January 16, 2018 Reference No. 081618

Mr. Steven Scharf
New York State Department of Environmental Conservation
Division of Solid & Hazardous Waste
Bureau of Solid Waste and Corrective Action
625 Broadway
Albany, New York
12233-7258

Dear Mr. Scharf:

Re: Remedial Design for Sub-Slab Depressurization Systems – Revision No. 2
RUCO Polymer Corp. Site
Hicksville, New York

1. Introduction

The assessment and potential remediation of off-site soil vapor associated with the RUCO Polymer Corp. Site in Hicksville, NY was designated as Operable Unit 05 (OU5) by the New York State Department of Environmental Conservation (NYSDEC) and is subject to NYSDEC Order on Consent and Administrative Settlement (Order) Index #A1-0799-12-10, effective September 30, 2013. In accordance with the Record of Decision (ROD) issued March 31, 2017 for Operable Unit 05: Offsite Soil Vapor, GHD, on behalf of Covestro and Glenn Springs Holdings Inc. (GSH), has prepared this Remedial Design (RD) for the installation, operation, maintenance, and monitoring of sub-slab depressurization (SSD) systems underneath the Simone Enterprises building located at 1 Enterprise Place in Hicksville, New York. The objective of this remedial action is to mitigate the potential for migration of residual sub-slab soil vapors located beneath the building slab into the Simone building. Figure 1 shows the layout of the area, including the building and the Hooker Ruco property. Figure 2 focuses on the 1 Enterprise Place building area and the planned mitigation system.

1.1 Background and Basis for Design

During the on-site remediation of the RUCO site, 1,450 cubic yards of on-site soil with elevated trichloroethylene (TCE) and perchloroethylene (PCE) concentrations were removed in 2009. Removal of this material eliminated the only known locations of elevated VOCs in soil that could be contributing to soil vapors. With the known source areas removed, only residual soil vapor concentrations remain and these will continue to dissipate with time. Therefore, any potential risk due to soil vapors sourced on the RUCO Site will also dissipate with time, including beneath the Simone Enterprises building.

In 2011, Arcadis performed a comprehensive sub-slab soil vapor and indoor air sampling program at the Simone Enterprise property for Bayer MaterialScience, owner of the adjacent RUCO property. The investigation revealed varying concentrations of TCE and PCE beneath the building. Simultaneous testing of the indoor air within the building showed TCE concentrations ranging from non-detect to 0.25 µg/m^3

and PCE concentrations ranging from non-detect to 6.5 µg/m^3. The PCE and TCE results are shown on Figures 2 and 3, respectively. All of the detected concentrations of both compounds were below New York State's 2006 ambient air guideline concentrations that were applicable at the time and are still below the revised (2013 and 2015) ambient air guidelines, which have been reduced to 2 µg/m^3 for TCE and 30 µg/m^3 for PCE[1].

Given that:

1. The TCE/PCE source areas have been removed from the soils at the adjacent RUCO property.
2. The Simone Enterprises building slab serves as a barrier to migration of sub slab vapors into the indoor air.
3. The indoor air meets the New York ambient air quality criteria.
4. The soil vapor concentrations measured in close proximity to the Simone Enterprises building decreased between 2014 and 2015.
5. Further decreases in the soil vapor concentrations are expected with time.

Wind powered SSD systems are proposed as a precautionary measure to provide a preferential pathway for residual sub-slab vapor beneath the building to vent to the atmosphere thereby mitigating the potential for migration of contaminated soil vapor to indoor air. The collection system for the SSD will be provided by horizontal wells drilled beneath the slab of the building.

2. Proposed Wind Powered Sub-Slab Depressurization Systems

2.1 System Design

The SSD systems will include the installation of a 3-inch diameter DR-11 HDPE horizontal vapor extraction pipe beneath the building for each of the six separate SSD systems. The extraction pipes will be perforated to reduce sub-slab pressure and draw soil vapor from the pore space of the sub slab bedding materials. One horizontal pipe will be installed to withdraw sub slab vapors for approximately every 100 feet of building length beneath which PCE and/or TCE is present at concentrations exceeding the no further action levels as described in the May 2017 Soil Vapor/Indoor Air Matrix.

Given that the building ranges from 100 to 180 feet in width, the 100-foot spacing of the proposed piping installation will result in a soil pore volume beneath the building ranging from approximately 10,000 cubic feet to 18000 cubic feet per horizontal pipe. This is based on the range of building widths for each particular pipe location and assuming a 4-foot depth to the base of the footing foundation and a 25 percent porosity for a silty-sand (SM) soil. The compacted sub-base gravel below the building slab may have

[1] NYSDOH Guidelines for indoor air (Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, that were in place in 2011 were based on the October 2006 guidelines. Since that time, the guideline concentrations have been reduced for both parameters with a September 2013 Revision to PCE Ambient Air Concentration from 100 µg/m^3 to 30 µg/m^3, and an August 2015 Revision to TCE Ambient Air Concentration from 5 µg/m^3 to 2 µg/m^3).

lower porosity depending upon the level of compaction used during construction and therefore using a porosity of 25 percent will result in a conservative estimate of the pore volume beneath the building. Removal of each pore volume of soil gas from beneath the building is expected to result in an improvement in the air quality beneath the building which translates into less potential for exposure due to migration of soil gas into the building. In addition, by removing pore volumes from beneath the building, it is expected that there will be no buildup of pressure in the pore space beneath the building. In fact, a slight negative pressure should result in the pore space beneath the building. This will result in the preferential flow path being in the direction of flowing from within the building to the subslab space rather than from the subslab area into the building. To maintain a steady flow of air from beneath the building slab, it would be desirable to remove (exchange) at least one pore volume of soil vapor from beneath the building every day. Therefore, the design of the SSD systems will incorporate the capability of removing at least one pore volume exchange per day. For this facility, each extraction pipe will need to remove from 10,000 to 18,000 cubic feet of air per day, or 7 to 13 cubic feet per minute (cfm). Given these design criteria, a wind powered rotary turbine ventilator will suffice to extract the necessary pore volume of soil gas.

Turbine manufacturer's literature shows that a 6-inch diameter rotary turbine can move up to 147 cfm in a 4 mph wind (see Attachment A). It is understood that air flow from the subslab pore space beneath the building will not achieve the free air flow rate of 147 cfm but even at a conservative 20 percent efficiency, this unit would remove 1.2 to 2.1 pore volumes per day from beneath each section of the building.

As a design consideration, the typical wind conditions in the Hicksville area were reviewed. Local weather station wind data (a wind rose) for the Farmingdale/Republic Airport on Long Island was obtained and is included as Figure 4. Table 1 contains the frequency of wind speeds over a 36-year period from this weather station and indicates that sufficient wind regularly occurs to power the rotary turbine at this site. Based on the data, winds greater than 2 miles per hour persist more than 90 percent of the time. Therefore, the Site conditions are suitable for a wind powered rotary turbine ventilator to drive this mitigative measure. Documentation on the rotary turbine manufacturer's specifications is included in Attachment A.

2.2 Green Remediation Principles and Techniques

An important part of any remedial measure is its sustainability and long term impact on the environment. Based on the green guideline principles listed in the ROD, it has been determined that the wind powered turbine is the proper choice for this application. It is a green solution. It will be effective. And it requires no external power source. This section provides a description of how the remedy design incorporates the green remediation principles and techniques contained within NYSDEC DER-31/Green Remediation.

2.2.1 Long-term Environmental Impacts of Treatment Technology and Remedy Stewardship

The long-term impact of the selected remedy will be sub-slab depressurization along with the reduction of soil vapor concentrations beneath the Simone Enterprises building over time, thereby reducing the potential for soil vapor migration into the building.

2.2.2 Direct and Indirect Greenhouse Gas Emissions

The primary man-made greenhouse gases are carbon dioxide, methane, and nitrous oxide. Manufacturing and installation of the physical components of the venting system (piping, wind powered turbines) will not require extensive energy, other than drilling for the installation of the sub slab perforated pipes. This limits the amount of such gases generated. Operation of the system will not use any energy sources other than natural wind. Thus, no greenhouse gases will be generated during operation.

2.2.3 Minimizing Use of Non-Renewable Energy

Other than for the manufacturing of the components of this mitigative remedy and for their installation, this wind powered design requires no consumption of non-renewable energy. If a higher powered venting system is determined to be needed, the option of solar powered low voltage blower fans is available, thereby reducing the use of non-renewable energy.

2.2.4 Conserving and Efficiently Managing Resources and Materials

Other than for the manufacturing of the components of this mitigative remedy and for their installation, this wind powered design requires no consumption of resources or materials.

2.2.5 Reducing Waste, Increasing Recycling and Reuse of Materials

No wastes are envisioned to be generated other than excess soil generated during drilling for installation of the perforated pipes and a small amount of spent personal protective equipment and household waste (e.g., from worker meals, etc.). In addition, if the selected contractor uses a proppant to keep the horizontal borehole open for ease of installation of the horizontal pipe and the proppant cannot be deactivated (i.e., converted to an innocuous fluid that can be left in the borehole), waste proppant generated during installation of the sub-slab piping will have to be properly managed. Soil excavated for the entry and exit excavations will be stockpiled and placed into the excavation after pipe installation is completed. The stockpile will be underlain with plywood or equivalent, if needed to prevent damage to the surface of the stockpile area. No wastes are generated during operation.

2.2.6 Maximizing Habitat Value

The Site is located within an industrial/commercial area. Thus, habitat is not a principle applicable to this Site.

2.2.7 Fostering Green and Healthy Communities

The Site is located within an industrial/commercial area. Thus, this is not a principle applicable to this Site.

2.2.8 Integrating Remedy with Land Use

The remedy is being installed at an existing facility and the design is taking into account the facility's utilities, property and building uses, and the building aesthetics.

Thus, the remedy is integrated with the existing land use.

3. System Installation

3.1 Preliminary Testing

Prior to implementation of Phase 1 of the system, a sub-slab negative pressure test will be conducted to verify the effectiveness of a sub--slab depressurization system. The primary purpose of the preliminary testing is to determine the radius of influence, which will ensure the areal extent of the sub-slab to be mitigated by Phase 1, is under adequate vacuum levels. The generally accepted minimum vacuum of one Pascal (Pa) (0.004 inches of water column) is desired throughout the area targeted for depressurization, thus a manometer capable of measuring as low as 1 Pa will be used during the test monitoring.

The initial extraction well will be installed in the area of SSV-6/IA-6. A proposed layout of the test extraction and monitoring locations is shown on Figure 2. A 2.5- inch diameter hole will be bored into the floor slab, after which any loose soil or gravel present will be removed down to one-foot below the bottom of the floor slab to form a void from which vapors can be extracted. A two-inch diameter, perforated or slotted Schedule 40 PVC pipe, with filter sock to prevent debris and dust from entering the system, shall then be placed down into the void. Piping, consisting of two-inch diameter Schedule 40 PVC, will be connected from the extraction pipe to the vacuum blower and the annular space between the concrete and piping will be sealed with concrete.

In order to measure the vacuum levels applied, a series of pressure monitoring sensors (Vapor Pin® - see Attachment D) or similar commercially available alternative will be installed to the north and south of the extraction point at alternating intervals of 5, 15, and 25 feet to the north and 10, 20, and 30 feet to the south. Using a hammer drill, a 5/8-inch diameter hole will be drilled through the slab and down 6-inches into the underlying soil/gravel to form a small void. The Vapor Pin® can then be inserted into the hole and tapped lightly into place with a hammer until it enters the void. A silicon sleeve around the Vapor Pin® will bulge out, creating a seal around the hole, while it is hammered into place. After the final Vapor Pin® is installed, the sub-slab conditions should be allowed a period of 20 minutes to re-equilibrate prior to sampling. During testing, a short piece of tubing can be connected from the Vapor Pin® to the manometer so that readings can be made at each point during the various steps of the test.

Once the extraction point and the six pressure sensors are installed and the sub-slab has re-equilibrated, a multi-phased step test will commence in order to measure the pressure field extension from the extraction point. During this test, a flow meter, flow control valve, and vacuum gauge will be installed in the piping between the extraction point and the vacuum blower, and extracted vapors will be discharged to the exterior of the building. A blower capable of approximately 50-inches water column (we) vacuum and 50 cfm will be used for the testing. A vacuum gauge will be attached to the blower to measure the vacuum generated at the source by the blower. The blower will be operated for short periods at a series of increasing flow and vacuum levels. After 15-minutes at each "step", the pressure and flow at the extraction point will be recorded by the technician performing the test, along with vacuum readings at each of the six

Vapor Pin® locations. If, at the end of the test, sub-slab vacuum in an area is found to be less than one Pa, the associated Vapor Pin® will be checked for proper installation and performance and a replacement may be installed to confirm the measured value. Following the testing, the Vapor Pins® will be removed from the floor slab; the holes will be filled in with concrete, and allowed adequate time to dry before Phase 1 of the system is operated.

After completion of Phase 1 of the SSDS (see Section 3.5), an evaluation of the Phase 1 data will be performed and a report provided to the NYSDEC providing all the data, evaluation of the data, any planned modifications to the design pre-installation testing, installation, operation and/or monitoring of the remaining 5 SSDSs, including the need for a vacuum monitoring point east of the end of the perforated pipes.

3.2 Layout

The planned locations of the extraction piping and screened intervals for the proposed SSD system are shown on Figures 2 and 3. The locations selected for the perforated pipe installations were chosen:

- To avoid utilities beneath the building
- In response to the sub-slab soil vapor concentrations detected

An inspection of the Simone building and discussion with Property personnel on May 31, 2017 identified that electrical, gas, water, and sewer utilities are present along the extent of the easterly portion of the building. Drawings showing the exact location of such utilities are not available and likely could not be relied upon in any event due to the age of the building and the changes to the use and ownership of the building. Thus, to minimize the potential for damaging subsurface utilities by the installation of the SSD system, the length of the horizontal extraction pipes will be limited to a total length of 50 feet from the west wall of the building.

The sub-slab PCE concentrations beneath the northerly 400 feet of the Simone building ranged from 11 to 340 $\mu g/m^3$ and TCE concentrations ranged from 1.1 to 37 $\mu g/m^3$. Indoor air PCE concentrations ranged from ND to 0.40 $\mu g/m^3$ and indoor air TCE concentrations ranged from ND to 0.25 $\mu g/m^3$. A comparison of the sub-slab soil vapor to indoor air concentrations indicates that, pursuant to New York State's Soil Vapor/Indoor Air Matrix A dated May 2017, no further actions are warranted in this area of the building. Consequently, no pipes will be installed beneath this portion of the building. Any additional post-installation monitoring of this area of the building will be determined in consultation with the NYSDEC upon evaluation of the Phase 1 SSDS monitoring results (see Section 3.4 for additional details). Horizontal extraction pipes will be installed in areas of higher VOC concentrations beneath the remainder of the building.

The perforated vapor mitigation piping will be installed across the central and southern part of the building as shown on Figures 2 and 3. The pipe will be perforated beginning approximately 10 feet from the west wall of the building and extending to its full length to the eastern tip of each pipe. The first 10 feet from the west side of the building will be constructed of solid pipe to avoid drawing in soil vapor from outside the footprint of the building rather than soil vapor from beneath the building slab. The perforated portion of the pipe will end approximately 50 feet from the west wall of the building.

3.3 Horizontal Boring and Installation

With the slab on grade construction of the building, the depth of the boring and the installed piping will be just below the subgrade of the perimeter of the building. It is intended that the final depth of the installed piping will be between 1 and 2 feet below the underside of the building slab. Currently, the area to the west of the building is open space used primarily for temporary storage by the various parties occupying the building. The materials stored thereon will be temporarily relocated prior to the start of the horizontal pipe installations.

A small entry excavation will be dug on the west side of the building at the selected locations for the horizontal pipe installations. The depth will extend two to three feet below the ground surface and will extend far enough away from the west building wall to allow the horizontal drilling and the pipe installation to proceed. A small opening will be cut into the west foundation wall of the building at the appropriate height and location to allow the installations to proceed. A 6-inch diameter horizontal boring will be drilled beneath the building slab from west to east to a distance of approximately 50 feet. The drill head will be pulled back and piping will be installed into the boring. The pipe will be assembled in sections and pushed into the open cavity of the boring. The pipe will be 3-inch diameter HDPE pipe. The pipe will be tipped with a cone shaped cap to further enable the pipe being pushed into the boring. The pipes will be pushed the full length (50 feet) beneath the building or to the extent possible with the equipment available.

The first pipe installation will be used as the trial to confirm the procedure to be used for the subsequent installations. If necessary, a proppant material may be used to prevent collapse of the borehole after the drilling equipment is removed and before the piping is installed. This may improve the penetration of the piping into the boreholes that have been drilled. The proppant material will be flushed out or deactivated, as appropriate, following pipe installation.

The horizontal borings will be drilled using a method that reduces the potential of damage to utilities (e.g., air knifing), if practical. Any holes through the foundation will be sealed around the extraction piping with concrete prior to backfilling the entry pits.

3.4 Riser and Ventilator Installation

Each horizontal pipe will consist of solid HDPE pipe from just outside the building foundation to 10 feet inside the building on the west side of the building to ensure that soil vapor is removed from the sub-slab area rather than air from outside the building envelope. The solid pipe will be fusion welded to perforated 3-inch diameter HDPE pipe across the center portion of the building. The solid pipe will extend through the foundation wall beyond the building footprint where it will tee upward and transition to a carbon steel riser stack to the building's roof line. The riser piping will be securely anchored to the building and at the top of the building wall to support the torque created by the wind-powered rotary turbines during operation. The extension of the teed portion of the pipe from beneath the building will be fitted with a removable plug so that the pipe extending beneath the building can be accessed, if necessary.

The top of each riser will be increased to a diameter of 6 inches at the roofline to accommodate the installation of a 6-inch diameter wind-powered rotary turbine at the top of each riser. This turbine will create a vacuum to induce the flow of the sub slab air through the mitigation piping.

A sample/access port will be installed on each riser approximately 4 feet above ground level to allow flow rates to be monitored, PID readings to be taken, and soil vapor samples to be collected of the extracted soil vapor.

3.5 Installation Phasing

It is planned to complete one horizontal boring and horizontal pipe installation to evaluate the installation, operating, and monitoring procedures. Should difficulties be encountered during Phase 1, the installation, operating, and/or monitoring procedures may be modified for the remainder of the installations. NYSDEC concurrence will be obtained prior to the implementation of any revised procedures.

The phased plan is as follows:

i. Perform the interior work as described in Section 3.7.

ii. Install an extraction pipe in the area in close proximity to SSV-5 which had the greatest PCE sub-slab concentration.

iii. Collect a sub-slab soil vapor sample prior to Phase 1 operation in close proximity to SSV-5 using NYSDEC standard collection techniques.

iv. Operate Phase 1 for a period of 6 months.

v. Monitor vacuum, PID, airflow and VOCs in accord with Table 2.

vi. Additionally, during the heating season (i.e., February/March 2018) collect 3 indoor air samples, one from above the installed lateral and two more from the southern half of the building. A survey of the building interior characteristics which may affect the indoor air results will be performed prior to sample collection.

vii. After the 6 months of Phase 1 operation another sub-slab soil vapor sample will be collected in close proximity to the pre-operations sample. Note that it is planned to seal up the opening after each sample collection.

viii. Thereafter, an evaluation of the data will be performed and a report will be submitted to the NYSDEC providing all the data, the interpretation of the data, any planned modifications to the design, pre-installation testing, installation, operating, and/or monitoring of the remaining 5 SSDS.

As a contingency, if the wind powered venting system does not function as designed and cannot withdraw sufficient soil vapor from beneath the building to reduce the potential for impacted soil vapor intrusion into the building, other options may be considered including low voltage direct current solar operated fans or fractional horsepower AC powered electric fans.

3.6 Restoration

All disturbed surface areas will be restored to pre-existing conditions by using materials that match the surrounding conditions.

3.7 Interior Work

In addition to the installation of the SSD system, all floor penetrations, floor joints, or slab cracks within the entire building will be inspected. Any penetrations, joints or cracks in accessible areas that are found to provide a potential pathway from the sub-slab will be sealed with urethane caulk or hydraulic cement, as determined based on the observed conditions, as part of the remediation implementation. It is anticipated that a NYSDEC representative will be on-site to provide immediate concurrence of which penetrations, joints and/or cracks need to be sealed. The interior work will be coordinated and completed in conjunction with the property owner and tenant's requirements.

4. Monitoring Plan

4.1 Vapor Monitoring during Systems Operation

During system operation, monitoring will be performed to determine the effectiveness of the systems for the removal of soil vapor from beneath the building.

During the first week following Phase I system start-up, readings will be collected daily from the riser stack to determine the flow rate, vacuum and relative organic vapor concentration of the air being discharged. Volatile organic vapors will be measured using a photoionization detector (PID). Flow will be measured using a hot-tip anemometer or other suitable instrument vacuum will be measured using a digital nanometer. During that first week, after the PID readings in each riser have stabilized, a summa canister sample will be collected from the riser pipe to determine if treatment of the soil vapor is needed prior to discharge to the atmosphere. After the first week, PID and flow readings will be collected weekly for the next 3 weeks, then monthly for the next 2 months, and then quarterly for the next 3 quarters. After the first 3 months of operation, which corresponds to the removal of approximately 100 to 200 pore volumes, a second set of summa canister samples will be collected. The two sets of analytical results will be used to evaluate the site conditions. The information will be shared with the NYSDEC so that appropriate discussions can be held regarding ongoing operation of the system and, if appropriate, applicable criteria for shut down of the system. A summary of the sampling and analyses is provided in Table 2.

The PID sampling results will be used to determine the effectiveness of the wind powered SSD system in removing residual vapors from beneath the building. The flow readings will be used to determine that an adequate volume of air is being withdrawn from beneath the building through the risers. These readings will allow an estimate to be made of the mass removal of the VOCs over time. The vacuum readings will be used to determine that a negative pressure has been established in the horizontal pipe.

4.2 Off-Site Soil Vapor Monitoring

Soil vapor probes VP-41 and VP-42, located along New South Road south of the LIRR tracks, are the two probes in closest proximity to residential properties. The PCE concentrations in VP-41 decreased from 2100 $\mu g/m^3$ in November 2014 to 3.4 $\mu g/m^3$ in December 2015 and in VP-42 from 2900 $\mu g/m^3$ in November 2014 to 3.7 $\mu g/m^3$ in December 2015 (see Figure 2). In accordance with the ROD, VP-41 and VP-42 will be sampled annually for four events. The scope of future actions, if any, will be determined based on review of the results in consultation with the NYSDEC.

The PCE concentrations in soil vapor probe VP-46, located south of the Simone Enterprises building decreased from 580 $\mu g/m^3$ in November 2014 to 380 $\mu g/m^3$ in December 2015 (see Figure 2). To confirm that the downward trend is continuing soil vapor samples will be collected annually from VP-46 for four events. Thereafter, a determination of appropriate sampling frequency will be discussed with the NYSDEC with the intent to sample until the PCE concentration reaches a concentration of less than 30 $\mu g/m^3$ or some other higher appropriate level based on the trends observed.

A summary of the monitoring described above is provided in Table 2.

4.3 Sampling and Analyses Procedures

The collection and analyses of soil vapor samples will follow the procedures presented in Attachment B. These procedures were contained in the letter report "Soil Vapor Investigation Work Plan - Revision No. 2" dated July 27, 2013, which was approved by the NYSDEC.

5. Reporting

The details regarding the installation of the venting system will be provided in a Final Engineering Report (FER) which will be in a letter format with appropriate figures. The FER will include:

1. A summary of the work activities performed
2. Data tables presenting the laboratory results
3. Drawings showing the installed system
4. Copies of the full laboratory report(s) (including a Data Usability Summary)
5. A CD containing the full laboratory analytical data reports

A Site Management Plan (SMP) has already been prepared and a draft is being submitted as a separate document. It is expected that the SMP will be updated at the time of submission of the first annual review report of the entire operating system to incorporate appropriate knowledge gained during this period of operation of the system. The SMP includes:

1. An Engineering and Institutional Control Plan:
    a) Description of the depressurization system

b) Provisions for the management and inspection of the depressurization system

c) Steps necessary for the periodic review and certification of the depressurization system

2. A Monitoring Plan:

   a) Periodic monitoring of the depressurization system to assess its effectiveness

   b) Frequency of submittals to the NYSDEC

   c) Monitoring along New South Road (VP-41 and VP-42)

   d) Monitoring of VP-46

3. An Operation and Maintenance (O&M) Plan:

   a) Procedures for O&M of the depressurization system

   b) Compliance inspection of the system to ensure proper O&M

The results of the mitigation system monitoring program will be reported as part of the Monthly Progress Reports being submitted to the NYSDEC for OU-5, Ruco Polymers Site, Hicksville, NY (Site No. 1300004). One year after the entire mitigation system becomes operational, it is planned to prepare a one-year evaluation of the system and to propose any appropriate modifications to the system. Thereafter, the progress reporting period will change from monthly to semi-annually.

6. Health and Safety

All works will be performed in compliance with the applicable procedures described in the USEPA approved report titled "Health and Safety Plan for the Operable Unit 3 Groundwater Remediation System" dated April 2009 (Updated October 2016) and the Community Air Monitoring Plan (CAMP) included as Attachment C. It is anticipated that the sub-slab material beneath the Simone Enterprises building is not impacted by chemicals. Thus, the work will start using Level D PPE (i.e., hard hats, safety boots, and eye and hearing protection as needed). PID readings will be periodically taken during construction of the SSD system to confirm that the Level D PPE is appropriate. Particulate (dust) readings will also be taken in the work zone to ensure that the levels do not exceed the OSHA permissible level of 5 mg/m^3.

7. Waste Material Handling

The only wastes anticipated are approximately 2 to 3 cubic yards of excess soil from the horizontal borings and a small quantity of used PPE and household rubbish (e.g., materials packaging and miscellaneous food wastes from lunches). In addition, if the selected contractor uses a proppant that cannot be deactivated, approximately 2 to 3 cubic yards of spent proppant will be generated. The excess soil will be containerized into a roll-off container and the spent proppant, if generated, will be containerized into a lined roll-off. After drilling is completed, one composite soil sample from each roll-off container will be analyzed for VOCs to determine the chemical concentrations and the appropriate method to dispose of the excess soils and spent proppant. It is anticipated that the excess soils will be clean and will be disposed of at an appropriately licensed facility. The spent proppant will be disposed at an appropriately licensed facility. The used PPE and household wastes will be placed in plastic garbage bags and disposed of at a sanitary landfill facility.

8. Schedule

It is anticipated that NYSDEC approval of this RD will be received by January 19, 2018. Anticipated dates for the remaining activities are:

Activity	Time Period
Pre-Installation Testing	30 days after receipt of NYSDEC approval
Installation of Phase 1	45 days after completion of Pre-Installation Testing
Operation & Monitoring of Phase 1	200 days after installation
Preparation & Submittal of Phase 1 Report	45 days thereafter

The schedule for activities after submittal of the Phase 1 report will be provided with the Phase 1 report.

Should you have any questions on the above, please do not hesitate to contact us.

Sincerely,

GHD

Klaus Schmidtke

Klaus Schmidtke, P.Eng.

KS/cb/51-Rev2

Encl.

Certification

I certify that I am currently a NYS registered professional engineer and that this Remedial Design Report for the RUCO Polymer Corporation Site was prepared in accordance with applicable statues and regulations and in substantial conformance with the New York State Department of Environmental Conservation (NYSDEC) DER Technical Guidance for Site Investigation and Remediation (DER-10).

STATE OF NEW YORK
RICHARD J. SNYDER
No. 66242
LICENSED PROFESSIONAL ENGINEER

Richard J. Snyder, P.E.
Senior Engineer

January 16, 2018

Date

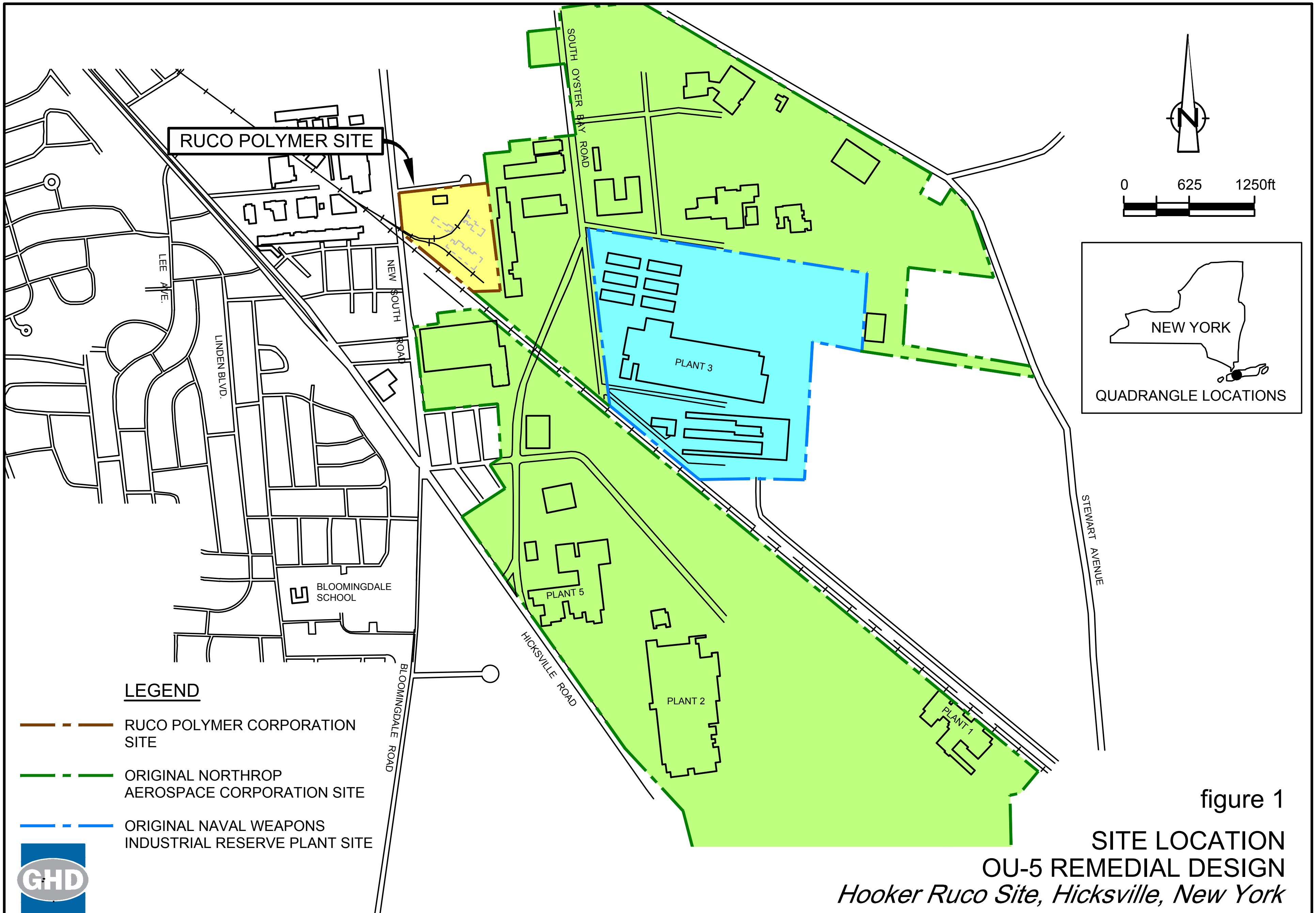


figure 1

SITE LOCATION
OU-5 REMEDIAL DESIGN
Hooker Ruco Site, Hicksville, New York

81618-D22102(SCHA051-REV.2)GN-WA001 JAN 2, 2018

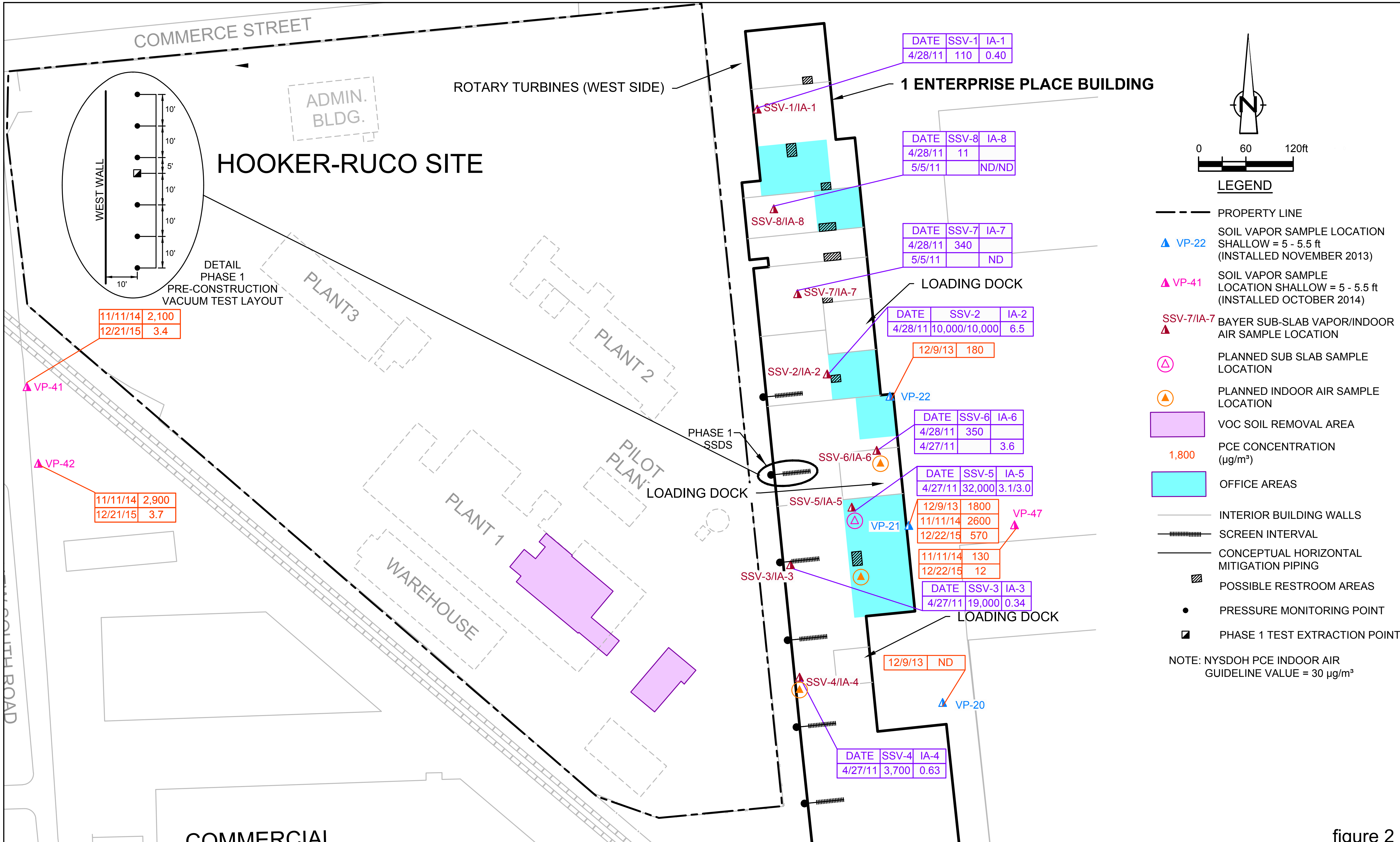


figure 2

1 ENTERPRISE PLACE DETAILS & PCE SOIL VAPOR & INDOOR AIR RESULTS
OU-5 REMEDIAL DESIGN
Hooker Ruco Site, Hicksville, New York

81618-D22102(SCHA051-REV.2)GN-WA002 JAN 2, 2018

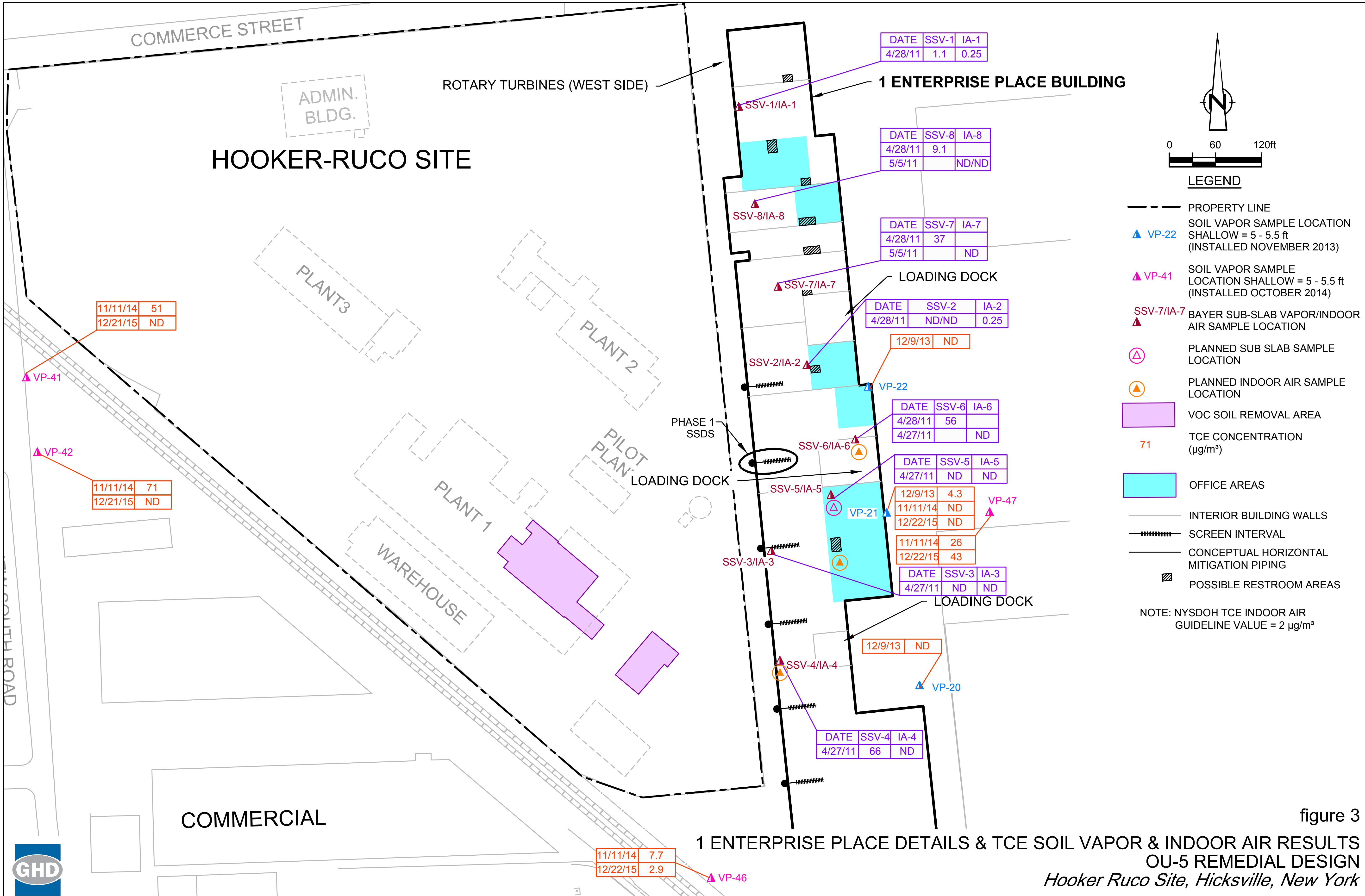
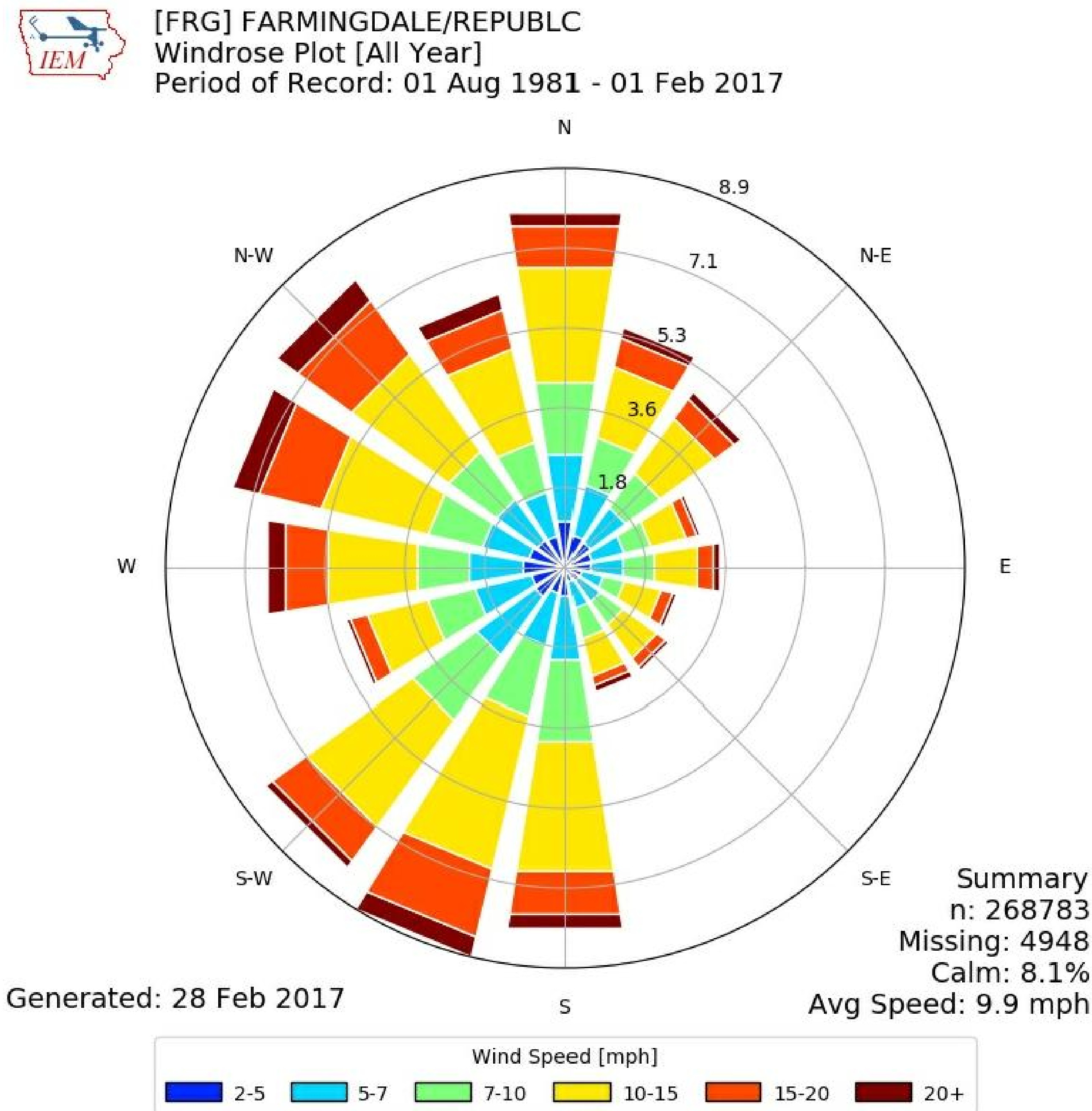


figure 3

1 ENTERPRISE PLACE DETAILS & TCE SOIL VAPOR & INDOOR AIR RESULTS
OU-5 REMEDIAL DESIGN
Hooker Ruco Site, Hicksville, New York

81618-D22102(SCHA051-REV.2)GN-WA003 JAN 2, 2018



Source: Iowa State University
Department of Science and Technology
Mesonet Database
Farmingdale/Republic Airport
Farmingdale, NY

figure 4

WINDROSE - 1981 TO 2017
OU-5 REMEDIAL DESIGN
Hooker Ruco Site, Hicksville, New York

Table 1

Wind Data from Farmingdale Republic Airport
Soil Vapor Venting System
1 Enterprise Place
Hicksville, New York

Windrose Data Table (Percent Frequency) for FARMINGDALE/REPUBLIC (FRG)
Observations Used/Missing/Total: 263835/4948/268783
Period: 1 Aug 1981 - 1 Feb 2017
Wind Speed Units: miles per hour
Generated 28 Feb 2017 16:18 UTC, contact: akrherz@iastate.edu

Frequency that wind blows at given speed from given direction

Wind From Direction	Calm 0 to 1.9 mph	2.0 to 4.99 mph	5.0 to 6.99 mph	7.0 to 9.9 mph	10.0 to 14.9 mph	15.0 to 19.9 mph	20 + mph	**Totals (1)**
348-011	8.051	1.024	1.519	1.624	2.595	0.936	0.295	16.044
011-033	0.000	0.726	1.156	1.090	1.624	0.661	0.243	5.500
033-056	0.000	0.681	0.964	0.950	1.505	0.542	0.193	4.835
056-078	0.000	0.596	0.738	0.617	0.810	0.243	0.083	3.087
078-101	0.000	0.561	0.732	0.700	0.979	0.360	0.144	3.476
101-123	0.000	0.369	0.487	0.486	0.843	0.268	0.096	2.549
123-146	0.000	0.366	0.579	0.634	0.929	0.244	0.092	2.844
146-168	0.000	0.329	0.603	0.705	0.860	0.210	0.149	2.856
168-191	0.001	0.646	1.436	1.826	2.922	0.974	0.320	8.125
191-213	0.000	0.594	1.194	1.606	3.496	1.556	0.459	8.905
213-236	0.000	0.807	1.612	1.768	2.932	0.938	0.184	8.241
236-258	0.000	0.756	1.296	1.081	1.386	0.391	0.094	5.004
258-281	0.000	0.922	1.217	1.169	2.023	0.964	0.406	6.701
281-303	0.000	0.812	1.070	1.244	2.457	1.424	0.610	7.617
303-326	0.000	0.743	1.124	1.319	2.685	1.480	0.584	7.935
326-348	0.000	0.711	1.005	1.152	2.140	0.896	0.374	6.278
Totals (2)	**8.052**	**10.643**	**16.732**	**17.971**	**30.186**	**12.087**	**4.326**	

Total (1) Frequency that wind blows from this direction at all speeds
Total (2) Frequency that wind blows at this speed from all directions

Table 2

Vapor Sampling and Analytical Summary
Soil Vapor Venting System
1 Enterprise Place, Hicksville, NY

Activity	Locations	Frequency	Observation/Activity
Operating System	Phase I Riser pipe valve	Daily for 1st week Next 3 weeks – weekly Next 2 months – monthly Next 3 quarters – quarterly Thereafter – TBD	PID, Flow Rate & Vacuum PID, Flow Rate & Vacuum PID, Flow Rate & Vacuum PID, Flow Rate & Vacuum
		Prior to operation (once) 1st week (once) Three Months Thereafter - TBD	VOCs VOCs VOCs VOCs
Operating System	Remainder of Riser Pipes	Daily for 1st week Next 3 weeks – weekly Next 2 months – monthly Next 3 quarters – quarterly Thereafter – TBD	PID, Flow Rate & Vacuum PID, Flow Rate & Vacuum PID, Flow Rate & Vacuum PID, Flow Rate & Vacuum
		Prior to operation (once) 1st week (once) Three Months Thereafter - TBD	VOCs VOCs VOCs VOCs
Off-Site	VP-41, VP-42, VP-46	Annual for 4 years Thereafter – TBD	VOCs

TBD - To Be Determined

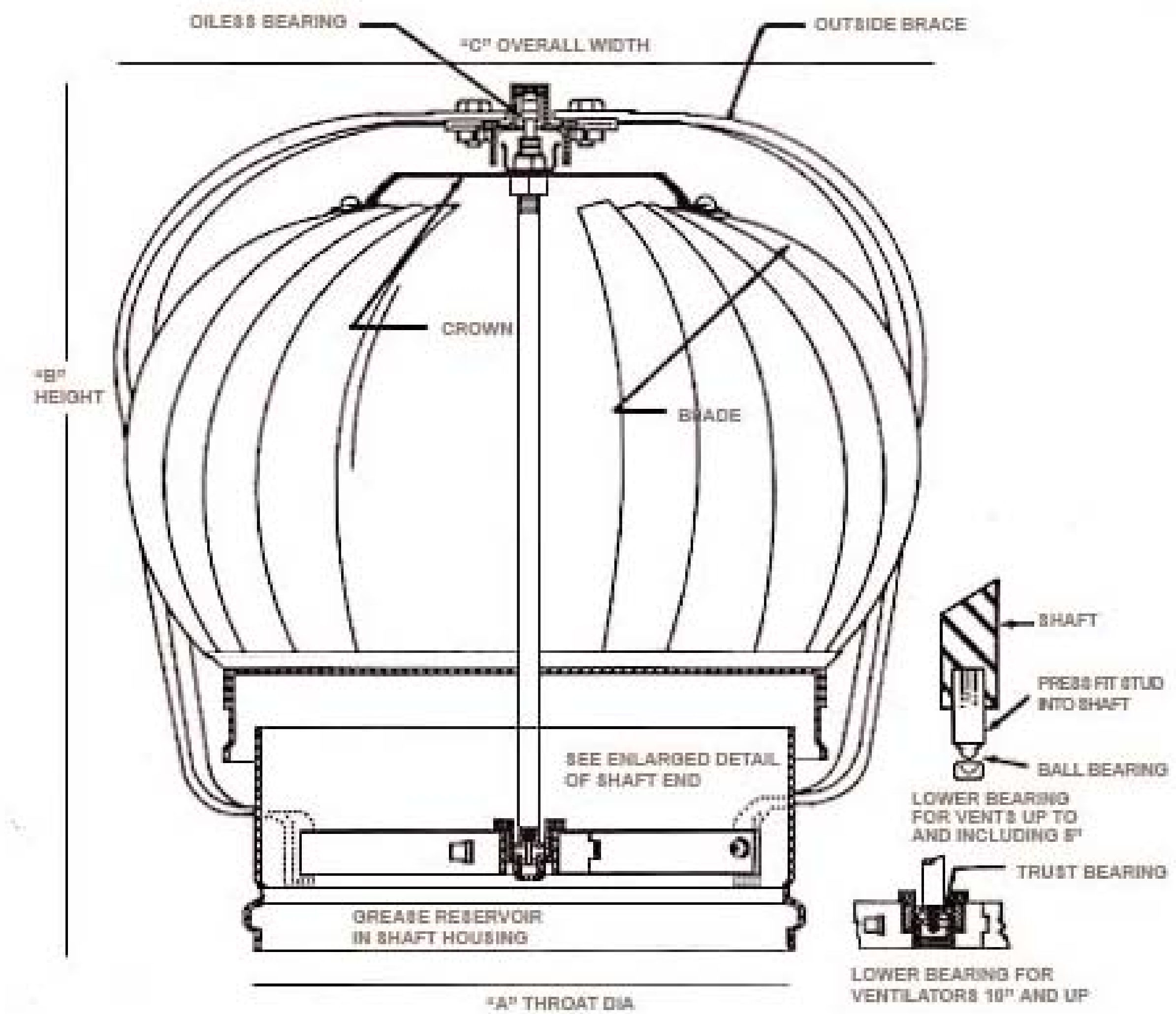
Attachment A
Rotary Turbine Specification Sheet

EMPIRE

VENTILATION EQUIPMENT CO., INC.

TOP OF THE LINE VENTILATORS
FOR BOTTOM LINE RESULTS

TURBINE VENTILATORS



CONSTRUCTION SPECIFICATIONS					
"A" THROAT SIZE	GUAGE			NO. OF BRACES	BRACE MATERIAL
	CROWN GALV.	BLADE GALV.	THROAT GALV.		
4	24	28	26	3	ALUMINUM
6	24	28	26	3	ALUMINUM
8	24	28	26	3	ALUMINUM
10	24	28	26	3	ALUMINUM
12	24	28	24	3	ALUMINUM
14	22	26	24	3	ALUMINUM
16	22	26	24	3	STEEL
18	22	26	24	4	STEEL
20	20	26	24	4	STEEL
24	20	26	22	4	STEEL

DIMENSIONAL AND PERFORMACE DATA				
"A" THROAT SIZE	"B" HEIGHT	"C" OVERALL WIDTH	EXHAUSTED CAPACITY*	APPROX. SHIPPING WEIGHT
4	12	10 1/4	125	5
6	14 1/2	12 3/4	147	7
8	15	14 1/4	255	8
10	16 1/4	16 1/4	425	11
12	17	19	631	13
14	19 3/4	22 3/4	700	21
16	21 3/4	25 1/2	950	31
18	24	29	1200	38
20	25 1/4	31 5/8	1700	46
24	28 1/4	35 3/4	2350	58

*4 MPH WIND CFM

Attachment B
Quality Assurance Project Plan

CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

July 24, 2013 Reference No. 081618

Mr. Stephen Scharf
New York State Department of Environmental Conservation
Division of Solid & Hazardous Materials
Bureau of Solid Waste and Corrective Action
625 Broadway
Albany, NY 12233-7258

Dear Mr. Scharf:

Re: Bayer Material Science LLC 125 New South Road Hicksville, New York
USEPA ID#: NYD002920312
Soil Vapor Investigation Work Plan-Revision No. 2

On behalf of Bayer Material Science LLC (Bayer) and Glenn Springs Holdings, Inc. (GSH), this letter presents a revised Work Plan for a soil vapor investigation to identify the current potential for off-site migration of soil vapor from the former Bayer facility in Hicksville, New York. This Work Plan is being presented to the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) pursuant to ongoing discussions regarding soil vapor and in response to the NYSDEC/NYSDOH comments dated April 25, 2013 and July 18, 2013. If the following approach is acceptable to the Departments, the Work Plan will be implemented on an expedited schedule by Bayer and GSH pursuant to an Order on Consent.

As described in this document, numerous activities have occurred at the site since 2004 that have reduced the concentrations of on-site volatile organic compounds (VOCs) thereby reducing the current possibility of off-site migration of soil vapors from the site and any residual off-site soil vapor that may have been sourced by the site in the past. This letter summarizes relevant information from soil, soil vapor, and groundwater investigations and remediation activities performed to date, and propose a Work Plan to determine current soil vapor conditions and to evaluate the potential for soil vapors to migrate off-site. The planned actions described in this Work Plan follow the protocols and procedures outlined in NYSDOH 2006 Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York (Guidance), and are consistent with the soil vapor investigations previously approved by NYSDEC/NYSDOH for this site.

GROUNDWATER INVESTIGATIONS

The groundwater beneath the site has been investigated extensively over the past 30 years. The investigations have demonstrated that the groundwater flows in a southerly direction and that the groundwater table is about 50 feet below the ground surface (ft bgs). Thus, the vadose zone is about 50 feet thick. The results of the groundwater sample analyses have confirmed that, with limited exception, the groundwater immediately beneath the site meets New York State Class GA drinking quality groundwater standards. Additionally, the highest concentrations of PCE, TCE, and vinyl chloride recorded at the site in the past 15 years were low (85 µg/L for PCE in 2002; 14 µg/L for TCE in 1998; and 17 µg/L for vinyl chloride in 2002). Now, 12 to 15 years later, the concentrations of these VOCs are expected to be at or below the Class GA drinking quality groundwater standards due to natural attenuation processes. Therefore, the focus of the soil vapor investigation should be vadose zone soils.

SOIL INVESTIGATIONS

Under NYSDEC's RCRA program, the vadose zone soils across the site were extensively investigated through a comprehensive series of seven successive phases of study over the period from 2004 to 2009. Initial phases of the investigations did not assess soils under the on-site buildings and structures existing at that time. However, the most recent sampling investigations (Phases IV through VII) were performed after the buildings were removed, providing access to all of the site soils. Soil samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals. Consequently, over the course of the seven phases of soil investigation, a thorough assessment of the presence of VOCs and VOC-impacted soil that could contribute to soil vapors has been completed. Moreover, of particular significance, when an area of VOC-impacted soil was identified, the horizontal and vertical extent of such impacted area was delineated and the soils removed as a RCRA Interim Corrective Measure.

During these seven phases, soil samples from over 450 locations have been analyzed for VOCs. The results of the VOC sampling events identified only two areas in the middle of the site, one beneath former Plant 1 and one immediately east of Plant 1, where VOC concentrations in excess of 1 mg/kg were present. Subsequent additional sampling was performed in these areas to fully delineate the horizontal and vertical extent of the elevated VOC concentrations. The primary VOCs present in these areas were tetrachloroethene (PCE) and trichloroethene (TCE). Figures 1 and 2 provide a color-coded depiction of the PCE and TCE concentrations found in the soil samples.

As previously stated, the primary VOCs were PCE and TCE. Additionally, cis-1,2-dichloroethene (a product of PCE and TCE degradation) was also present in some of the PCE and TCE impacted soil locations. Methylene chloride, toluene, MIBK, and styrene were present in four, two, one, and one sample locations respectively in the former Plant 1 area at concentrations greater than 1 mg/kg. Outside the Plant 1 areas, no VOCs, other than acetone (a common laboratory artifact) were detected in soils at concentrations exceeding the soil guidance values presented in the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) titled "Determination of Soil Cleanup Objectives and Cleanup Levels," HWR-94-4046, dated January 24,1994 (TAGM 4046) or above current 6 NYCRR Part 375 soil cleanup objectives. The identified elevated VOC-impacted soils in the former Plant 1 area were removed in 2009 as a RCRA Interim Corrective Measure.

There are no known remaining areas of soil with elevated concentrations of VOCs on the site. Other than five locations in the vicinity of former Plant 1 where PCE concentrations ranged from 0.05 to 1 mg/kg, the total VOC concentrations were either less than 0.05 mg/kg or were non-detect across the remainder of the site. Given that more than 450 sample locations have been tested, it is not expected that there are any residual sources of VOCs s that remain in soil on the site. Figures 1 and 2 illustrate the limited pre-remedial areal extent of VOCs in soil and indicate that the localized areas of elevated concentrations of PCE and TCE were removed in 2009. With this known source removed, it is expected that any residual soil vapors will have begun to reduce in concentration and mass through natural attenuation processes including biodegradation, advection, dispersion, and diffusion since the last on-site soil vapor sampling events in 2009.

Details of the VOC soil sampling programs are included in the following documents, which have been reviewed and approved by the NYSDEC:

- RCRA Facility Investigation Report (ARCADIS BBL, June 2004)
- Phase II RFI Report contained in a letter from ARCADIS BBL to the NYSDEC dated January 5, 2005
- Interim Corrective Measure Certification Report (ARCADIS BBL, November 2005)
- Phase III soil results letter report, May 2006
- Phase IV Sampling Plan contained in a letter from ARCADIS BBL to the NYSDEC dated July 6, 2006
- Phase IV soil sample results and Proposed Phase V Scope Report, October 2006
- Phase V soil results letter report, October 2006
- Phase VI soil results letter report, June 2007

- Phase VII soil results letter report, June 2008

SOIL VAPOR INVESTIGATIONS

Soil vapor samples were first collected in 1989 during the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Remedial Investigation at 55 locations across the site, except for areas covered by pavement or buildings at the time. Soil vapor field screening was performed using a photoionization detector (PID) and confirmatory soil vapor analysis for site-related VOCs, including TCE, PCE, trans-1,2- dichloroethene, and vinyl chloride was performed using portable gas chromatography. Based on the analytical results, PCE was the only VOC detected in the soil vapor samples, and then only in two sampling locations; one location southeast of Plant 1 and one location northwest of Plant 2. Details of this soil vapor sampling program are presented in the Remedial Investigation Report (Leggette, Brashears & Graham, Inc., revised August 1992).

Between September 2008 and August 2009, Bayer collected soil vapor samples from 28 sampling locations (locations SG-1 through SG-28, shown on Figure 3). The sampling locations were approved by NYSDEC/NYSDOH and selected to provide coverage across the site, including areas within/near the footprints of the former plant buildings and the various paved areas. Several samples were also collected along the entire property boundary to measure the soil vapors adjacent to neighboring properties. The results of the soil vapor sampling were presented in the reports submitted in 2007 through 2009. The results indicate that elevated VOC concentrations were present in the middle of the site, primarily in the location of former Plant 1. This finding is consistent with the results of the soil sampling program. Also consistent with the VOC concentrations in the soil, the highest soil vapor concentrations were those for PCE and TCE. Figures 3 and 4 show the historical soil vapor concentration contours for PCE and TCE respectively, and as can be seen on the figures, the elevated concentrations of PCE and TCE are centered in the former VOC source area in the soils beneath the former Plant 1 area that were removed in May through August 2009.

With regard to the prior soil vapor samples that were collected from along the property boundaries, the following conditions were identified:

- There were no exceedances of the NYSDOH Indoor Air Guidance Values along the north property boundary.
- There was one location (SG-21) with a PCE concentration of 430 $\mu g/m^3$ and TCE concentration of 170 $\mu g/m^3$ near the southwest corner of the site. However, follow-up sampling at four additional locations around this location identified no VOC concentrations

greater than the NYSDOH Indoor Air Guidance Values at these four locations, confirming that the one identified location is isolated and of limited areal extent.

- There was one other location with elevated VOC concentrations (at SG-11 the PCE concentration was 3,000 $\mu g/m^3$ and the TCE concentration was 32 $\mu g/m^3$) along the southwest property boundary proximal to the former Plant 1 source area.
- The sampling on the eastern property boundary did identify some locations of elevated VOC concentrations with the highest VOC concentration being PCE at 8,100 $\mu g/m^3$.

In April 2011, a supplemental soil vapor investigation was conducted beneath and inside the neighboring warehouse located to the east of the site. This investigation determined that while soil vapors were detected in some of the sub-slab areas beneath the building, no soil vapors were detected at actionable levels within the indoor air when compared to the NYSDOH soil vapor intrusion matrices. Some of the sub-slab soil vapor concentrations were higher than those observed on the Bayer property (with the highest VOC concentration being PCE at 32,000 $\mu g/m^3$ vs. the highest east property boundary on-site concentration of 8,100 $\mu g/m^3$), indicating that there are potential VOC sources on the warehouse property contributing to soil vapor in these areas. Also, considerable variability in the sub-slab samples was observed which is indicative that multiple sources exist. The results of this supplemental investigation were submitted to the NYSDEC in the report entitled "Vapor Intrusion Investigation Summary Report" (August 2011). Based upon a holistic evaluation of the existing soil vapor data, it is possible that VOC sources on the warehouse property are affecting the east side of the Bayer property.

The results of these investigations have been discussed with the NYSDEC and NYSDOH. This Work Plan proposes additional investigation to assess current soil vapor conditions at the site and the potential for off-site soil vapor migration.

REMEDIAL ACTION AND OTHER RELEVANT FACTORS

Since the start of the on-site soil vapor assessment in 2007, several activities have been performed that have the potential to reduce the on-site VOC concentrations. These activities have also reduced the potential for the presence of off-site vapor related to the site. The significant activities that have taken place include the following:

- In 2009, Bayer removed the only known pockets of elevated VOC-impacted soil from the site. Considering that over 450 soil samples were analyzed for VOCs, it is expected that any remaining pockets of soil with elevated VOC concentrations would be small and of limited extent. The 2009 remedial action removed approximately 1,450 cubic yards of soil primarily impacted with PCBs and the VOCs PCE and TCE. Removal of this material eliminated the only known locations of elevated VOCs in soil that would be contributing to soil vapors. This removal action will have had a significant effect on soil vapor concentrations and is expected to have substantially eliminated the generation of new soil vapors. This was confirmed by a subsequent soil gas sample collected in the area that was non-detect (see Figure 3). With the source removed, residual soil vapor concentrations in the surrounding areas will continue to dissipate and new soil vapor generation potential will have been minimalized. Given that the last on-site soil vapor samples were collected only 1 or 2 months after the 2009 removal activities, and almost 4 years ago, they are not believed to be representative of current concentrations.

- In 2009, a number of soil excavation projects were completed, primarily for PCBs. The opening of excavations to remove these soils promoted soil vapor movement in the immediate vicinity of the excavations. The degree of enhanced soil vapor movement depends on the size of the excavation, the duration for which the excavation remains open, and the fluctuations in the atmospheric conditions (wind, barometric pressure, temperature, etc.). Since the removal action, the subsurface conditions have had a few years to stabilize. Therefore the soil vapor concentrations detected in the last sampling event may not be representative of current conditions.
- In 2006, the former building foundations and floor slabs on the site were removed and, in the process, some of the pavement areas were broken up by the heavy equipment and some of the pavement was removed. The removal of the floor slabs and disturbance/removal of the pavement opens the pathway for soil vapor release to the atmosphere and for replenishment of clean air into the soil. The exposed soil is also subject to diurnal and seasonal variations in temperature and pressure that promotes vertical movement of soil vapor. The 2009 soil vapor samples were collected only 3 years after the removal of the relatively impervious cover layer across large areas of the site. Seven years have now passed and it is expected that the soil vapor concentrations will have decreased since the time of the last sampling event.

Based upon these events and circumstances, soil vapor migration/generation theory suggests that it would be most appropriate to collect a set of additional on-site soil vapor samples to provide a clearer understanding of current site conditions relevant to assessing the potential for off-site migration of soil vapor and to determine the most appropriate locations for certain off-Site soil vapor sampling locations (i.e., biased locations in areas of greatest potential impact). There are no underground utilities (i.e., electric, gas, etc.) that cross the east or southwest property boundaries that could provide a preferential pathway for off-site migration of soil vapors. Clearly, (1) the lack of any identifiable preferential pathway such as a utility corridor that would allow soil vapors to migrate onto the neighboring property and (2) the presence of the soil vapor concentrations that are higher on the neighboring property to the east than along the eastern property boundary, make it necessary to obtain current data from the site. Evaluation of these data may resolve the question of whether on-site soil vapor has the potential to affect off-site property and whether the off-site soil vapors beneath the warehouse east of the property are related to past activities at the site.

PROPOSED PLAN

The proposed plan of investigation has been developed with a phased implementation approach to allow for the best decisions to be made with respect to sample location selection. The phased approach will begin with a set of on-site and off-site samples being collected to determine the current conditions across the site, more particularly along the property boundaries and to the east of the commercial building located east of the site. Based on the results of the first sample phase, the appropriate locations for sampling on adjacent properties to the west/southwest will be selected. The intent will be to locate the westerly/southwesterly off-site sampling stations adjacent to on-site locations that exhibit the highest soil vapor concentrations, thereby biasing the off-site sampling stations in the area of highest probabilities of detecting soil vapor emanating from the site.

At the conclusion of each phase of sampling, and prior to issuance of a formal report, the NYSDEC and NYSDOH will receive the final soil vapor analytical data and a figure showing the sampling locations in a monthly progress report. Bayer and GSH will evaluate the data and make a written recommendation to the NYSDEC/NYSDOH with regard to the appropriate next actions. After reviewing the data, NYSDEC / NYSDOH can, as needed, provide their recommendations. To expedite the completion of this work, it is recommended that a conference call be held by the parties, one week after each such submittal to review the recommendations and to move to the next phase as expeditiously as possible. At the conclusion of Phase II, a formal soil vapor investigation report will be presented to NYSDEC / NYSDOH.

The details of the proposed sampling program are as follows:

PHASE I

- Collection of vadose zone soil vapor samples from along the perimeter of the site as shown on Figure 5. The samples will be collected from locations spaced approximately 150 ft apart along the eastern and southwestern property boundaries. To the extent practical, the sampling locations will match those locations that were sampled in 2009 to help determine whether the passage of time and the completed on-site remediation work have resulted in any improvement in soil vapor conditions. Consistent with the 2009 investigation, the probes will be installed with a screened interval that is 5 to 5.5 ft bgs.

- Collection of three soil vapor samples in the previously identified high soil concentration areas to help assess the changes that have occurred as a result of the on-site remediation work. Comparison to the historic data should demonstrate the effect of the remedial actions that have been performed. The locations of these three sampling points are also shown on Figure 5.
- Collection of pairs of soil vapor samples at three of the perimeter locations to help assess the potential for off-site migration of soil vapors. One of the probes will be installed immediately adjacent to the property boundary and the other probe will be installed 20 ft inward, perpendicular to the property boundary. Comparison of the results obtained at each probe pair will help assess whether there is a concentration gradient leading onto the adjacent neighboring properties off-site. The locations of these probe pairs are shown on Figure 5.
- Three of the sampling locations will be installed as vertical pairs to help assess the concentration gradients with depth. The shallow soil vapor probe of each pair will be installed at a depth of 5 to 5.5 ft to match the zone measured at all of the other probe locations. The deeper soil vapor probe will be installed and screened to collect samples from a depth of 15 to 15.5 ft bgs. The locations of these deep probes are shown on Figure 5.
- Collection of soil vapor samples from three off-site locations to the east of the commercial building bordering the east property boundary. The locations of these probes are shown on Figure 5.

PHASE II

- Based on the results of the first phase of sampling, appropriate additional off-site sample locations will be selected from areas adjacent to the on-site sample locations that exhibit elevated soil vapor concentrations. It is planned that three off-site sample locations will be completed along each of the following property boundaries (a total of six additional off-site sample locations):
  - Three off-site samples on the commercial property to the southwest of the railroad trenches
  - Three off-site samples along New South Road between the site and the residential neighborhood

- Tentative locations for the above off-site sampling are presented on Figure 5. It is noted that these locations are tentative and may be adjusted as necessary based upon the on-site concentrations of soil vapors and to accommodate property owner access permission and utility locations. In the event that no significant on-site concentrations of VOCs are detected, the proposed locations on Figure 5 will be utilized to provide sufficient coverage for the targeted off-site investigation.
  - Each off-site sample will be collected from the 5 to 5.5 foot depth below ground surface (bgs) to be consistent with the 2009 investigation.

Following receipt of final analytical data, a monthly progress report will be submitted to NYSDEC / NYSDOH containing a site map, the final analytical data received during the reporting period, an evaluation of the data, and recommendations. A final soil vapor investigation report will be prepared at the conclusion of Phase II as provided by the Order on Consent. The report will include a comparison of previous data to the current data to evaluate the impact of the completed remedial activities on the site and to assess potential migration of vapors. The report will also include comparison of the soil vapor data to the NYSDOH Indoor Air Guidance values. Based on these comparisons and other relevant scientific principles and concepts, the report will include a recommendation for consideration of NYSDEC / NYSDOH as to the next appropriate action under the Order on Consent.

The analytical data will include a Data Usability Summary.

SAMPLING PROCEDURES AND PROTOCOLS

Before the soil vapor sampling begins, a field survey crew will field- identify the proposed sampling locations using coordinates obtained from the sampling locations map. The sampling locations will be adjusted in the field, if needed, for equipment access and to match as closely as possible with previous sampling locations, where appropriate. Each proposed final sampling location will then be located and recorded utilizing latitude/longitude GPS coordinates and marked using a flagged, wooden stake.

The methods for collecting soil vapor and ambient air samples are detailed in the Standard Operating Procedures (SOPs) provided in Attachments 1 and 2, respectively. The NYSDOH's Guidance was considered in the development of these SOPs. In accordance with the NYSDOH's Guidance, samples will be collected at depths greater than 5 ft bgs to reduce the likelihood of atmospheric air being introduced into the samples. Sample collection is proposed for the 5.0 to 5.5-foot interval bgs at each shallow location. The deep soil vapor probes will be set at a depth of 15 to 15.5 ft bgs. The sampling interval will be limited to approximately 6 inches to reduce potential sample dilution that could otherwise occur across a larger interval. To the extent that any soils are returned to the surface during the installation process, they will be screened using a photoionization detection unit (PID) to provide an indication of the vertical profile of the VOC content within the soils encountered.

At each proposed soil vapor sampling location, the Geoprobe® rig will be used to advance an assembly consisting of interconnected 4-foot lengths of 1.25"-diameter steel probe rod, affixed with an expendable point holder and expendable point at the downhole end, to the desired sampling depth (5.5/15.5 ft bgs). Hydrated bentonite will be used to seal the annular space (if any) between the steel rod and borehole wall to isolate the subsurface interval from the atmospheric air. After the target depth is reached, the expendable point will be disengaged by hydraulically retracting the steel probe rods upwards approximately 0.5 feet to create a void in the subsurface soil for soil vapor collection. A high-density polyethylene (HDPE) or fluoropolymer sample delivery tube (3/16" or 1/4" inside diameter) with an attached Post-Run-Tubing (PRT) threaded adapter will be lowered through the 1.25"-diameter steel rod and threaded into the expendable point holder. Digital photos will be taken to document the soil gas probe installations.

An initial gas draw (purging) will be performed immediately prior to sampling. At the ground surface, the sample delivery tube will be attached to an air sampling pump, and a minimum of one volume will be evacuated from the sampling system. An electronic flow sensor will be used to measure pump flow rate (not to exceed 100 milliliters per minute [mL/min] during purging activities), and the desired volume will be purged based on pumping duration. After one full purge volume (equivalent to 1½ times the volume inside the sampling line) has been expelled from the sampling system, the pump will be disconnected and a PID equipped with a 10.6 electron volt lamp will be attached to the tubing to measure approximate total organic vapor levels. A Swagelock™ valve will be closed prior to disconnecting the pump and connecting the PID to prevent atmospheric air from entering the tubing.

Sample collection and analysis will be conducted in accordance with USEPA Compendium Method TO-15, titled "Determination of VOCs in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)" and the USEPA Method TO-15 Standard Operating Procedure. At each sampling location, a pre-cleaned stainless-steel canister (a 6-liter SUMMA® canister) with an attached flow regulator will be connected to the sample tubing and slowly opened to collect the soil vapor sample. Batch-certified-clean canisters will be provided by the laboratory with an initial vacuum of at least 26 inches of mercury. Flow regulators will be pre-set to draw soil vapor at a flow rate of 200 mL/min. Each soil vapor sample will be collected over an approximately 30-minute period. When the canister vacuum reaches approximately 2 inches of mercury, the valve on the canister will be closed, leaving a vacuum in the canister as a means for the laboratory to verify the canister does not leak while in transit. Four sets of vacuum readings will be obtained in connection with sampling and analysis:

1. Following canister cleaning for shipping to the field
2. Prior to sampling, with all the connections and leak checks completed
3. At the end of sampling
4. Prior to analysis in the laboratory

A tracer gas (helium) will be used in connection with the soil vapor sampling to provide a means to evaluate whether the soil vapor samples are diluted by surface air. A 5-gallon plastic pail will be placed over the soil vapor sampling location, and hydrated bentonite will be used to create a seal between the pail and the ground surface and penetration for the downhole tooling (at the top of the pail) to create a containment unit within the pail. Prior to sampling, helium will be introduced into the pail through a fitting on the side of the pail to create a minimum 50 percent helium content level within the pail. The helium levels in the purge gas and in the pail (prior to and immediately after sampling) will be measured using a gas detector. In the event that the helium meter measures a helium content within the sampling assembly of greater than 10 percent of the helium content measured within the containment unit (e.g., 5 percent for 50 percent helium in the containment unit), the soil gas probe will be considered to permit significant leakage such that the collected soil gas sample will not be considered reliable or representative of soil gas concentrations. In such case, the sample will be recollected following appropriate remedial steps to eliminate surface air inclusion in the sample.

An upwind ambient air sample will be collected each day of soil vapor sampling. Consistent with the soil vapor sampling approach, the proposed air sampling will also involve use of a pre-cleaned 6-liter SUMMA® canister with an attached flow regulator. However, the regulator for the soil vapor sampling will be adjusted by the laboratory to provide uniform sample collection over an approximate 8-hour sampling period.

Prior to moving to the next sampling location, the sampling location will be confirmed by measurement to the survey marker and all down-hole equipment (i.e., steel rods, expendable point holder) will be decontaminated. Following completion of the sampling activities, the boreholes will be backfilled with bentonite grout. Soil sample liners, recovered soil samples, and used soil vapor sample tubing will be placed in steel 55-gallon drums for off-site transportation and disposal.

The air sample and soil vapor sample Summa canisters will be submitted to TestAmerica Laboratories, Inc. located in Burlington, Vermont for laboratory analysis for VOCs in accordance with USEPA Compendium Method TO-15. The samples will be analyzed for the complete VOC TO-15 analyte list and tentatively identified compounds (TICs). These constituents and their associated detection limits are identified in Table 1. Soil vapor samples from the Summa canisters will also be analyzed for helium using American Society for Testing and Materials (ASTM) Method D1946 to determine if surface air infiltration has occurred. TestAmerica is certified in the State of New York to perform air sample analyses. Laboratory analysis will be performed on a standard turnaround for reporting of analytical results (i.e., 3 to 4 weeks following sample collection).

REPORTING

As provided in the Order on Consent, written progress reports will be provided by the 10th day of each month. Following completion of the second phase of the investigation, a final soil vapor investigation report will be prepared. The final report will include:

- A summary of work activities performed and analytical results obtained for the soil vapor investigation
- An evaluation of the soil vapor results to the NYSDOH Indoor Air Guidance values
- Data tables presenting laboratory analytical results
- Figures showing the surveyed air and soil vapor sampling locations and corresponding laboratory analytical results
- Copies of the full laboratory report (including a Data Usability Summary)
- A CD containing the full laboratory analytical data reports
- An assessment of the results
- A review of any NYSDEC / NYSDOH preliminary recommendations
- Proposed future actions under the Order on Consent

The report will be submitted to the NYSDEC/NYSDOH approximately 6 weeks after receipt of the final analytical data from the laboratory.

ANTICIPATED SCHEDULE

Bayer/GSH is prepared to implement the proposed soil vapor sampling activities within 60 days following NYSDEC/NYSDOH approval of this sampling plan and execution of the Order on Consent. The proposed field activities for the first phase will take approximately 2 weeks to arrange and 2 weeks to complete. Preliminary laboratory analytical results for the soil vapor sampling activities will be available approximately 3 to 4 weeks following sampling. As indicated above, a progress report will be submitted to the NYSDEC/NYSDOH after receipt of the final laboratory analytical data. Thereafter, arrangements for the second phase of sampling will be made and implemented.

We request NYSDEC/NYSDOH approval of the proposed soil vapor sampling activities. Please do not hesitate to contact David Schnelzer of Bayer at 412-777-7603 or Roger Smith at GSH at 972-687-7516 if you have any questions or require additional information.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

James Kay

James K. Kay, P. Eng.

JK/mg/2
Encl.

cc: Thomas Taccone, USEPA
Mark Fisher, The ELM Group
Roger Smith, GSH
David Schnelzer, Bayer

figure 1

PCE SOIL CONCENTRATIONS

Hooker Ruco Site, Hicksville, New York

figure 2

TCE SOIL CONCENTRATIONS

Hooker Ruco Site, Hicksville, New York

0081618-D22101-403 February 27, 2013

figure 3

MOST RECENT (2007-2011) PCE SHALLOW SOIL VAPOR CONCENTRATIONS

Hooker Ruco Site, Hicksville, New York

0081618-D22101-403 February 27, 2013

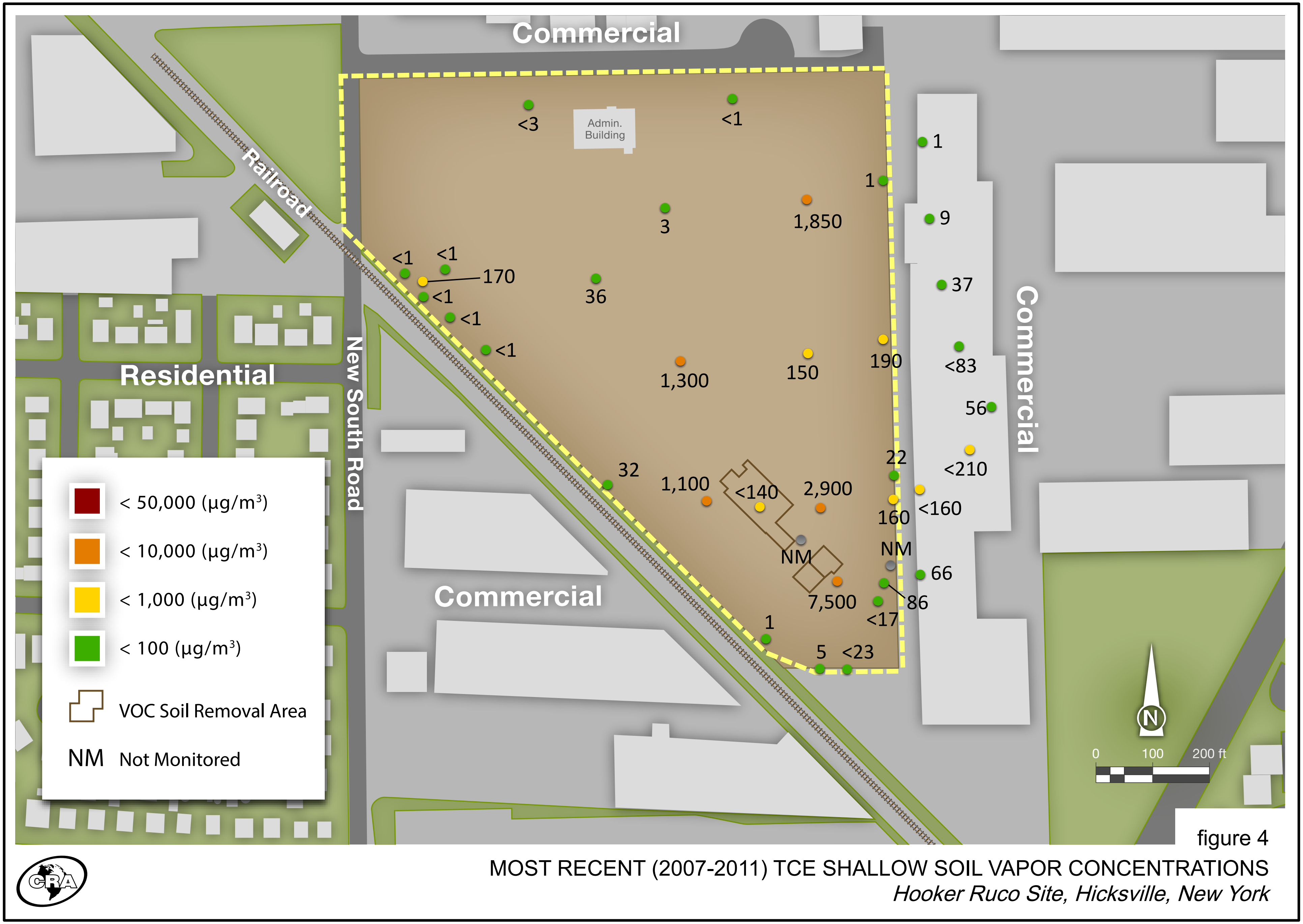
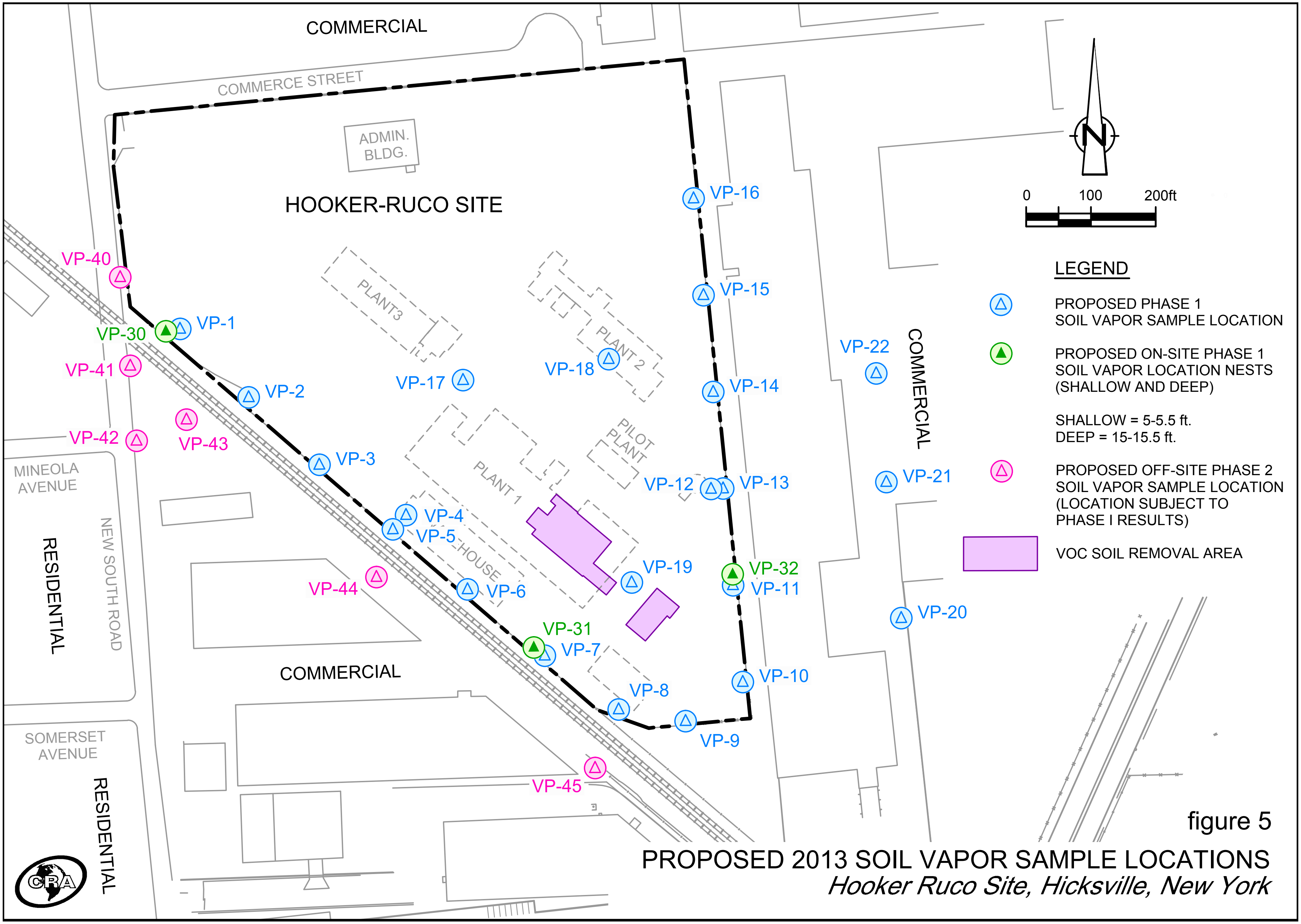


figure 4

MOST RECENT (2007-2011) TCE SHALLOW SOIL VAPOR CONCENTRATIONS

Hooker Ruco Site, Hicksville, New York

0081618-D22101-403 February 27, 2013



81618-D22101(SCHA002)GN-WA001 MAY 8/2013

TABLE 1

PROPOSED ANALYTE LIST AND REPORTING LIMITS
SOIL VAPOR INVESTIGATION WORK PLAN
BAYER MATERIALSCIENCE LLC
125 NEW SOUTH ROAD
HICKSVILLE, NEW YORK

Compound	*CAS Number*	*Reporting Limit (ppb v/v)*	*Reporting Limit (µg/m³)*	*NYSDOH Indoor Air Guidance Value (µg/m³)*
Acetone (2-propanone)	67-64-1	4	10	- -
Benzene	71-43-2	0.16	0.51	- -
Bromodichloromethane	75-27-4	0.16	1.1	- -
Bromoethene	593-60-2	0.16	0.70	- -
Bromoform	75-25-2	0.16	1.7	- -
Bromomethane (Methyl bromide)	74-83-9	0.16	0.62	- -
1,3-Butadiene	106-99-0	0.40	0.88	- -
2-Butanone (Methyl ethyl ketone)	78-93-3	0.4	1.2	- -
Carbon disulfide	75-15-0	0.4	1.2	- -
Carbon tetrachloride	56-23-5	0.16	1.0	- -
Chlorobenzene	108-90-7	0.16	0.74	- -
Chloroethane	75-00-3	0.40	1.06	- -
Chloroform	67-66-3	0.16	0.78	- -
Chloromethane (Methyl chloride)	74-87-3	0.40	0.83	- -
3-Chloropropene (allyl chloride)	107-05-1	0.40	1.25	- -
2-Chlorotoluene (o-Chlorotoluene)	95-49-8	0.16	0.83	- -
Cyclohexane	110-82-7	0.16	0.55	- -
Dibromochloromethane	124-48-1	0.16	1.4	- -
1,2-Dibromoethane	106-93-4	0.16	1.2	- -
1,2-Dichlorobenzene	95-50-1	0.16	1.0	- -
1,3-Dichlorobenzene	541-73-1	0.16	1.0	- -
1,4-Dichlorobenzene	106-46-7	0.16	1.0	- -
Dichlorodifluoromethane (Freon 12)	75-71-8	0.40	1.98	- -
1,1-Dichloroethane	75-34-3	0.16	0.65	- -
1,2-Dichloroethane	107-06-2	0.16	0.65	- -
1,1-Dichloroethene	75-35-4	0.16	0.63	- -
1,2-Dichloroethene (cis)	156-59-2	0.16	0.63	- -
1,2-Dichloroethene (trans)	156-60-5	0.16	0.63	- -
1,2-Dichloropropane	78-87-5	0.16	0.74	- -
cis-1,3-Dichloropropene	10061-01-5	0.16	0.73	- -
trans-1,3-Dichloropropene	10061-02-6	0.16	0.73	- -
1,2-Dichlorotetrafluoroethane (Freon 114)	76-14-2	0.16	1.1	- -
Ethylbenzene	100-41-4	0.16	0.69	- -
4-Ethyltoluene (p-Ethyltoluene)	622-96-8	0.16	0.79	- -
n-Heptane	142-82-5	0.16	0.66	- -
Hexachlorobutadiene	87-68-3	0.16	1.7	- -
n-Hexane	110-54-3	0.40	1.41	- -
Methylene chloride	75-09-2	0.4	1.4	60
4-Methyl-2-pentanone (MIBK)	108-10-1	0.4	1.64	- -
MTBE (Methyl tert-butyl ether)	1634-04-4	0.4	1.4	- -
Styrene	100-42-5	0.16	0.68	- -
Tertiary butyl alcohol (TBA)	75-65-0	4	12	- -
1,1,2,2-Tetrachloroethane	79-34-5	0.16	1.1	- -
Tetrachloroethene (PCE)	127-18-4	0.16	1.1	100
Toluene	108-88-3	0.16	0.60	- -
1,2,4-Trichlorobenzene	120-82-1	0.40	3.0	- -
1,1,1-Trichloroethane	71-55-6	0.16	0.9	- -
1,1,2-Trichloroethane	79-00-5	0.16	0.9	- -
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon TF)	76-13-1	0.16	1.2	- -

TABLE 1

PROPOSED ANALYTE LIST AND REPORTING LIMITS
SOIL VAPOR INVESTIGATION WORK PLAN
BAYER MATERIALSCIENCE LLC
125 NEW SOUTH ROAD
HICKSVILLE, NEW YORK

Compound	*CAS Number*	*Reporting Limit (ppb v/v)*	*Reporting Limit (µg/m³)*	*NYSDOH Indoor Air Guidance Value (µg/m³)*
Trichloroethene (TCE)	79-01-6	0.16	0.86	5
Trichlorofluoromethane (Freon 11)	75-69-4	0.16	0.9	- -
1,2,4-Trimethylbenzene	95-63-6	0.16	0.79	- -
1,3,5-Trimethylbenzene	108-67-8	0.16	0.79	- -
2,2,4-Trimethylpentane	540-84-1	0.16	0.75	- -
Vinyl chloride	75-01-4	0.16	0.41	- -
Xylenes (m&p)	1330-20-7	0.40	1.74	- -
Xylenes (o)	95-47-6	0.16	0.69	- -
1,2-Dichloroethene (total)	540-59-0	0.16	0.63	- -
1,4-Dioxane	123-91-1	4.0	14	- -
Isopropyl Alcohol	67-63-0	4.0	10.0	- -
Methyl Butyl Ketone	591-78-6	0.4	1.64	- -
Tetrahydrofuran	109-99-9	4.0	12	- -
Helium	7440-59-7	0.2%		

Notes:

1. Analyses to be performed by Severn Trent Laboratories, Inc. (STL) of Burlington, Vermont using the following methods:
   - United States Environmental Protection Agency (USEPA) Method TO-15 for volatile organic compounds (VOCs); and
   - American Society for Testing and Materials (ASTM) Method D1946 for helium.
2. CAS = Chemical Abstract Service.
3. ppb (v/v) = parts per billion volumetric basis.
4. µg/m³ = micrograms per cubic meter.
5. -- = Not available.
6. NYSDOH Indoor Air Guidance Value is from Table 3.1 of the "Guidance for Evaluating Soil Vapor in the State of New York" (NYSDOH, October 2006).
7. Shading designates VOCs detected in soil samples previously collected at the site as part of the 2004 RCRA Facility Investigation, the 2005 Interim Corrective Measure, and the 2006 Phase I through Phase III pre-design soil sampling activities.

TABLE 2

PROPOSED SOIL VAPOR SAMPLING PROBE DETAILS
BAYER MATERIAL SCIENCE LLC
125 NEW SOUTH ROAD
HICKSVILLE, NEW YORK

	Sampling Interval (ft bgs)	
Vapor Probe ID	*Phase I*	*Phase II*
VP-1	5.0 to 5.5	
VP-2	5.0 to 5.5	
VP-3	5.0 to 5.5	
VP-4	5.0 to 5.5	
VP-5	5.0 to 5.5	
VP-6	5.0 to 5.5	
VP-7a	5.0 to 5.5	
VP-7b	15.0 to 15.5	
VP-8	5.0 to 5.5	
VP-9	5.0 to 5.5	
VP-10	5.0 to 5.5	
VP-11a	5.0 to 5.5	
VP-11b	15.0 to 15.5	
VP-12	5.0 to 5.5	
VP-13	5.0 to 5.5	
VP-14	5.0 to 5.5	
VP-15	5.0 to 5.5	
VP-16	5.0 to 5.5	
VP-17	5.0 to 5.5	
VP-18	5.0 to 5.5	
VP-19	5.0 to 5.5	
VP-20	5.0 to 5.5	
VP-21	5.0 to 5.5	
VP-22	5.0 to 5.5	
VP-23a	5.0 to 5.5	
VP-23b	15.0 to 15.5	
VP-40		5.0 to 5.5
VP-41		5.0 to 5.5
VP-42		5.0 to 5.5
VP-43		5.0 to 5.5
VP-44		5.0 to 5.5
VP-45		5.0 to 5.5

Notes:

(1) All sampling probes are currently planned to be tempora

ATTACHMENT 1

Attachment 1

Standard Operating Procedure:
Soil Vapor Sampling and Analysis
Using USEPA Method TO-15

Standard Operating Procedure: Soil Vapor Sampling and Analysis Using USEPA Method TO-15

I. Scope and Application

This document describes the procedures to install a temporary soil vapor sampling point and collect soil vapor samples for the analysis of volatile organic compounds (VOCs) by United States Environmental Protection Agency (USEPA) Method TO-15 (TO-15). The TO-15 method uses a passivated stainless steel canister to collect a whole-air sample that is then analyzed for VOCs using a quadrupole or ion-trap gas chromatograph/mass spectrometer (GS/MS).

The following sections list the necessary equipment and detailed instructions for installing temporary soil vapor sampling points and collecting samples for VOC analysis.

II. Personnel Qualifications

ARCADIS BBL field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first-aid, and cardiopulmonary resuscitation (CPR), as needed. ARCADIS BBL field sampling personnel will be well versed in the relevant standard operating procedures (SOPs) and possess the required skills and experience necessary to successfully complete the desired field work. ARCADIS BBL personnel responsible for leading soil vapor sample collection activities must have previous soil vapor sampling experience.

III. Equipment List

The equipment required to install a temporary soil vapor point is presented below:

- Direct-push rig (e.g., PowerProbe™ or Geoprobe®) equipped with interconnecting 4-foot lengths of 1.25 inch-diameter steel rods;
- Expendable points (one per sample);
- Expendable point holder, and appropriate twist-to-lock connector;
- Photoionization detector (PID);
- High-density polyethylene (HDPE) tubing;
- Non-coated bentonite;
- Appropriate PPE (as required by the Health and Safety Plan); and

- Digital camera.

The equipment required for vapor sample collection is presented below:

- Stainless steel SUMMA® canisters (order at least one extra, if feasible);
- Flow controllers with in-line particulate filters and vacuum gauges; flow controllers are pre-calibrated to specified sample duration (e.g., 30 minutes, 8 hours, 24 hours) or flow rate (e.g., 200 milliliters per minute [mL/min]); confirm with the laboratory that the flow controller comes with an in-line particulate filter and pressure gauge (order at least one extra, if feasible);
- 1/4-inch or 3/16-inch ID tubing (Teflon®, HDPE, fluoropolymer, or similar);
- Twist-to-lock fittings;
- Stainless steel "T" fitting (if collecting duplicate [i.e., split] samples);
- Portable vacuum pump capable of producing very low flow rates (e.g., 100 to 200 mL/min);
- Rotameter or an electric flow sensor if vacuum pump does not have a flow gauge;
- Tracer gas source (e.g., helium);
- PID;
- Appropriate-sized open-end wrench (typically 9/16-inch);
- Chain-of-custody (COC) form;
- Sample collection log (a sample is attached); and
- Field notebook.

IV. Cautions

Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens, wear/apply fragrances, or smoke cigarettes/cigars before and/or during the sampling event

Care should also be taken to ensure that the flow controller is pre-calibrated to the proper sample collection time (confirm with laboratory). Sample integrity is maintained if the sampling event is shorter than the target duration, but sample integrity can be compromised if the event is extended to the time that the canister reaches atmospheric pressure.

Care must be taken to properly seal around the steel rods and tubing at the ground surface to prevent leakage of atmosphere into the soil vapor point during purging and sampling. Temporary points are to be sealed at the surface using hydrated bentonite.

V. Health and Safety Considerations

Field sampling equipment must be carefully handled to minimize the potential for injury and the spread of hazardous substances. For soil vapor sampling point installation, the direct-push rig should be operated only by personnel with prior experience using such a piece of equipment.

VI. Procedures

Temporary Soil Vapor Point Installation

Temporary soil vapor points are installed using a direct push rig to advance an assembly of interconnected 4-foot lengths of 1.25"-diameter steel probe rod, affixed with an expendable point holder and expendable point at the downhole end, to the desired sampling depth. Hydrated bentonite is used to seal the annular space (if any) between the steel rod and borehole wall to isolate the subsurface interval from the atmospheric air. After the target depth is reached, the expendable point is disengaged by hydraulically retracting the steel probe rods upwards approximately 0.5-feet to create a void in the subsurface soil for soil gas collection. An HDPE or fluoropolymer sample delivery tube (3/16" or 1/4" inside diameter) with an attached Post-Run-Tubing (PRT) threaded adapter is lowered through the 1.25"-diameter steel rod and threaded into the expendable point holder. The tubing will be purged with a portable sampling pump prior to collecting the vapor sample.

1. Advance an assembly consisting of interconnected lengths of decontaminated 1.25-inch-diameter steel drive rods, affixed with an expendable point holder and expendable point at the downhole end, to the bottom of the desired sampling interval.

2. Cut a length of sample collection tubing slightly longer (e.g., 2 to 3 feet) than the collection depth. Attach a twist-to-lock connector to one end of the sample collection tubing and lower the twist-to-lock connector and attached tubing through the drive rods. Thread the twist-to-lock connector into the expendable point holder, by twisting counterclockwise.

3. Hydraulically retract the sampling assembly approximately 6 inches or more if needed, allowing the expendable point to fall off, and creating a void in the subsurface for soil gas sample collection.

4. Fill annular space between the steel drive rod and the borehole wall (if any) with hydrated bentonite. Typically, only a bentonite surface seal is needed since there is no annular space between the steel drive rods and the borehole wall.

5. Proceed to vapor sample collection.

6. When soil vapor sampling is complete, backfill the borehole with bentonite grout.

Soil Vapor Sample Collection

Preparation of Stainless Steel Canister and Collection of Sample

1. Record the following information in the field notebook/sample collection logs, if appropriate (contact the local airport or other suitable information source [e.g., site-specific measurements, weatherunderground.com] to obtain the information):

   a. wind speed and direction;
   b. ambient temperature;
   c. barometric pressure; and
   d. relative humidity.

2. A tracer gas (helium) will be used in connection with the soil vapor sampling to provide a means to evaluate whether the soil vapor samples are diluted by surface air. A 5 gallon plastic pail will be placed over the soil vapor sampling location, and hydrated bentonite will be used to create a seal between the pail and the ground surface and penetration for the downhole tooling (at the top of the pail to create a containment unit within the pail). Prior to sampling, helium will be introduced into the pail through a fitting on the side of the pail to create a minimum 50 percent helium content level within the pail. The helium levels in the purge gas and in the pail (prior to and immediately after sampling) will be measured using a gas detector. In the event that the helium meter measures a helium content within the sampling assembly of greater than 10 percent of the helium content measured within the containment unit (e.g., 5 percent for 50 percent helium in the containment unit), the soil gas probe will be considered to permit significant leakage such that the collected soil gas sample will not be considered reliable or representative of soil gas concentrations. In such case,

the sample will be recollected following appropriate remedial steps to eliminate surface air inclusion in the sample.

3. Remove the brass plug (dust cap) from the sampling canister and connect the flow controller with in-line particulate filter and vacuum gauge to the canister. Do not open the valve on the canister. Record in the field notebook/sample collection log and on the COC form the flow controller number with the appropriate canister number.

4. Connect the flow controller, sample collection tubing, and purge pump to a T-connection equipped with a valve. Be sure the purge pump is connected to the valved opening of the T-connection. Open the valve on the T-connection and purge 1 to 2 (target 1.5) volumes of air from the sampling line using the purge pump [purge volume = 1.5 Pi r^2h] at a rate of approximately 100 mL/min. An electronic flow sensor will be used to measure pump flow rate. Close the Swagelock™ valve on the T-connection following purging. Disconnect the pump and attach a PID with a 10.6 eV lamp to the tubing to measure approximate total organic vapor levels.

5. Open the *valve* on the sampling canister. Record the initial canister vacuum pressure in the field notebook/sample collection log and COC form. If the initial vacuum pressure does not register less than -28 inches of Hg, then the canister is not appropriate for use and another canister should be used (if this occurs, return to Step 2).

6. Record in the field notebook/sample collection log the time sampling began and take a photograph of the canister and surrounding area.

Termination of Sample Collection

1. Arrive at the canister location at least 10 to 15 minutes prior to the end of the required sampling interval.

2. Stop collecting the sample by closing the canister *valve.* Record the final vacuum pressure. The canister should have a minimum amount of vacuum (approximately 2 inches of Hg or slightly greater).

3. Record the date and local time (24-hour basis) of valve closing in the field notebook/sample collection log and COC form.

4. Remove the particulate filter and flow controller from the canister, re-install the brass plug on the canister fitting, and tighten with the appropriate wrench.

5. Package the canister and flow controller in the shipping container supplied by the laboratory for return shipment to the laboratory. The canister does not

require preservation with ice or refrigeration during shipment.

6. Complete the appropriate forms and sample labels as directed by the laboratory (e.g., affix card with a string).

7. Complete the COC form and place the requisite copies in a shipping container. If shipping by courier service (e.g. FedEx) close the shipping container and affix a custody seal to the container closure. Ship the container to the laboratory *via* overnight carrier for analysis. If transporting directly to laboratory or for laboratory sample pick up, follow standard Chain of Custody procedures.

Soil Vapor Monitoring Point Abandonment

Once the soil vapor samples have been collected, the soil vapor monitoring points will be abandoned by removing the drive rods and filling the resulting hole with bentonite.

VII. Waste Management

Field personnel will collect and containerize all investigation-derived waste materials (including disposable equipment) for proper disposal.

VIII. Data Recording and Management

Measurements will be recorded on field sample collection logs or in the field notebook at the time of measurement with notations of the project name, sample date, sample start and finish time, sample location (e.g., GPS coordinates, distance from permanent structure, canister serial number, flow controller serial number, initial vacuum reading, and final pressure reading. Field sampling logs and COC records will be transmitted to the Project Manager.

IX. Quality Assurance

Vapor sample analysis will be performed using USEPA TO-15 methodology. This method uses a quadrupole or ion-trap GC/MS with a capillary column to provide optimum detection limits. The GC/MS system requires a 1-liter gas sample (which can easily be recovered from a 6-liter canister) to provide a 0.5-ppbv detection limit. The 6-liter canister also provides several additional 1-liter samples in case subsequent re-analyses or dilutions are required. This system also offers the advantage of the GC/MS detector, which confirms the identity of detected compounds by evaluating their mass spectra in either the SCAN or SIM mode.

X. References

New York State Department of Health (NYSDOH). 2006. "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" October 2006.

ARCADIS BBL *Infrastructure, environment, facilities*	# Soil Gas Sample Collection Log (Page 1 of 2) Sample ID:

Client:		Date/Day:	
Project:		Weather:	
Location:		Temperature:	
Project#:		Wind Speed/Direction:	
Samplers:		Subcontractor:	
Logged By:		Equipment:	
Coordinates:		Moisture Content of Sampling Zone (circle one):	Dry / Moist
Sampling Depth:			
Probe (circle one):	Permanent / Temporary	Approximate Purge Volume:	
Time of Collection:	Start: Finish:	Background PID Ambient Air Reading:	

Nearby Groundwater Monitoring Wells/Water Levels:

Well ID	Depth to Groundwater (feet)

SUMMA Canister Information

Size (circle one): 1L 6L

Canister ID: ____________________

Flow Controller ID: --------------------

Tracer Gas Information (if applicable)

Tracer Gas: --------------------

Canister Pressure (inches Hg):		
Reported By Laboratory	Measured Prior to Sample Collection	Measured Following Sample Collection

Tracer Gas Concentration (if applicable):		
Measured in Purge Effluent	Measured in 'Concentrated' Area Prior to Sample Collection	Measured in 'Concentrated' Area Following Sample Collection

Weather Conditions	Start of Sample Collection	End of Sample Collection
Temperature		
Humidity		
Wind Velocity		
PID		

Approximating One-Well Volume (for purging):
When using 1.25.-inch "Dummy Point" and a 6-inch sampling interval, the sampling space will have a volume of approximately 150 mL.
Each foot of 0.25-inch tubing will have a volume of approximately I0 mL.

ARCADIS BBL Infrastructure, environment, facilities	Soil Gas Sample Collection Log (Page2 of2)
	Sample ID:

General Observations/Notes:

ATTACHMENT 2

ARCADIS BBL

Attachment 2

Standard Operating Procedure: Ambient Air Sampling and Analysis Using USEPA Method TO-15

Standard Operating Procedure: Ambient Air Sampling and Analysis Using USEPA Method TO-15

I. Scope and Application

This standard operating procedure (SOP) describes the procedures to collect ambient air samples for the analysis of volatile organic compounds (VOCs) using United States Environmental Protection Agency (USEPA) Method TO-15 (TO-15). The TO-15 method uses a passivated stainless steel canister to collect a whole-air sample that is then analyzed for VOCs using a quadrupole or ion-trap gas chromatograph/mass spectrometer (GS/MS).

The following sections list the necessary equipment and provide detailed instructions for placing the sampling device and collecting ambient air samples for VOC analysis.

II. Personnel Qualifications

ARCADIS BBL field sampling personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervisor training, site-specific training, first aid, and cardiopulmonary resuscitation (CPR), as needed. ARCADIS BBL field sampling personnel will be well versed in the relevant SOPs and possess the required skills and experience necessary to successfully complete the desired field work. ARCADIS BBL personnel responsible for leading ambient air sample collection activities must have previous ambient air sampling experience.

III. Equipment List

The equipment required for ambient air sample collection is presented below:

- 6-liter, stainless steel SUMMA® canisters (order at least one extra, if feasible);
- Flow controllers with in-line particulate filters and vacuum gauges (flow controllers are pre-calibrated by the laboratory to a specified sample duration [e.g., 8-hour, 24-hour]). Confirm with lab that flow controller comes with in-line particulate filter and pressure gauge (order an extra set for each extra SUMMA® canister, if feasible);
- Appropriate-sized open-end wrench (typically 9/16-inch);
- Chain-of-custody (COC) form;
- Sample collection log;
- Field notebook;

- Sample collection logs (a sample is attached);
- Digital camera;
- Lock and chain; and
- Ladder or similar to hold canister above the ground surface (optional).

IV. **Cautions**

Care must be taken to minimize the potential for introducing interferences during the sampling event. As such, care must be taken to keep the canister away from heavy pedestrian traffic areas (e.g., main entranceways, walkways). If the canister is not to be overseen for the entire sample duration, precautions should be taken to maintain the security of the sample (e.g., do not place in areas regularly accessed by the public, fasten the sampling device to a secure object using lock and chain, label the canister to indicate it is part of a scientific project, place the canister in secure housing that does not disrupt the integrity/validity of the sampling event). Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens, wear/apply fragrances, or smoke cigarettes before and/or during the sampling event.

Care should also be taken to ensure that the flow controller is pre-calibrated to the proper sample collection time (confirm with laboratory). Sample integrity is maintained if the sampling event is shorter than the target duration, but sample integrity can be compromised if the event is extended to the point that the canister reaches atmospheric pressure.

V. Health and Safety Considerations

Field sampling equipment must be carefully handled to minimize the potential for injury and the spread of hazardous substances.

VI. Procedures

Preparation of Stainless Steel Canister and Collection of Sample

1. Record the following information in the field notebook/sample collection log (contact the local airport or other suitable information source [e.g., site-specific measurements, weatherunderground.com] to obtain the following information):

   a. wind speed and direction;

b. ambient temperature;
c. barometric pressure; and
d. relative humidity.

2. Choose the sample location in accordance with the sampling plan. If a breathing zone sample is required, place the canister on a ladder, tripod, or other similar stand to locate the canister orifice 3 to 5 feet above ground or floor surface. If the canister will not be overseen for the entire sampling period, secure the canister as appropriate (e.g., lock and chain).

3. Record canister serial number and flow controller number in the field notebook/sample collection log and COC form. Assign sample identification on canister ID tag, and record in the field notebook/sample collection log and COC form.

4. Remove the brass plug (dust cap) from the canister. Attach the flow controller with in-line particulate filter and vacuum gauge (leave swage-lock cap on the vacuum gauge during this procedure) to the canister with the appropriate-sized wrench. Tighten with fingers first, then gently with the wrench.

5. Open the canister valve to initiate sample collection. Record the date and local time (24-hour basis) of valve opening in the field notebook/sample collection log and COC form.

6. Record the initial canister vacuum pressure in the field notebook/sample collection log and COC form. If the initial vacuum pressure does not register less than -28 inches of Hg, then the canister is not appropriate for use and another canister should be used.

7. Take a photograph of the canister and surrounding area.

Termination of Sample Collection

1. Arrive at the canister location at least 10 to 15 minutes prior to the end of the sampling interval (e.g., 8-hour).

2. Stop collecting the sample when the canister vacuum reaches approximately 2 inches of Hg (leaving some vacuum in the canister provides a way to verify if the canister leaks before it reaches the laboratory) or when the desired sample time has elapsed.

3. Record the final vacuum pressure. Stop collecting the sample by closing the canister valve. Record the date, local time (24-hour basis) of valve closing in the field notebook/sample collection log and COC form.

4. Remove the particulate filter and flow controller from the canister, re-install brass plug on canister fitting, and tighten with wrench.

5. Package the canister and flow controller in the shipping container supplied by the laboratory for return shipment to the laboratory. The canister does not require preservation with ice or refrigeration during shipment.

6. Complete the appropriate forms and sample labels as directed by the laboratory (e.g., affix card with string).

7. Complete COC form and place requisite copies in shipping container. Close shipping container and affix custody seal to container closure. Ship to laboratory via overnight carrier (e.g., Federal Express) for analysis.

VII. Waste Management

No specific waste management procedures are required.

VIII. Data Recording and Management

Measurements will be recorded on field sample collection logs or in the field notebook at the time of measurement, with notations of project name, sample date, sample start and finish times, sample location (e.g., description and GPS coordinates if available), canister serial number, flow controller number, initial vacuum reading, and final vacuum reading. Field notebooks/sample collection logs and COC records will be transmitted to the Project Manager.

IX. Quality Assurance

Ambient air sample analysis will be performed using USEPA Method TO-15. This method uses a quadrupole or ion-trap GC/MS with a capillary column to provide optimum detection limits. The GC/MS system requires a 1-liter gas sample (which can easily be recovered from a 6-liter canister) to provide a 0.5 ppbv detection limit. The 6-liter canister also provides several additional 1-liter samples in case subsequent re-analyses or dilutions are required. This system also offers the advantage of the GC/MS detector, which confirms the identity of detected compounds by evaluating their mass spectra in either the SCAN or SIM mode.

ARCADIS BBL
Infrastructure, environment, facilities

Indoor/Ambient Air Sample Collection Log

Sample ID:

Client:		Date/Day:	
Project:		Sample Intake Height:	
Location:		Subcontractor:	
---P_ro_j'--e_ct_#_: Samplers:		Miscellaneous Equipment:	
Coordinates:		Time Start:	
Outdoor/Indoor:		Time Stop:	

Instrument Readings:

Time	Canister Pressure (inches Hg)	Temperature (F or C)	Relative Humidity (%)	Air Speed (ft/min)	Barometric Pressure	PID (ppm or ppb)

SUMMA Canister Information

Size (circle one): 1L 6L

Canister ID: _______________

Flow Controller ID: _______________

General Observations/Notes:

Attachment C
Community Air Monitoring Plan

Attachment C Community Air Monitoring Plan

1. Introduction

This Community Air Monitoring Plan (CAMP) provides for the real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when the ground intrusive activities described below are in progress at the Ruco Polymer Site (Site). The intent of the CAMP 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.

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

2. Community Air Monitoring Plan

Continuous monitoring will be performed for all ground intrusive activities. Ground intrusive activities include, soil excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil samples.

VOC Monitoring. Response Levels. and Actions

2.1 VOC Monitoring, Response Levels, and Actions

VOCs will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during ground intrusive activities. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using a PID equipped with a 10.6 eV lamp. The equipment will be calibrated daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- 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 will 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.
- 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 will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will 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-miriute average.

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

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

2.2 Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations during ground intrusive activities. The particulate monitoring will 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 will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for State (DEC and DOH) personnel to review.

Attachment D
Vacuum Monitoring Points

Standard Operating Procedure
Use of the Vapor Pin™ Drilling Guide and Secure Cover

December 3, 2013

Scope:

This standard operating procedure (SOP) describes the methodology to use the Vapor Pin™ Drilling Guide and Secure Cover to install and secure a Vapor Pin™ in a flush mount configuration.

Purpose:

The purpose of this SOP is to detail the methodology for installing a Vapor Pin™ and Secure Cover in a flush mount configuration. The flush mount configuration reduces the risk of damage to the Vapor Pin™ by foot and vehicular traffic, keeps dust and debris from falling into the flush mount hole, and reduces the opportunity for tampering. This SOP is an optional process performed in conjunction with the SOP entitled "Installation and Extraction of the Vapor Pin™". However, portions of this SOP should be performed prior to installing the Vapor Pin™.

Equipment Needed:

- Vapor Pin™ Secure Cover (Figure 1);
- Vapor Pin™ Drilling Guide (Figure 2);
- Hammer drill;
- 1½-inch diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent);
- 5/8-inch diameter hammer bit (Hilti™ TE-YX 5/8" x 22" #00226514 or equivalent);
- assembled Vapor Pin™;
- #14 spanner wrench;
- Wet/Dry vacuum with HEPA filter (optional); and
- personal protective equipment (PPE).

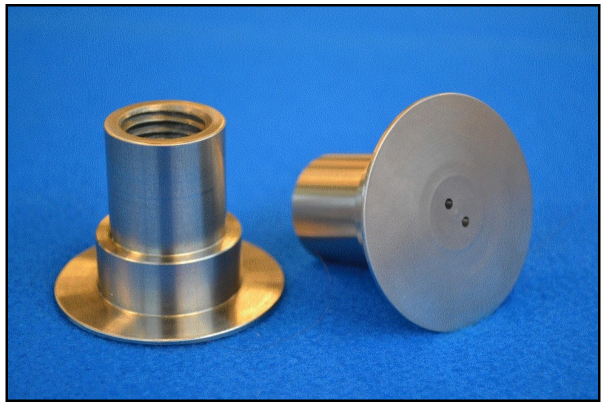


Figure 1. Vapor Pin™ Secure Cover.

Figure 2. Vapor Pin™ Drilling Guide.

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) While wearing PPE, drill a 1½-inch diameter hole into the concrete slab to a

depth of approximately 1 3/4 inches. Pre-marking the desired depth on the drill bit with tape will assist in this process.

4) Remove cuttings from the hole and place the Drilling Guide in the hole with the conical end down (Figure 3). The hole is sufficiently deep if the flange of the Drilling Guide lies flush with the surface of the slab. Deepen the hole as necessary, but avoid drilling more than 2 inches into the slab, as the threads on the Secure Cover may not engage properly with the threads on the Vapor Pin™.

Figure 3. Testing Depth with the Drilling Guide.

5) When the 1½-inch diameter hole is drilled to the proper depth, replace the drill bit with a $^5/_8$-inch diameter bit, insert the bit through the Drilling Guide (Figure 4), and drill through the slab. The Drilling Guide will help to center the hole for the Vapor Pin™, and keep the hole perpendicular to the slab.

6) Remove the bit and drilling guide, clean the hole, and install the Vapor Pin™ in accordance with the SOP "Installation and Extraction of the Vapor Pin™.

Figure 4. Using the Drilling Guide.

7) Screw the Secure Cover onto the Vapor Pin™ and tighten using a #14 spanner wrench by rotating it clockwise (Figure 5). Rotate the cover counter clockwise to remove it for subsequent access.

Figure 5. Tightening the Secured Cover.

<u>Limitations:</u>

On slabs less than 3 inches thick, it may be difficult to obtain a good seal in a flush mount configuration with the Vapor Pin™.

K:\CCA\TOOLS\SOPs\Vapor Pin\Secure Cover\Vapor Pin Cover & Drill Guide SOP 120313.wpd

Standard Operating Procedure Installation and Extraction of the Vapor Pin®

Updated September 9, 2016

Scope:

This standard operating procedure describes the installation and extraction of the VAPOR PIN® for use in sub-slab soil-gas sampling.

Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the VAPOR PIN® for the collection of sub-slab soil-gas samples or pressure readings.

Equipment Needed:

- Assembled VAPOR PIN® [VAPOR PIN® and silicone sleeve(Figure 1)]; Because of sharp edges, gloves are recommended for sleeve installation;
- Hammer drill;
- 5/8-inch (16mm) diameter hammer bit (hole **must** be 5/8-inch (16mm) diameter to ensure seal. It is recommended that you use the drill guide). (Hilti™ TE-YX 5/8" x 22" (400 mm) #00206514 or equivalent);
- 1½-inch (38mm) diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch (19mm) diameter bottle brush;
- Wet/Dry vacuum with HEPA filter (optional);
- VAPOR PIN® installation/extraction tool;
- Dead blow hammer;
- VAPOR PIN® flush mount cover, if desired;
- VAPOR PIN® drilling guide, if desired;
- VAPOR PIN® protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel for repairing the hole following the extraction of the VAPOR PIN®.

Figure 1. Assembled VAPOR PIN®

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) If a flush mount installation is required, drill a 1½-inch (38mm) diameter hole at least 1¾-inches (45mm) into the slab. Use of a VAPOR PIN® drilling guide is recommended.

4) Drill a 5/8-inch (16mm) diameter hole through the slab and approximately 1-inch (25mm) into the underlying soil to form a void. Hole **must** be 5/8-inch (16mm) in diameter to ensure seal. It is recommended that you use the drill guide.

5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.

6) Place the lower end of VAPOR PIN® assembly into the drilled hole. Place the small hole located in the handle of the installation/extraction tool over the vapor pin to protect the barb fitting, and tap the vapor pin into place using a dead blow hammer (Figure 2). Make sure the installation/extraction tool is aligned parallel to the vapor pin to avoid damaging the barb fitting.

Figure 2. Installing the VAPOR PIN®

During installation, the silicone sleeve will form a slight bulge between the slab and the VAPOR PIN® shoulder. Place the protective cap on VAPOR PIN® to prevent vapor loss prior to sampling (Figure 3).

Figure 3. Installed VAPOR PIN®

7) For flush mount installations, cover the vapor pin with a flush mount cover, using either the plastic cover or the optional stainless-steel Secure Cover (Figure 4).

Figure 4. Secure Cover Installed

8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to re-equilibrate prior to sampling.

9) Remove protective cap and connect sample tubing to the barb fitting of the VAPOR PIN®. This connection can be made using a short piece of Tygon™ tubing to join the VAPOR PIN® with the Nylaflow tubing (Figure 5). Put the

Nylaflow tubing as close to the VAPOR PIN® as possible to minimize contact between soil gas and Tygon™ tubing.

Figure 5. VAPOR PIN® sample connection

10) Conduct leak tests in accordance with applicable guidance. If the method of leak testing is not specified, an alternative can be the use of a water dam and vacuum pump, as described in SOP Leak Testing the VAPOR PIN® via Mechanical Means (Figure 6). For flush-mount installations, distilled water can be poured directly into the 1 1/2 inch (38mm) hole.

Figure 6. Water dam used for leak detection

11) Collect sub-slab soil gas sample or pressure reading. When finished, replace the protective cap and flush mount cover until the next event. If the sampling is complete, extract the VAPOR PIN®.

<u>Extraction Procedure:</u>

1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the VAPOR PIN® (Figure 7). Turn the tool clockwise continuously, don't stop turning, the VAPOR PIN® will feed into the bottom of the installation/extraction tool and will extract from the hole like a wine cork, DO NOT PULL.

2) Fill the void with hydraulic cement and smooth with a trowel or putty knife.

Figure 7. Removing the VAPOR PIN®

- Prior to reuse, remove the silicone sleeve and protective cap and discard. Decontaminate the VAPOR PIN® in a hot water and Alconox® wash, then heat in an oven to a temperature of 265° F (130° C) for 15 to 30 minutes. For both steps, **STAINLESS – ½ hour, BRASS 8 minutes**

3) Replacement parts and supplies are available online.

DRAWING INDEX

DWG. Nº	REV. No.	DATE	TITLE
GENERAL DRAWINGS			
GN-001		5/17	TITLE SHEET
MECHANICAL/PIPING			
ME-001	-	5/17	OVERALL SITE PLAN
ME-002	-	5/17	PIPE INSTALLATION DIAGRAM
ENGINEERING FLOW SHEETS			
EF-001	-	5/17	P&ID

RUCO POLYMER CORP. SITE
HICKSVILLE, NEW YORK

SUB-SLAB DEPRESSURIZATION SYSTEM

SIMONE ENTERPRISES BUILDING

JULY 11, 2017

81618-D22102(MIT001)GN

GHD Consulting Services Inc.

No.	Issue	Drawn	Approved	Date

Bar is one inch on original size drawing

0 1"

Reuse of Documents

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Drafting Check	D. SZALACH	Design Check	D. SZALACH
Project Manager	M. ALOWITZ	Date	Jun 14, 2017
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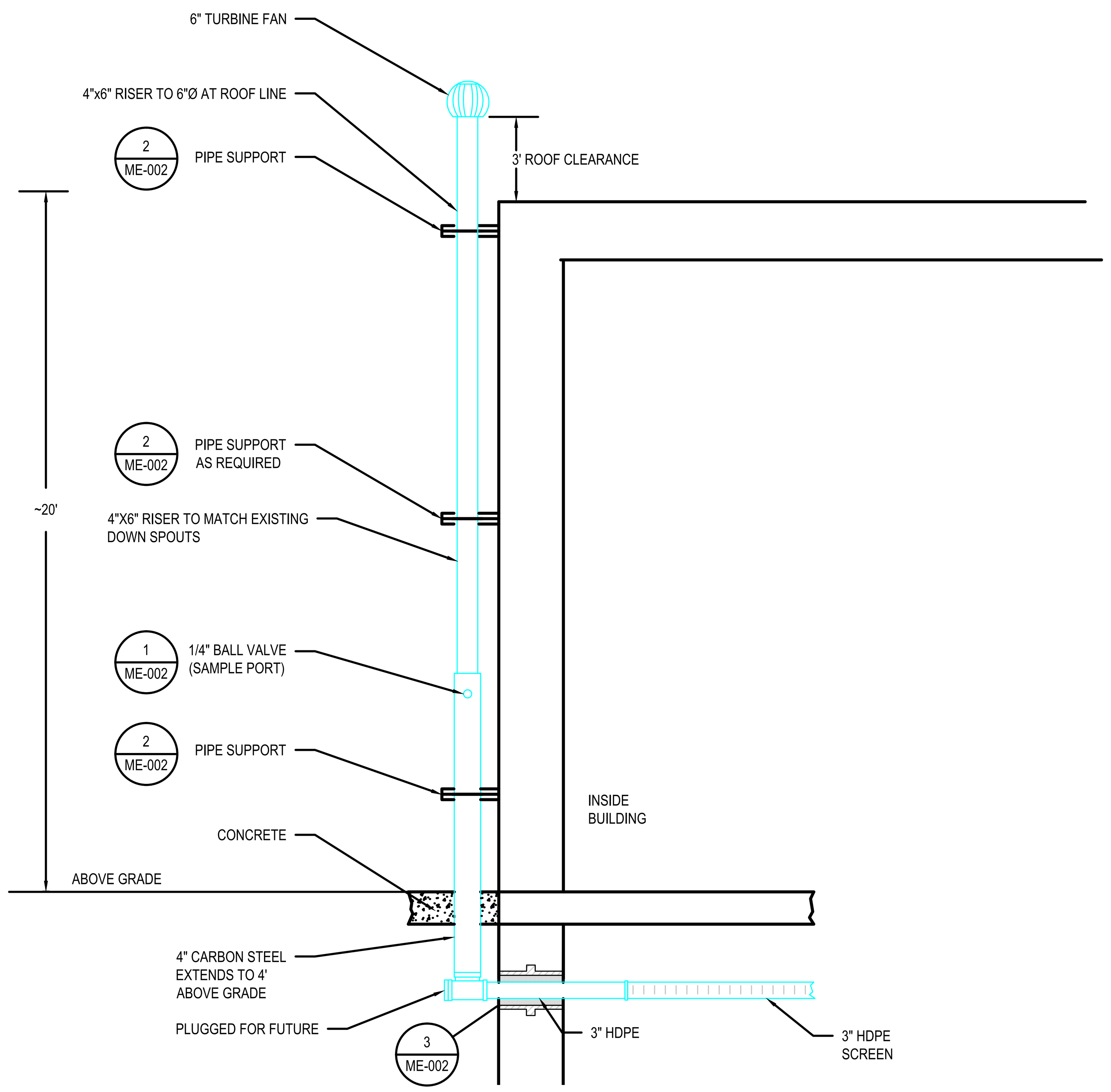
Client / Project: **RUCO POLYMER CORP. SITE**
HICKSVILLE, NEW YORK

Title: **OVERALL SITE PLAN**
SUB SLAB DEPRESUURIZATION SYSTEM

Project No. **81618-00**

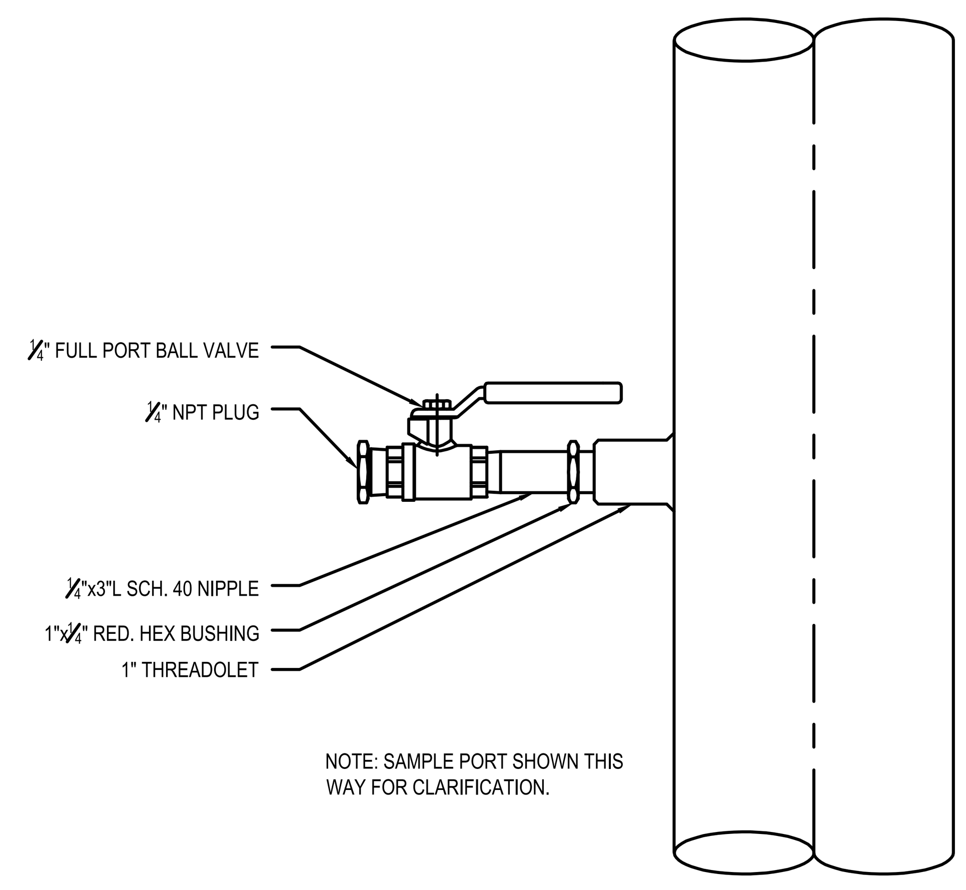
Original Size **ANSI D** | Sheet No. **81618-D22102(MIT001)ME-001** | Sheet 1 of 1

Plot Date: 11 July 2017 - 11:21 AM   Plotted By: Bruce Ogilvie   Filename: P:\drawings\81000s\81618\81618-corr\81618-D22102(MIT001)\81618-D22102(MIT001)ME\81618-00(MIT001)ME-BU003.dwg



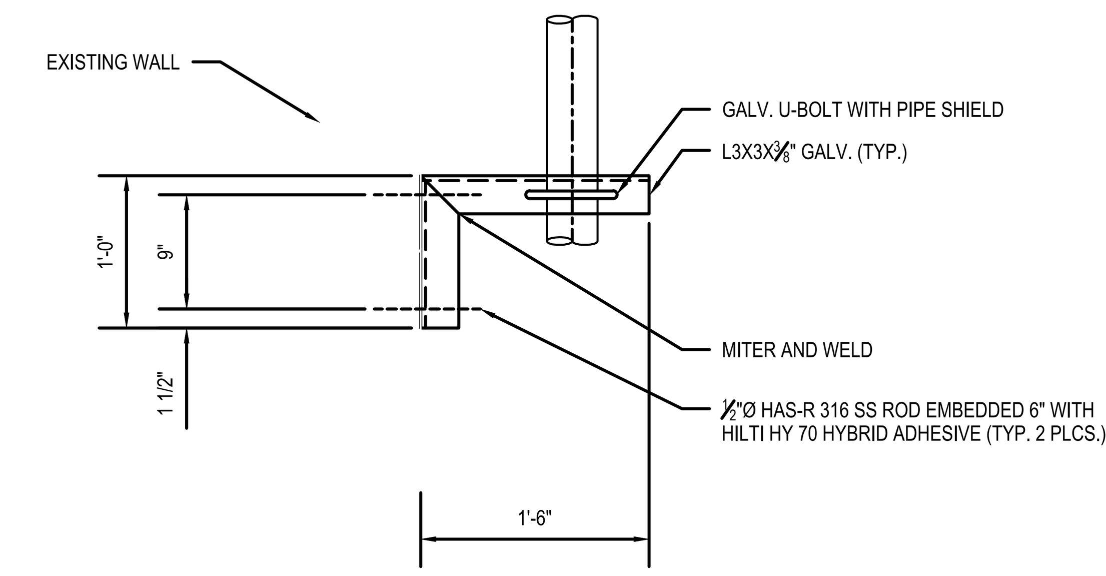
DISCHARGE PIPE/TURBINE INSTALLATION DETAILS

NO SCALE



1 ME-002 **SAMPLE PORT**

SCALE NTS



2 ME-002 **ANGLE BRACKET PIPE SUPPORT**

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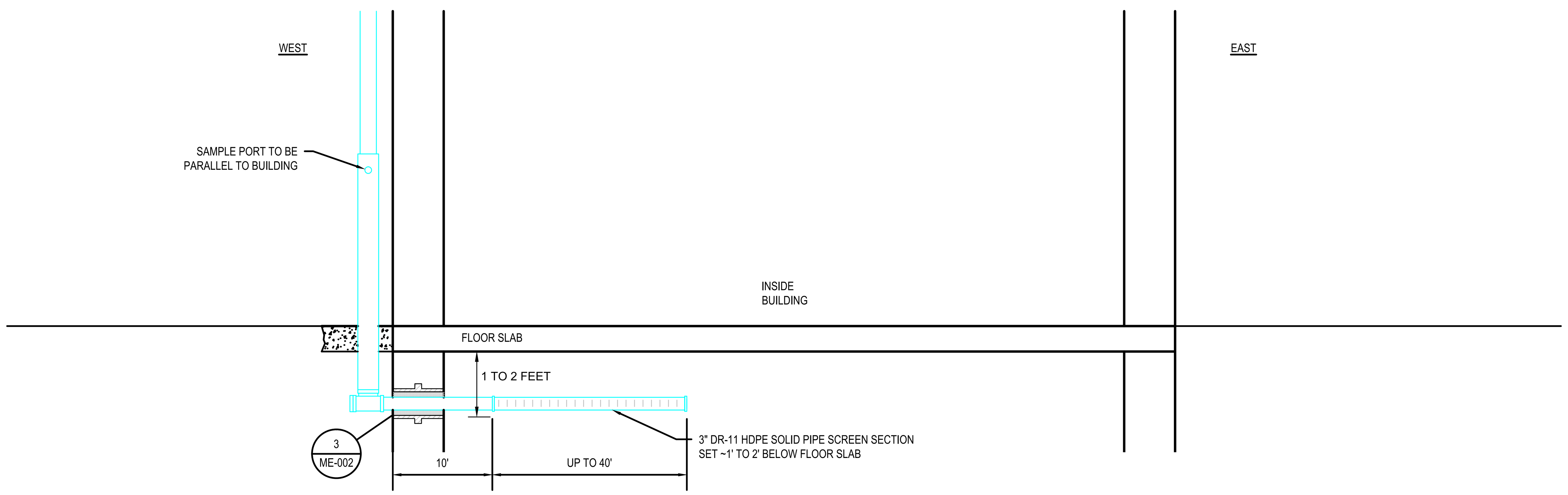
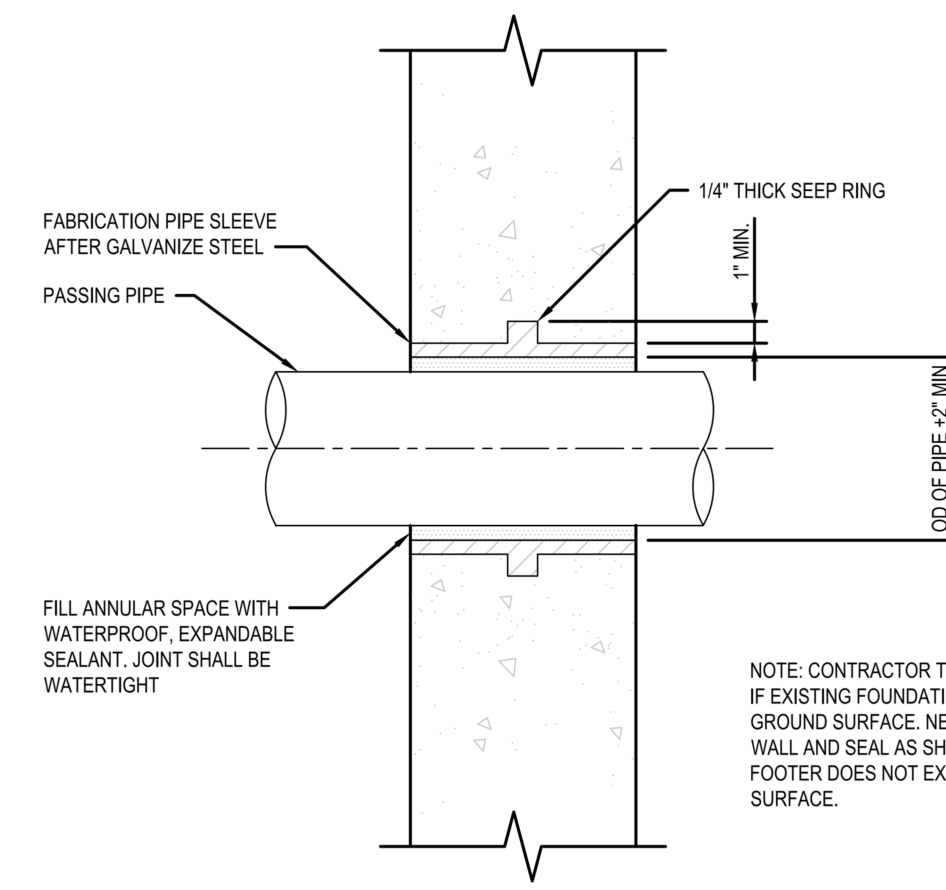


HORIZONTAL PIPE INSTALLATION PROFILE

NO SCALE



NOTE: CONTRACTOR TO USE PIPE SLEEVE DETAIL IF EXISTING FOUNDATION EXTENDS 2'-0" BELOW GROUND SURFACE. NEW PIPE SHALL PENETRATE WALL AND SEAL AS SHOWN. NOT NEEDED IF THE FOOTER DOES NOT EXTEND 2'-0" BELOW GROUND SURFACE.

3 ME-002 **PIPE SLEEVE**

SCALE NTS

No.	Issue	Drawn	Approved	Date

Bar is one inch on original size drawing
0 1"

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Drafting Check	D. SZALACH	Design Check	D. SZALACH
Project Manager	M. ALOWITZ	Date	Jun 14, 2017
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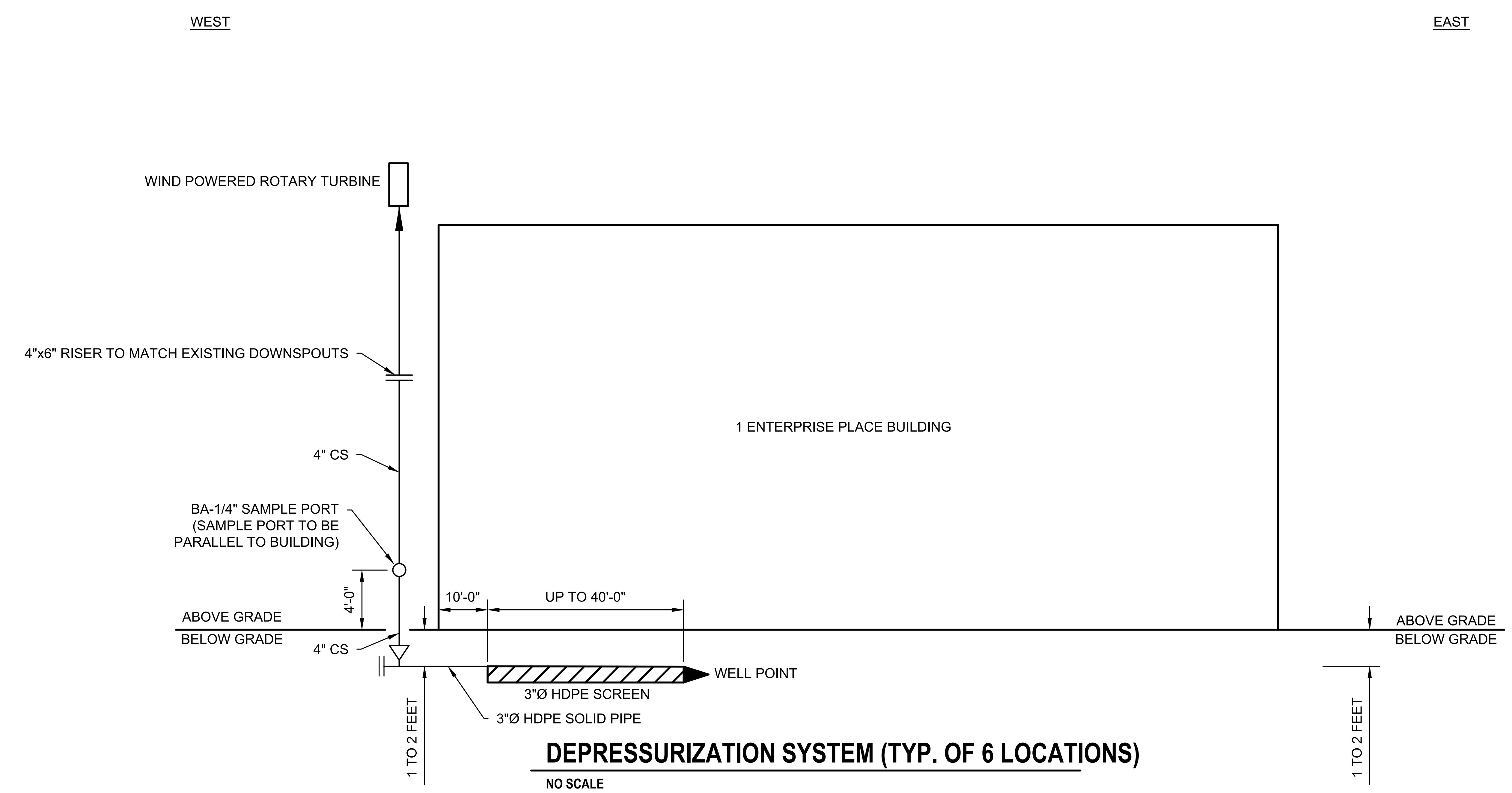
Client **RUCO POLYMER CORP. SITE**
Project **HICKSVILLE, NEW YORK**
Title **PIPE & FAN INSTALLATION DETAILS**
SUB SLAB DEPRESSURIZATION SYSTEM
Project No. **81618-00**
Original Size **ANSI D** Sheet No. **81618-D22102(MIT001)ME-002** Sheet **1** of **1**

Plot Date: 11 July 2017 - 11:22 AM Plotted By: Bruce Ogilvie Filename: P:\drawings\81000s\81618\81618-corr\81618-D22102(MIT001)\81618-D22102(MIT001)ME\81618-00(MIT001)ME-BU005.dwg



DEPRESSURIZATION SYSTEM (TYP. OF 6 LOCATIONS)

NO SCALE

LEGEND

	MAIN PROCESS LINE
	REDUCER
	BLIND FLANGE
	SPECIFICATION CHANGE
BA- "	BALL VALVE
CS	CARBON STEEL PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE

NOTE:
FOR DETAILS - SEE ME-002.

TAG	1	2	3	4	5	6
NAME						
DESCRIPTION MFG						
SIZE						
CAPACITY						
HP/V/RPM						
MODEL						
OTHER						

No.	Issue	Drawn	Approved	Date

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Project Manager	**M. ALOWITZ**	Date	**Jun 14, 2017**
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Client **RUCO POLYMER CORP. SITE**
Project **HICKSVILLE, NEW YORK**
Title **EF P&ID**
SUB SLAB DEPRESSURIZATION SYSTEM
Project No. **81618-D21102**
Original Size **ANSI D**
Sheet No. **81618-D21102(MIT001)EF-001**
Sheet **1** of **1**

Plot Date: 11 July 2017 - 11:18 AM
Plotted By: Bruce Ogilvie
Filename: P:\drawings\81000s\81618\81618-corr\81618-D22102(MIT001)\81618-D22102(MIT001)EF\81618-00(MIT001)EF-BU004.dwg