of 15.5 to 17.5 feet bgs. Surface soil samples (1 to 3 feet bgs) from Area 4 contained cis-1,2-DCE at concentrations from 400 to 1,200,000 µg/kg, trans-1,2-DCE at concentrations from 400 to 130,000 µg/kg, TCE at concentrations from 76,000 to 130,000 µg/kg, and PCE at concentrations from 1,300 to 3,900 µg/kg. A subsurface sample collected from 6 to 8 feet bgs at SB-131 contained elevated levels of the following VOCs: cis-1,2-DCE (730,000 µg/kg), trans-1,2-DCE (4,300 µg/kg); MC (140 µg/kg); TCE (4,400 µg/kg); vinyl chloride (380 µg/kg); toluene (800 µg/kg), and xylenes (2,000 µg/kg). Also, a subsurface soil sample collected from 15 to 17 feet bgs at SB-27 contained elevated levels of MC (850 µg/kg), toluene (5,200 µg/kg), ethylbenzene (1,100 µg/kg), TCE (720 µg/kg), and xylenes (11,600 µg/kg). The presence of VOCs in both vadose and saturated zone soils suggests that VOCs may be present in groundwater in these areas. Therefore, WSP is proposing to install AS and SVE wells in Areas 3 and 4.

Area 5 (Figure 5) is characterized by elevated concentrations of PCE (140,000 µg/kg), TCE (170,000 µg/kg), cis-1,2-DCE (260,000 µg/kg), and trans-1,2-DCE (9,000 µg/kg) detected in surface soil sample SS-12. Similarly, Area 6 (Figure 6) is characterized by elevated concentrations of PCE (6,800 µg/kg) and TCE (95,000 µg/kg) detected at surface soil sample location SS-1. Since these constituents were detected within the 1 to 3 foot depth interval only, it is unlikely that groundwater quality has been affected in these areas. Therefore, the proposed system includes only the installation of SVE wells in these areas.

2.2 Summary of VOCs in Groundwater

Based on groundwater investigations performed from 2002 through 2011, the highest VOC concentrations in groundwater at the site are present in two well-defined areas: Former Degreaser Area (Area 1) and the Former

Metal Finish and Chemical Storage Area (Area 2). Figure 8 illustrates the results from the groundwater sampling event conducted in November 2011. The results indicate that groundwater samples from wells MW-14 and MW-15 in the Former Degreaser Area and wells MW-4, MW-16, and MW-17 in the Former Metal Finish and Chemical Storage Area contained cis-1,2-DCE, PCE, and TCE at concentrations above the evaluation criteria. The maximum VOC concentrations in the Former Degreaser Area were detected in MW-14. Groundwater samples from this well contained 5,900 micrograms per liter (μg/l) of TCE, 877 μg/l of PCE, and 953 μg/l of cis-1,2-DCE. The maximum concentrations of these compounds detected in the Former Metal Finish and Chemical Storage Area were 86 μg/l of TCE at MW-17, 6.9 μg/l of PCE in MW-17, and 2,630 μg/l of 1,2-DCE at MW-16. In addition, vinyl chloride was detected in a groundwater sample from MW-9 at a concentration above the evaluation criterion. The ambient water quality standard (class GA groundwater) for cis-1,2-DCE, PCE, and TCE is 5 μg/l. The ambient water quality standard for vinyl chloride is 2 μg/l. An isoconcentration map of total VOCs in groundwater, based on the November 2011 sampling event, is presented in Figure 3.

During the 2004 pre-design investigations, in situ groundwater samples were collected at three separate depth intervals within the two areas exhibiting the highest VOC concentrations to evaluate the vertical extent of VOCs in groundwater (WSP 2007). The results of this vertical profiling were detailed in the Final Site investigation and Pre-Design Report (WSP Environmental Strategies, 2007). In summary, the results indicated that VOCs at concentrations above the evaluation criteria were restricted primarily to the upper 10 feet of the saturated zone.

3 Full-Scale Air Sparging and Soil Vapor Extraction System Design and Installation

3.1 Design Considerations

3.1.1 Design Criteria

This section describes the design for the proposed AS/SVE system to be installed at the Site. The proposed system consists of an AS component designed to target VOC-affected groundwater and a SVE component designed to remove VOCs from the vadose zone, as well as VOCs released from the groundwater due to the AS component operation. The AS/SVE design is based largely on the results of the pilot test that was conducted at the Site by WSP between March 14 and March 21, 2010. The AS/SVE pilot test report was submitted to NYSDEC on July 23, 2010 (WSP Engineering 2010). The two key pilot test results that were used to design the full-scale system were:

- The maximum effective radius of influence (ROI) for the SVE well was found to be 28 feet, using a design SVE flow rate of approximately 157 standard cubic feet per minute (scfm), a vacuum of approximately 46 inches water column (WC), and a SVE well depth of 11 feet bgs and screen length of 8 feet.
- The maximum effective ROI for the AS well was found to be approximately 20 feet, using a design air injection rate of 12 to 13 scfm, a pressure of 4.2 to 4.8 pounds per square inch (psi), and an AS well depth of 29 feet bgs and a screen length of 4 feet.

3.1.2 SVE System Layout

The layout of the SVE System in Area 1 is designed to complement the AS System in the area. That is, the pattern of SVE wells is arranged to encompass the estimated ROI of each of the AS wells. The resulting layout includes a total of four SVE wells (SV-1 to SV-4) within Area 1 at an approximate spacing of 40 feet. Based on this spacing, and considering the 28-foot ROI estimated from the pilot test (WSP Engineering 2010), WSP has arranged the SVE wells to maximize the SVE well coverage and provide sufficient ROI overlap. Figures 4, 5, 6, and 7 provide the layout and the ROI of the SVE wells in Areas 1 through 6. Based on the same design considerations, two SVE wells will be installed in Area 4 (SV-7, SV-8) and Area 5 (SV-9, SV-10). One SVE well will be installed in Area 2 (SV-11), Area 3 (SV-6), and Area 6 (SV-5).

The extracted vapor stream will be treated with an existing 2,000-pound vapor phase granular activated carbon (GAC) unit prior to discharge to the atmosphere through the existing SVE system discharge stack.

Vapor phase GAC was selected as the most appropriate control technology based on the VOC concentrations detected at the Site during the AS/SVE pilot test and successful use of this treatment technology with the existing SVE trench system. The GAC unit to be used was originally installed to treat extracted vapor from Line 3 of the existing trench SVE system (Area 7) at a designed vapor flow rate of approximately 760 scfm and an estimated maximum VOC concentration of 60 parts per million by volume (ppmv). As discussed in WSP's response to comment letter, dated November 14, 2011, the GAC unit servicing Line 3 was used for 240 days between the last carbon change-out on October 5, 2004, and the bypassing of the carbon unit on June 2, 2005. A letter requesting to bypass the GAC units was submitted to the NYSDEC on May 31, 2005, and the request was verbally approved by the NYSDEC on May 31, 2005. Based on the influent analytical data collected from Line 3 on December 15, 2004, a carbon consumption rate of 0.30 pounds per day was calculated using the Polanyi Adsorption Theory (using a total influent concentration of 0.14 parts per million by volume at 700 standard cubic feet per minute). The estimated carbon usage between December 2004 and June 2005 is 72 pounds, which indicates a remaining sorptive capacity of 1928 pounds. As requested by the NYSDEC in an email, dated April 24, 2013, the GAC units will no longer be bypassed during future monthly pulse events.

During the three days of AS/SVE pilot test activities, VOC concentrations from the SVE pilot test well, SV 1, dropped from a maximum concentration of approximately 15 ppmv down to 8 ppmv (or from approximately 100 mg/m3 to 53 mg/m3, conservatively assuming the entire VOC mass is PCE). Based on these data points, and the estimated average combined air flow rate (600 scfm: 6 wells at 100 scfm each), WSP anticipates that the mass loading from the proposed AS/SVE system will be less than 3 pounds per day. It should be noted that this estimate assumes that all SVE wells will have a concentration similar to SV-1, which is in an area with the highest VOC concentrations in groundwater at the Site. Using these data points further, WSP estimates that a conservative future carbon consumption rate, with all of the existing and proposed systems in operation (again, conservatively assuming the entire VOC mass is PCE), of approximately 2,000 pounds in 233 days. As discussed in Section 3.2.5, WSP intends to “cycle” the SVE wells in two groups.

The PID measurements and analytical samples collected from the system influent and effluent during system startup and subsequent operation and maintenance (O&M) visits (as described below in Sections 4.1 and 4.2) will provide the necessary data to closely track remaining sorptive capacity of the GAC and ensure that the substantive requirements of DAR-1 are being met. Based on these data, WSP will establish a conservative schedule for GAC replacement that will ensure breakthrough does not occur. As evidenced by the observed decrease in VOC concentrations during the 3-day pilot test, the rate of GAC usage by the full-scale system will decrease over time and, thus, the replacement schedule will be adjusted accordingly.

3.1.3 AS System Layout

The AS well layout for the Former Degreaser Area (Area 1) is designed to address the highest concentrations of VOCs in groundwater in this area. In Area 1, the AS design involves the operation of 5 AS wells (AS-1 through AS-5). The AS wells will be spaced approximately 30 feet apart, which will provide a conservative overlap between sparge wells based on the 20-foot ROI. Figures 4, 5, and 7 provide the layout and the ROI of the AS wells in Areas 1, 2, 3, and 4.

The area of highest VOC concentrations in groundwater in the Former Metal Finish and Chemical Area (Area 2) will be addressed with a single AS well (AS-8). A single AS well will also be operated in Areas 3 (AS-6) and 4 (AS-7) to address the potential presence of VOCs in groundwater. The design air injection rate is anticipated to be 12 scfm at an applied pressure of approximately 4.2 psi. As discussed above, the remainder of the areas will be treated solely using SVE.

3.2 Full-Scale Air Sparging and Soil Vapor Extraction System Installation

3.2.1 Proposed Onsite System Configuration and Equipment

This section describes WSP’s process design and mechanical components for the AS and SVE systems. Detailed depiction of the system’s design and configuration is provided in the drawing package included in Appendix A. The following drawings comprise the drawing package:

- Drawing Sheet 1 – Title Sheet
- Drawing Sheet 2 – System Layout
- Drawing Sheet 3 – Process and Instrumentation Diagram
- Drawing Sheet 4 – Well Locations and Piping Routes – Cycle Group 1
- Drawing Sheet 5 – Well Locations and Piping Routes – Cycle Group 2

- Drawing Sheet 6 – Soil Vapor Extraction and Air Sparging Equipment Layout And Manifold Connection Details
- Drawing Sheet 7 – Soil Vapor Extraction and Air Sparging Manifold Details
- Drawing Sheet 8 – Air Sparging Wellhead Completion Details
- Drawing Sheet 9 – Soil Vapor Extraction Wellhead Completion and Pipe Hanger Details

The system will use SVE and AS well networks, air moving equipment, overhead and underground piping for vapor/air transfer, and existing vapor extraction and treatment equipment. The well configuration of the proposed system is shown on Appendix A, Sheet 2. The air moving and treatment equipment will be housed in the existing SVE equipment room on the east side of the facility (Appendix A, Sheets 2, 4, 5, and 6). Approximate routes for air/vapor transfer piping are provided on Appendix A, Sheets 4, 5, and 6. Design details for the wells, transfer piping, air moving equipment, and the treatment equipment are described in the following sections. A process and instrumentation diagram of the system is provided on Appendix A, Sheet 3.

3.2.2 Soil Vapor Extraction Wells

To induce vapor flow across the vadose zone, the SVE wells will be installed to an approximate depth of 11 feet bgs (approximately 1 to 2 feet above the seasonal high water table elevation, as determined from groundwater elevations collected between November 2004 and November 2011) with 8 feet of well screen. Existing pilot test well SV-1 will be used as an extraction well (Appendix A, Sheet 2) and will be renamed SV-3. The vacuum is anticipated to propagate from the well screen to the ground surface, pulling air through shallow soil affected by VOCs, if present. To ensure short-circuiting does not occur at the wellhead or along the AS or SVE pipe bedding material, WSP will use flowable fill in place of highly permeable backfill at each wellhead and along all trenches in close proximity to a SVE well. WSP may elect to install the piping without bedding material if the native fill does not contain large aggregate.

Consistent with the pilot test, each extraction well screen and casing will be 2 inches in diameter and installed with a portable direct-push drill rig (Geoprobe® 540MT, or similar). Each well will be comprised of Schedule 80 black iron pipe well riser and stainless steel well screen, or similar. Because the proposed SVE well locations outside the facility are accessible with a truck-mounted drilling rig, WSP may elect to install Schedule 40 polyvinyl chloride (PVC) wells using hollow-stem auger drilling methods. Construction details for the extraction wells are provided on Appendix A, Sheet 9.

3.2.3 Air Sparging Wells

The AS wells will be installed to an approximate depth of 29 feet bgs (5 feet below the estimated vertical extent of the affected groundwater) with four feet of well screen. The AS wells will be 2-inch diameter and installed with a portable direct-push drill rig (Geoprobe® 540MT, or similar). Each well will be comprised of Schedule 80 black iron pipe well riser and stainless steel well screen, or similar. Because the proposed AS well locations outside the facility are accessible with a truck-mounted drilling rig, WSP may elect to install Schedule 40 PVC wells outside the facility using hollow-stem auger drilling methods. Construction details for the AS wells are provided on Appendix A, Sheet 8. Existing pilot test well AS-1 will be renamed ASP-1 and will not be used in the full-scale AS/SVE system.

3.2.4 Monitoring Points

WSP will install five vacuum monitoring points, in addition to the existing four monitoring points installed during the pilot test activities, to monitor subsurface vacuum during operation of the AS/SVE system. The proposed monitoring points are designated MP-5 through MP-9 on Appendix A, Sheet 2. The monitoring points will be used solely to monitor vacuum in the vadose zone; therefore, MP 5 through MP-9 will be installed with the same construction as the SVE wells.

3.2.5 Soil Vapor Extraction Equipment

WSP will use the existing SVE equipment at the Site to operate the full-scale system. The existing SVE system consists of three horizontal extraction lines that extend approximately 810 feet along a portion of the main building (Line 1), Grand Street (Lines 2 and 3), and the southern property boundary (Line 3; ESC Engineering 2004). The lines are served by two blowers located in the SVE equipment room: a 25-horsepower (hp) unit that is connected to Lines 1 and 2 (referred to as Zone 1); and a 40-hp unit that is connected to Line 3 (referred to as Zone 2). Vacuum-induced vapor flow will be produced by the existing 40 horsepower, positive displacement Roots® RAI Series Model 615 blower capable of approximately 900 scfm at 9 inches Hg vacuum. The blower is powered by the existing 480-volt, 3-phase electrical service provided inside the SVE equipment room. The existing SVE system is equipped with an air inlet filter and a 120-gallon vapor liquid separator (VLS) with a float switch-operated discharge pump. Condensate in the extracted vapor will be removed and collected in the VLS. Liquid collected in the VLS will be pumped to the existing 400-gallon poly tank and then containerized for proper offsite disposal. An in-line filter located before the VLS will collect particulates from the extracted vapor. After the condensate and particulates are removed, the vapor stream will pass through a 2,000-pound GAC unit, where VOCs will be removed from the extracted vapor.

A new 6-inch, Schedule 40 PVC tee will be installed within the existing 6-inch PVC system piping in the SVE equipment room, prior to the inlet filter, to create a permanent connection between the SVE blower and the SVE manifold for the AS/SVE system. The header pipe between the SVE blower and the SVE manifold will be equipped with a 6-inch butterfly valve that can be closed to enable pulsing of Zone 2 (Line 3) of the existing SVE trench system. The header pipe will be routed through the west wall of the SVE equipment room into an adjacent storage locker. The SVE manifold will be housed within the storage locker and a series of branches and isolation valves will allow for the control of vacuum levels and vapor flow for each SVE well (Appendix A, Sheet 7).

During operation of the existing Area 7 SVE trench system, WSP has found that in order to optimize VOC removal efficiency, the system should be operated using a pulsing or cyclical mode of operation. Specifically, WSP found that the highest concentrations of VOC were removed during the first 20 minutes of SVE operation, followed by a sharp decline and asymptotic long term removal. Based on these observations, WSP is proposing to use cyclical operation of the SVE well network using one group of five SVE wells and one group of six SVE wells. Cycle Group 1 will address Areas 1 and 6; Cycle Group 2 will address Areas 2, 3, 4, and 5. During operation of each SVE well cycle group, only the corresponding AS wells will be operated. The SVE cycle groups are displayed on Appendix A, Sheets 4 and 5. Cycling of grouped SVE wells will be achieved manually using ball valves at the SVE piping manifold, to be housed within the storage locker adjacent to the SVE equipment room. Cycling between the two SVE groups and two AS groups will be performed manually during each O&M visit by WSP's O&M contractor. O&M visits will be performed bi-weekly for the first 2 months of operation and monthly thereafter.

The 40 horsepower blower will continue to be used to apply a vacuum to Zone 2 (Line 3) and the 25-hp blower will continue to be used to apply a vacuum to Zone 1 (Lines 1 and 2) on a monthly basis, in accordance with the established pulse frequency for the existing SVE trench system. However, as discussed above in Section 3.1.2, the NYSDEC has requested that the vapor extracted during the monthly pulse events be treated with GAC before discharge to the atmosphere. For each pulse event, the AS portion of the system will be shut down and the piping associated with the SVE portion of the system will be valved to apply a vacuum to Zone 2 for the established pulse duration. At the conclusion of each pulse event, the SVE piping associated with the 40-horsepower blower will be re-valved to apply vacuum to the AS/SVE system and the AS portion of the system will be turned on. Because Zone 2 of the SVE trench system will continue to be pulsed on a monthly basis, operation of the AS/SVE system will not adversely affect indoor air quality on the adjacent properties.

3.2.6 Air Sparging Equipment

The onsite AS equipment will consist of an air compressor, which will be pre-manufactured on a skid to be housed within the northern portion of the existing SVE equipment room (Appendix A, Sheet 6). The compressor will be sized to generate at least 70 scfm at 6 psi to allow for the operation of up to five AS wells simultaneously. Again, as discussed in Section 3.2.5, the AS wells will be cycled in two cycle groups. Cycle Group 1 will include five AS wells (AS-1 through AS-5) and Cycle Group 2 will include AS-6, AS-7 and AS-8. To eliminate the potential for vapor intrusion to indoor air, WSP will not operate any of the AS wells inside or outside the facility without operating the corresponding SVE cycle group. In addition, the process logic controller inside the control panel of the new AS/SVE system will be equipped with the logic to interlock the operation of the AS and SVE system. Therefore, if the SVE system shuts down, the AS portion of the system will automatically shut down.

Cycling of grouped AS wells will be achieved manually using ball valves at the AS manifold, to be installed within the same storage locker as the SVE manifold (Appendix A, Sheet 6). The cycle groups of AS wells are displayed on Sheets 4 (Cycle Group 1) and 5 (Cycle Group 2) of Appendix A. The 3-inch Schedule 40 steel AS header pipe will be routed from the AS manifold to the air compressor, which will be housed in the northern portion of the SVE equipment room. To prevent excessive buildup of condensate in the AS piping network, a self-activating condensate drain valve will be installed on the 3-inch AS header piping (Appendix A, Sheet 7).

3.2.7 Equipment Area

The air-moving and treatment equipment is housed on the east side of the facility in the SVE equipment room (Appendix A, Sheet 6). The AS and SVE piping manifolds will be secured to the facility roof support structure, the concrete floor, and the storage locker wall.

3.2.8 Transfer Pipe Network

Transfer of vapor from the SVE wells and transfer of air to the AS wells will require a transfer piping network dedicated to each system component. WSP configured the transfer piping network to conform to site conditions and space constraints. Proposed piping routes for the AS and SVE systems are depicted on Appendix A, Sheets 4 and 5. The SVE transfer piping will consist of 4-inch-diameter Schedule 40 PVC piping dedicated to each SVE well (SV-1 through SV-11). The SVE transfer piping will connect to the SVE manifold, which will consist of dedicated 4-inch-diameter PVC legs connected to a 6 inch PVC header (Appendix A, Sheet 7). Balancing of vapor flow to the SVE wells will be accomplished using butterfly valves. Vapor flow will be measured using instrumentation mounted on the SVE manifold piping, including a differential pressure flow sensor equipped with a differential pressure gauge, a vacuum gauge, and a temperature gauge.

SVE transfer piping located inside the facility will be routed to the nearest storage locker or facility wall, and trenched from the storage locker or facility wall to the respective SVE well (Appendix A, Sheet 9). SVE piping routed outside to Areas 3, 4, 5, and 6 will transition from above ground piping to below grade piping immediately after exiting the facility (Appendix A, Sheet 9). Buried SVE piping will be trenched to a depth of approximately 16 inches below grade and piping within the building will be hung from the facility roof trusses (Appendix A, Sheet 9). Underground SVE piping runs will be sloped toward the respective SVE well to promote condensate drainage back into the well and prevent freezing. In addition, to prevent excessive condensate accumulation in indoor or outdoor transfer pipes, the piping runs will be installed to ensure that the maximum allowable elevation “dip” is less than the associated pipe diameter. SVE wellhead piping details are provided on Appendix A, Sheet 9.

The AS piping network inside the facility will consist of 1.5-inch-diameter schedule 80 PVC piping dedicated to each well. AS transfer piping located inside the facility will be hung from roof trusses, routed to the nearest storage locker or facility wall, and trenched from the storage locker or facility wall to the respective AS well (see detail, Appendix A, Sheet 8). AS piping routed outside to Areas 3 and 4 will transition to 1.5-inch diameter Duraplus™ Airline after exiting the building and will transition back to 1.5 inch diameter Schedule 80 PVC before connection to the AS wellhead (Appendix A, Sheet 8). Duraplus™ Airline was selected to minimize the chance of pipe breakage if excessive condensation buildup occurs during a period of extreme cold. Underground AS piping runs will be sloped toward the respective AS well to promote condensate drainage back into the well. In addition, to prevent excessive condensate accumulation in indoor or outdoor transfer pipes, the piping runs will be installed to ensure that the maximum allowable elevation “dip” is less than the associated pipe diameter. Transfer piping located outside the facility will be trenched underground to an approximate depth of 16 inches (see detail, Appendix A, Sheet 8). Balancing of compressed air flow to the AS wells will be accomplished using butterfly valves. Air flow will be measured using instrumentation mounted on the manifold piping, including a pressure gauge, temperature gauge, and a differential pressure flow sensor equipped with a portable differential pressure gauge. AS manifold details and wellhead piping are provided on Appendix A, Sheets 7 and 8, respectively.

3.2.9 Electrical Service

The 480-volt/3-phase electrical power service required to operate the system will be provided by existing service inside the SVE equipment room. The electrical feed to the system is fitted with a separate dedicated meter to track electricity consumption for the system. The electrical service is also equipped with a primary shutoff switch.

3.2.10 Programmable Logic Control

The AS/SVE system equipment will be controlled using a computerized programmable logic control (PLC) system centralized in a master control panel. The existing master control panel inside the SVE equipment room will be upgraded or replaced. The PLC will be equipped with the logic to interlock the operation of the AS and SVE system. Therefore, irrespective of specific alarm conditions programmed into the PLC (see below), the AS portion of the system will automatically shut down if the SVE system shuts down for any reason.

Alarm conditions will be incorporated into the system and controlled by the PLC. Three alarms, at a minimum, will exist within the system that will trigger the immediate shutdown of the entire system. A liquid switch high (LSH) in the VLS will be activated to shut down the system in the event that a VLS tank fills with condensate water. A temperature switch high (TSH), located on the discharge stack inside the equipment room, will protect the SVE blower from overheating. The AS header piping exiting the AS compressor skid will be equipped with a pressure switch high (PSH) to safeguard against damage to air transfer piping, due to excessive line pressure, caused by malfunction of the system equipment.

3.2.10.1 Remote Monitoring

The system will be equipped with a wireless remote monitoring package using an internet connection. The remote capabilities include starting and stopping the system and monitoring system component operation and logs of shutdown conditions. Other system functions, such as manipulating control and isolation valves for AS/SVE cycling, may also be automated in the future, if remote operation is determined to be more economical.

3.2.11 Waste Management

Waste generated during installation of the AS/SVE wells and system, including, but not limited to, concrete debris, soil, purge water, and decontamination rinsate, will be placed in Department of Transportation-approved 55-gallon steel drums (or other appropriate approved waste containers) and staged onsite for later offsite disposal. WSP will arrange for transportation and disposal of the waste in accordance with all federal and state requirements.

4 System Startup and Operations and Maintenance Activities

Startup of the AS/SVE system will be completed as soon as the AS/SVE system installation is complete. The AS/SVE startup will follow procedures outlined in Section 4.1. After all tasks are complete, the system will be considered operational and WSP or its subcontractor will conduct O&M site visits on a periodic basis to ensure optimal operation of the AS/SVE system. The periodic O&M activities to be performed are described in detail below.

4.1 System Startup

Before startup of the system, groundwater samples will be collected from monitoring wells MW-1 through MW-18 to serve as a baseline (along with the November 2011 results) for comparison to subsequent groundwater sample results collected under the groundwater performance monitoring program described in Section 4.4. WSP initiated a quarterly groundwater sampling program in December 2012. Depending on the timing of the AS/SVE system installation, additional baseline data may be collected.

During start-up, the AS compressor and SVE blower will be energized and set at minimum operating levels to verify that the equipment is functioning in accordance with the design and manufacturer's specifications. The SVE system will be periodically checked for leaks and inspected to ensure proper performance as the vacuum levels are increased incrementally. Once the system is operating at or close to the expected operating specifications, air flow, vacuum, and temperature for each well will be monitored at the SVE manifold. The air flow to SVE Cycle Group 1 and Cycle Group 2 will be balanced (equal air flow from each well in each Cycle Group) independently during the initial startup.

After both SVE cycle groups are balanced, the AS startup will be initiated. The AS system will be periodically checked for leaks and inspected to ensure proper performance as the pressure levels are increased incrementally. During the startup, the pressure, temperature, and flow for each well will be monitored at the AS manifold. Following the balancing of both the AS and SVE cycle groups, Cycle Group 1 will be put into operation. Separate startups will be completed for Cycle Groups 1 and 2. The startup for each cycle group will include, at a minimum, the procedures outlined below and will last a minimum of 24 hours.

The initial mass removal rates will be monitored during the start-up sequence at the influent and effluent of the SVE system and at the SVE manifold using a photoionization detector (PID). The measurements will be collected approximately every hour for the first 8 hours of operation and then periodically thereafter. Analytical samples will also be collected from each Cycle Group to verify the field PID readings, provide data on the baseline recovery of the system, and confirm that the substantive requirements of DAR-1 are being met. The analytical samples will be collected from the inlet of the SVE system using an evacuated 1-liter Entech Instruments, Inc. (Entech), sample canister (or equivalent) at intervals of approximately 2, 4, 8, and 24 hours after the system has reached the projected operating specifications. Analytical samples will also be collected from the effluent of the SVE system at the start and end of each Cycle Group startup. The samples will be shipped to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified laboratory for analysis of TCE, PCE, and cis-1,2-DCE by U.S. Environmental Protection Agency (EPA) Method TO-15.

4.2 Vapor Treatment Monitoring

During each O&M visit, PID measurements will be obtained from the cycle group that is operating on arrival to the site, and also from the cycle group put into operation during the site visit. For each cycle group, PID measurements will be collected from the influent to the carbon vessel and from each SVE well using the manifold sample ports. Concurrent analytical samples will also be periodically collected from the system influent (before the carbon vessel) and effluent (from the discharge stack) to evaluate the total mass removal rate, mass removed, and to verify the PID measurements. The analytical samples will be collected using 1 liter Entech canisters (or similar) and will be analyzed by a NYSDOH ELAP-certified laboratory for TCE, PCE, and cis-1,2-DCE using EPA Method TO-15. The PID measurements and analytical results from the system effluent will also be used to confirm that the substantive requirements of DAR-1 are being met. Each progress report will include an estimate of the remaining GAC sorptive capacity and the anticipated carbon change-out schedule. A conservative estimate of the carbon change-out schedule was provided earlier in this document as 2,000 pounds in 233 days. This estimate was prepared using the very conservative assumptions that all of the VOC mass is PCE (heaviest of the primary compounds at the Site) and that all of the SVE wells to be installed will generate the same VOC loading as SV-1 (pilot test well installed in the area of highest VOC concentrations). It is likely that the carbon change-out schedule will be longer than 233 days.

Analytical samples will be collected bi-weekly for the first 2 months of operation, quarterly for the remainder of the first year of operation, and semi-annually thereafter. The proposed schedule assumes continuous operation of the AS/SVE system. If the system becomes inoperable during a cycle that is scheduled for influent and effluent sampling, the collection of samples for that cycle group may be postponed until the next cycle if it is determined by WSP that VOC levels will not reach asymptotic levels by the end of the cycle. Any changes to the sampling schedule will be approved in advance by the NYSDEC.

4.3 AS/SVE System Performance Monitoring

WSP, or its O&M subcontractor, will collect and record AS and SVE system flow and pressure/vacuum measurements to confirm proper operation. Cycling between the two SVE groups and two AS groups will be performed during each O&M visit by WSP's O&M contractor. O&M visits will be performed bi-weekly for the first 2 months of operation and monthly thereafter. Tasks and measurements to be performed during O&M visits include, but are not limited to, the following:

- check for alarm conditions and verify proper operation of all equipment
- inspect all valve positions to verify none of the devices have been misadjusted or vary from their original position
- inspect filters and replace, as necessary
- check all visible and accessible aboveground transfer piping for leaks
- SVE manifold line differential pressure, temperature, vacuum, and VOC concentrations (using a PID)
- line vacuum upstream and downstream of GAC treatment units
- AS heat exchanger inlet line pressure and temperature
- AS heat exchanger outlet line pressure, temperature, and differential pressure
- AS primary manifold line temperature
- AS secondary manifold line pressure, temperature, and differential pressure
- check breakthrough pressure is maintained at operating AS wells, and adjust AS manifold valves, as necessary, to maintain positive air flow
- rebalance air flow for the AS and SVE wells, as necessary

4.4 Groundwater Performance Monitoring

Groundwater samples will be collected from monitoring wells MW-1 through MW-9 and MW-14 through MW-18 on a quarterly basis and from all monitoring wells on an annual basis to evaluate changes in dissolved VOC concentrations as a result of AS operation (Appendix A, Sheet 2). The groundwater samples will be analyzed for

VOCs by a NYSDOH ELAP- certified laboratory using EPA Method 8260B. While the AS/SVE system is operating, groundwater samples will be collected from all wells using passive diffusion bag (PDB) samplers to evaluate the progress of treatment and trends in the groundwater quality onsite and offsite. The thin layer of light non-aqueous phase liquid that is present in MW-14 will be removed (e.g., by bailing or with absorbent socks) before deploying and retrieving the PDBs. Alternatively, MW-14 may be sampled with low flow techniques, or by purging the well with a peristaltic pump and collecting the samples with a small-diameter bailer. If low flow sampling or a bailer is used, the system will be turned off for a period of time before the samples are collected (or the well may be sampled when Cycle group 1 is not operating). Based on the proposed system design presented in this document, monitoring wells MW-14 and MW-16 are within the ROI of the proposed AS wells. Therefore, groundwater samples collected from these wells with the system operating will not be representative of ambient groundwater conditions. However, the data from these wells will be useful for evaluating trends in groundwater quality within the treatment areas.

4.5 Subsurface Vacuum Monitoring

Subsurface vacuum/pressure measurements will be collected from the existing pilot test monitoring points (MP-1 through MP-4) and proposed monitoring points (MP-5 through MP-9; Appendix A, Sheet 2). The vacuum monitoring will be done on an as-needed basis during startup to ensure design criteria are being met and will continue on a quarterly basis to confirm subsurface vacuum influence.

5 Health and Safety

5.1 Site Health and Safety Plan

All work performed by WSP will be conducted in accordance with the project health and safety plan (HASP). This plan will apply to WSP site personnel only. WSP's subcontractors will be required to adhere to a separate HASP that is substantially consistent with WSP's HASP and is commensurate with the work and activities that will be completed by the subcontractor. The subcontractor's HASP will be submitted to WSP for review before initiating any field work.

WSP's HASP will be reviewed and signed by all onsite WSP personnel. Routine health and safety briefings will be held. Before beginning work each day, a health and safety tailgate meeting will be conducted by the onsite safety coordinator for the project team and subcontractor personnel.

5.2 Air Monitoring

During the performance of intrusive activities associated with installation of the AS/SVE system, such as AS and SVE well installation and trench excavation activities, air monitoring will be conducted for particulates and organic vapors in accordance with the Community Air Monitoring Plan (CAMP) provided in Appendix B. A PID (MiniRae 2000 by RAE Systems, or similar) equipped with a 10.6 eV lamp will detect VOCs at a level well-below the VOC action level specified in the CAMP and can be programmed to perform data logging. Continuous particulate monitoring will be performed using a MIE PDM-3 Miniram direct-sensing, real-time monitor or equivalent, with data logging capabilities. This device can detect airborne particulates at levels well-below the CAMP particulate action level. The PID and MIE PDM-3 will be placed at an approximate height of 4 feet above ground surface to be representative of the breathing zone.

6 Project Schedule and Reporting

WSP will begin soliciting proposals for the procurement of equipment for the AS/SVE system and the installation of AS/SVE wells and piping once written approval of this work plan is received from the NYSDEC. Drilling activities are anticipated to begin in September 2013 and take 2 to 3 weeks to complete. The AS/SVE system installation will begin once the well installation is complete. The AS/SVE System Construction Completion Report and the O&M Plan (containing procedures for both the AS/SVE system and reconfigured SVE system) will be submitted to the NYSDEC within 8 weeks of completing the system installation and start-up activities.

7 References

ESC Engineering of New York, P.C. 2004. Interim Remedial Measures Summary Report, Huck Manufacturing Facility, Kingston, New York. August 6.

WSP Engineering of New York, P.C. 2012. Summary of Groundwater Results, Former Huck Manufacturing Facility, Kingston, New York. June 1.

WSP Engineering of New York, P.C. 2010. Air Sparge and Soil Vapor Extraction Pilot Test Report, Former Huck Manufacturing Facility, Kingston, New York. July 30.

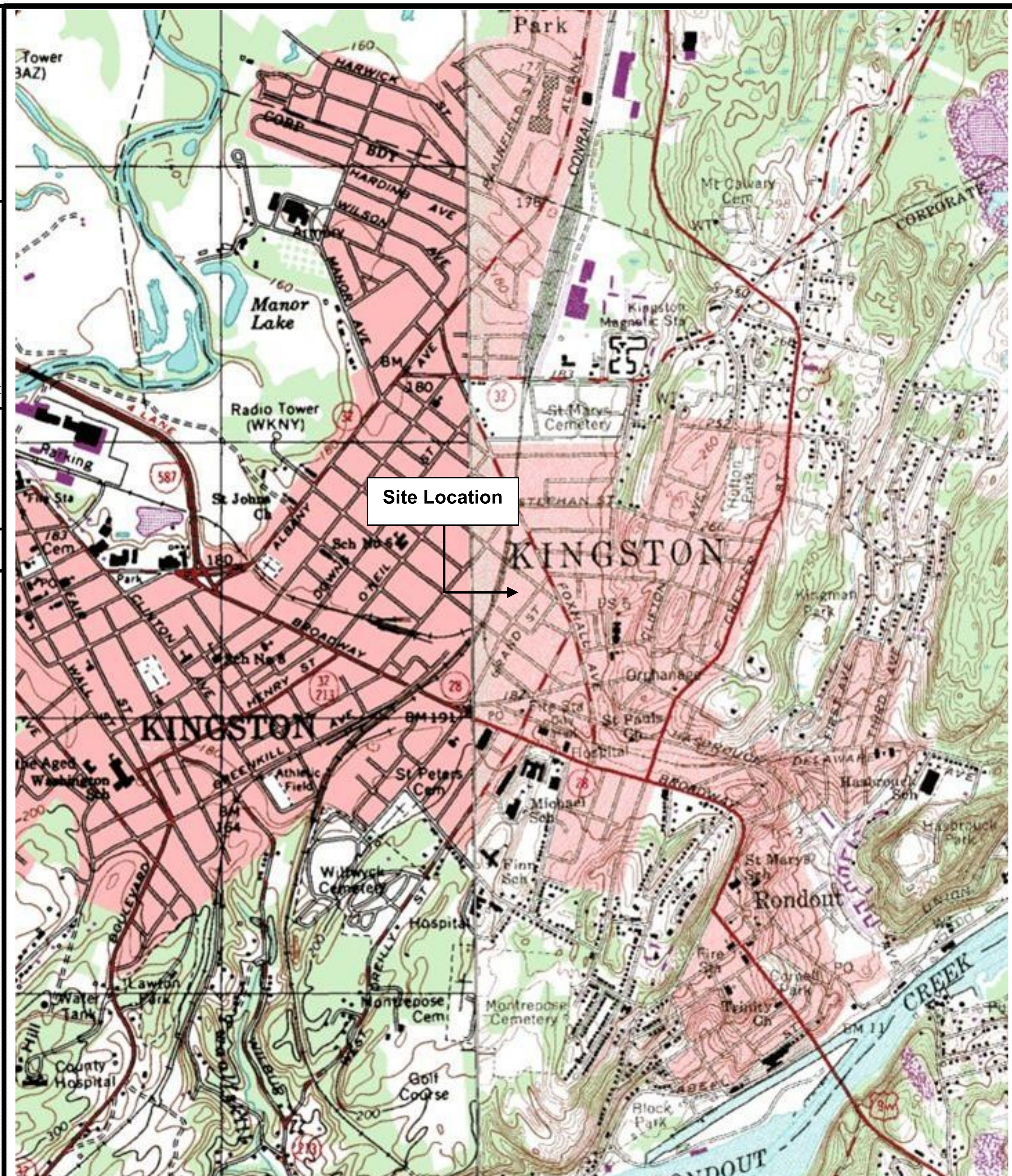
WSP Engineering of New York, P.C. 2009. Combined Additional Pre-Design Investigation Report, Remedial Action Selection Report, and Air Sparge/Soil Vapor Extraction Pilot Test Work Plan, Former Huck Manufacturing Facility, Kingston, New York. December 7.

WSP Environmental Strategies. 2007. Final Site Investigation and Pre-Design Report, Huck Manufacturing Facility, Kingston, NY. December 14.

8 Acronym List

µg/kg	micrograms per kilograms
AS	air sparging
bgs	below ground surface
DCE	dichloroethene
ELAP	Environmental Laboratory Approval Program
EPA	Environmental Protection Agency
GAC	granular activated carbon
Hg	mercury
LSH	liquid switch high
MC	methylene chloride
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	operations and maintenance
PCE	tetrachloroethene
PID	photoionization detector
PLC	programmable logic control
ppmv	part per million by volume
PSH	pressure switch high
psi	pounds per square inch
PVC	polyvinyl chloride
ROI	radius of influence
scfm	standard cubic feet per minute
SCO	soil cleanup objectives
SVE	soil vapor extraction
TCE	trichloroethene
TSH	temperature switch high
VLS	vapor liquid separator
VOC	volatile organic compound
WC	water column

Figures



REFERENCE:
7.5 MINUTE SERIES TOPOGRAPHIC QUADRANGLE
KINGSTON EAST, NEW YORK
PHOTOREVISED 1980 SCALE 1:24,000

WSP
WSP USA Corp.
2360 Sweet Home Road, Suite 3
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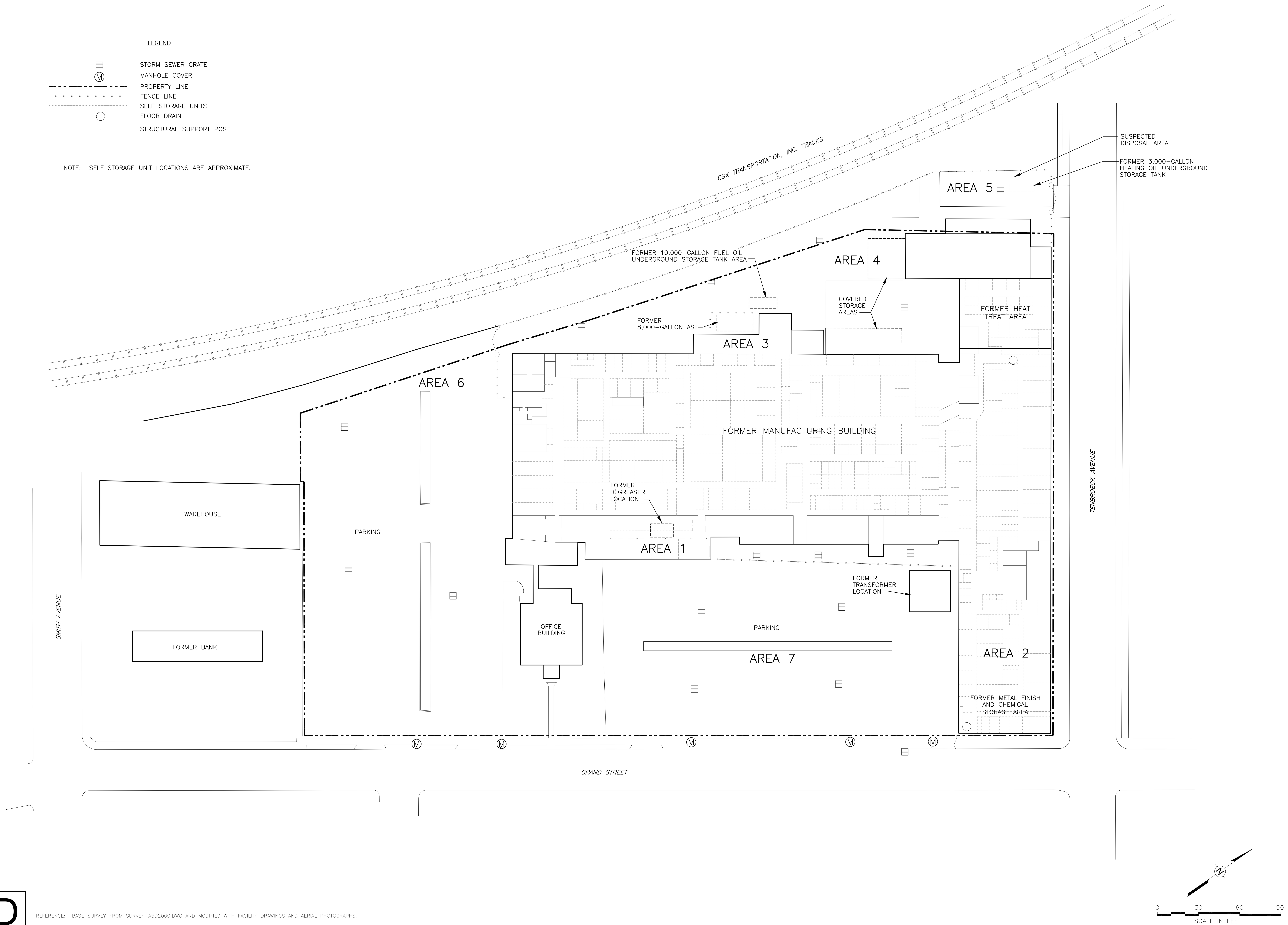
FIGURE 1

SITE LOCATION MAP

HUCK MANUFACTURING FACILITY
KINGSTON, NEW YORK

PREPARED FOR

FEDERAL-MOGUL CORPORATION
SOUTHFIELD, MICHIGAN



D

REFERENCE: BASE SURVEY FROM SURVEY-ABD2000.DWG AND MODIFIED WITH FACILITY DRAWINGS AND AERIAL PHOTOGRAPHS.

REV	DESCRIPTION	Revised:	Chkd:	Appr:

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APPROVED	KDS 08232012

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SITE LAYOUT

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FIGURE 2

Drawing Number
00005609-047

Total VOC Isoconcentration Contour Color Scale
(Measured in ug/L)

8500
8000
7500
7000
6500
6000
5500
5000
4500
4000
3500
3000
2500
2000
1500

Legend

MW-12		Groundwater Monitoring Well Location
448		Total VOC Concentration (Measured in ug/L)
ND		VOCs Not Detected
NS		Not Sampled
NA		Not Analyzed
171.5		Groundwater Elevation Contour (Measured in Feet Above Mean Sea Level)

Notes:

1. Groundwater monitoring wells MW-1 through MW-18 and MP-1 and MP-3 were sampled between November 2 and 15, 2011. Groundwater elevations were measured on November 2, 2011.
2. Isoconcentration contour interval is 500 ug/L.

D

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REV	DESCRIPTION

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TOTAL VOCs IN GROUNDWATER
(NOVEMBER 2011)

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FIGURE 3

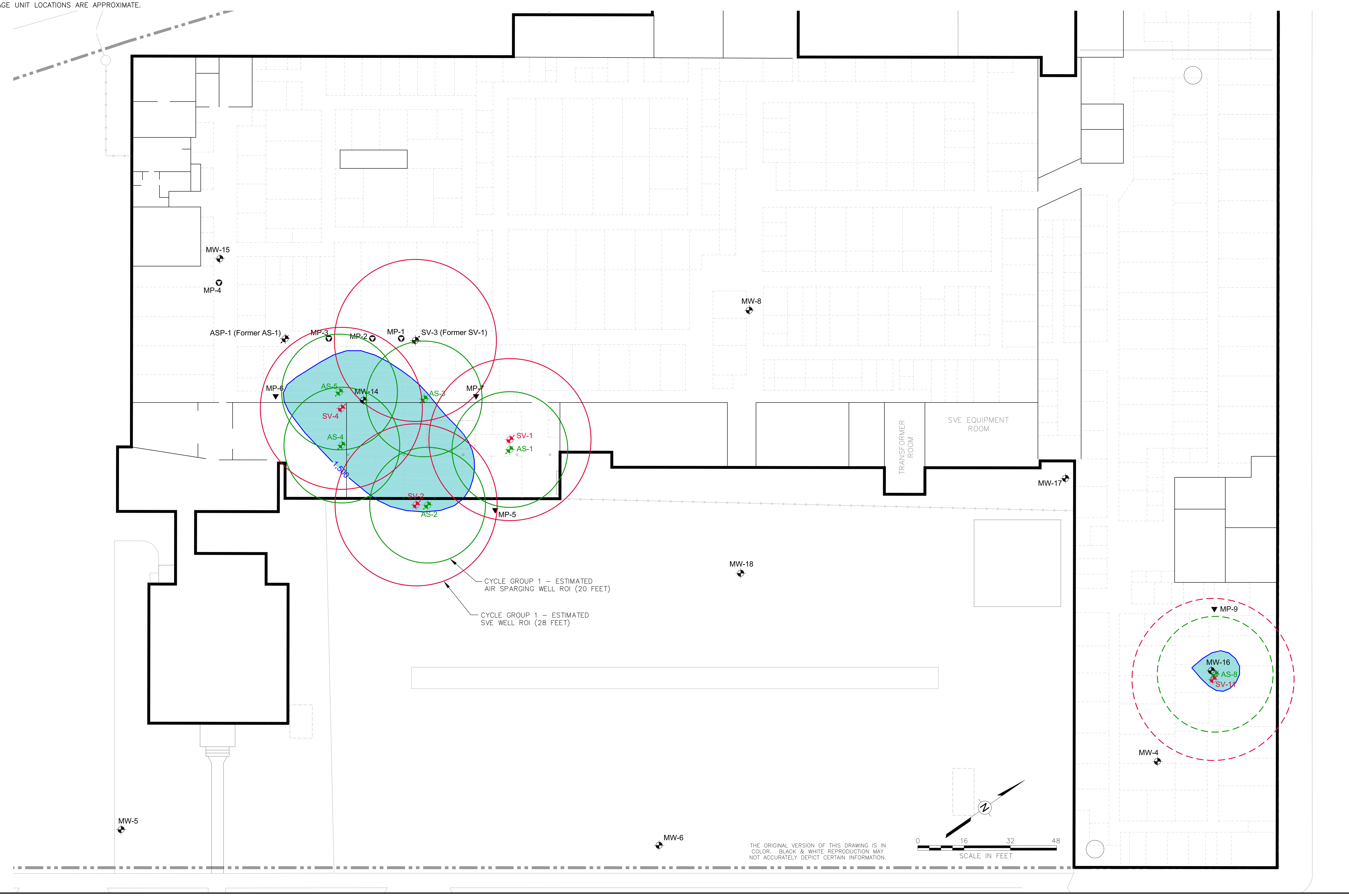
Drawing Number
00005609-046

LEGEND

- MONITORING WELL
- AIR SPARGING WELL
- SVE WELL
- PROPOSED SVE WELL
- PROPOSED AIR SPARGING WELL
- MONITORING POINT
- PROPOSED MONITORING POINT
- ROI RADIUS OF INFLUENCE
- 1,500 ug/l TOTAL VOCs IN GROUNDWATER CONTOUR (NOVEMBER 2011)
- STRUCTURAL SUPPORT POST

NOTES:
1. 1,500 ug/l ISOCONCENTRATION CONTOUR BASED ON GROUNDWATER SAMPLES FOR VOC ANALYSIS COLLECTED IN NOVEMBER 2011.
2. ISOCONCENTRATION CONTOUR FOR 1,500 ug/l IS SHOWN TO ILLUSTRATE LOCATION OF HIGHEST VOC CONCENTRATIONS IN GROUNDWATER.
3. PROPOSED SVE WELL AND AIR SPARGE WELL LOCATIONS ARE APPROXIMATE AND SUBJECT TO CHANGE BASED ON SITE ACCESS.
4. THE LOCATIONS OF THE WELLS INSTALLED FOR THE PILOT TEST ACTIVITIES ARE APPROXIMATE.

NOTE: SELF STORAGE UNIT LOCATIONS ARE APPROXIMATE.



REV	REVISIONS DESCRIPTION
1	Revised: Chkd: Appr.:
2	Revised: Chkd: Appr.:
3	Revised: Chkd: Appr.:

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PROPOSED AS/SVE WELL LOCATIONS

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Figure 4

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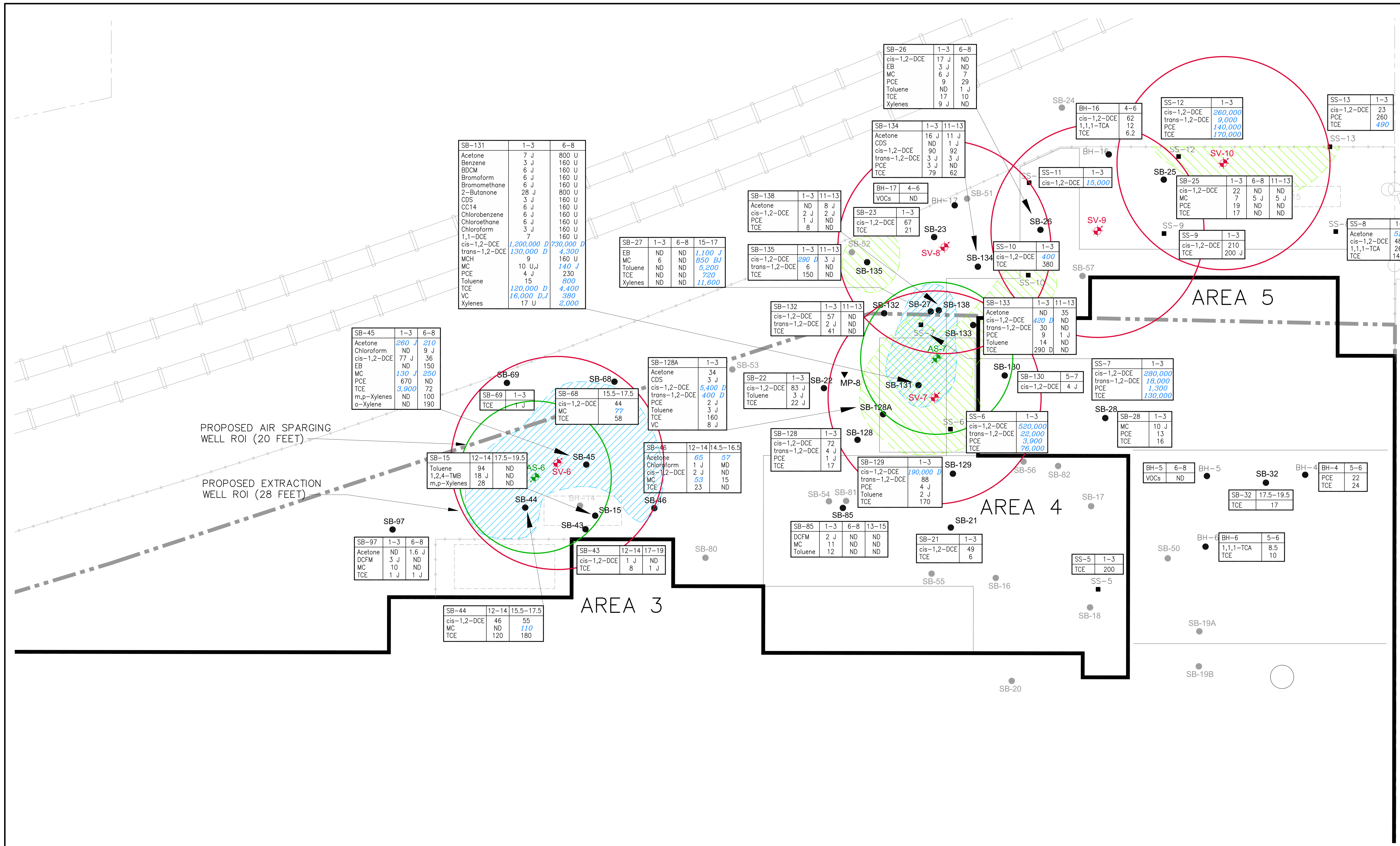
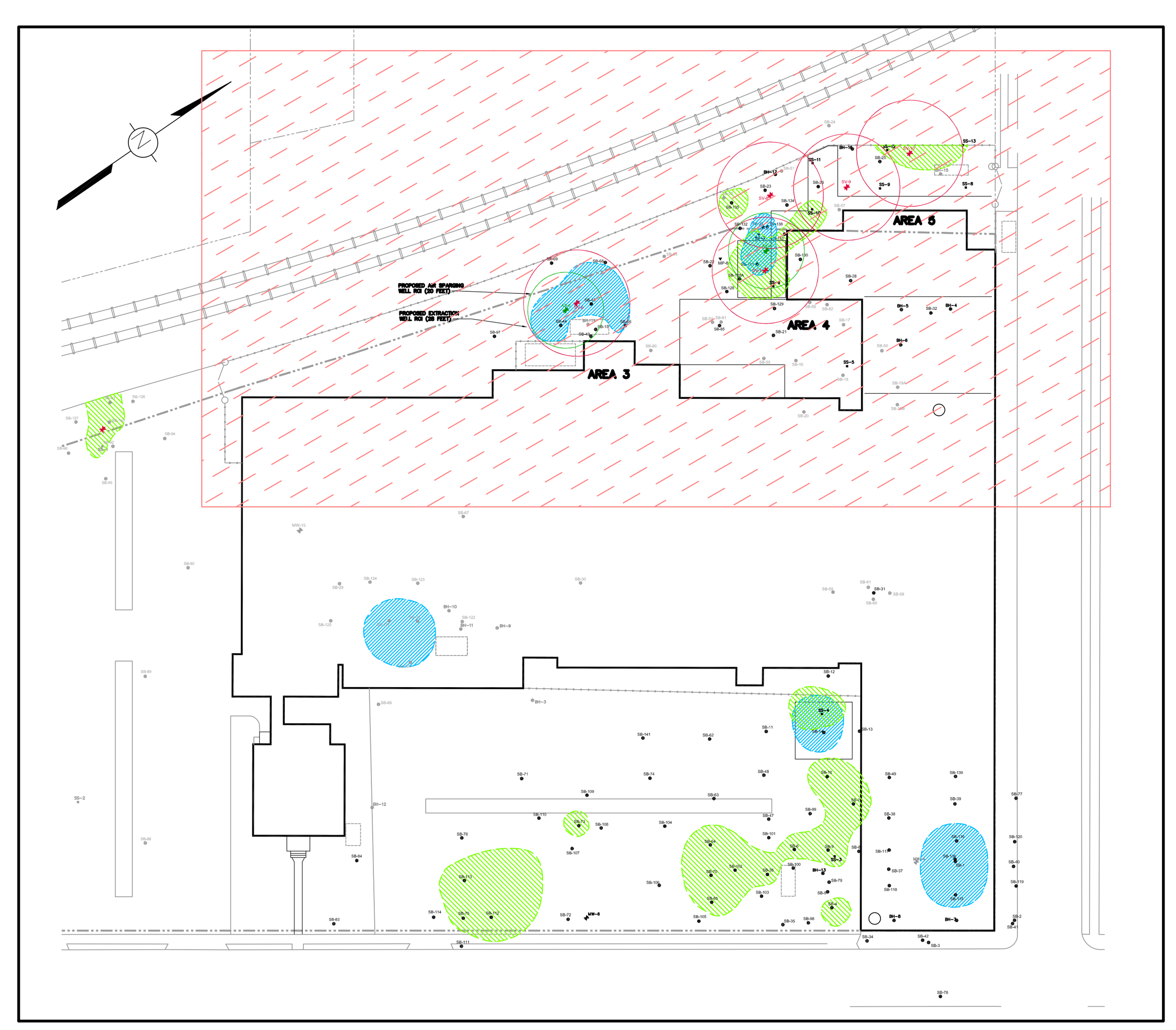
00005609–048



LEGEND

BH-	SOIL BORING (CRA, 1993)
SS-	SURFACE SOIL SAMPLE (CRA, 1993)
SB-36	SOIL BORING (WSPES, 2002–2006)
MW-6	MONITORING WELL (CRA)
	PROPOSED SVE WELL
	PROPOSED AIR SPARGING WELL
	PROPOSED MONITORING POINT
ROI	RADIUS OF INFLUENCE
SS-4	SAMPLE DESIGNATION
1–3	SAMPLE DEPTH (IN FEET BGS)
	CONCENTRATIONS IN µg/kg – VALUES IN BLUE ITALIC TYPE EXCEED RECOMMENDED SOIL CLEANUP OBJECTIVES (NYCRR PART 375–6.8) FOR PROTECTION OF GROUNDWATER – VALUES FROM FIELD DUPLICATES ARE REPORTED WHERE THEY EXCEED VALUES MEASURED IN THE ORIGINAL SAMPLE
BDCM	BROMODICHLOROMETHANE
CDS	CARBON DISULFIDE
DCE	DICHLOROETHENE
DCFM	DICHLORODIFLUOROMETHANE
EB	ETHYLBENZENE
MC	METHYLENE CHLORIDE
PCE	TETRACHLOROETHENE
TCE	TRICHLOROETHENE
ND	COMPOUND NOT DETECTED
J	ESTIMATED CONCENTRATION BELOW DETECTION LIMIT
D	RESULT IS FROM SECONDARY DILUTION
B	BLANK CONTAMINATION
	SOIL RESULTS FROM 1–3 FEET BELOW GROUND SURFACE (BGS) EXCEED RECOMMENDED SOIL CLEANUP OBJECTIVES (NYCRR PART 375–6.8) FOR PROTECTION OF GROUNDWATER
	SOIL RESULTS BELOW 3 FEET BGS EXCEED RECOMMENDED SOIL CLEANUP OBJECTIVES (NYCRR PART 375–6.8) FOR PROTECTION OF GROUNDWATER



KEY MAP

0 80 160 240
SCALE IN FEET

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0 15 30 45
SCALE IN FEET

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AREAS 3, 4, AND 5
VOC RESULTS IN SOIL AND
PROPOSED AS/SVE WELL LOCATIONS
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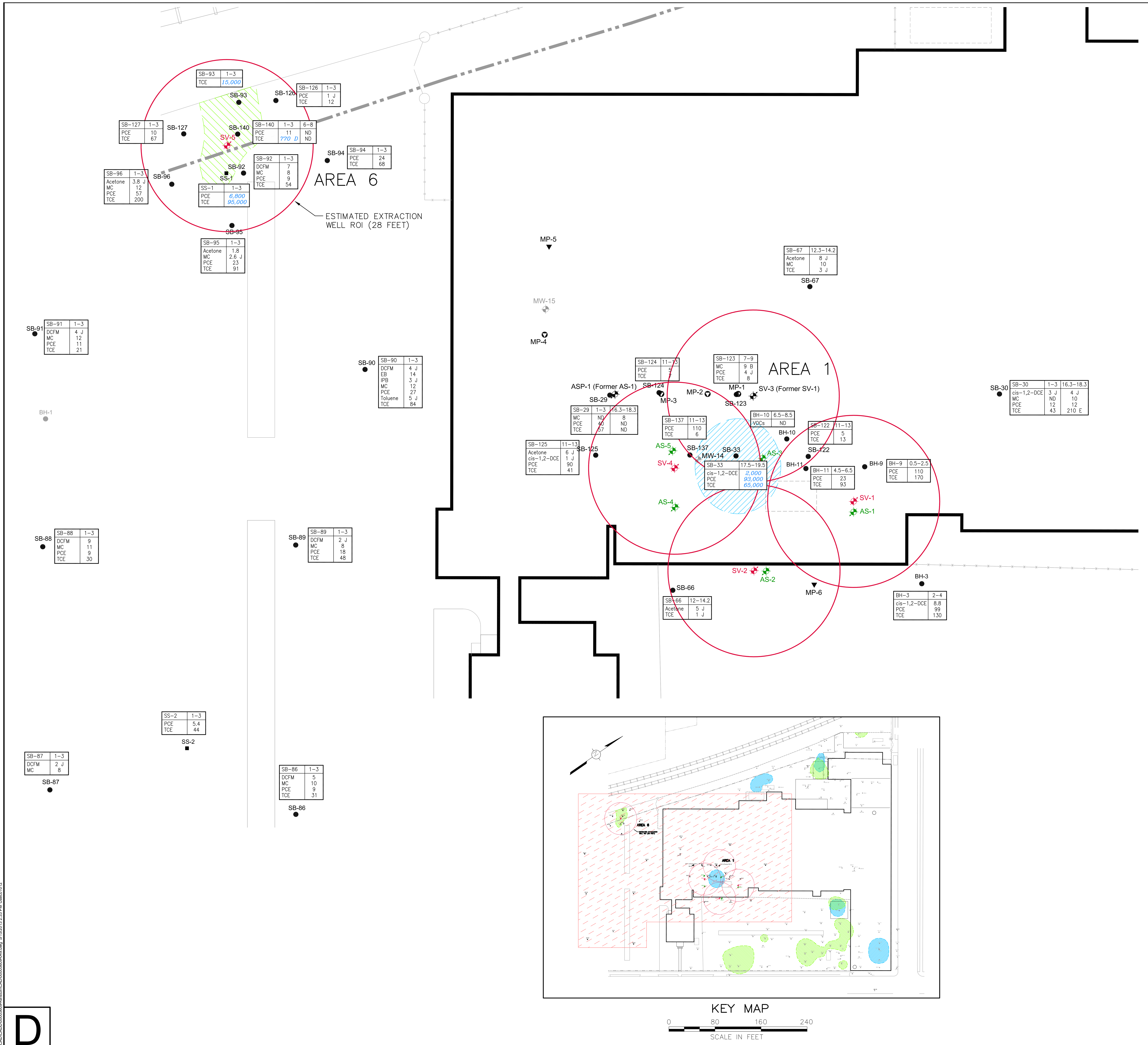
FIGURE 5

Drawing Number
00005609–044

D



LEGEND

BH-1	SOIL BORING (CRA, 1993)
SS-1	SURFACE SOIL SAMPLE (CRA, 1993)
SB-36	SOIL BORING (WSP, 2002–2006)
MW-15	MONITORING WELL
	AIR SPARGING WELL
	SVE WELL
	PROPOSED SVE WELL
	PROPOSED AIR SPARGING WELL
	MONITORING POINT
	PROPOSED MONITORING POINT
ROI	RADIUS OF INFLUENCE

SS–4	1–3
PCE	*18,000*
1,1,1–TCA	5.9
TCE	120

SAMPLE DESIGNATION
SAMPLE DEPTH (IN FEET BGS)
CONCENTRATIONS IN $\mu g/kg$
– VALUES IN *BLUE ITALIC* TYPE EXCEED RECOMMENDED SOIL CLEANUP OBJECTIVES (NYCRR PART 375–6.8) FOR PROTECTION OF GROUNDWATER
– VALUES FROM FIELD DUPLICATES ARE REPORTED WHERE THEY EXCEED VALUES MEASURED IN THE ORIGINAL SAMPLE

DCE	DICHLOROETHENE
DCFM	DICHLORODIFLUOROMETHANE
EB	ETHYLBENZENE
IPB	ISOPROPYLBENZENE
MC	METHYLENE CHLORIDE
PCE	TETRACHLOROETHENE
TCE	TRICHLOROETHENE
ND	COMPOUND NOT DETECTED
J	ESTIMATED CONCENTRATION BELOW DETECTION LIMIT
E	EXCEEDS CALIBRATION RANGE
B	BLANK CONTAMINATION
D	RESULT IS FROM SECONDARY DILUTION

SOIL RESULTS FROM 1–3 FEET BELOW GROUND SURFACE (BGS) EXCEED RECOMMENDED SOIL CLEANUP OBJECTIVES (NYCRR PART 375–6.8) FOR PROTECTION OF GROUNDWATER

SOIL RESULTS BELOW 3 FEET BGS EXCEED RECOMMENDED SOIL CLEANUP OBJECTIVES (NYCRR PART 375–6.8) FOR PROTECTION OF GROUNDWATER

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0 15 30 45
SCALE IN FEET

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AREAS 1 AND 6 VOC RESULTS IN SOIL AND PROPOSED AS/SVE WELL LOCATIONS

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FIGURE 6

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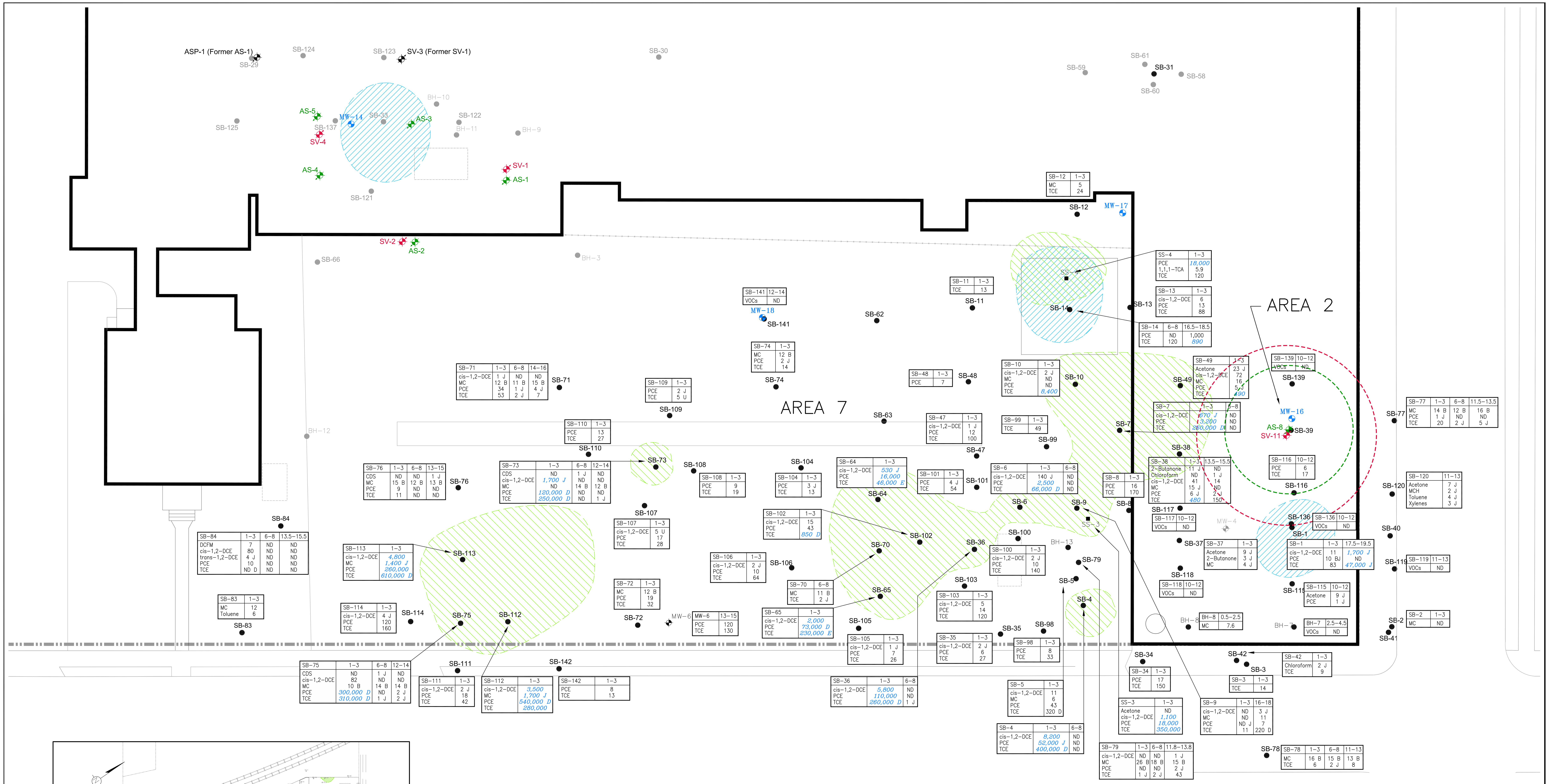
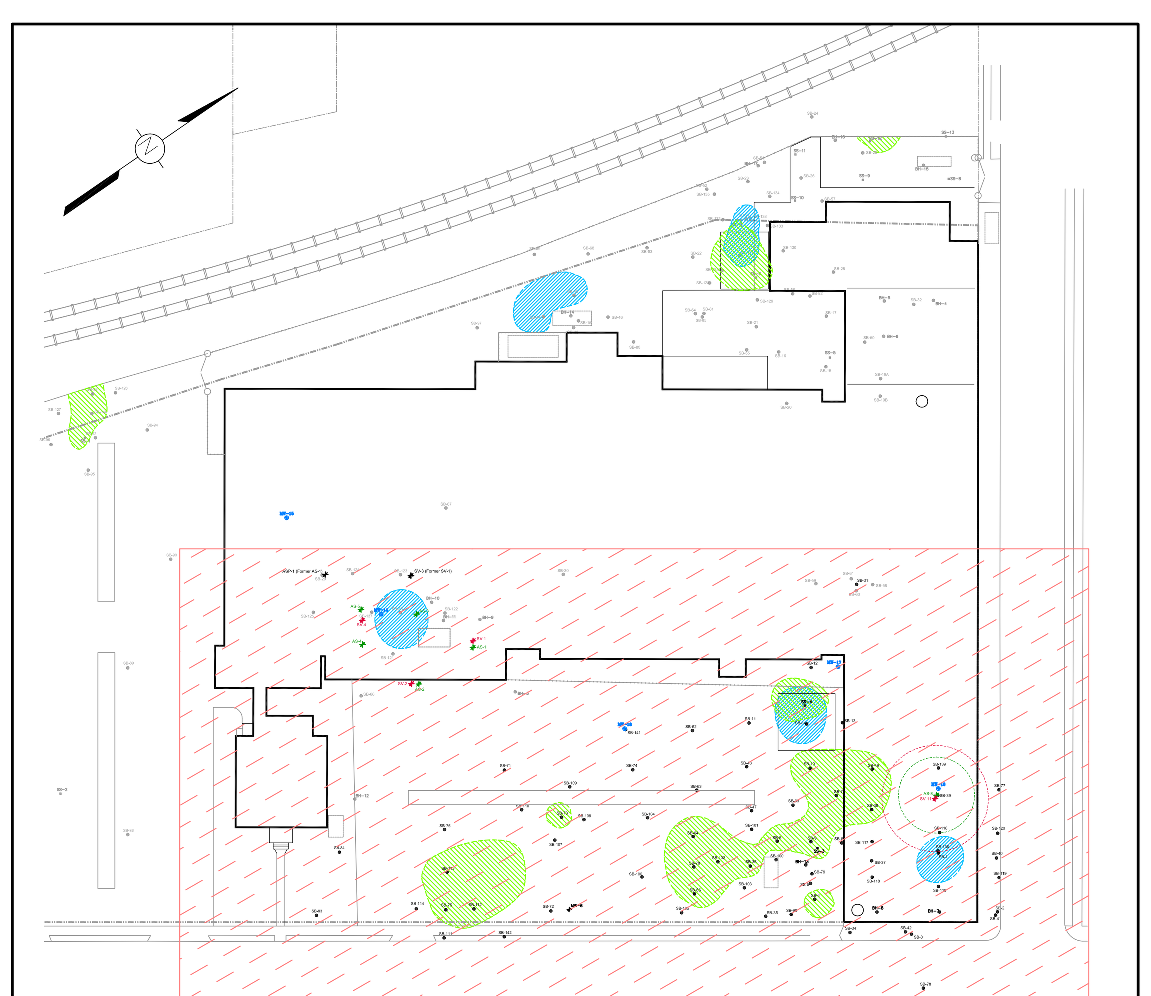
00005609–049

D





KEY MAP

0 80 160 240

SCALE IN FEET

LEGEND

MW-16	MONITORING WELL (WSP, JULY 2008)
MW-6	MONITORING WELL
BH-	SOIL BORING (CRA, 1993)
SS-	SURFACE SOIL SAMPLE (CRA, 1993)
SB-36	SOIL BORING (WSP, 2002–2008)
SV-1	PROPOSED SVE WELL
AS-1	PROPOSED AIR SPARGING WELL

SS-4	1-3
PCE	18,000
1,1,1-TCA	5.9
TCE	120

SAMPLE DESIGNATION

SAMPLE DEPTH (IN FEET BGS)

CONCENTRATIONS IN µg/kg

– VALUES IN BLUE ITALIC TYPE EXCEED RECOMMENDED SOIL CLEANUP OBJECTIVES (NYCRR PART 375–6.8) FOR PROTECTION OF GROUNDWATER

– VALUES FROM FIELD DUPLICATES ARE REPORTED WHERE THEY EXCEED VALUES MEASURED IN THE ORIGINAL SAMPLE

CDS	CARBON DISULFIDE
DCE	DICHLOROETHENE
DCFM	DICHLORODIFLUOROMETHANE
MC	METHYLENE CHLORIDE
MCH	METHYLCYCLOHEXANE
PCE	TETRACHLOROETHENE
TCA	TRICHLOROETHANE
TCE	TRICHLOROETHENE

LEGEND

ND	COMPOUND NOT DETECTED
J	ESTIMATED CONCENTRATION BELOW DETECTION LIMIT
E	EXCEEDS CALIBRATION RANGE
B	BLANK CONTAMINATION
D	RESULT IS FROM SECONDARY DILUTION

SOIL RESULTS FROM 1–3 FEET BELOW GROUND SURFACE (BGS) EXCEED RECOMMENDED SOIL CLEANUP OBJECTIVES (NYCRR PART 375–6.8) FOR PROTECTION OF GROUNDWATER

SOIL RESULTS BELOW 3 FEET BGS EXCEED RECOMMENDED SOIL CLEANUP OBJECTIVES (NYCRR PART 375–6.8) FOR PROTECTION OF GROUNDWATER

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0 15 30 45

SCALE IN FEET

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REV | DESCRIPTION

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DATE

AREA 2 VOC RESULTS IN SOIL AND PROPOSED AS/SVE WELL LOCATIONS

FORMER HUCK MANUFACTURING FACILITY

KINGSTON, NEW YORK

PREPARED FOR

FEDERAL-MOGUL CORPORATION

WSP

WSP USA Corp.
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Cazenovia, New York 13035
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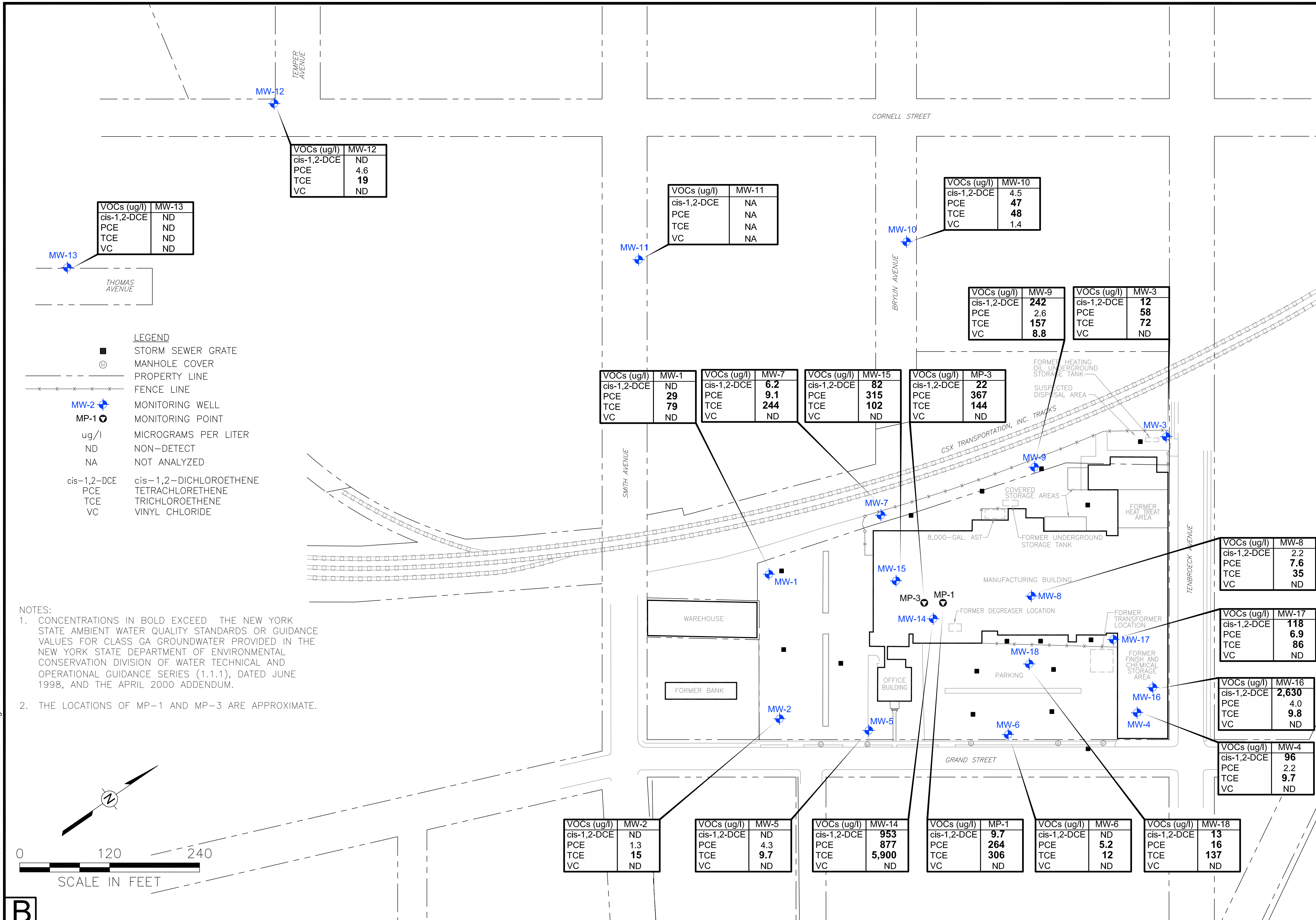
FIGURE 7

Drawing Number

00005609-043



VOCs (ug/l)	MW-12
cis-1,2-DCE	ND
PCE	4.6
TCE	**19**
VC	ND

VOCs (ug/l)	MW-13
cis-1,2-DCE	ND
PCE	ND
TCE	ND
VC	ND

VOCs (ug/l)	MW-11
cis-1,2-DCE	NA
PCE	NA
TCE	NA
VC	NA

VOCs (ug/l)	MW-10
cis-1,2-DCE	4.5
PCE	**47**
TCE	**48**
VC	1.4

VOCs (ug/l)	MW-9
cis-1,2-DCE	**242**
PCE	2.6
TCE	**157**
VC	**8.8**

VOCs (ug/l)	MW-3
cis-1,2-DCE	**12**
PCE	**58**
TCE	**72**
VC	ND

VOCs (ug/l)	MW-1
cis-1,2-DCE	ND
PCE	**29**
TCE	**79**
VC	ND

VOCs (ug/l)	MW-7
cis-1,2-DCE	**6.2**
PCE	**9.1**
TCE	**244**
VC	ND

VOCs (ug/l)	MW-15
cis-1,2-DCE	**82**
PCE	**315**
TCE	**102**
VC	ND

VOCs (ug/l)	MP-3
cis-1,2-DCE	**22**
PCE	**367**
TCE	**144**
VC	ND

VOCs (ug/l)	MW-8
cis-1,2-DCE	2.2
PCE	**7.6**
TCE	**35**
VC	ND

VOCs (ug/l)	MW-17
cis-1,2-DCE	**118**
PCE	**6.9**
TCE	**86**
VC	ND

VOCs (ug/l)	MW-16
cis-1,2-DCE	**2,630**
PCE	4.0
TCE	**9.8**
VC	ND

VOCs (ug/l)	MW-4
cis-1,2-DCE	**96**
PCE	2.2
TCE	**9.7**
VC	ND

VOCs (ug/l)	MW-2
cis-1,2-DCE	ND
PCE	1.3
TCE	**15**
VC	ND

VOCs (ug/l)	MW-5
cis-1,2-DCE	ND
PCE	4.3
TCE	**9.7**
VC	ND

VOCs (ug/l)	MW-14
cis-1,2-DCE	**953**
PCE	**877**
TCE	**5,900**
VC	ND

VOCs (ug/l)	MP-1
cis-1,2-DCE	**9.7**
PCE	**264**
TCE	**306**
VC	ND

VOCs (ug/l)	MW-6
cis-1,2-DCE	ND
PCE	**5.2**
TCE	**12**
VC	ND

VOCs (ug/l)	MW-18
cis-1,2-DCE	**13**
PCE	**16**
TCE	**137**
VC	ND

NOTES:

1. CONCENTRATIONS IN BOLD EXCEED THE NEW YORK STATE AMBIENT WATER QUALITY STANDARDS OR GUIDANCE VALUES FOR CLASS GA GROUNDWATER PROVIDED IN THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION DIVISION OF WATER TECHNICAL AND OPERATIONAL GUIDANCE SERIES (1.1.1), DATED JUNE 1998, AND THE APRIL 2000 ADDENDUM.
2. THE LOCATIONS OF MP-1 AND MP-3 ARE APPROXIMATE.

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Checked: SB 08232012
Approved: KJS 08232012
DWG Name: 00005609-045

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Figure 8

GROUNDWATER SAMPLING RESULTS
PRIMARY VOCs (NOVEMBER 2011)

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Appendix A – Interim Remedial Measure Air Sparging/Soil Vapor Extraction System – Design Drawing Package

INDEX OF DRAWINGS

INTERIM REMEDIAL MEASURE
AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM

DESIGN DRAWING PACKAGE

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SHEET 1

Drawing Number
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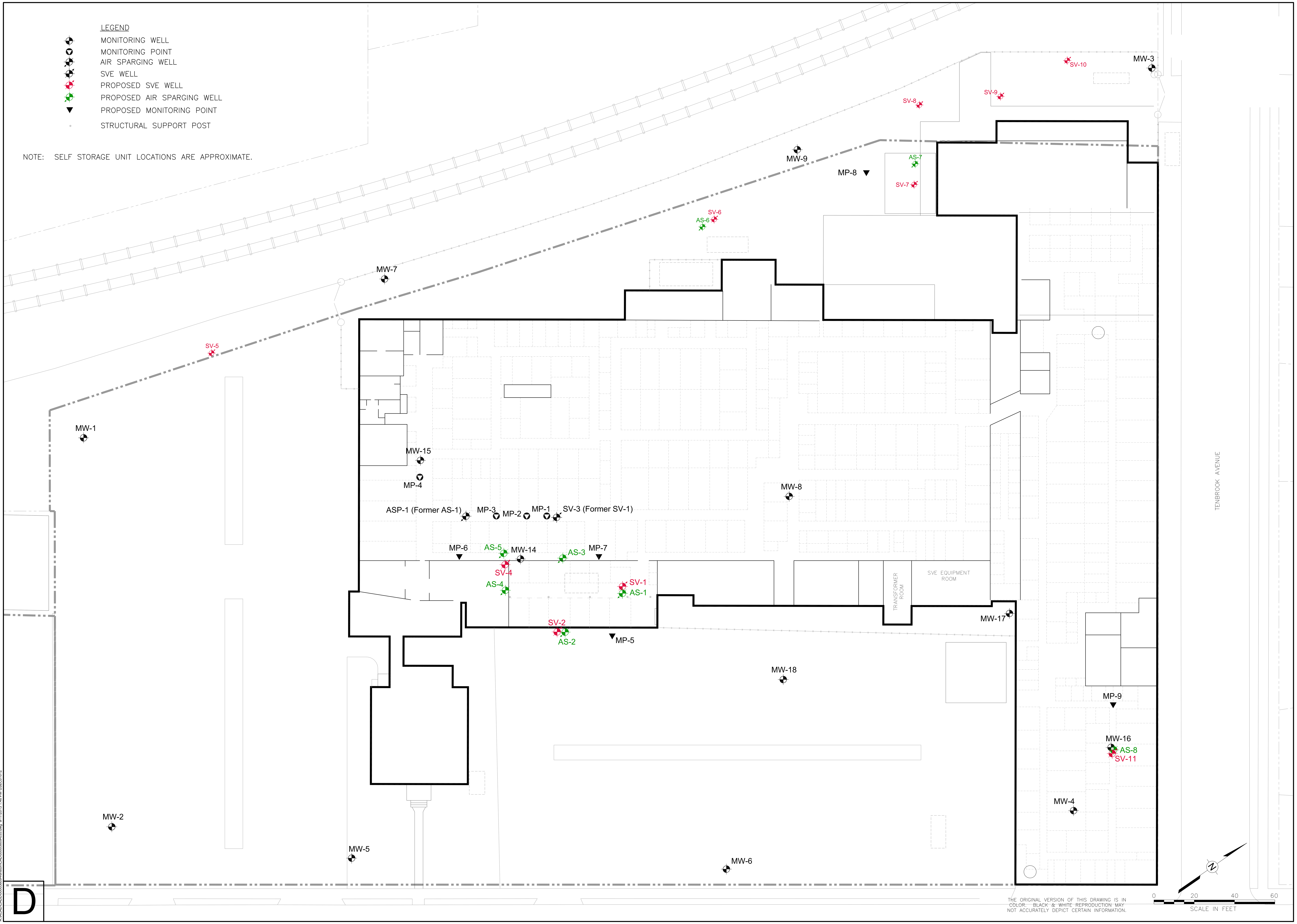

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SYSTEM LAYOUT

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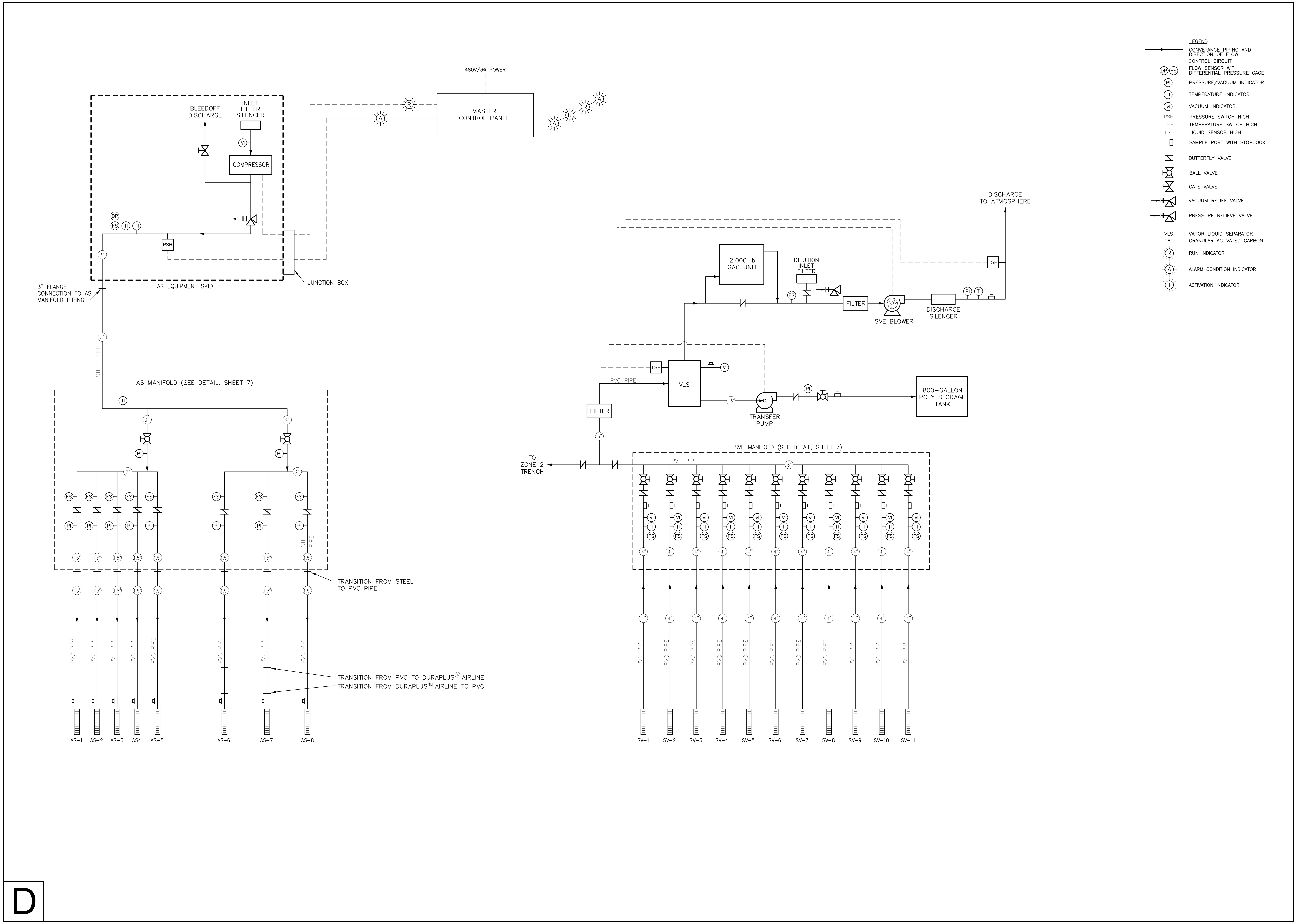

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PROCESS AND INSTRUMENTATION DIAGRAM CONCEPTUAL

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SHEET 3

Drawing Number
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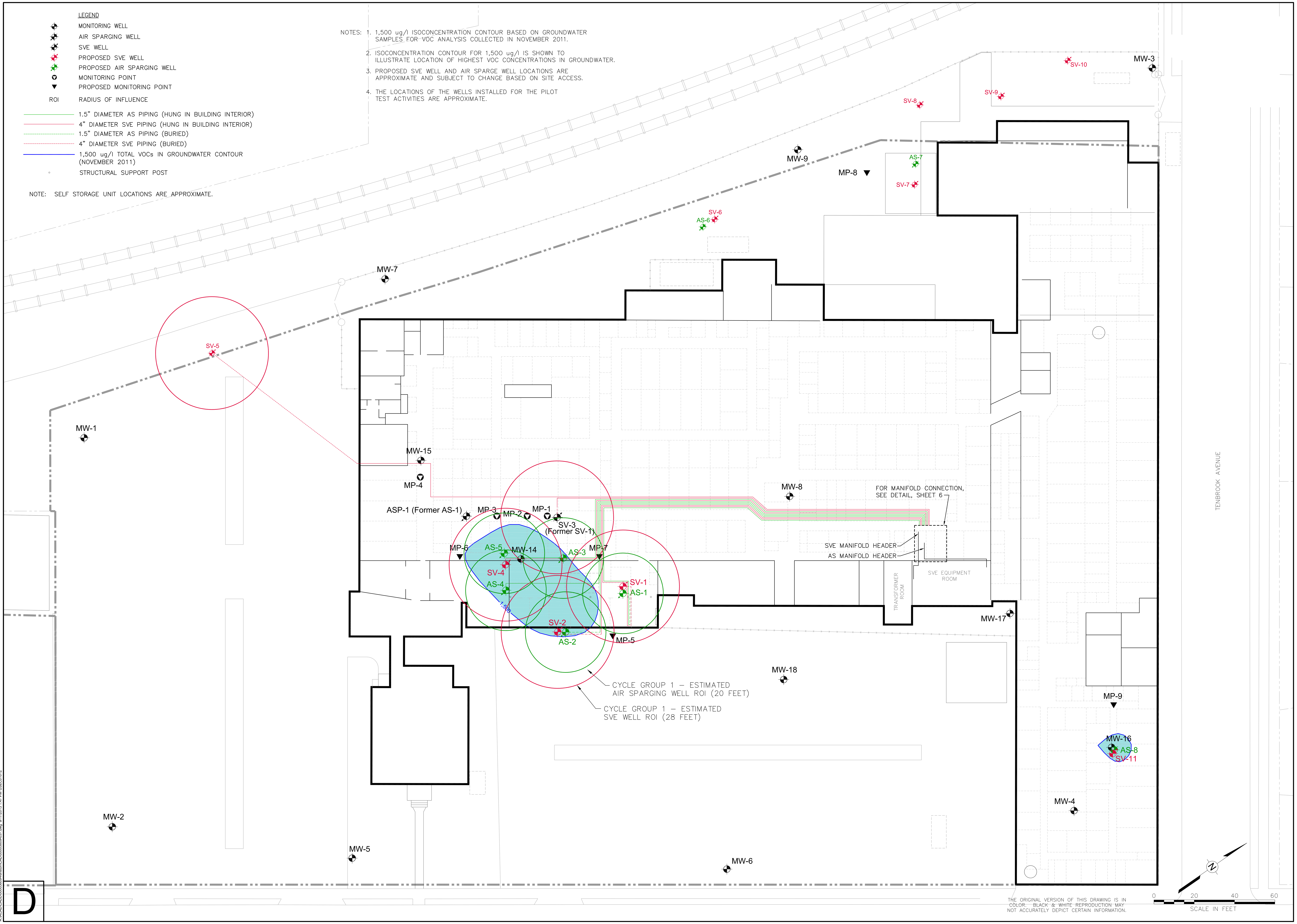
LEGEND

- MONITORING WELL
- AIR SPARGING WELL
- SVE WELL
- PROPOSED SVE WELL
- PROPOSED AIR SPARGING WELL
- MONITORING POINT
- PROPOSED MONITORING POINT
- ROI RADIUS OF INFLUENCE
- 1.5" DIAMETER AS PIPING (HUNG IN BUILDING INTERIOR)
- 4" DIAMETER SVE PIPING (HUNG IN BUILDING INTERIOR)
- 1.5" DIAMETER AS PIPING (BURIED)
- 4" DIAMETER SVE PIPING (BURIED)
- 1,500 ug/l TOTAL VOCs IN GROUNDWATER CONTOUR (NOVEMBER 2011)
- STRUCTURAL SUPPORT POST

NOTE: SELF STORAGE UNIT LOCATIONS ARE APPROXIMATE.

NOTES:
1. 1,500 ug/l ISOCONCENTRATION CONTOUR BASED ON GROUNDWATER SAMPLES FOR VOC ANALYSIS COLLECTED IN NOVEMBER 2011.
2. ISOCONCENTRATION CONTOUR FOR 1,500 ug/l IS SHOWN TO ILLUSTRATE LOCATION OF HIGHEST VOC CONCENTRATIONS IN GROUNDWATER.
3. PROPOSED SVE WELL AND AIR SPARGE WELL LOCATIONS ARE APPROXIMATE AND SUBJECT TO CHANGE BASED ON SITE ACCESS.
4. THE LOCATIONS OF THE WELLS INSTALLED FOR THE PILOT TEST ACTIVITIES ARE APPROXIMATE.



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WELL LOCATIONS AND PIPING ROUTES CYCLE GROUP 1

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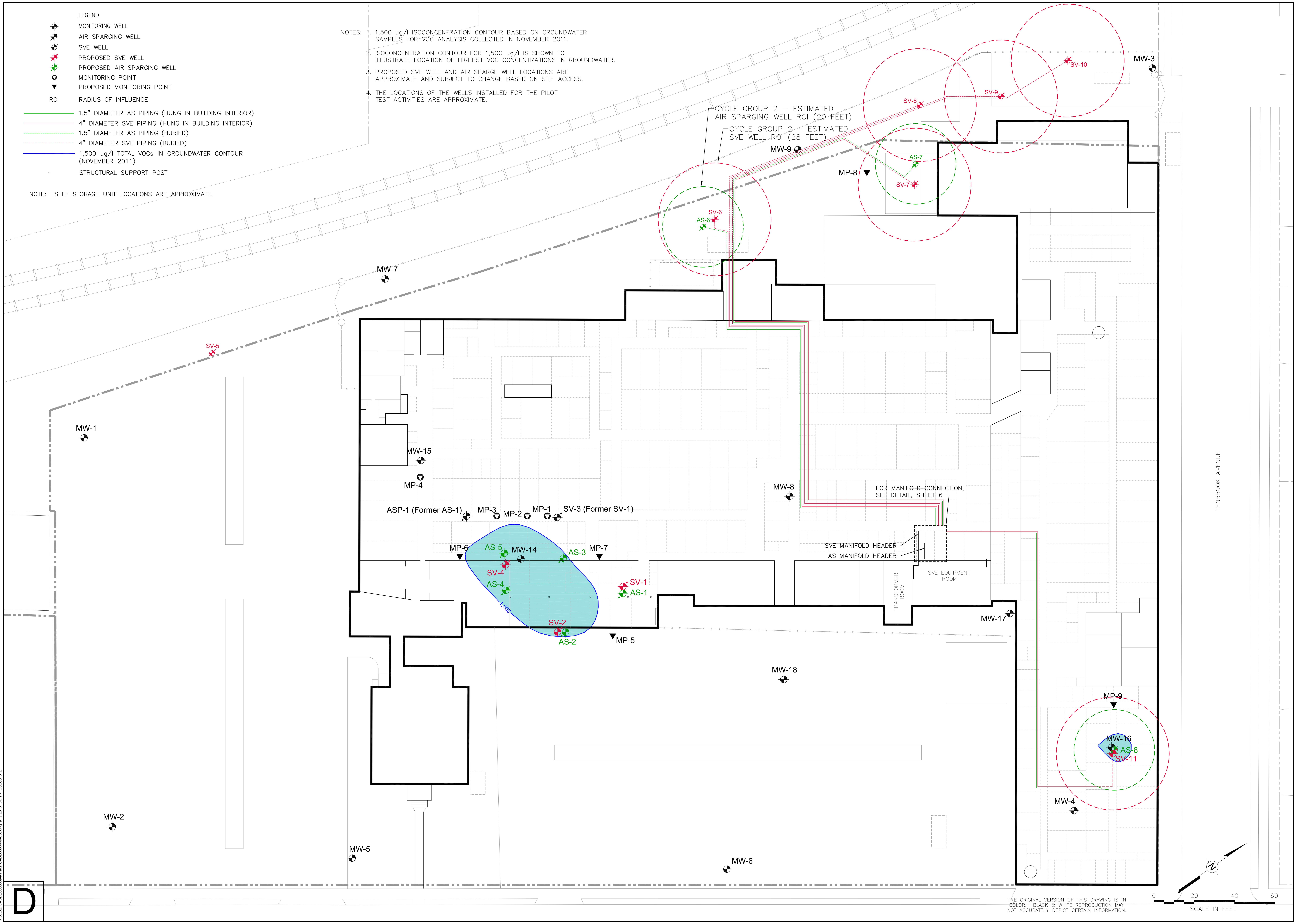

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WELL LOCATIONS AND PIPING ROUTES CYCLE GROUP 2

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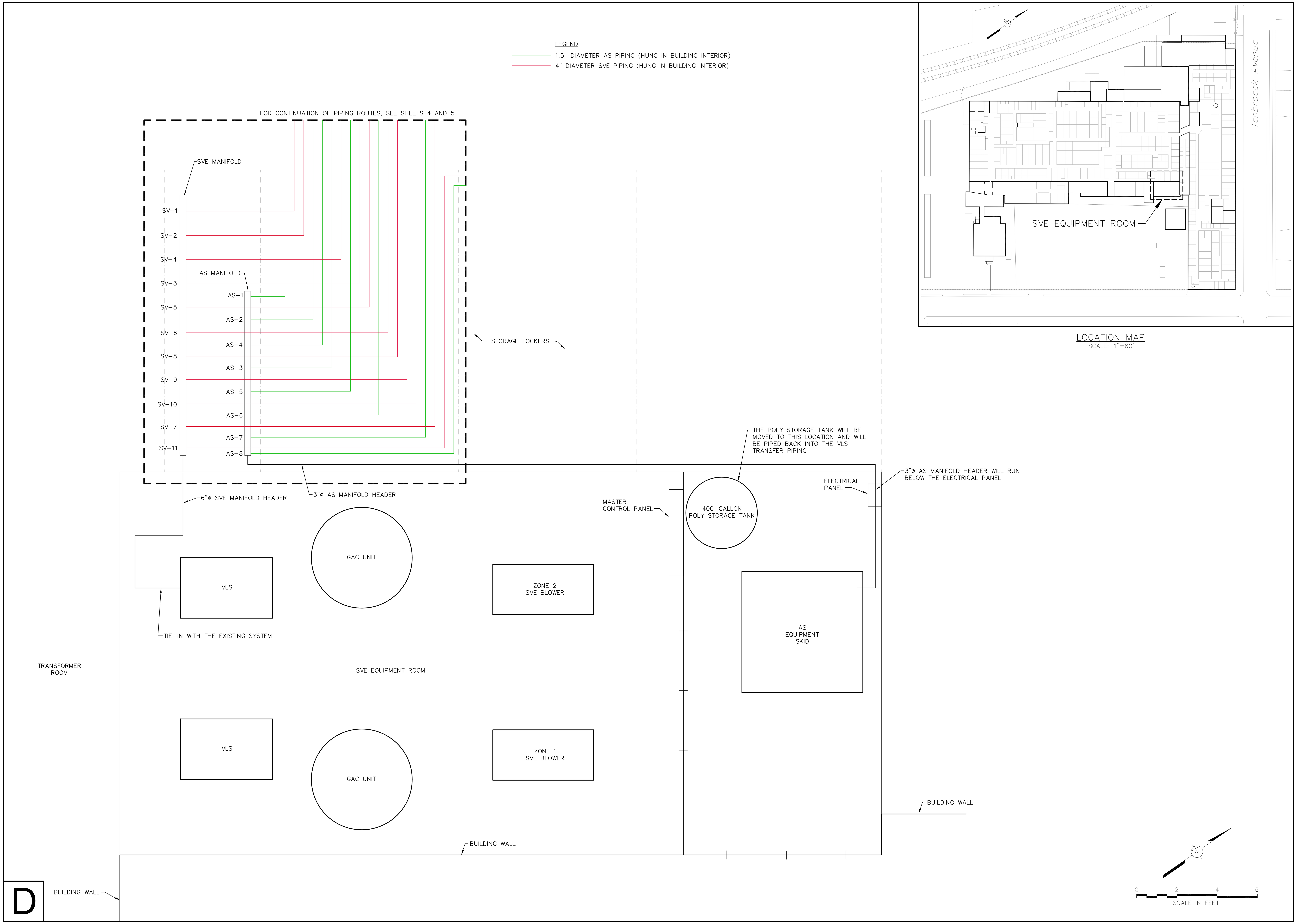

LOCATION MAP
SCALE: 1"=60'

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SOIL VAPOR EXTRACTION AND AIR SPARGING EQUIPMENT LAYOUT AND MANIFOLD CONNECTION DETAILS
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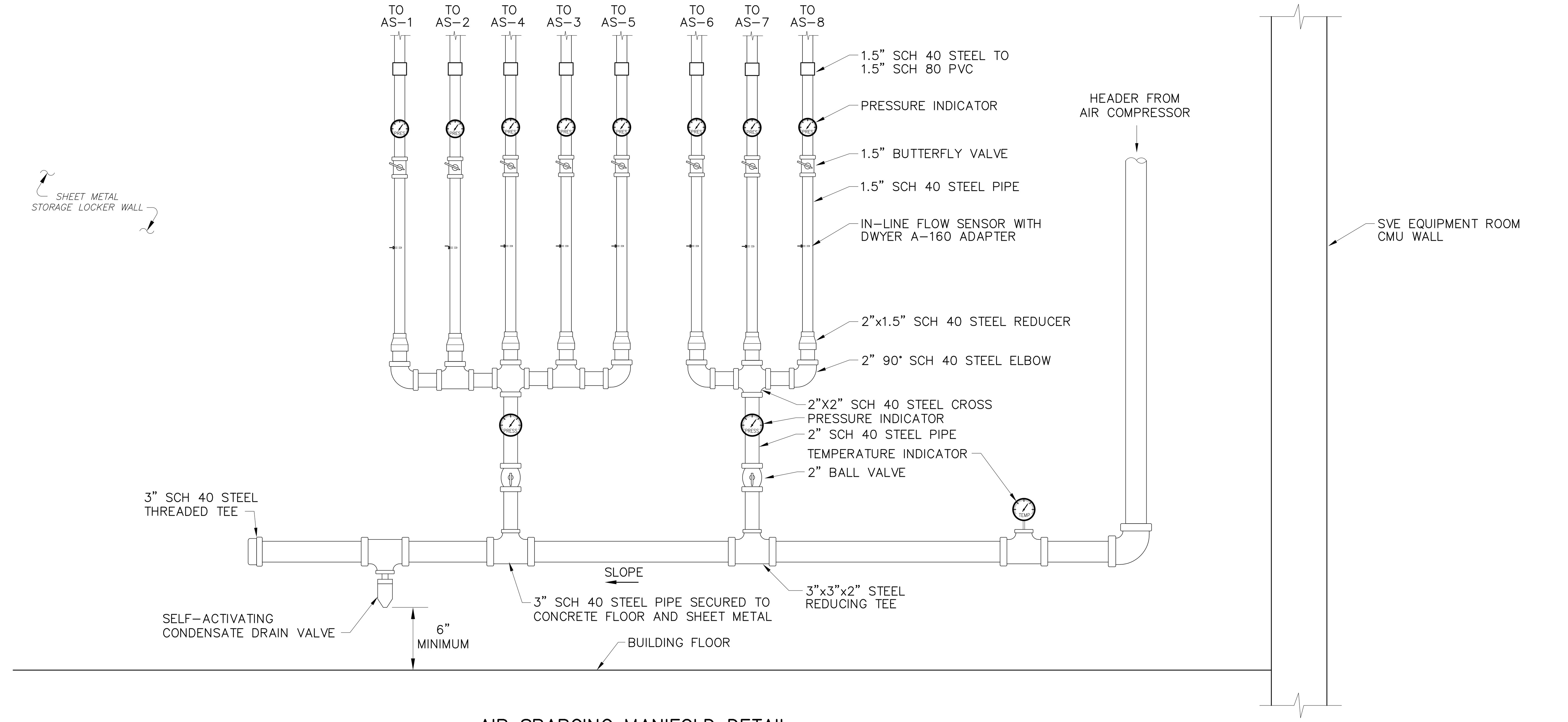
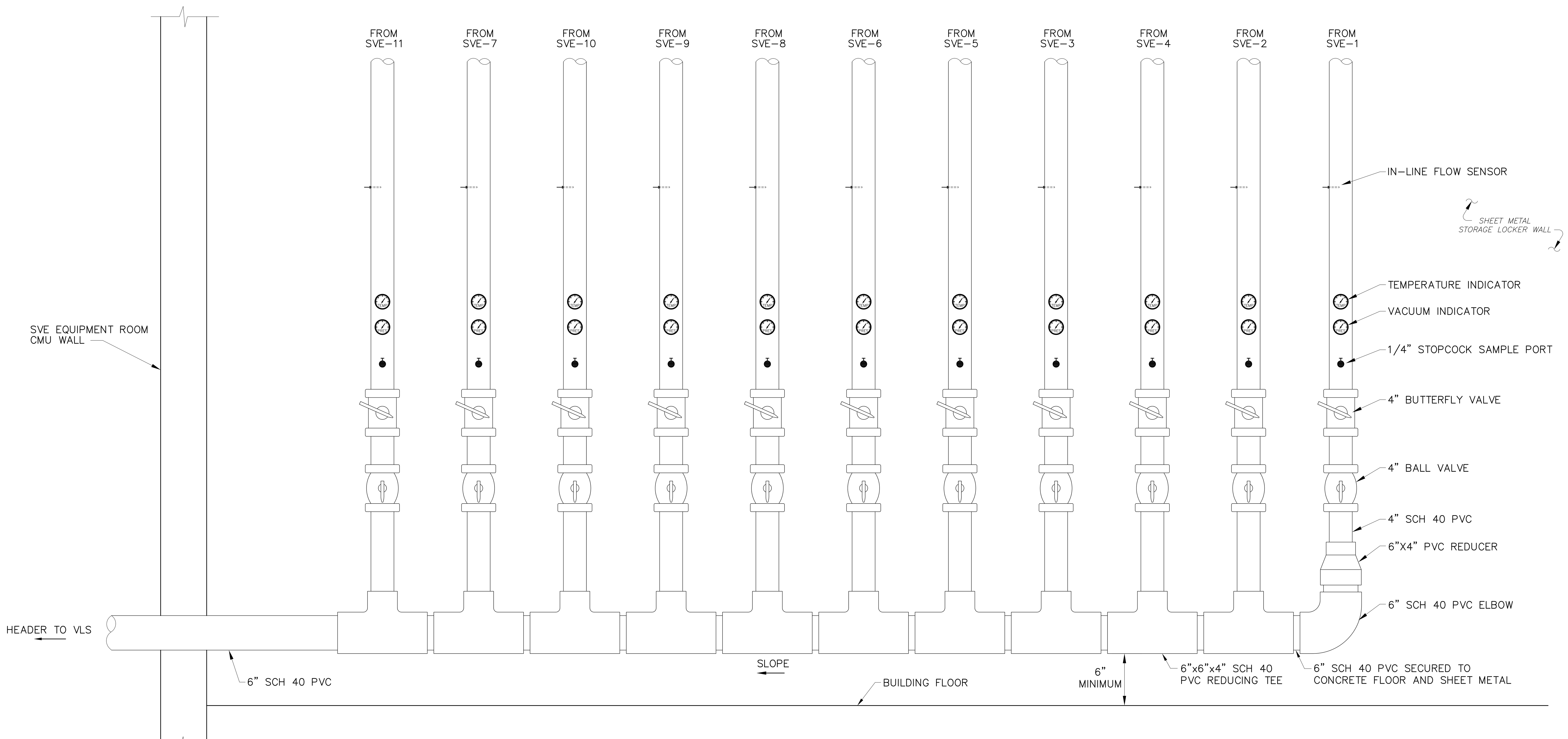


AIR SPARGING MANIFOLD DETAIL

NOT TO SCALE



SOIL VAPOR EXTRACTION MANIFOLD DETAIL

NOT TO SCALE

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SOIL VAPOR EXTRACTION AND AIR SPARGING MANIFOLD DETAILS

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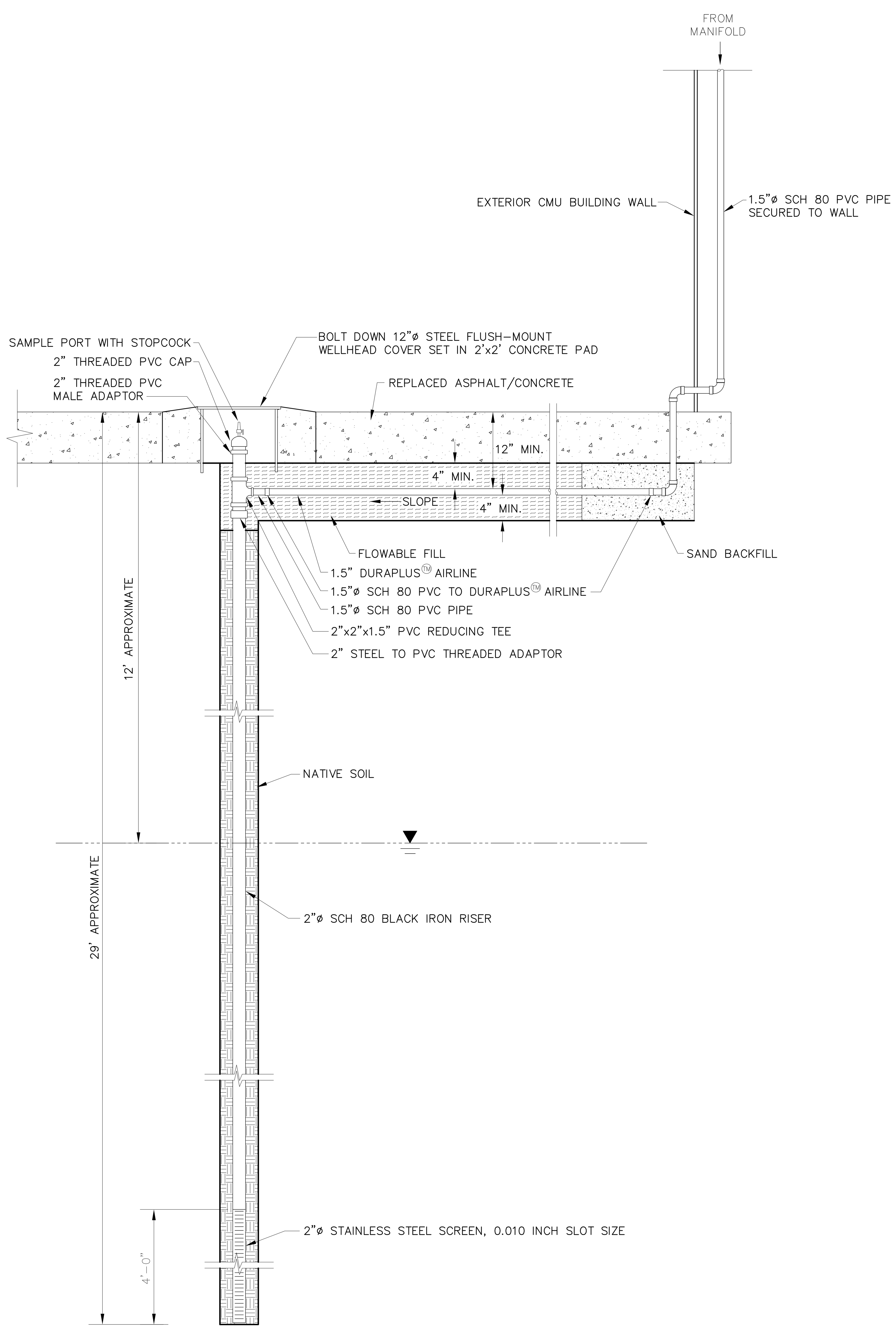
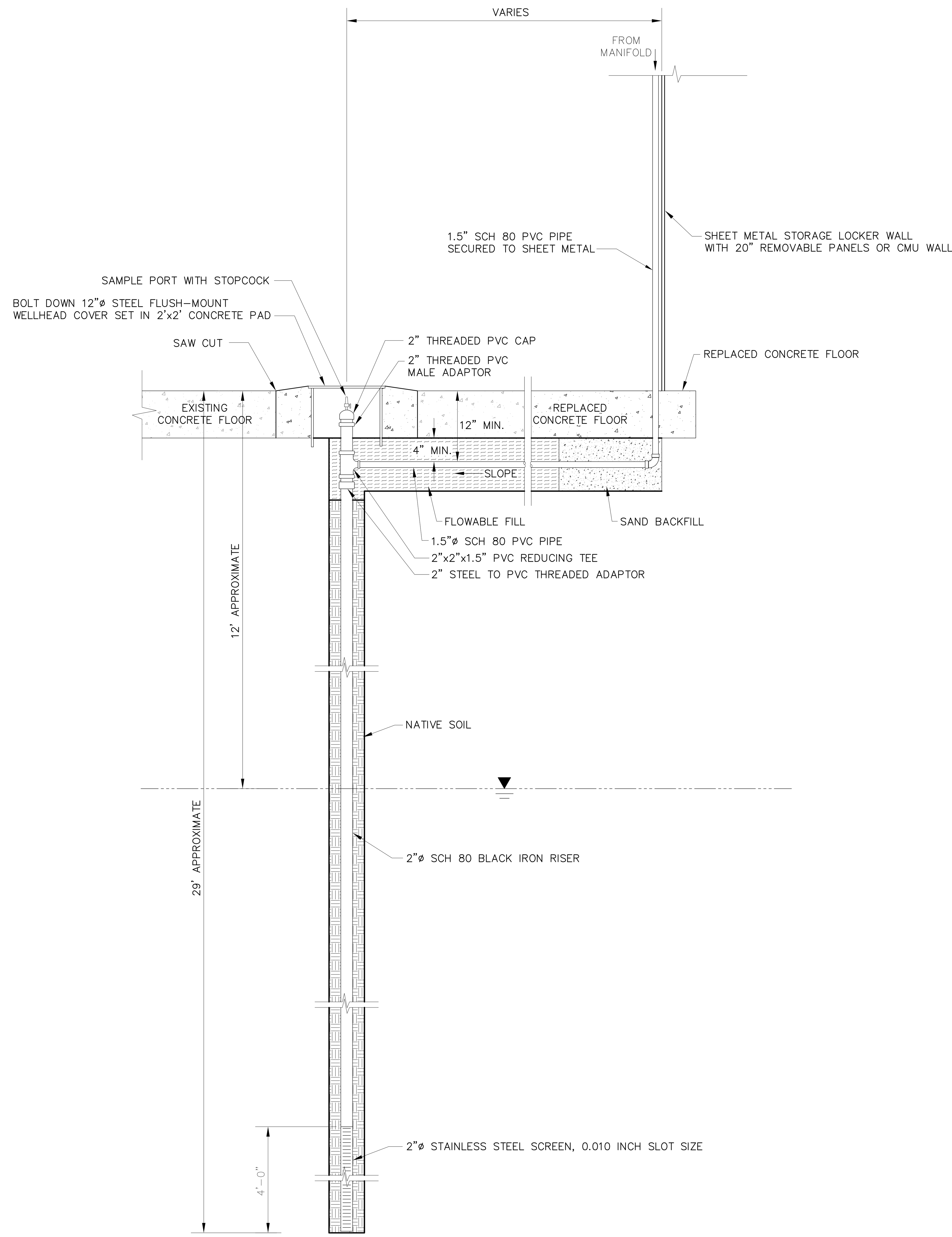


TYPICAL EXTERIOR AIR SPARGING WELL DETAIL (IN ASPHALT/CONCRETE)
1"=1'-0"



TYPICAL INTERIOR AIR SPARGING WELL DETAIL
1"=1'-0"

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AIR SPARGING WELLHEAD COMPLETION DETAILS

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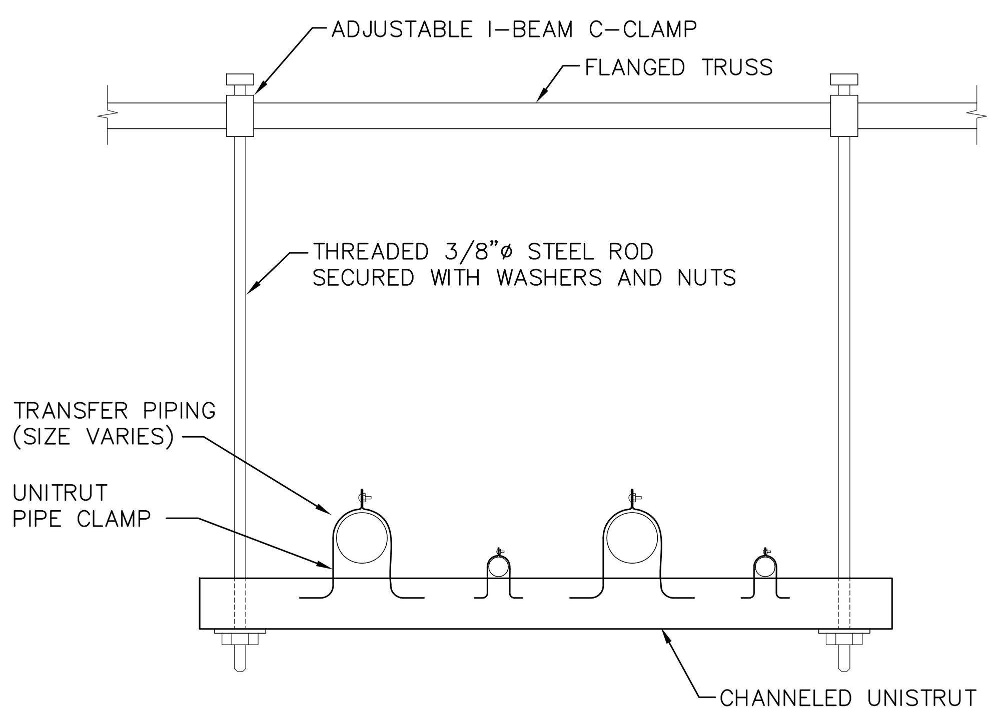
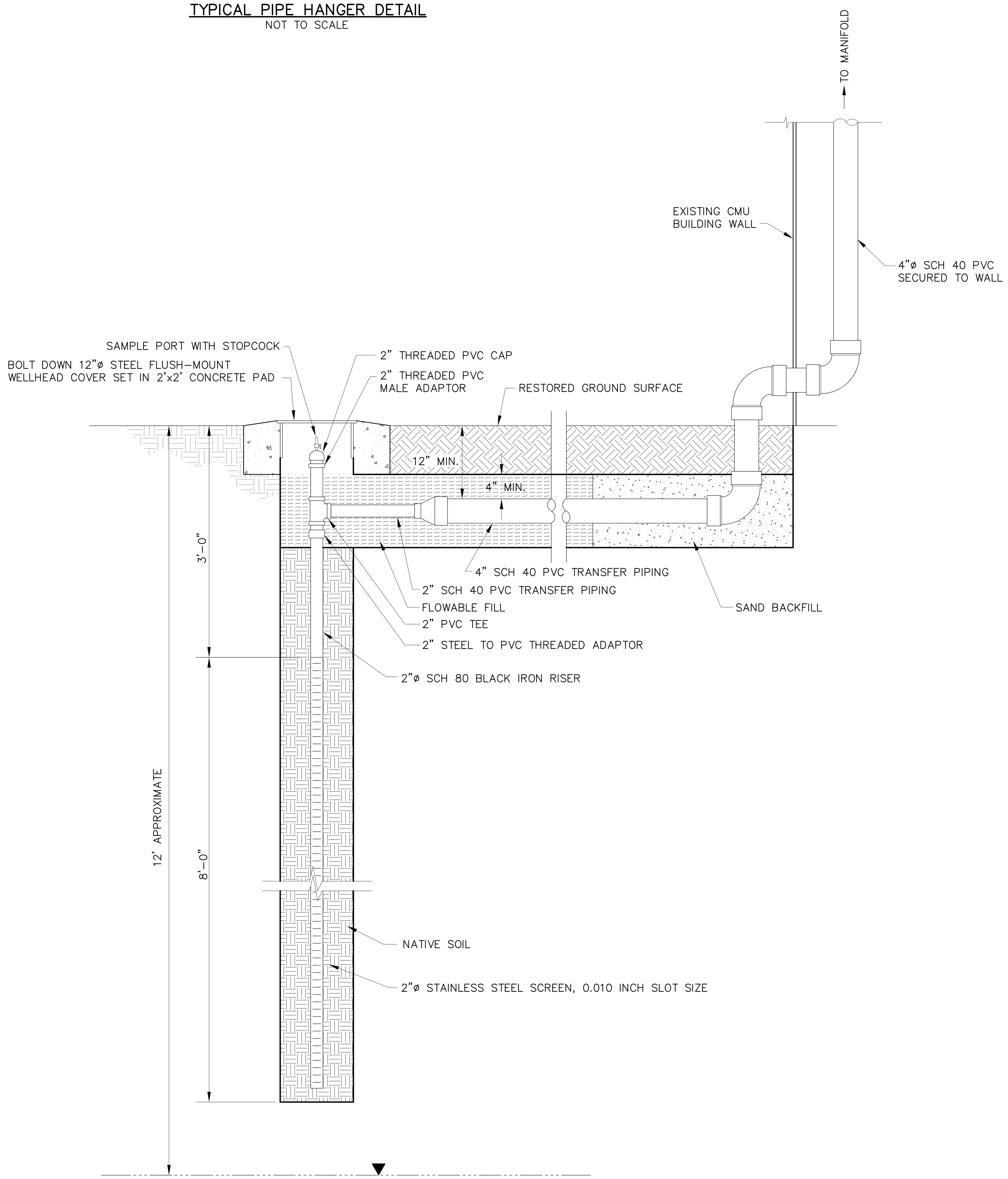


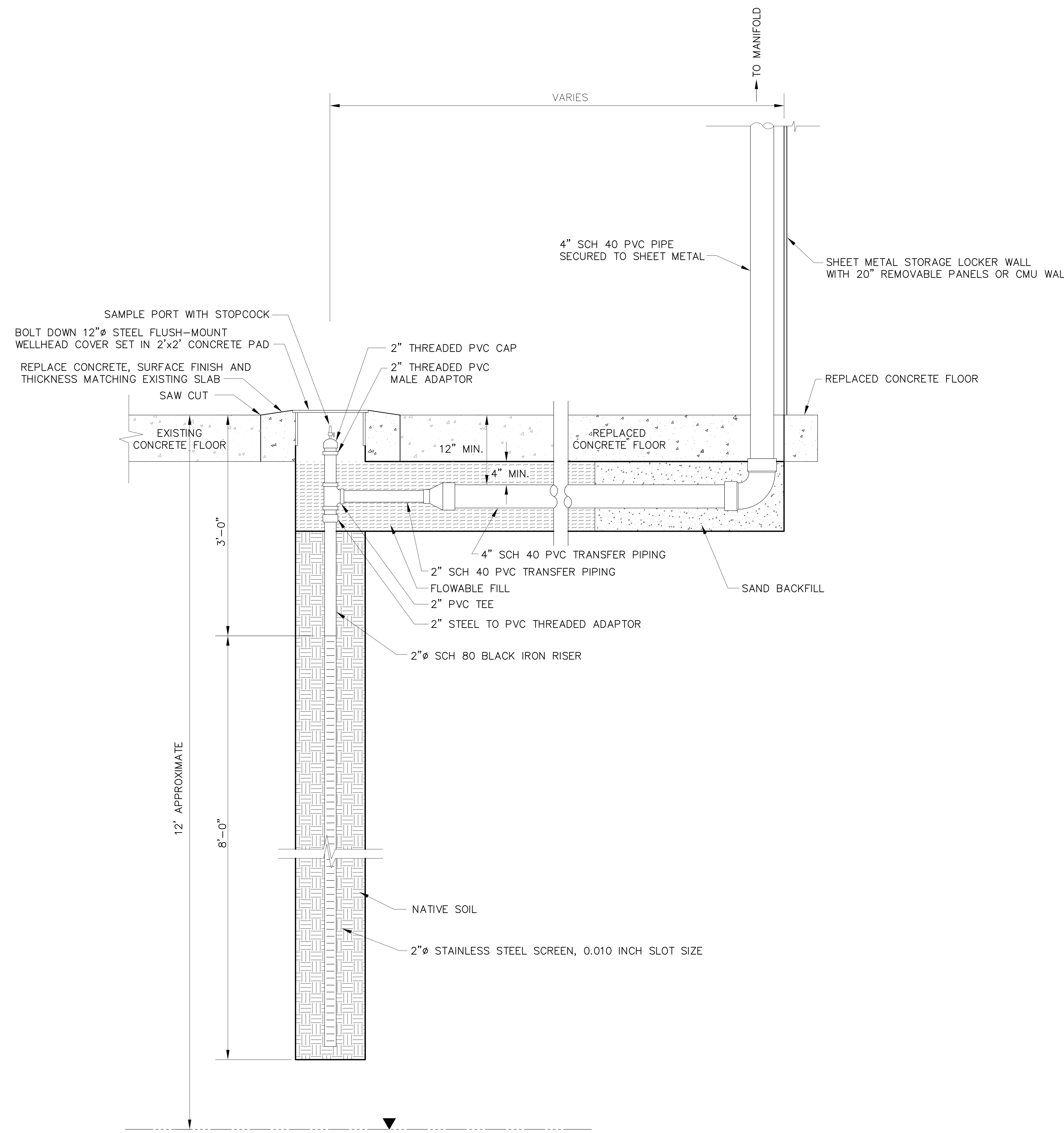
TYPICAL PIPE HANGER DETAIL
NOT TO SCALE

NOTES:

1. HANGER SPACING TO BE IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS
2. HANGERS NOT CONNECTED DIRECTLY TO STRUCTURAL SUPPORTS SHALL BE EVALUATED BY THE ENGINEER.



TYPICAL EXTERIOR SOIL VAPOR EXTRACTION WELL COMPLETION DETAIL
1"=1'-0"



TYPICAL INTERIOR SOIL VAPOR EXTRACTION WELL COMPLETION DETAIL
1"=1'-0"

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	Revised: Chkd: Appr:
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SOIL VAPOR EXTRACTION WELLHEAD COMPLETION AND PIPE HANGER DETAILS

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SHEET 9

Drawing Number
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Appendix B – Community Air Monitoring Plan

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Appendix B
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. APeriodic@ monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

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