MODIFICATION OF MCP
PHASE III REMEDIAL ACTION PLAN
AND
PHASE IV REMEDY IMPLEMENTATION PLAN
TO ADDRESS THE BUILDING 5 AREA

FORMER VARIAN FACILITY SITE
150 SOHIER ROAD
BEVERLY, MASSACHUSETTS 01915

MADEP RELEASE TRACKING NUMBER (RTN) # 3-0485

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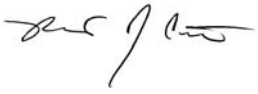

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1.0 INTRODUCTION

1.1 Statement of Purpose

Shaw Environmental & Infrastructure, Inc. (Shaw) on behalf of Varian Medical System, Inc. (Varian) has prepared this Modification of the Phase III Remedial Action Plan (RAP) and Phase IV Remedy Implementation Plan (Phase IV Plan) in accordance with the Massachusetts Contingency Plan (MCP; Section 310 CMR 40.0835) for the former Varian facility located at 150 Sohier Road and other properties located in the vicinity (the Site) in Beverly, Massachusetts. This modification addresses the Building 5 remedial area which was not previously included in the original Phase III RAP and Phase IV Plan submitted to MADEP in 2001 (IT, 2001a and IT, 2001b).

A Site Location Map illustrating the location of the former Varian facility is attached as **Figure 1,** and a Site Plan is attached as **Figure 2**. The Massachusetts Department of Environmental Protection (MADEP) has assigned Release Tracking Number (RTN) 3-0485 to the subject Site. As required by the MCP, this document has been submitted electronically to the MADEP along with a completed Comprehensive Response Action Transmittal Form (BWSC-108) through eDEP. A copy of form BWSC-108 is provided as **Appendix A**.

The purpose of this modification to the Phase III RAP is to identify, evaluate, and select remedial action alternatives to address potential risk associated with indoor air exposure recently identified in the Building 5 area. Specifically, this document modifies applicable sections of the original RAP for RTN 3-0485 to include technologies that are reasonably likely to achieve a Permanent or Temporary Solution at the Site. The Phase IV portion of this report presents modifications to the existing Phase IV Plan that detail engineering design plans for the remedial action alternative selected for this portion of the Site.

1.2 Background Information

Based on the Phase II Comprehensive Site Assessment (CSA) completed in 2000 (IT, 2000), a condition of No Significant Risk existed at the Site with the exception of potential future significant risk associated with groundwater use in the area identified as a Potentially Productive Aquifer (PPA) north of Route 128. Groundwater concentrations in this area were above applicable Massachusetts Drinking Water Standards. As a result, one of the stated remedial action goals in the December 2001 Phase IV Plan submitted to MADEP for the Site, was to achieve Drinking Water Standards in this area of the site (IT, 2001b). At the time of the Phase II CSA submittal, an evaluation of potential risk associated with indoor air exposure at the Site showed No Significant Risk in accordance with the MCP and available guidance.

The original Phase IV Plan proposed remedial actions for addressing volatile organic compounds (VOCs) in soil and groundwater at the subject Site. *In situ* oxidation of VOCs in soil and groundwater using permanganate solution was chosen as the best remedial alternative for the Site. The Phase IV Plan proposed treatment in the “source areas” to achieve these objectives. The Potential Source Location (PSL) areas at the former facility identified in the Phase IV Plan as potentially affecting the GW-1 area are

listed below:

- PSL 5 – Potential former septic tank near Building 3
- PSL 6 – Building 6 - Potential former septic tank/leach field
- PSL 9 – Inspection pit near Building 3
- PSL 11 – Building 3 laboratory
- PSL 12 – Potential former lime pit near Building 3

Other PSL areas that do not impact the PPA and certain other downgradient areas have been included in the *in situ* oxidation program to expedite groundwater cleanup. These areas include PSL 7--Building 5 Lab, PSL 10--open field at south end of 150 Sohier Road, downgradient treatment areas at 31 Tozer Road, and in the Longview/Hill Street area.

Implementation of the Comprehensive Response Action, including the injection of permanganate solution, began in July 2002 and a Phase IV As-Built and Final Inspection Report (Shaw, 2002a) detailing initial Phase IV activities including permitting, well installation, construction of the remedial treatment system, and initial implementation of comprehensive actions was submitted to MADEP in October 2002. The Phase IV As-Built and Final Inspection Report also provided results of additional soil and groundwater analyses, identified minor modifications made to the Phase IV Plan, and documented the final inspection of the remedial system.

In December 2002, Varian submitted a Remedy Operation Status Opinion (Shaw, 2002b), which stated that the performance standards for Remedy Operation Status (ROS), as specified in 310 CMR 40.0893(2), have been achieved and will be maintained at the Site. A Response Action Outcome (RAO) had not yet been achieved at the Site, and the operation and maintenance of the remedial action will continue to proceed under ROS.

The sodium permanganate treatment conducted at the Site since 2002 has produced significant reductions in chlorinated VOC levels at multiple depths in groundwater across the Site. These remedial activities are reported to MADEP in regular semi-annual ROS reports. As detailed in the October 2006 status report, bioremediation was proposed as a supplemental remedial approach to address two small areas at the Site (Shaw, 2006). These areas include shallow groundwater with residual trichloroethene (TCE) impacts located close to the Unnamed Stream at the northeast corner of the Site. Bioremediation was used to address the shallow groundwater by the Unnamed Stream because permanganate treatment may affect the stream. The second bioremediation area is at the northeast corner of Building 3, where deep overburden groundwater is impacted with residual 1,1,1-trichloroethane (TCA), which is more effectively treated through bioremediation than permanganate addition.

Subsequent to the start of Comprehensive Response Actions at the Site, the PPA designation for the area to the north of Route 128 was removed by MADEP. As a result, Drinking Water Standards no longer apply to this area. Therefore, the primary remedial action goal specified in the Phase IV Plan to achieve drinking water standards in downgradient Site wells in the PPA area is no longer applicable. As presented in the October 30, 2010 status report (Shaw, 2010), the following updated remedial action

goals will be used to guide ongoing response actions being conducted at the Site under Phase V ROS:

1. Maintain compliance with Upper Concentration Limits (UCLs)
2. Achieve a condition of No Significant Risk for site workers in Building 3 (RTN 3-28531), as well as other site buildings, by remediating, where present, elevated VOC concentrations in soil and groundwater beneath the building.
3. Limit rebound in VOC source areas such that potential impacts to indoor air in downgradient areas continue to pose No Significant Risk,
4. Demonstrate that VOC concentrations in groundwater at the Site do not represent an uncontrolled source for impacts to surface water, and
5. Demonstrate that VOC concentrations in soil and groundwater at the Site continue to pose No Significant Risk in accordance with current MADEP requirements.

To achieve these goals, the previously proposed remediation planning criteria have been applied to focus remediation activities at the Site. The goals include the decrease of target VOC concentrations in certain source area wells to 50 percent or less of the UCL and the reduction of target VOC concentrations (including breakdown products) in treatment areas by at least 50 percent below pretreatment levels in order to mitigate potential post-remediation rebound effects. These goals are consistent with MADEP guidance (Policy #WSC-04-160) on the feasibility of achieving background concentrations, which indicates that the reduction of risk to 50% of a level where No Significant Risk is achieved will be considered appropriate site closure criteria with Presumptive Certainty (MADEP, 2004).

As part of the original Phase II assessment, the indoor air pathway was assessed using soil and soil vapor data from across the Site and determined to present No Significant Risk (IT, 2000). As presented in subsequent ROS reports (Shaw, 2011 and Shaw, 2012b) submitted for the Site, indoor air sampling was conducted in 2011 and 2012 to confirm this conclusion of the Phase II report. This indoor air sampling was conducted in part to respond to revised guidance issued by MADEP (MADEP, 2011) and based on new data associated with RTN 3-28531 (issued for a potential Imminent Hazard resulting from indoor air concentrations inside Building 3). Following a review of sub-slab soil vapor sampling results from the Phase II CSA and data from the Building 3 Area, additional soil vapor and indoor air sampling was conducted inside Buildings 5 and 6 as these areas appeared to present the potential for indoor air impacts. As presented in the April 2012 ROS report, indoor air sampling results do not indicate the presence of an Imminent Hazard or Significant Risk in Building 6. At Building 6, the estimated hazards are below the MCP risk limits. However, in Building 5 current indoor air sampling data suggest that indoor air VOC concentrations are variable and the estimated hazards are at, but do not exceed, the MCP risk limit. Therefore, it is likely that a Permanent Solution for the Site may not be achieved without some VOC remediation at Building 5 to reduce potential risk to site workers. Hence, an evaluation of remedial alternatives that are likely to achieve a Permanent Solution for potential worker exposure in Building 5 has been conducted and presented in this report. Based upon discussions with the MADEP, it is acceptable to evaluate and implement an additional remedial approach (e.g. soil vapor extraction) for the Building 5 area of the Site after submitting this supplemental Phase III and IV report, and continue with the on-going groundwater remediation program under ROS (Shaw, 2012a).

1.3 Summary of Building 5 Assessment Data

This section presents a brief review of environmental data associated with Building 5 area. This includes data collected during the Phase II CSA and as part of Comprehensive Response Actions.

1.3.1 Groundwater Data

Groundwater analytical results from monitoring wells in the area of Building 5 are summarized in **Table 1**. In the shallow overburden, VOC concentrations in groundwater can be characterized by sampling results from well B-2 (**Figure 3**). As indicated on **Table 1**, groundwater sample results from April 2012 indicated a trichloroethene (TCE) concentration of 0.27 milligrams per liter (mg/l), a tetrachloroethene (PCE) concentration of 0.0069 mg/l and a cis-1,2-dicholoroethene (DCE) concentration of 0.26 mg/l at shallow well B-2. The concentrations of TCE and cis-1,2-DCE detected in April 2012 exceeded the Method 1 GW-2 standards (0.03 mg/l and 0.1 mg/l, respectively). Higher concentrations of VOCs are observed in the deep overburden aquifer in the Building 5 area. For example, TCE and PCE were detected at 5.4 mg/l and 19 mg/l, respectively, in a groundwater sample collected from well OB35-DO in April 2012.

1.3.2 Soil Data

Available soil data collected in the area of Building 5 are summarized on **Table 2**. A soil sample collected from the Shipping Area in Building 5 during Phase II assessment activities (**Figure 3**) indicated a TCE concentration of 3,500 micrograms per kilogram (ug/kg) and a PCE concentration of 1,000 ug/kg. As presented in the October 2012 ROS report, soil samples were collected periodically during installation of the three SVE trench wells in Building 5 during August 2012 and screened for VOCs with a photoionization detector (PID) using a jar headspace method. Soil headspace screening results revealed VOC concentrations of up to 52 parts per million (ppm) in the Sanding Room trench, up to 22 ppm in the Shipping Area trench, and up to 22 ppm in the QA Area trench. A soil sample was collected from the bottom of the excavations at BLDG5-SVE1 (Sanding Room) and BLDG5-SVE2 (Shipping Area) and submitted for laboratory analysis of VOC by EPA Method 8260B at ALS Environmental. These soil samples were collected using methods consistent with EPA Method 5035 to limit volatilization of target VOC. Analytical results of soil samples collected in Building 5 Area in July 2012 are included on **Table 2** and indicate VOCs were not detected above the reporting limit.

1.3.3 Soil Vapor Data

As presented in the April 2012 ROS report, on January 9, 2012, sub-slab soil vapor samples were collected from the three vapor points beneath Building 5 (BLD5-SV1, BLD5-SV2 and BLD5-SV3, **Figure 3**). Analytical results of the soil vapor samples are summarized on **Table 3** along with previous results and indicate:

- TCE was detected at concentrations ranging from 1,300 micrograms per meter cubed (ug/m^3) at BLD5-SV2 to 22,000 ug/m^3 at BLD5-SV3,
- PCE was detected at concentrations ranging from 140 ug/m^3 at BLD5-SV2 to 2,700 ug/m^3 at BLD5-SV1, and
- cis-1,2, DCE was detected at 96 ug/m^3 at BLD5-SV1.

Additional VOCs detected in sub-slab soil vapor samples collected beneath Building 5 in January 2012 included 2-butanone (300 ug/m^3), 2-hexanon (110 ug/m^3), 4-methyl-2-pentanon (24 ug/m^3), acetone (320 ug/m^3), and toluene (24 ug/m^3).

Concentrations of TCE and PCE in soil vapor samples collected from beneath Building 5 exceeded the Commercial Sub-Slab Soil Gas Screening Values provided in MADEP guidance (MADEP, 2011)

1.3.4 Indoor Air Data

In conjunction with the January 2012 sub-slab vapor sampling, indoor air samples were collected inside Building 5 (BLD5-1, BLD5-2, BLD5-3, and BLD5-4, **Figure 3**). Analytical results of the indoor air samples are summarized on **Table 4** along with pervious results and indicate:

- TCE was reported at concentrations ranging from non-detect at BLD 5-4 (Production Area) to 33 ug/m^3 at BLD5-3 (Sanding Room),
- PCE was reported at concentrations ranging from non-detect at BLD 5-4 (Production Area) to 14 ug/m^3 at BLD5-2 (Shipping Area), and
- acetone was detected at concentrations ranging from 670 ug/m^3 at BLD5-4 (Production Area) to 10,000 at BLD5-1 (QA Area),

These indoor air data were evaluated and indicated that indoor air VOC concentrations in the Building 5 area are variable and the estimated hazards are at, but do not exceed, the MCP risk limit. However, it is likely that a Permanent Solution for the Site may not be achieved without some VOC remediation at Building 5 to reduce potential risk to site workers (Shaw, 2012b).

2.0 REMEDIAL TECHNOLOGY FEASIBILITY TESTING

Field testing of several remedial technologies was historically conducted at the Site. These tests included aquifer pumping and permanganate pilot tests which focused on the remediation of groundwater. These technologies would not be applicable to addressing potential indoor air impact at Building 5. Soil vapor extraction (SVE) has been successfully implemented at Building 3, located at the 150 Sohier Road property, under RTN 3-28531 to reduce risk associated with potential indoor air exposure. However, due to differences in building construction and variable site lithology, additional pilot testing was conducted beneath Building 5 to evaluate if SVE would be effective at removing VOC from vadose zone soil and at limiting potential vapor migration into Building 5. This section presents the methods and results of SVE pilot testing conducted in the Building 5 area in 2012.

2.1 Trench SVE Well Installation

Shaw installed three horizontal SVE trench wells inside Building 5 in July and August 2012 to evaluate the potential effectiveness of SVE to remediate VOCs in vadose zone soil beneath Building 5. The SVE trench wells were installed during a manufacturing shutdown in accessible locations around the Building 5 utility trench system and former sump that represent the likely source of sub-surface VOC impacts

resulting in indoor air concentrations. The SVE trench wells were installed in the Sanding Room, Shipping Area, and the QA Area in Building 5 (**Figure 3)**. Each well was constructed of 4-inch diameter slotted PVC well screen installed approximately three feet below the concrete floor. Trench SVE well BLDG5-SVE1 was completed as an 11 foot horizontal SVE well in the Sanding Room. Trench SVE well BLDG5-SVE-2 was installed as a 15 foot horizontal SVE well in the Shipping Area and BLDG5-SVE3 was completed as a 15 foot horizontal SVE well in the QA Area. Each SVE trench was backfilled with washed stone and covered with concrete. Details of the SVE trench well installation were provided in the October 2012 ROS report (Shaw, 2012c). A cross-sectional diagram of the SVE trench wells is provided in **Figure 4**.

2.2 SVE Pilot Test and Results

On September 8, 2012, Shaw conducted a soil vapor extraction pilot test to verify the feasibility of this technology as a remediation method for the Site and to collect the technical data necessary to design a soil vapor extraction system. The soil vapor extraction pilot test was conducted to accomplish the following site-specific goals:

- Evaluate airflow and radius of influence of soil vapor extraction: The relationship between well vacuum, airflow, and vacuum dissipation with distance from the soil vapor extraction well was evaluated.

- Mass Removal: During the SVE pilot test, vapor samples were collected for field screening using a photoionization detector (PID) and for laboratory analysis. Vapor concentrations were used to estimate the mass removal from the subsurface. These mass removal data were used to evaluate the requirements for off-gas treatment and estimate cleanup time for a full-scale treatment system.

The soil vapor extraction pilot test was performed by inducing a vacuum at two SVE trench wells (BLDG5-SVE1 and BLDG5-SVE2), and measuring sub-slab vacuum influence at nearby vacuum monitoring points. The following is a summary of the test procedures:

- A regenerative blower was used to extract soil vapor from well BLDG5-SVE1 at two different flow rates (43 and 58 cubic feet per minute [cfm]). Vacuum readings were measured at vacuum monitoring points (Temp SV1, SV2 and SV3 and BLDG5-SV2, see **Figure 5**) during the pilot test at each of the two flow rates to determine the relationship between flow and vacuum in the subsurface.

- A regenerative blower was used to extract soil vapor from well BLDG5-SVE-2 at two different flow rates (46 and 65 cfm). Vacuum readings were measured at vacuum monitoring points (Temp SV4, SV5 and SV6) during the pilot test at each of the two flow rates to determine the relationship between flow and vacuum in the subsurface.

- Soil vapor samples were collected in Summa canisters from the SVE blower effluent at each pilot test location (BLDG5-SVE1 and BLDG5-SVE2) during the maximum flow rate phase of each test (a flow rate of 58 cfm at an applied vacuum of 45 inches of water column at BLDG5-SVE1 and a flow rate of 65 cfm at an applied vacuum of 45 inches of water column at BLDG5-SVE2). The vapor samples were submitted to ALS Environmental for analysis of VOC by EPA Method TO15.

Analytical results for soil vapor samples collected during the SVE pilot test are summarized in **Table 5.** A copy of the laboratory report is included as **Appendix B.**

- Two 200 pound granular activated carbon (GAC) vessels were used for off-gas treatment during the pilot test.

Results of the various parameters measured during the soil vapor extraction pilot test are summarized in **Tables 6A** and **6B**. The pilot test monitoring points are shown on **Figure 5**.

The SVE pilot test data were evaluated to determine the effective radii of influence (ROI) using VENT-ROI©, a proprietary computer model developed by Shaw. VENT-ROI© defines the effective cleanup radius for SVE systems as "the maximum distance from a vapor extraction point through which sufficient vapor is drawn to remove the required fraction of contamination in the desired time." This flow-based program evaluates the quantity of air moving through the vadose zone at a given applied vacuum and provides an assessment of remediation time and design information specific to the contaminant. The program input parameters include: SVE pilot test flow rates, applied vacuums, and measured vacuum vs. distance data.

This model incorporates the following parameters: contaminant vapor pressure, temperature of the soil vapor, vertical depth of the unsaturated zone, standard rates of aerobic degradation where applicable to the compound of interest, and soil characteristics. VENT-ROI© model results are included as **Appendix C**.

The following section presents conceptual system parameters based on the SVE pilot test data evaluation:

- An interwell effective radius of influence ranging from 18 to 25 feet and a single-well radius of influence ranging from 20 to 27 feet was estimated by the VENT-ROI© model for appropriate volatilization of TCE as encountered during pilot testing. A higher ROI was estimated at well BLDG5-SVE1 located in the Sanding Room. The table below lists the ROIs calculated from the pilot test data. The variability in the ROIs may be due to non-homogenous subsurface material seen during SVE well installation.

Venting Well	Single-Well ROI (feet)	Interwell ROI (feet)
BLDG5-SVE1	26.8	24.6
BLDG5-SVE2	19.5	18.4

- An ROI of 20 feet was conservatively estimated based on the interwell ROIs observed during the pilot test.

- To achieve 97 percent removal of TCE within approximately 19 months, a flow rate of 65 cfm per well and a corresponding SVE well head vacuum of 45 inches of water column was estimated for the trench SVE wells based on the pilot test results.

Based on the SVE pilot test results, a SVE system utilizing the existing trench SVE wells would be expected to effectively remediate TCE in vadose zone soil within the ROI indicated on **Figure 5**. Based

on the available soil and soil vapor data from beneath Building 5, the SVE treatment area shown on **Figure 5** should adequately remediate VOCs in soil adjacent to the utility trench system and former sump.

3.0 MCP PHASE III REMEDIAL ACTION PLAN FOR BUILDING 5 AREA

Shaw has prepared this Phase III RAP for the Building 5 area to address potential VOC migration from soil vapor into indoor air. The purpose of a Phase III RAP is to identify, evaluate and select a remedial action alternative that is reasonably likely to achieve a Permanent or Temporary Solution at the Site. This RAP has been prepared in accordance with applicable MCP requirements (310 CMR 40.0850), MADEP Guidance on conducting Feasibility Evaluations (MADEP, 2004) and describes the evaluation processes used to select the preferred remedial alternative.

This section is organized in a format consistent with the MCP Phase III RAP requirements set forth in 310 CMR 40.0861(2).

3.1 Overall Approach to Evaluating Remedial Alternatives

In this Phase III, the process used to evaluate various remedial alternatives was conducted as follows:

- First, an initial screening of remediation technologies and/or alternatives was completed to determine the most applicable approaches to reduce potential exposures. The initial screening of alternatives was conducted considering site-specific conditions such as the types of contaminants present, soil types, groundwater depth and flow considerations, site physical constraints, general technology applicability and availability. The initial screening process identified a short-list of applicable and available alternatives that are expected to effectively achieve a Permanent or Temporary Solution for the Site.

- Next, using the short-listed alternatives identified during the initial screening process, several remedial approaches were assembled for further evaluation. These remedial alternatives were described and evaluated in the detailed evaluation step. The remedial alternatives that were determined to be most appropriate were retained and ranked in the detailed evaluation process. The detailed evaluation process considers criteria such as remedial effectiveness, reliability, ease of implementation, relative cost, risk, benefits, and timeliness.

- The most applicable remedial alternative was selected based on the detailed evaluation criteria and alternative ranking.

Section 3.2 below presents the initial screening process used to identify applicable remedial alternatives to address the remedial treatment area.

Section 3.3 presents the detailed evaluation process used to evaluate and select the preferred remedial alternative to be implemented at the site

3.2 Initial Screening of Remedial Alternatives [310 CMR 40.0861(2)(a)]

In accordance with the MCP, an initial screening was conducted to identify remedial action alternatives that are reasonably likely to be feasible based on the oil and hazardous materials (OHM) present, impacted media, and site characteristics. A remedial action alternative is deemed feasible if it is reasonably likely to achieve a Permanent or Temporary Solution, and if the individuals with the expertise needed to effectively implement a solution are available.

The initial screening was based upon the following criteria (310 CMR 40.0856(1)):

- *Technical Feasibility:* This criterion evaluates the applicability and reliability of the alternative to treat the contaminants based on performance on similar sites and contaminants.

- *Available Expertise:* This criterion evaluates whether the individuals with the expertise needed to implement the alternatives are available.

The following table contains a summary of potential remedial alternatives identified for discussion in the initial screening:

Potential Remedial Alternatives to Address VOC-impacted Soil, Soil Vapor and/or Groundwater
No Action Alternative
Vapor Barrier Installation
Monitored Natural Attenuation
Soil Vapor Extraction
Soil Vapor Extraction and Air Sparging
Dual Phase Extraction
In situ Oxidation using Permanganate Addition
Groundwater Extraction and Treatment
Excavation with Off-Site Treatment/Disposal
Sub-slab Depressurization

The following sections briefly discuss and evaluate these remedial alternatives.

3.2.1 No Action Alternative

A No Action Alternative was determined to not be applicable since indoor air VOC concentrations suggest that a Permanent Solution may not be attainable without remedial treatment. Therefore, this alternative was not retained for further consideration.

3.2.2 Vapor Barrier Installation

Typically, vapor barriers are installed beneath the floor of an impacted building during initial construction; however, that is not practical in the case of an existing building like Building 5. Therefore, this alternative

would include the installation of a vapor barrier over the existing concrete floor of the Building 5 to prevent the migration of VOC vapors through the slab and reduce concentrations in indoor air. Vapor barriers are typically made from a rubber or asphaltic emulsion material and would be applied to the existing floor. Given the current use of the building as an active manufacturing facility, significant quantities of equipment and materials would need to be moved to expose the floor for the installation of a vapor barrier. In addition, a vapor barrier would need to be covered with another concrete floor slab throughout the building to protect it from manufacturing activities.

This alternative would require that an Activity and Use Limitation (AUL) be implemented to ensure proper maintenance of the vapor barrier system. In addition, periodic indoor air monitoring, vapor barrier inspections, and record-keeping would be necessary to verify safe exposure levels are maintained for site employees. While this alternative does not treat, destroy, or detoxify OHM at the Site, it is capable of preventing VOC migration into indoor air from below the floor and reduces potential indoor air exposures. However, installation of a vapor barrier in this active manufacturing building would be highly disruptive to facility operations; therefore, this alternative was not retained for further consideration.

3.2.3 Monitored Natural Attenuation

This alternative includes naturally occurring processes in soil and/or groundwater that act to reduce the mass, toxicity, mobility, volume, and concentration of contaminants in those media. Natural attenuation processes include volatilization, adsorption, dispersion and biological or chemical degradation to reduce chemical concentrations. This alternative is generally applicable to the remedial treatment of the VOC present at the Site as they have been documented to degrade naturally (Davis, 1990).

This alternative would include regular sampling of impacted media to monitor VOC concentrations and periodic evaluations of contaminant degradation rates to confirm the continued applicability of the technology. Key advantages of this approach are that it generates minimal wastes, operates in situ with limited site disturbance and includes active monitoring of site conditions.

Although degradation of VOC in groundwater at the Site has been documented, this has required the application of a remedial additive as a carbon source (Shaw, 2011). As a result, it is expected that little natural attenuation would occur under current conditions and this alternative will not be retained as a standalone option to address VOC potentially migrating into indoor air in the Site.

3.2.4 Soil Vapor Extraction

This alternative involves the use of the existing trench SVE wells in Building 5 and additional SVE wells if needed. These wells would be connected to a blower system to create a vacuum beneath the building and remove VOC vapors from the impacted soil before they potentially migrate through the floor into indoor air, thus reducing indoor air concentrations and potential exposure. In addition to removing soil vapors from the subsurface, an added benefit of the SVE alternative would be the volatilization of VOC sorbed to soils beneath the building. This alternative includes a vapor treatment component, such as granular activated carbon.

Based on the successful application of this technology to remove chlorinated solvents from the subsurface beneath Building 3 at the property under RTN 3-28531, and the favorable results of the SVE pilot test discussed above, the SVE alternative will be retained for further evaluation as a remedial option for addressing residual VOC in soil and soil vapor at the Site.

3.2.5 Soil Vapor Extraction System and Air Sparging

This alternative involves the same SVE approach described in Section 3.2.4 with air sparging added to address the potential for shallow groundwater VOC impacts affecting indoor air. This alternative would include the additional installation of vertical air sparging wells within a treatment area at the Site for injection of air under low pressure below the water table. This process introduces air into the soil pore space by displacing water in the soil matrix and causing volatilization of the VOC. These VOC are then collected and treated by the SVE system.

Air sparging has the dual purpose of contributing to biodegradation of aerobically degradable compounds by providing oxygen (air) to the subsurface and contributing to the physical removal of volatile organic compounds through volatilization from subsurface soil and groundwater. Soil vapor extraction is usually used in conjunction with air sparging to control vapor migration. A vacuum is applied through soil vapor extraction wells to create a pressure gradient that induces vapor-phase VOC to diffuse through soil to the extraction wells. The process includes a treatment system for handling off-gases, such as activated carbon.

Based on the successful application of this technology to remove chlorinated solvents from the subsurface at other sites in Massachusetts, the SVE with air sparging alternative will be retained for further evaluation as a remedial option for addressing residual VOC in soil, soil vapor and groundwater at the Site.

3.2.6 Dual Phase Extraction

Dual Phase Extraction (DPE) is the simultaneous removal of fluids and vapors from an extraction well. A typical DPE extraction well includes a screened section in the zone of contaminated soil and groundwater. The vapor extraction process removes VOC from the unsaturated zone, including previously saturated zone soils exposed by dewatering, by inducing airflow (and volatilization of the VOC) in the soil matrix. Fluid extraction is accomplished by use of either a single-vacuum pump (for liquids and vapors) or double-pump system (one pump for liquids and a separate pump for vapors). DPE potentially increases the gradient toward the extraction wells and may provide enhanced groundwater recovery rates. This technology can be applied when soil and groundwater remediation of a source area is required.

However, this alternative would be considerably more expensive to install and operate than a SVE system. These increased costs result from more sophisticated pumps, controls, and the need to treat soil vapor and groundwater prior to discharge. Therefore, DPE is not anticipated to be cost-effective and has been eliminated from further consideration for this site.

3.2.7 In situ Oxidation using Permanganate Addition

Potassium permanganate and sodium permanganate are widely used oxidants in the water treatment industry which oxidize a wide range of common organic contaminants relatively quickly and completely. Permanganate is very effective at treating chlorinated ethenes (like TCE and PCE) by reacting rapidly with the non-conjugated (i.e., non-aromatic) double bonds to produce non-toxic byproducts including manganese dioxide, carbon dioxide, water, and chloride ions. The limiting factor in treatment of VOC is the ability to establish and maintain contact between the permanganate and VOC. The primary factors driving contact in the subsurface are the subsurface permeability and the ability to apply the permanganate in the areas that contain the targeted VOC.

At the Site, sodium permanganate has already been used effectively to reduce VOC concentrations in shallow and deep groundwater and to a lesser degree shallow soil. However, this alternative would be difficult to apply effectively to the shallow contaminant mass underneath the building in the unsaturated zone. However, it may be effective when used following SVE for shallow groundwater treatment of VOC, if shallow groundwater continues to re-impact soil vapor after vadose zone soils are remediated. Therefore, this alternative used in conjunction with SVE will be retained for further evaluation as a remedial option for addressing residual VOC in shallow groundwater at the Site.

3.2.8 Groundwater Extraction and Treatment

This alternative would consist of the installation of a groundwater extraction and treatment system to address the remedial treatment area. The remedial system would include groundwater extraction wells and associated pumps to pump extracted groundwater to a central treatment system. The treatment system would consist of a flow equalization tank, air stripper(s), and vapor phase carbon for treatment of the air from the air stripper prior to discharge to the atmosphere. Treated groundwater from the air stripper could be discharged to the sanitary sewer.

While groundwater extraction has been documented to be effective for migration control, it is relatively ineffective at VOC mass removal. In addition this alternative would not address soil vapor or the contaminant mass that is present in the unsaturated soil. Therefore, this alternative is not anticipated to be effective for this Site and has been eliminated from further consideration.

3.2.9 Excavation with Off-Site Treatment and/or Disposal

Excavation of soil and adsorbed VOC involves the removal of soils from beneath a Site building for off-site treatment and/or disposal (i.e., thermal destruction or lined land filling). This alternative would reduce the mass of VOC in soil, and thus also reduce soil vapor concentrations and indoor air exposure. Material handling and processing involves the movement of soils from their current environmental setting below the floor slab to off-site treatment facilities for contaminant removal and/or disposal. Due to the presence of chlorinated solvents and prior classification of VOC-impacted site soils as hazardous waste, on-site soil treatment at the property will not be considered. In addition, the hazardous waste classification of the excavated soil will add considerable cost to waste transportation and soil disposal at an appropriately licensed facility.

The soil excavation alternative is generally applicable to shallow, limited extent and well-defined locations that can be accessed without major interruption to ongoing site activities. Excavation of soils from beneath active facility buildings at the Site would be difficult and highly disruptive to current facility operations. Therefore, this alternative was not retained for further evaluation.

3.2.10 Sub-slab Depressurization

This alternative involves the installation of vertical sub-slab depressurization wells within the affected building and a blower to create a small vacuum and remove VOC vapors before they potentially migrate through the floor into indoor air, thus reducing indoor air concentrations and potential exposure. The sub-slab wells are typically piped to an extraction blower that discharges VOC directly to the atmosphere. Off-gas treatment is not needed if emissions are less than 100 pounds per year (MADEP, 1994 and MADEP, 1995).

This alternative would require that an AUL be implemented to ensure proper maintenance of the sub-slab depressurization system during building occupation. In addition, periodic indoor air monitoring and record-keeping would be necessary to verify safe exposure levels are maintained for site employees. The sub-slab depressurization approach would not treat the VOC impacted soil and/or groundwater below the building floor. As a result, the sub-slab depressurization system would need to operate for a very long duration and would be considered a Temporary Solution. However, this approach would be capable of controlling VOC migration into indoor air from below the floor and protect site workers. This alternative was therefore retained for further consideration.

3.2.11 Conclusion of Initial Screening

Based on the Initial Screening conducted above, a short-list of retained remedial alternatives is presented below:

Retained Remedial Alternatives to Address VOC-impacted Soil and/or Groundwater
Remedial Alternative 1 – Soil Vapor Extraction
Remedial Alternative 2 – Soil Vapor Extraction with Air Sparging
Remedial Alternative 3 – Soil Vapor Extraction with In situ Chemical Oxidation
Remedial Alternative 4 – Sub-slab Depressurization

A detailed evaluation of these retained remedial alternatives is presented in the next section of this report.

3.3 Detailed Evaluation of Remedial Action Alternatives [310 CMR 40.0861 (2)(b)]

Detailed evaluations of applicable remedial alternatives identified in the initial screening process were conducted to select the most applicable, cost-effective, timely, and beneficial remedial alternative. The following four criteria were used to identify remedial alternatives to be included in the detailed evaluation (310 CMR 40.0857):

- *Effectiveness:* The remedial alternative is considered effective in remediating the types of OHM present at the site, based on experience with similar site and contaminant conditions;

- *Reuses, Recycles, Treats, Destroys or Detoxifies*: The alternative results in the reuse, recycling, destruction, detoxification, treatment or any combination thereof of the OHM present at the site;

- *Can be Safely Implemented to Achieve No Significant Risk:* The alternative is anticipated to be implemented in a safe manner that will achieve a condition of No Significant Risk of harm to health, safety, public welfare or the environment; and

- *Attains Class A Response Action Outcome (RAO):* The alternative is anticipated to result in the reduction and/or control of oil and/or hazardous material at the disposal site that is consistent with the requirements of a Class A RAO (i.e., a Permanent Solution having achieved a level of No Significant Risk).

The methodology used for conducting the detailed evaluations is described below.

3.3.1 Remedial Alternative Evaluation Methodology

Detailed evaluations of each remedial alternative retained from the Initial Screening were conducted in two steps:

Step 1. Evaluate and score retained alternatives using a detailed evaluation process; and
Step 2. Rank and select a remedial alternative using an evaluation scoring matrix.

The following factors were used in this evaluation: applicability, effectiveness, short- and long-term reliability, difficulty in implementation, comparative cost, and relative risk associated with implementation, comparative green benefits, and treatment time.

Shaw developed a detailed alternative evaluation scoring matrix based on the categories listed above. Using this matrix, potential alternatives were evaluated, consistent with MCP evaluation criteria (310 CMR 40.0858), and a score was calculated to rank each potential remediation alternative for this Site. The scores for each criterion are weighted based on importance; for example, Effectiveness is scored from 1 to 5 whereas Relative Treatment Time is scored from 1 to 3.

To rank the alternatives in terms of effectiveness (E), a score of 1 to 5 was assigned to each alternative under consideration. A score of 5 was assigned to only those alternatives that have been demonstrated to be a successful remediation approach at sites with similar compounds and geologic characteristics. To receive a rating of 5, the alternatives should reuse, recycle, destroy, detoxify, or treat the oil or hazardous material, as this is a required consideration under the Response Acton Performance Standards (RAPS) identified in 310 CMR 40.0191(3)(b), and have a high probability of achieving a Permanent or Temporary solution. Decreasing scores were assigned to alternatives which are less proven or not readily available and do not reduce levels of untreated oil or hazardous material to concentrations that achieve or approach background or properly control residues or wastes or discharges to the environment.

The comparative short-term and long-term reliability (R1) of the alternatives was evaluated. A score of 1 to 3 was assigned to each alternative under consideration. Those alternatives which provided a higher degree of certainty of being successful were given a higher score. In addition, a higher score indicates a greater effectiveness in managing wastes, controlling emissions or potential discharges to the environment.

To rank alternatives in terms of difficulty (D) of implementation or technical complexity, a score of 1 to 3 was assigned to each alternative under consideration. A score of 3 was assigned to those alternatives that are anticipated to have the least delay due to permitting, equipment procurement and the materials and resources are readily available for implementation. A score of 3 also indicates that the technology has a low technical complexity. Decreasing scores were assigned to alternatives that are anticipated to have difficulties with permitting, access agreements, interruption to present operations, availability of necessary off-site treatment, storage and disposal facilities, and increased complexity requiring a higher level of training for operators.

The alternatives were further ranked from 1 to 4 according to relative cost (C). The alternative with the lowest expected relative costs was assigned a score of 4. The scores decrease to a minimum of 1 as relative costs increase. This scoring takes into consideration initial investment and O&M over the expected life of the remedial program (i.e. present worth).

The alternatives were also ranked from 1 to 3 based on the potential relative short- and long-term risk (R2) of harm to human health, safety, public welfare or the environment associated with their implementation. The implementation risks should also consider on-site and off-site risks associated with excavation, transport, disposal, containment, construction, operation or maintenance activities, or potential discharges to the environment. A score of 3 was assigned to alternatives that expect to incur minimal risks. Decreasing scores were assigned as risk associated with implementation increased.

Each alternative was ranked either from 1 or 3 based on the comparative benefits (B) related to that alternative. Alternatives that are expected to restore the property's productive reuse, avoid costs of relocation of people, businesses, or alternative water supplies, received a score of 3. Alternatives that will relocate people, business, and/or result in potential property value loss were assigned a score of 1.

In addition, each alternative was ranked on a scale of 1 to 3 based on the estimated time (T) required to achieve the desired remediation goal. Alternatives that will achieve the goal the quickest were assigned a value of 3. Alternatives that will take longer but result in an acceptable treatment time were assigned value of 2. Alternatives with treatment times longer than desired were assigned a value of 1.

Finally, each scenario was rated from 1 to 3 based on the comparative green benefits (G) related to implementing that scenario. Green benefits include minimizing energy use or using renewable energy, minimizing air pollution or greenhouse gas emission, reducing/reusing/recycling waste, protecting the land and ecosystems, and minimizing visual and aesthetic impacts. The scenario that is most beneficial

compared to the others was assigned a score of 3. The scores decrease to a minimum of 1 as relative green benefits decreased.

The following equation was used to calculate the overall score of each alternative:

Score = E+R1+D+C+R2+B+T+G

where:
E = effectiveness
R1 = reliability
D = difficulty score
C = estimated relative cost score
R2 = risk associated with implementation score
B = benefits
T = estimated time score required to meet the project goal, and
G = green benefits

The scores may range from 8 to 27. The alternative evaluation scores were developed based upon the above described matrix system, literature review, professional judgment, and Shaw's remediation experience. The selected remedial action alternative was chosen based on the results of the scoring matrix unless otherwise stated.

3.3.2 Detailed Evaluation of Potential Remedial Alternatives

This section reviews four potential remedial alternatives to address the potential indoor air impacts in Building 5.

3.3.2.1 Soil Vapor Extraction

This alternative includes using the existing trench soil vapor extraction wells within Building 5 and if warranted additional extraction wells to remove VOCs from the vadose zone beneath Building 5. These SVE wells would need to be connected to an SVE system which would include a vacuum blower, piping, wiring, controls and a telemetry system to notify the operator of alarm conditions. Off-gas treatment would need to be provided by vapor phase carbon units. Although the trench SVE wells are in place, connecting the SVE system to the wells would cause some temporary disruption to the existing facility.

Costs for this alternative would include the installation of the components noted above and would include design, materials, labor, and engineering support. In addition, costs for this alternative would include labor, equipment and materials for system O&M, and indoor air monitoring.

Based on the results of the pilot test and experience at other site, this alternative would treat VOC-impacted soil and soil vapor beneath the building and should reduce potential indoor air concentrations and exposures. This remedial alternative is expected to operate for two to three years and achieve a Permanent Solution in the Building 5 area of the Site.

3.3.2.2 Soil Vapor Extraction with Air Sparging

This alternative would combine the benefits of soil vapor extraction with air sparging to treat VOC-impacted soil, soil vapor and groundwater in the future, if necessary. The air sparging wells and system would be installed as a contingency following operation of the SVE system if additional treatment of VOC in groundwater was necessary to reduce indoor air levels to achieve a Permanent Solution.

This alternative would include the installation of approximately 10 vertical air sparging wells connected to an air sparging blower system located outside the Building 5. The air sparging system would be in addition to the existing SVE wells and equipment. Based on soil conditions and experience at similar sites, it is assumed that the treatment area can effectively be treated by up to 10 air sparging wells, at approximately 10 standard cubic feet per minute (scfm) per well. The air sparging system would include a blower, controls, alarms, and a telemetry system to notify the operator of alarm conditions. The air sparging system would be run in conjunction with the SVE system so that the SVE system would capture vapors liberated by the air sparging system.

Costs for this alternative would include the installation of the air sparging system, system design, materials, labor, engineering support, and waste management, combined with the costs for the SVE system discussed above. In addition, costs for this alternative would include labor, equipment, and materials for system O&M, indoor air monitoring and groundwater sampling.

This alternative treats VOC in soil, soil vapor and shallow groundwater to reduce potential indoor air exposures. One disadvantage of the SVE with air sparging system alternative is the increased costs due to installation of the air sparging wells and system operation. Another disadvantage of an air sparging system is the need to maintain control of soil vapors so that VOC impacted vapor is not pushed to other areas. Because the treatment area is located beneath a building, there are physical limitations that could limit the placement or effectiveness of SVE wells required to maintain control and treat soil vapor. This alternative would result in temporary disruption to manufacturing activities in Building 5 during installation of the air sparge wells and additional system piping.

This remedial alternative is expected to include two to three years of SVE operation followed by operation of the air sparge system for an additional two to three years to achieve a Permanent Solution (a total of four to six years of operation).

3.3.2.3 Soil Vapor Extraction with In situ Chemical Oxidation

This alternative would combine the benefits of soil vapor extraction with in situ chemical oxidation to treat VOC-impacted soil and groundwater in the future, if necessary. Chemical oxidation using sodium permanganate would be conducted as a contingency if additional treatment of VOCs in groundwater was necessary to reduce indoor air levels to achieve a Permanent Solution.

The existing SVE trench wells and/or new wells would be used to apply a sodium permanganate solution directly to sub-slab soil and groundwater. Once introduced, the permanganate would destroy residual VOCs on contact in the vadose zone, and then percolate down to groundwater. Once in groundwater, the

permanganate would also destroy dissolved VOCs in groundwater upon contact. Degradation products generated through oxidation of chlorinated ethene compounds include carbon dioxide (CO_2), manganese dioxide (MnO_2 - a black precipitate/solid) and soluble ions (K^+, Na^+, Cl^-); the ions rapidly form insoluble salts which remain in the soil at concentrations that would generally not create a groundwater quality problem. The pH of the reaction is dependent on the type of chlorinated ethene being oxidized but generally remains close to neutral.

Permanganate dose estimates would be calculated to ensure efficient application of permanganate. These estimates would use detected VOC concentrations in groundwater and existing soil matrix demand values for the Building 5 area. Treatment would be conducted using a 20 percent, or lower, sodium permanganate solution.

Costs for this alternative would include the engineering support, labor to conduct injections and the cost of permanganate, combined with the costs for the SVE system discussed above. In addition, costs for this alternative would include groundwater monitoring and sampling needed to comply with the remedial additive requirements in the MCP.

This alternative treats VOCs in soil and groundwater to reduce potential indoor air exposures. One disadvantage of in situ chemical oxidation approach is the difficulty to establish and maintain contact between the permanganate and VOCs. To accomplish this, additional application wells may be needed inside Building 5, which would increase the costs of this alternative and result in disruption to manufacturing activities at the facility.

This remedial alternative is expected to include two to three years of SVE operation followed by two years of permanganate treatment to achieve a Permanent Solution (for a total of four to five years).

3.3.2.4 Sub-slab Depressurization System

This alternative would include the installation of approximately four sub-slab depressurization systems. Three of these systems would use the existing SVE trench wells, but it is assumed that at least one additional trench SVE well would need to be installed to treat the Building 5 area. A sub-slab depressurization pilot test would be conducted as part of the design process to determine system flow rates and vacuum requirements. The sub-slab depressurization systems would each include a blower and controls. Off-gas treatment would not be needed if emissions are less than 100 pounds per year (MADEP, 1994).

Costs for this alternative would include the installation of the sub-slab depressurization systems, including design, materials, labor, and engineering support. In addition, costs for this alternative would include labor, equipment and materials for system O&M, and indoor air monitoring. While this remedial alternative will limit worker exposure, it is not expected to significantly reduce VOC concentrations in the soil beneath the building. This alternative is expected to achieve a Temporary Solution, as continued operation of the system would be required in an AUL to ensure safe building occupation.

3.4 Evaluation and Discussion of Retained Remedial Alternatives

The retained remedial alternatives were further evaluated using a detailed evaluation matrix and alternative scoring matrix, as discussed in Section 3.3. Results of the detailed evaluation for retained remedial alternatives are presented in **Tables 7** and **8**.

Alternative 1, Soil Vapor Extraction, scored best when compared to the other retained remedial alternatives. Alternative 3, Soil Vapor Extraction with In Situ Chemical Oxidation, scored second best. Both scored well because the SVE trench wells are already installed, resulting in lower initial costs. In addition, both technologies have been shown to be effective at the Site in reducing VOC in the environment and potential risk. Finally, both alternatives will control potential worker exposures and are expected to reach a Permanent Solution. Alternative 3, Soil Vapor Extraction with In Situ Chemical Oxidation, provides the added benefit of treating groundwater impacts if necessary. Alternative 2, Soil Vapor Extraction with Air Sparging, has a higher initial cost and would create more disruption to ongoing business operations within the building. While the estimated treatment times of alternatives 2 and 3 are the same, the O&M costs for Soil Vapor Extraction with Air Sparging are higher due to the complexity and continuous operation of equipment associated with this alterative. Alternative 4, Sub-Slab Depressurization System, scored lowest and is not expected to result in a Permanent Solution. Alternative 4 has a high cost associated with long term operation, maintenance and regular monitoring that would be necessary since this approach does not remediate VOCs in the treatment area.

3.5 Selection of Remedial Action Alternative [310 CMR 40.0861(2)(c)]

As discussed above, Soil Vapor Extraction (Alternative 1) scored best in the detailed evaluation when compared to the other retained alternatives. This alternative is expected to safely reduce potential indoor air exposures for site workers to achieve a condition of No Significant Risk. Soil Vapor Extraction is expected to reach a Permanent Solution (Class A-3 Response Action Outcome).

Soil Vapor Extraction with In Situ Chemical Oxidation (Alternative 3), ranked second and provides the added benefit of groundwater treatment, if needed in the future. Therefore, Soil Vapor Extraction with In Situ Chemical Oxidation has been selected as a contingent remedial alternative.

3.6 Additional Requirements for Remedial Action Plans [310 CMR 40.0861(2)(f)&(h)]

The MCP requires additional evaluations of aspects of the selected alternative, in accordance with 310 CMR 40.0861. The description of the initial screening of remedial action alternatives and the detailed evaluation are described above, as is the selection of the proposed remedial action alternative, and the justification for its selection. Since a Permanent Solution was identified as feasible and was selected, none of the requirements specified in the MCP for Temporary Solutions are relevant (310 CMR 40.0861(2)(f) and (h). The following sections address specific requirements that must be discussed relative to the selected Permanent Solution.

3.6.1 Achievement of No Significant Risk and a Permanent Solution [310 CMR 40.0861 (2)(d) and (e)]

The selected alternative (SVE) is expected to achieve a condition of No Significant Risk through the reduction of tetrachloroethene and trichloroethene concentrations in soil, and consequently in soil vapor and indoor air. The implementation of the SVE system is expected to achieve this condition and a Permanent Solution within a period of two to three years. If operational data from the Building 5 SVE system indicate a Permanent Solution may not be achieved, then modifications will be made to maximize VOC removal beneath the affected building. This may include new extraction wells or modification to the existing trench SVE wells. If indoor air concentrations are not reduced and maintained at a level of No Significant Risk following operation of the SVE system with modifications, then permanganate treatment or another contingent remedy may be implemented to reduce groundwater and/or soil concentrations such that a Permanent Solution is achieved.

3.6.2 Feasibility of Concentrations Achieving or Approaching Background [310 CMR 40.0861 (2)(g)]

The MCP requires that if a Permanent Solution is selected, the feasibility of reducing the concentrations of oil and hazardous material in the environment at the disposal site to levels that achieve or approach background must be evaluated. This evaluation was done in accordance with the MADEP Policy on Conducting Feasibility Evaluations under the MCP (MADEP, 2004), and conforms to Presumptive Certainty requirements as outlined in the MADEP policy.

3.6.2.1 Soil Feasibility Evaluation

Soil impacts associated with this portion of the Site are limited to the identified release areas associated with the utility trench and former sump within Building 5. Soil in these areas are considered to have low exposure potential (i.e., MCP soil categories S-2 and S-3) under current and foreseeable future use given that the impacted soil is currently located beneath a building and the planned implementation of an Activity and Use Limitation prohibiting future residential development at 150 Sohier Road. MADEP guidance states that for *persistent* contaminants located in S-2 and S-3 soils, a finding that it is "categorically infeasible" to achieve or approach background *can* be supported without a detailed feasibility evaluation. Site-related VOCs including tetrachloroethene and trichloroethene are considered persistent chemicals under MADEP policy (MADEP, 2004) and are the primary contaminants of concern in soil and indoor air in the Building 5 area. Therefore, these source area soils meet the presumptive infeasibility criteria for achieving or approaching background.

3.6.2.2 Groundwater Feasibility Evaluation

In the Building 5 area of the Site, the potential exposure pathway for groundwater impacts is through volatilization into indoor air. Potential risk associated with indoor air is being assessed using measured indoor air concentrations.

3.6.2.3 Technological Evaluation

For this evaluation, it is anticipated that the selected alternative (i.e. soil vapor extraction) for the Building 5 area will achieve a condition of No Significant Risk through remedial measures. SVE is considered technologically feasible to implement to reduce concentrations at the Site to approach background. The

following section presents a cost-benefit evaluation to assess if approaching background at the Site is feasible.

3.6.2.4 Benefit-Cost Evaluation

The MCP (310 CMR 40.0860(7)) specifies that concentrations shall be reduced to levels which achieve or approach background unless the incremental cost of conducting the remedial alternative is substantial and disproportionate to the incremental benefit of risk reduction, environmental restoration, and monetary and non-pecuniary values.

MADEP has developed Threshold Values for indoor air in commercial and industrial settings. Indoor air concentrations below the Threshold Values are generally considered to represent indoor air quality in the absence of a vapor intrusion pathway (MADEP, 2011). For the purpose of evaluating the feasibility of approaching background in indoor air, these Threshold Values are considered background levels. It is expected that the selected remedial approach for the Building 5 (SVE) will achieve a condition of No Significant Risk, and it is expected that the selected remedial approach will reduce the indoor air exposure point concentrations for Site related VOCs to a level that approaches the MADEP's Threshold Values (i.e. background). Therefore a benefit-cost evaluation is not required.

3.7 Schedule for Implementation of Remedial Activities [310 CMR 40.0861 (2)(i)]

The selected remedy (SVE system) will be implemented in the Building 5 area over the first quarter of 2013. To limit the impact on facility operations, construction activities inside the building will be conducted during the holiday shutdown at the end of December 2012. Depending on the delivery schedule for the SVE system, system installation is expected to be conducted in January or February 2013 with the system startup following. Details of the system installation will be provided in a Phase IV As-Built or Completion report. Subsequent operation and maintenance activities will be documented in future Phase V ROS reports.

3.8 Public Involvement Activities [310 CMR 40.0863]

In accordance with the MCP and the Public Involvement Plan (PIP) established for the Site (Varian, 1996), the following public involvement activity will be completed relevant to Phase III including:

- notice of this modification to the Phase III RAP will be provided to people on the PIP mailing list
- the Chief Municipal Officer and Board of Health will be notified of the availability of the modified Phase III RAP

A copy of the PIP mailing list notice and the letter to Beverly officials are included in **Appendix D**.

4.0 PHASE IV REMEDY IMPLEMENTATION PLAN (310 CMR 40.0874(3))

The following sections address the Phase IV Plan requirements as listed in the MCP (310 CMR 40.0874).

4.1 Relevant Site Contact Information (310 CMR 40.0874(3)(a))

4.1.1 Responsable Parties

The responsible party for submittal of this Remedy Implementation Plan is:

Varian Medical Systems, Inc.
3120 Hansen Way M/S G-100
Palo Alto, CA 94304
Attention: Mr. John R. Buchanan, Manager of Environmental Affairs
(650) 424-6103
john.buchanan@varian.com

4.1.2 Licensed Site Professional

The licensed site professional responsible for submittal of this Remedy Implementation Plan is:

Mr. Timothy W. Kemper, PE, LSP
Shaw Environmental & Infrastructure, Inc.
150 Royall Street
Canton, Massachusetts 02021
(617) 589-6162
tim.kemper@shawgrp.com

4.1.3 Owner and Operator

The owner of selected remedial action alternative during and following implementation will be:

Varian Medical Systems, Inc.
3120 Hansen Way M/S G-100
Palo Alto, CA 94304

On behalf of Varian Medical Systems, Inc., the operator of the selected remedial action alternative during and following implementation will be:

Shaw Environmental & Infrastructure, Inc.
150 Royall Street
Canton, Massachusetts 02021

4.2 Engineering Design (310 CMR 40.0874(3) (b))

4.2.1 Remedial Action Goals

The objective of this Phase IV Plan is to set forth a detailed plan to reduce and maintain oil and hazardous materials (OHM) concentrations at the Site to a level of No Significant Risk in accordance with MCP requirements. The goal of the selected remedial action alternative in the Modified Phase III RAP (Soil Vapor Extraction) is to control exposures and reduce VOC concentrations remaining in shallow soil that have the potential to migrate into the indoor air of Building 5.

Implementation of the selected remedial action alternative is expected to address environmental impacts identified at the Site and is reasonably likely to achieve a Permanent Solution as defined by the MCP.

4.2.2 Significant New Information Not Previously Submitted

There is no significant new information which has not been previously submitted to the MADEP. Refer to the Phase II CSA (IT, 2000) and the most recent ROS report (Shaw, 2012c) for current Site information regarding the Building 5 area.

4.2.3 Disposal Site Maps

Figure 2 presents a Site Plan showing monitoring well locations. **Figure 3** illustrates Building 5 and **Figure 5** presents the Building 5 remedial treatment area.

4.2.4 Description of Environmental Media to be Treated

The environmental media to be treated in this Phase IV Plan includes soil and soil vapor containing VOC located beneath Building 5. Based on soil borings and observations during installation of the trench SVE wells, the soil primarily consists of hard packed silty till. The selected SVE remedial alternative will treat both soil and soil vapor. Current data indicates some shallow groundwater VOC impacts are present in the area of Building 5. If warranted, permanganate applications may be conducted to treat VOCs in shallow groundwater beneath the Building 5 area.

The remedial treatment area includes the central and eastern portion of Building 5 and measures approximately 60 feet by 50 feet, or approximately 3,000 square feet. Groundwater in this area of the Site varies from 3 to 6 feet below grade.

4.2.5 Description of Selected Remedial Action Alternative

The selected remedial action alternative includes operation of an SVE system. The SVE system will include three trench extraction wells, a moisture knock-out drum, regenerative vapor blower, and vapor phase granular activated carbon (GAC) vessels for removal of VOC prior to atmospheric discharge. The SVE system also includes appropriate instrumentation, controls and alarms to notify the system operator of key operating conditions. Refer to **Appendix E** for system design drawings.

Should indoor air concentrations not be reduced adequately by the proposed SVE system to achieve and maintain a condition of No Significant Risk, then modifications will be made to the system (e.g. additional SVE wells). If, after SVE system modification, a condition of No Significant Risk cannot be achieved, then

permanganate treatment may be implemented to reduce groundwater and/or soil concentrations such that a Permanent Solution may be achieved. Permanganate treatment would be conducted by the injection of an approximate 20 percent sodium permanganate solution to the subsurface through the existing trench SVE wells. If determined to be necessary, new shallow permanganate application wells may be installed and used to treat VOC impacts in the Building 5 area. As required by the MCP, periodic monitoring of groundwater will be conducted to evaluate the application of sodium permanganate to the subsurface as remedial additive. Consistent with permanganate treatment already conducted at the Site, this monitoring will likely include monitoring parameters like oxidation reduction potential, conductivity, chloride and manganese in groundwater to ensure that treatment does not create adverse impacts to groundwater.

4.2.6 Relevant Design and Operation Parameters

This section presents relevant design and operation parameters, as required by 310 CMR 40.0874(3)(b)(6), for the proposed SVE system.

Preliminary design drawings for the Building 5 SVE remedial system are provided in **Appendix E** and include:

Sheet T-1	Title Sheet
Sheet Y-1	Site Plan
Sheet Y-2	Site Detail
Sheet Y-3	Sub-Slab SVE System Equipment Plan
Sheet Y-4	Construction Details – SVE Piping, Monitoring Well, Pipe Support, and Electrical Schematic Detail
Sheet P-1	Piping and Instrumentation Legend
Sheet P-2	Sub-Slab SVE System Piping and Instrumentation Diagram

The SVE system is comprised of a regenerative vacuum blower and associated filters, silencers, instrumentation, corresponding SVE wells, and controls. Off-gas treatment for the SVE system is accomplished with two vapor phase carbon vessels. There are a total of three SVE trench wells. The SVE system equipment will be housed in a trailer located outside Building 5 along the eastern side of the building (Sheet Y-1).

4.2.7 Design Control Features

The MCP provides in 310 CMR 40.0874(3)(b)(7) that design features to control OHM spills, accidental discharges and system malfunctions shall be incorporated into remedial system design. The SVE system is anticipated to include the following design control features as shown on the Piping & Instrumentation Diagram (**Appendix E**):

- two vapor phase GAC vessels will be provided to treat VOC in the effluent stream prior to discharge to the atmosphere
- a flow control valve, pressure indicator and sampling port at each vapor extraction well will be used to regulate flow from different remedial treatment areas and facilitate mass balance calculations
- a high level and high-high level switches are included on the moisture knock-out drum to shutdown the system in the event the drum becomes full

- a high vacuum and high temperature switches are included on the SVE blower to monitor proper operation
- sampling ports on the influent and effluent sides of the vapor phase GAC are included to monitor proper operation and collect samples to monitor for carbon breakthrough
- an electrical control panel is included with disconnect switches and lock-out points to facilitate proper maintenance
- an instrument control panel is provided with running lights, alarm indicators and on-off switches to maintain proper operation
- an autodialer with a wireless phone connection is included to provide timely notice to the system operator in the event of a system fault.

4.2.8 Waste Management

Waste streams that are anticipated during the planned treatment system operation will include: 1) vapor phase GAC impacted with VOC, and 2) condensed soil vapor moisture collected in the moisture knock-out drum.

As required, samples of used GAC will be collected and analyzed by a certified laboratory in accordance with the receiving facility's acceptance criteria. Consistent with other waste profiling from the Site, the presence of VOCs in the GAC may result in the spent carbon being managed as a hazardous waste. Spent carbon will likely be regenerated at Siemens Water Technologies Corporation in Parker, Arizona or another appropriate facility.

GAC that is characterized as a hazardous waste will be managed in accordance with the requirements of the Massachusetts Hazardous Waste Regulations (310 CMR 30.0000) and transported from the Site to a licensed hazardous waste treatment or disposal facility under a uniform hazardous waste manifest.

Condensed moisture (or groundwater) collected in the soil vapor moisture knock-out drum will be handled like purge water in accordance with MCP section 310 CMR 40.0045(7). This water may be discharged on site near the points of withdrawal.

4.2.9 Identification of Site-Specific Characteristics Affecting Design, Construction, or Operation

Site-specific characteristics affecting design, construction or operation of the proposed remedial action and the corresponding design features are identified in the following table:

Site-Specific Characteristic Affecting Remedy Implementation	Design Feature	Characteristic is Applicable to the following Remedial Action(s)
Occupied building located above remedial treatment area	Periodic indoor air monitoring will be conducted during remedy implementation and system operation. Site-specific monitoring activities are included in Health & Safety Plan and Operation & Maintenance Plan. GAC-treated vapors will be discharged outside building.	Soil Vapor Extraction
Underground utilities present in remedial treatment area	Contractor to locate utilities using available facility plans, utility dig safe, or locating services and/or hand digging prior to well installation	Soil Vapor Extraction or Permanganate Treatment
Occupied building located above remedial treatment area	Cone off treatment area, install plastic sheeting to protect the floor and equipment, have spill containment equipment and neutralization solution ready and available in work area	Permanganate Treatment
Underground Utilities present in remedial treatment area	Shield conduits and/or apply permanganate below depth of conduits; hand or vacuum excavate to depth of conduits; plug abandoned conduits to control migration.	Permanganate Treatment

4.2.10 Environmental Impact Mitigation Measures

Environmental impact mitigation measures are precautions incorporated into the design, construction and operation of the remedial action alternative to avoid deleterious impacts on environmental receptors and natural resource areas.

The closest surface water body, the Unnamed Stream, is located in a culvert approximately 130 feet to the north of the Building 5. Given that the SVE system equipment is housed inside a trailer it is unlikely that the proposed SVE system will have deleterious impacts on environmental receptors or natural resource areas. Given its distance from the treatment area and the groundwater flow direction (to the west), is unlikely that permanganate application in the Building 5 treatment area would impact the Unnamed Stream. However, consistent with current permanganate treatment practices at other areas of the Site, field monitoring will be conducted to ensure control of this remedial additive is maintained.

4.2.11 Construction Inspections and Monitoring

During system construction, construction personnel experienced with the installation of remedial systems will be utilized to ensure that construction activities satisfy the intent of the proposed SVE system design and are performed safely. The individual in charge on-site will be intimately familiar with the design documents, the site-specific Health and Safety Plan and experienced with the installation of remedial

systems. A project engineer will periodically inspect construction activities and support on-site personnel to ensure that the performance specifications are met.

The following processes and tools are expected to be used during construction to document the progress of work and provide a protocol for safe work practices:

Tailgate Safety Meetings
A site safety meeting will be held at the beginning of each day by the field supervisor or designee. The purpose of the meeting is to review the planned work, identify potential hazards and review safe work practices for the tasks to be completed. The meeting agenda and attendees will be documented on a Tailgate Meeting form and submitted daily to the project manager.

Daily Construction Report
The Daily Construction Report that summarizes the activities performed on the site each day will be completed. These reports will document work performed, labor and subcontractors on-site, planned and completed tasks, results of field tests performed, equipment and material deliveries and key issues relating to engineering plans, specifications and project schedule. Additional sketches, notes, copies of log books, Tailgate Safety Meeting notes, Chains-of-Custody for sampling performed and air monitoring results may also be attached to this Daily Construction Report.

Site Inspections
To verify compliance with this work plan, the project manager or designee will perform routine inspections of the project activities. These inspections will include the following:

- An evaluation of the work performed (including safety procedures), work areas and present activities;
- An evaluation of the quality assurance procedures and the effectiveness of their implementation; and
- A review of project documentation.

The results of the inspections and follow-up responses will be formally documented and maintained in the project files.

4.3 Construction Plans and/or Equipment Specifications (310 CMR 40.0874(3)(c))

Construction plans and remedial equipment specifications have been prepared in conformance with appropriate engineering and construction standards, practices, and applicable regulations. Construction plans and equipment specifications for the selected SVE remedial alternative are provided in **Appendix E**.

4.3.1 Design and Construction Schedule

The selected remedy (SVE system) will be installed in the Building 5 area over the first quarter of 2013. To limit the impact on facility operations, construction activities inside the building will be conducted during the holiday shutdown at the end of December 2012. Depending on the delivery schedule for the SVE system, system installation is expected to begin in January or February 2013 with the system startup following. Details of the system installation will be provided in a Phase IV As-Built or Completion report. Subsequent operation and maintenance activities will be documented in the Phase V ROS reports.

4.4 Operation, Maintenance and/or Monitoring (310 CMR 40.0874(3)(d))

Operation, maintenance and/or monitoring (OM&M) activities will be conducted to ensure the effective performance and the achievement of remedial goals. The frequency of routine monitoring and maintenance activities at the remediation system will vary by task and may range from daily during the first week of new system operation to weekly during the first month of operation to twice per month during routine O&M. The following activities will generally be performed during routine operation of the remedial SVE system to evaluate system operation and performance:

- collect subsurface vacuum measurements inside the building,
- measure air extraction vacuum and flow rates at the trailer,
- conduct off-gas emissions VOC screening, and
- monitor water level in the moisture separator tank; drain as needed.

Performance parameters such as VOC recovery, subsurface vacuum influence and air flow will be evaluated for system optimization. Readings and tasks performed will be documented on a site visit log.

Health and Safety monitoring will also be conducted to ensure worker safety during remedy implementation. Health and safety monitoring activities are described in the existing site specific Health and Safety Plan.

4.5 Health and Safety Plan (310 CMR 40.0874(3)(e))

A Health and Safety Plan (HASP) has been developed for this site and will be used during the implementation of specific remedial activities described in the Phase IV Plan. A copy of the HASP was submitted previously and is available upon request.

4.6 Federal, State or Local Permits and Approvals Required (310 CMR 40.0874(3)(f))

The following permits and/or approvals are anticipated to be necessary to conduct the activities presented in this Phase IV Plan:

- An electrical permit from the City of Beverly will be obtained for the installation of an electrical service panel and associated equipment for the SVE remediation system.

An air discharge permit is not anticipated to be necessary to operate the SVE system under Phase IV activities. The Massachusetts Air Pollution regulations (310 CMR 7.00) require an air discharge permit for all new sources that have the *potential* to emit greater than 1-ton per year of air pollutants. Installation of off-gas treatment control equipment (i.e. vapor phase granular activated carbon) is expected to reduce emissions to significantly less than 1-ton per year from the SVE remedial system; therefore, an air discharge permit is not anticipated to be necessary for operation of the SVE system.

4.7 Property Access Issues (310 CMR 40.0874(3)(g))

The remedial activities identified in this Phase IV Plan are being conducted on the property at 150 Sohier Road, Beverly, MA which is owned by Communication & Power Industries, Inc. Varian Medical Systems has an existing property access agreement with Communication & Power Industries, Inc. and therefore property access issues are not anticipated to affect remedial implementation.

4.8 Public Involvement Activities [310 CMR 40.1403 (3)(e)]

In accordance with the MCP and the PIP established for the Site (Varian, 1996), the following public involvement activity will be completed relevant to the modified Phase IV Plan including:

- notice of this modification to the Phase IV Plan will be provided to people on the PIP mailing list
- the Chief Municipal Officer and Board of Health will be notified of the availability of the modified Phase IV Plan and anticipated Phase IV field activities

A copy of the PIP mailing list notice and the letter to Beverly officials are included in **Appendix D**.

5.0 SUMMARY AND CONCLUSIONS

The following is a summary of the pertinent findings and conclusions of this Modified Phase III Remedial Action Plan and Phase IV Remedy Implementation Plan:

- As part of the Phase II assessment, the indoor air pathway was assessed and determined to present No Significant Risk (IT, 2000). To confirm this conclusion of the Phase II report, additional indoor air sampling was conducted in 2011 and 2012.
- Indoor air sampling results from 2011 and 2012 in Building 5 suggest that indoor air concentrations are variable and the estimated hazards are at, but do not exceed, the MCP risk limits. However, it is likely that a Permanent Solution for the Building 5 area may not be achieved without some VOC remediation at Building 5 to reduce potential risk to site workers (Shaw, 2011 and Shaw, 2012b).
- This modification to the Phase III RAP identifies, evaluates, and selects a remedial action alternative to address potential risk associated with indoor air exposure recently identified in the Building 5 area. Specifically, this document modifies applicable sections of the original RAP for

RTN 3-0485 to include technologies that are reasonably likely to achieve a Permanent Solution for the Building 5 area.

- In accordance with the MCP, an initial screening was conducted to identify remedial action alternatives that are reasonably likely to be feasible based on the OHM present, impacted media, and site characteristics. The focus of the remedies screened in this Phase III is to control exposures and/or eliminate VOC remaining in shallow soil and soil vapor that have the potential to migrate into the indoor air of Building 5.
- The initial screening process identified a short-list of applicable and available alternatives that are expected to effectively achieve a Permanent or Temporary Solution for the Site. These included: Alternative 1 – Soil Vapor Extraction, Alternative 2 – Soil Vapor Extraction with Air Sparging, Alternative 3 – Soil Vapor Extraction with In situ Chemical Oxidation, and Alternative 4 – Sub-slab Depressurization.
- Based upon the results of the detailed evaluation presented in this report, Alternative 1 - Soil Vapor Extraction was selected as the preferred remedial alternative.
- Soil Vapor Extraction with In Situ Chemical Oxidation (Alternative 3), ranked second and provides groundwater treatment, if needed, to abate indoor air impacts. Permanganate treatment has been shown to effectively treat VOC impacts in groundwater in at the Site. Therefore, Soil Vapor Extraction with In Situ Chemical Oxidation has been selected as a contingent remedial alternative.
- Modifications to the existing Phase IV Plan, including a detail engineering design, waste management plans and an initial operation and maintenance activities were provided for the selected SVE remedial alternative.
- Initial construction of the selected remedy (SVE) will be conducted during the holiday shutdown at the end of December 2012 to limit the impact on facility operations. Depending on the delivery schedule for the SVE system, system install may be conducted in January or February 2013 with the system startup following. It is expected that implemented of the selected remedy will be completed during the first quarter of 2013.

4.0 REFERENCES

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5.0 LIMITATIONS ON WORK PRODUCT

The information contained in this report, including its conclusions, is based upon the information that was made available to Shaw during the investigation and obtained from the services described, which were performed within time and budgetary restraints.

Shaw makes no representation concerning the legal significance of its findings or of the value of the property investigated. Shaw has no contractual liability to any third parties for the information or opinions contained in this report.

Unless and until the parties agree otherwise in writing, the use of this report or any information contained therein by any third party shall be at such third party's sole risk. Such use shall constitute an agreement to release, defend and indemnify Varian Medical Systems, Inc. and Shaw from and against any and all liability in connection therewith.

TABLES

Table 1
Building 5 Water Quality Data - VOC Results
June 2002 - September 2012
Former Varian Facility Site
150 Sohier Road
Beverly, Massachusetts

SITE ID	DATE	DEPTH	1,1,1-TCA (mg/l)	1,1-DCA (mg/l)	1,1-DCE (mg/l)	1,2-DCA (mg/l)	Carbon tetra chloride (mg/l)	Chloro benzene (mg/l)	Chloro form (mg/l)	Chloro ethane (mg/l)	Chloro methane (mg/l)	PCE (mg/l)	TCE (mg/l)	Trichloro fluoro methane (mg/l)	Vinyl chloride (mg/l)	cis-1,2-DCE (mg/l)	trans-1,2-DCE (mg/l)
AP-27-DO	7/22/2004	NA	ND(0.25)J	ND(0.25)J	ND(0.25)J	ND(0.25)J	ND(0.25)J	ND(0.50)J	ND(0.25)J	ND(0.50)J	ND(1.3)J	14J	32J	ND(0.25)J	ND(0.50)J	0.82J	ND(0.0010)
	12/28/2004	61	ND(0.0010)	0.0033	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	5/3/2005	62	ND(0.0010)	0.0015	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	0.0032	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	1/3/2006	62	ND(0.0010)	0.0042	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	0.0011	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	4/7/2006	59	ND(0.0010)	0.0029	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	0.002	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0025)
	1/31/2007	62	ND(0.0025)	0.0055	ND(0.0025)	ND(0.0025)	ND(0.0025)	ND(0.0050)	ND(0.0025)	ND(0.0050)	ND(0.013)	0.26	ND(0.0025)	ND(0.0025)	ND(0.0050)	ND(0.010)	ND(0.0010)
	4/13/2007	62	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	0.022	0.073	ND(0.0010)	ND(0.0020)	0.0018	ND(0.0010)
	11/15/2007	60	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	0.021	0.042	ND(0.0010)	ND(0.0020)	0.0084	ND(0.025)
	4/25/2008	61	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.050)	ND(0.025)	ND(0.050)	ND(0.13)	0.46	3.4	ND(0.025)	ND(0.050)	0.071	ND(0.050)
	10/22/2008	61	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.10)	ND(0.25)	0.72	4.4	ND(0.050)	ND(0.10)	0.093	ND(0.0010)
	4/9/2009	60	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	0.003	0.019	ND(0.0010)	ND(0.0010)	0.0023	ND(0.0010)
	10/28/2009	57	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	0.0017	0.022	ND(0.0010)	ND(0.0010)	0.001	ND(0.0010)
	4/21/2010	61	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	0.0036	ND(0.0010)	ND(0.0010)	ND(0.0010)	0.0049
	10/14/2010	57.5	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	0.009	1.2D	ND(0.0020)	ND(0.0020)	0.01	ND(0.0020)J
	4/7/2011	57.2	ND(0.0020)J	ND(0.0020)J	ND(0.0020)J	ND(0.0020)J	ND(0.0020)J	ND(0.0020)J	ND(0.0020)J	ND(0.0020)J	ND(0.0020)J	0.0027	0.027	ND(0.0020)J	ND(0.0020)J	0.01	0.037
	10/26/2011	61	ND(0.0020)	ND(0.0020)	0.0027	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	0.17	12D	ND(0.0020)	0.0031	0.08	ND(0.0050)
	4/6/2012	57	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	13	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)
B-2	4/27/2005	14	0.013	0.013	0.0026	ND(0.0020)	ND(0.0020)	ND(0.0040)	ND(0.0020)	ND(0.0040)	ND(0.010)	0.031	0.2	ND(0.0020)	0.0072	0.091	0.0057
	3/28/2006	12	ND(0.0050)	0.0079	0.006	ND(0.0050)	ND(0.0050)	ND(0.010)	ND(0.0050)	ND(0.010)	ND(0.025)	0.014	0.42	ND(0.0050)	ND(0.010)	0.33	ND(0.0050)
	1/31/2007	17	ND(0.0050)	0.0054	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.010)	ND(0.0050)	ND(0.010)	ND(0.025)	0.013	0.43	ND(0.0050)	ND(0.010)	0.37	ND(0.025)
	4/14/2007	13	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.025)	ND(0.050)	ND(0.025)	ND(0.050)	ND(0.13)	2.4	1.2	ND(0.025)	ND(0.050)	0.18	0.0016
	11/16/2007	11	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.019	ND(0.0010)	0.012	0.065	0.0064
	4/25/2008	12	ND(0.0025)	0.0051	0.0048	ND(0.0025)	ND(0.0025)	ND(0.0050)	ND(0.0025)	ND(0.0050)	ND(0.013)	0.0078	0.24	ND(0.0025)	ND(0.0050)	0.3	0.0054
	10/22/2008	12	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.010)	ND(0.0050)	ND(0.010)	ND(0.025)	ND(0.0050)	0.16	ND(0.0050)	ND(0.010)	0.49	ND(0.0010)J
	4/9/2009	11	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	0.019J	ND(0.0010)J	ND(0.0010)J	0.022J	0.0049
	10/26/2009	11	ND(0.0025)	ND(0.0025)	0.0026	ND(0.0025)	ND(0.0025)	ND(0.0025)	ND(0.0025)	ND(0.0025)	ND(0.0025)	ND(0.0025)	0.091	ND(0.0025)	ND(0.0025)	0.32	0.0056
	4/21/2010	12	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	ND(0.0050)	0.29	ND(0.0050)	0.022	0.46	0.016
	10/14/2010	12	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	ND(0.010)	0.011	ND(0.010)	0.03	1.2D	0.007
	4/6/2011	15.7	ND(0.0040)	0.0044	ND(0.0040)	ND(0.0040)	ND(0.0040)	ND(0.0040)	ND(0.0040)	ND(0.0040)	ND(0.0040)	ND(0.0040)	0.092	ND(0.0040)	ND(0.0040)	0.23	0.0053
	10/27/2011	11.5	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	0.017	ND(0.0020)	0.19	0.18	ND(0.0020)
	4/6/2012	11.5	ND(0.0020)	ND(0.0020)	0.0025	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	ND(0.0020)	0.0069	0.27D	ND(0.0020)	ND(0.0020)	0.26D	0.0038
OB-35-DO	2/2/2004	62	ND(2.5)	ND(2.5)	ND(0.50)	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	77	ND(2.5)	ND(1.0)	ND(2.5)	ND(2.5)
	5/4/2004	62	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(2.0)	ND(4.0)	ND(2.0)	ND(4.0)	ND(10)	3.0	170	ND(2.0)	ND(4.0)	ND(2.0)	ND(5.0)
	12/28/2004	61	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	ND(2.5)	ND(5.0)	ND(2.5)	ND(5.0)	ND(13)	9.8	330	ND(2.5)	ND(5.0)	ND(2.5)	ND(0.020)
	5/3/2005	61	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(5.0)	ND(10)	ND(5.0)	ND(10)	ND(25)	11	440	ND(5.0)	ND(10)	ND(5.0)	ND(0.20)
	1/3/2006	63	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.020)	ND(0.040)	ND(0.020)	ND(0.040)	ND(0.10)	1.8	ND(0.020)	ND(0.020)	ND(0.040)	ND(0.020)	ND(0.20)
	4/7/2006	59	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.40)	ND(0.20)	ND(0.40)	ND(1.0)	23	18	ND(0.20)	ND(0.40)	1.9	ND(0.050)
	2/5/2007	63	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.40)	ND(0.20)	ND(0.40)	ND(1.0)	14	6.4	ND(0.20)	ND(0.40)	0.77	ND(0.0010)
	4/13/2007	63	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.10)	ND(0.25)	5.7	0.088	ND(0.050)	ND(0.10)	ND(0.050)	ND(0.25)
	11/15/2007	62	ND(0.0010)	0.025	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	0.01	ND(0.0010)	0.0021	ND(0.0020)	ND(0.0010)	ND(0.0010)
	4/25/2008	62	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.25)	ND(0.50)	ND(0.25)	ND(0.50)	ND(1.3)	20	8.2	ND(0.25)	ND(0.50)	1.9	ND(0.20)
	10/23/2008	62	ND(0.0010)	0.021	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	0.0022	ND(0.0020)	ND(0.0010)	ND(0.20)
	4/9/2009	57	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	19	6.2	ND(0.20)	ND(0.20)	1.7	ND(0.20
	10/28/2009	57	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	22	6.9	ND(0.20)	ND(0.20)	1.6	ND(0.40)
	4/22/2010	62	ND(0.20	ND(0.20	ND(0.20	ND(0.20	ND(0.20	ND(0.20	ND(0.20	ND(0.20	ND(0.20	22	7.5	ND(0.20	ND(0.20	1.6	ND(1.0)
	10/14/2010	49	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	34	7.7	ND(0.40)	ND(0.40)	1.6	ND(0.50)J
	4/7/2011	48.7	ND(0.50)J	ND(0.50)J	ND(0.50)J	ND(0.50)J	ND(0.50)J	ND(0.50)J	ND(0.50)J	ND(0.50)J	ND(0.50)J	32J	7.7J	ND(0.50)J	ND(0.50)J	1.6J	ND(0.40)
	10/27/2011	62	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	ND(0.40)	29	5.0	ND(0.40)	ND(0.40)	0.95	ND(0.25)
	4/6/2012	48	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	ND(0.20)	19	5.4	ND(0.20)	ND(0.20)	0.79	ND(0.20)

Table 1
Building 5 Water Quality Data - VOC Results
June 2002 - September 2012
Former Varian Facility Site
150 Sohier Road
Beverly, Massachusetts

SITE ID	DATE	DEPTH	1,1,1-TCA (mg/l)	1,1-DCA (mg/l)	1,1-DCE (mg/l)	1,2-DCA (mg/l)	Carbon tetra chloride (mg/l)	Chloro benzene (mg/l)	Chloro form (mg/l)	Chloro ethane (mg/l)	Chloro methane (mg/l)	PCE (mg/l)	TCE (mg/l)	Trichloro fluoro methane (mg/l)	Vinyl chloride (mg/l)	cis-1,2-DCE (mg/l)	trans-1,2-DCE (mg/l)
OB-39-DO	7/26/2004	NA	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0020)J	ND(0.0010)J	ND(0.0020)J	ND(0.0050)J	ND(0.0010)J	0.0046J	ND(0.0010)J	ND(0.0020)J	ND(0.0010)J	ND(0.0010)
	12/28/2004	54	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.0018	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	4/27/2005	54	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.0073	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	1/6/2006	55	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.012	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	3/28/2006	54	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.013	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	1/31/2007	55	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.011	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	4/10/2007	55	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.008	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	11/14/2007	53	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.011	ND(0.0010)	ND(0.0020)	0.0012	ND(0.0010)
	4/25/2008	54	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.0083	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	10/22/2008	54	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.0091	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)J
	4/9/2009	53	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	0.0076	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)
OB-40-DO	7/23/2004	NA	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0020)J	ND(0.0010)J	ND(0.0020)J	ND(0.0050)J	ND(0.0010)J	ND(0.0010)J	ND(0.0010)J	ND(0.0020)J	ND(0.0010)J	ND(0.0010)
	12/28/2004	69	ND(0.0010)	0.0015	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	0.0019	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	4/27/2005	69	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	12/29/2005	69	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	3/28/2006	68	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	1/31/2007	69	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	4/10/2007	69	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	11/14/2007	66	ND(0.0010)	0.0045	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	0.0014	0.0038	ND(0.0010)	ND(0.0020)	0.0027	ND(0.0010)
	4/25/2008	68	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)
	10/22/2008	68	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0020)	ND(0.0050)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0020)	ND(0.0010)	ND(0.0010)J
	4/9/2009	68	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0010)	ND(0.0040)

Notes:

Analytical results presented in milligrams per liter (mg/l).

Analytical results are reported by the laboratory in micrograms per liter (ug/l). Results are presented without changing the number of significant figures reported by the laboratory.

Sample depths are in feet below grade. A sample depth of NA indicates that the sample was not collected at a discrete depth.

TCA - Trichloroethane
DCE - Dichloroethene
TCE - Trichloroethene
DCA - Dichloroethane
PCE - Tetrachloroethene
ND - None Detected, detection limit provided in parentheses

E - Estimated concentration
L - Sample analyzed outside of holding time.
N - Matrix interference
Z - Sample results switched in May 7, 2004 status report.
D - Indicates that the result is reported from a secondary dilute sample.
J - Estimated concentration

Table 2
Building 5 Soil Analytical Results

Former Varian Facility Site
150 Sohier Road
Beverly, Massachusetts

CONSTITUENT	BLD5-SHIP 1995	BLDG5-SVE1 8/2/2012	BLDG5-SV2 8/2/2012
VOC (ug/kg)			
1,1,1,2-Tetrachloroethane	--	<690	<460
1,1,1-Trichloroethane	<5.6	<690	<460
1,1,2,2-Tetrachloroethane	--	<690	<460
1,1,2-Trichloroethane	--	<690	<460
1,1-Dichloroethane	<5.6	<690	<460
1,1-Dichloroethene	<5.6	<690	<460
1,1-Dichloropropene	--	<690	<460
1,2,3-Trichlorobenzene	--	<690	<460
1,2,3-Trichloropropane	--	<690	<460
1,2,4-Trichlorobenzene	--	<690	<460
1,2,4-Trimethylbenzene	--	<690	<460
1,2-Dibromo-3-chloropropane	--	<690	<460
1,2-Dibromoethane (EDB)	--	<690	<460
1,2-Dichlorobenzene	--	<690	<460
1,2-Dichloroethane	--	<690	<460
1,2-Dichloropropane	--	<690	<460
1,3,5-Trimethylbenzene	--	<690	<460
1,3-Dichlorobenzene	--	<690	<460
1,3-Dichloropropane	--	<690	<460
1,4-Dichlorobenzene	--	<690	<460
1,4-Dioxane	--	<14000	<9300
2,2-Dichloropropane	--	<690	<460
2-Butanone	--	<690	<460
2-Hexanone	--	<690	<460
4-Isopropyltoluene	--	<690	<460
4-Methyl-2-pentanone	--	<690	<460
Acetone	--	<690	<460
Benzene	--	<690	<460
Bromobenzene	--	<690	<460
Bromodichloromethane	--	<690	<460
Bromoform	--	<690	<460
Bromomethane	--	<690	<460
Carbondisulfide	--	<690	<460
Carbontetrachloride	--	<690	<460
Chlorobenzene	--	<690	<460
Chlorobromomethane	--	<690	<460
Chloroethane	--	<690	<460
Chloroform	--	<690	<460
Chloromethane	--	<690	<460

Table 2
Building 5 Soil Analytical Results

Former Varian Facility Site
150 Sohier Road
Beverly, Massachusetts

CONSTITUENT	BLD5-SHIP 1995	BLDG5-SVE1 8/2/2012	BLDG5-SV2 8/2/2012
cis-1,2-Dichloroethene	<5.6	<690	<460
cis-1,3-Dichloropropene	--	<690	<460
Dibromochloromethane	--	<690	<460
Dibromomethane	--	<690	<460
Dichlorodifluoromethane	--	<690	<460
Dichloromethane	--	<690	<460
Diethyl ether	--	<690	<460
Diisopropyl Ether	--	<690	<460
Ethylbenzene	--	<690	<460
Hexachlorobutadiene	--	<690	<460
Isopropylbenzene	--	<690	<460
Methyltert-butylether	--	<690	<460
Naphthalene	--	<690	<460
n-Butylbenzene	--	<690	<460
n-Propylbenzene	--	<690	<460
o-Chlorotoluene	--	<690	<460
p-Chlorotoluene	--	<690	<460
sec-Butylbenzene	--	<690	<460
Styrene	--	<690	<460
tert-AmylMethyl Ether	--	<690	<460
tert-Butylbenzene	--	<690	<460
tert-ButylEthyl Ether	--	<690	<460
Tetrachloroethene	1000	<690	<460
Tetrahydrofuran	--	<690	<460
Toluene	--	<690	<460
trans-1,2-Dichloroethene	<5.6	<690	<460
Trans-1,3-Dichloropropene	--	<690	<460
Trichloroethene	3500	<690	<460
Trichlorofluoromethane	--	<690	<460
Vinyl chloride	--	<690	<460
m/p-xylene	--	<1400	<930
o-Xylene	--	<690	<460

Notes:

Analytical results presented in micrograms per kilogram (ug/kg).

-- = results not available

<690 = not detected above listed detection limit

VOC - volatile organic compounds

TABLE 3
Building 5 Soil Vapor Analytical Results

Former Varian Facility Site
150 Sohier Road
Beverly, Massachusetts

	BLD5-SV1	BLD5-SV1	BLD5-SV1	BLD5-SV1	BLD5-SV1	BLD5-SV2	BLD5-SV2	BLD5-SV2	BLD5-SV2	BLD5-SV2	BLD5-SV3	BLD5-SV3	BLD5-SV3	BLD5-SV3	BLD5-SV3
			QA Area					Paint Mixing Storage Rm					Sanding		
CONSTITUENT (ug/m3)	**2/21/2011**	**6/4/2011**	**8/22/2011**	**10/7/2011**	**1/9/2012**	**2/21/2011**	**6/4/2011**	**8/22/2011**	**10/7/2011**	**1/9/2012**	**2/21/2011**	**6/4/2011**	**8/22/2011**	**10/7/2011**	**1/9/2012**
1,1,1-Trichloroethane	<31	<350	<290	<66	<80	<44	<25	<5.0	<3.5	<16	<2600	<8400	<5700	<220	<330
1,1,2,2-Tetrachloroethane	<7.8	<88	<72	<16	<20	<11	<6.2	<1.2	<0.87	<4.0	<640	<2100	<1400	<55	<84
1,1,2-Trichloroethane	<31	<350	<290	<66	<80	<44	<25	<5.0	<3.5	<16	<2600	<8400	<5700	<220	<330
1,1-Dichloroethane	<24	<260	<220	<49	<60	<33	<19	<3.7	<2.6	<12	<1900	<6300	<4300	<170	<250
1,1-Dichloroethene	<23	<260	<210	<48	<59	<32	<18	<3.6	<2.5	<12	<1900	<6200	<4200	<160	<240
1,2-Dibromoethane (EDB)	<8.9	---	---	---	<23	<12	---	---	---	<4.5	<730	---	---	---	<95
1,2-Dichlorobenzene	<69	---	---	---	<180	<97	---	---	---	<35	<5600	---	---	---	<730
1,2-Dichloroethane	<24	<260	<220	<49	<60	<33	<19	<3.7	<2.6	<12	<1900	<6300	<4300	<170	<250
1,2-Dichloropropane	<27	<300	<250	<56	<68	<37	<21	<4.2	<2.9	<14	<2200	<7100	<4900	<190	<280
1,3-Dichlorobenzene	<69	---	---	---	<180	<97	---	---	---	<35	<5600	---	---	---	<730
1,4-Dichlorobenzene	<69	---	---	---	<180	<97	---	---	---	<35	<5600	---	---	---	<730
1,4-Dioxane	---	---	---	---	<670	---	---	---	---	<130	---	---	---	---	<2800
2-Butanone	**60**	---	---	---	<86	<48	---	---	---	**300**	<2800	---	---	---	<360
2-Hexanone	<24	---	---	---	<60	<33	---	---	---	**110**	<1900	---	---	---	<250
4-Methyl-2-pentanone	<47	---	---	---	<120	<66	---	---	---	**24**	<3800	---	---	---	<500
Acetone	<260	<2900	---	**670**	<670	<370	<210	---	**840**	**320**	<21000	<70000	---	<1800	<2800
Benzene	<18	---	---	---	<47	<26	---	---	---	<9.3	<1500	---	---	---	<190
Bromodichloromethane	<7.8	<88	<72	<16	<20	<11	<6.2	<1.2	<0.87	<4.0	<640	<2100	<1400	<55	<84
Bromoform	<60	<670	<550	<120	<150	<84	<47	<9.4	<6.6	<30	<4900	<16000	<11000	<420	<630
Bromomethane	<22	<250	<210	<47	<57	<32	<18	<3.6	<2.5	<11	<1800	<6000	<4100	<160	<240
Carbondisulfide	<18	---	---	---	---	<25	---	---	---	---	<1500	---	---	---	---
Carbontetrachloride	<3.7	<41	<34	<7.7	<9.3	<5.1	<2.9	<0.58	0.64	<1.9	<300	<980	<670	<26	<39
Chlorobenzene	<27	<300	<250	<56	<68	<37	<21	<4.2	<2.9	<14	<2200	<7100	<4900	<190	<280
Chloroethane	<30	<340	<280	<64	---	<43	<24	<4.8	<3.4	---	<2500	<8100	<5500	<210	---
Chloroform	<28	<320	<260	<59	<72	<40	<22	<4.5	<3.1	<14	<2300	<7600	<5100	<200	<300
Chloromethane	<24	<260	<220	<49	---	<33	<19	<3.7	<2.6	---	<1900	<6300	<4300	<170	---
cis-1,2-Dichloroethene	**47**	**420**	**400**	**130**	**96**	<32	<18	6.6	5.1	<12	<1900	<6200	<4200	<160	<240
cis-1,3-Dichloropropene	<52	<580	<480	<110	<130	<74	<41	<8.3	<5.8	<27	<4300	<14000	<9500	<370	<560
Dibromochloromethane	<9.9	<110	<92	<21	<25	<14	<7.8	<1.6	<1.1	<5.1	<810	<2700	<1800	<70	<110
Dichloromethane	<20	<220	<180	<42	<51	<28	<16	<3.1	<2.2	<10	<1600	<5300	<3600	<140	<210
Ethylbenzene	<50	---	<460	<100	<130	<70	---	<7.9	**8.1**	<25	<4100	---	<9100	<350	<530
Freon 113	<8.9	---	---	---	---	<12	---	---	---	---	<730	---	---	---	---
Hexachlorobutadiene	---	---	---	---	<400	---	---	---	---	<80	---	---	---	---	<1700
m/p-xylene	<100	---	<920	<210	<250	<140	---	**17**	**28**	<51	<8100	---	<18000	<700	<1100
Methyltert-butylether	<41	---	---	---	<110	<58	---	---	---	<21	<3400	---	---	---	<440
Naphthalene	---	---	---	---	<270	---	---	---	---	<53	---	---	---	---	<1100
o-Xylene	<50	---	<460	<100	<130	<70	---	<7.9	**11**	<25	<4100	---	<9100	<350	<530
Styrene	<49	---	---	---	<130	<69	---	---	---	<25	<4000	---	---	---	<520
Tetrachloroethene	**390**	**9900**	**5200**	**790**	**2700**	**150**	**230**	**47**	**25**	**140**	**5300**	**33000**	**14000**	**1400**	**2100**
Toluene	**44**	---	---	---	<55	<30	---	---	---	**24**	<1700	---	---	---	<230
trans-1,2-Dichloroethene	<23	<260	<210	<48	<59	<32	<18	<3.6	<2.5	<12	<1900	<6200	<4200	<160	<240
Trans-1,3-Dichloropropene	<26	<290	<240	<55	<67	<37	<21	<4.1	<2.9	<13	<2100	<7000	<4800	<180	<280
Trichloroethene	**2100**	**31000**	**26000**	**5100**	**5800**	**2300**	**2000**	**1200D**	**410D**	**1300D**	**130000**	**470000**	**340000**	**20000**	**22000**
Trichlorofluoromethane	<32	<360	<300	<68	---	<46	<26	<5.1	<3.6	---	<2600	<8700	<5900	<230	---
Vinyl acetate	<260	---	---	---	---	<370	---	---	---	---	<21000	---	---	---	---
Vinyl chloride	<3.1	<35	<29	<6.6	<8.0	<4.4	<2.5	0.51	1.2	<1.6	<260	<840	<570	<22	<33
Xylene (total)	<100	---	<920	<210	<250	<140	---	**17**	**39**	<51	<8100	---	<18000	<700	<1100

Notes:

D = Result reported from a diluted run
ug/m3 = Micrograms per cubic meter
detected concentrations in bold

--- = Not sampled for
<31 = not detected above listed detection limit

Table 4
Building 5 Indoor Air Analytical Results

Former Varian Facility Site
150 Sohier Road
Beverly, Massachusetts

CONSTITUENT (ug/m^3)	BLD5-1 8/22/2011	BLD5-1 10/7/2011	BLD5-1 1/9/2012	BLD5-2 8/22/2011	BLD5-2 10/7/2011	BLD5-2 1/9/2012	BLD5-3 8/22/2011	BLD5-3 10/7/2011	BLD5-3 1/9/2012	BLD5-4 8/22/2011	BLD5-4 10/7/2011	BLD5-4 1/9/2012
	QA Area			Shipping			Sanding			Center of Production Area		
1,1,1-Trichloroethane	<3.1	<6.6	<310	<1.4	<1.6	<94	<1.7	<1.6	<110	<1.1	<1.8	<26
1,1,2,2-Tetrachloroethane	<0.78	<1.7	<78	<0.34	<0.40	<24	<0.44	<0.41	<26	<0.28	<0.44	<6.6
1,1,2-Trichloroethane	<3.1	<6.6	<310	<1.4	<1.6	<94	<1.7	<1.6	<110	<1.1	<1.8	<26
1,1-Dichloroethane	<2.3	<5.0	<230	<1.0	<1.2	<71	<1.3	<1.2	<79	<0.83	<1.3	<20
1,1-Dichloroethene	<2.3	<4.8	<230	<1.0	<1.2	<69	<1.3	<1.2	<77	<0.81	<1.3	<19
1,2-Dichloroethane	<2.3	<5.0	<230	<1.0	<1.2	<71	<1.3	<1.2	<79	<0.83	<1.3	<20
1,2-Dichloropropane	<2.7	<5.6	<260	<1.2	<1.4	<80	<1.5	<1.4	<90	<0.94	<1.5	<22
Acetone	---	**9700**	**10000**	---	**2000**	**3300**	---	**1200**	**3400**	---	**1000**	**670**
Bromodichloromethane	<0.78	<1.7	<78	<0.34	<0.40	<24	<0.44	<0.41	<26	<0.28	<0.44	<6.6
Bromoform	<5.9	<13	<590	<2.6	<3.1	<180	<3.3	<3.1	<200	<2.1	<3.3	<50
Bromomethane	<2.2	<4.7	<220	<0.97	<1.2	<68	<1.3	<1.2	<76	<0.79	<1.3	<19
Carbontetrachloride	**0.61**	<0.77	<36	**0.59**	**0.63**	<11	**0.55**	**0.58**	<12	**0.59**	**0.63**	<3.1
Chlorobenzene	<2.7	<5.6	<260	<1.2	<1.4	<80	<1.5	<1.4	<90	<0.94	<1.5	<22
Chloroethane	<3.0	<6.4	<300	<1.3	<1.6	<91	<1.7	<1.6	<100	<1.1	<1.7	<25
Chloroform	<2.8	<5.9	<280	<1.2	<1.5	<85	<1.6	<1.5	<95	<1.0	<1.6	<24
Chloromethane	<2.3	<5.0	<230	<1.0	<1.2	<71	<1.3	<1.2	<79	**1**	<1.3	<20
cis-1,2-Dichloroethene	<2.3	<4.8	<230	**2.4**	**1.3**	<69	**1.5**	<1.2	<77	<0.81	<1.3	<19
cis-1,3-Dichloropropene	<5.2	<11	<520	<2.3	<2.7	<160	<2.9	<2.7	<180	<1.8	<2.9	<44
Dibromochloromethane	<0.99	<2.1	<98	<0.43	<0.51	<30	<0.55	<0.52	<33	<0.35	<0.56	<8.3
Dichloromethane	<2.0	<4.2	<200	<0.86	<1.0	<60	<1.1	<1.0	<67	<0.70	<1.1	<17
Ethylbenzene	<4.9	<10	<490	<2.1	<2.6	<150	<2.8	<2.6	<170	<1.8	<2.8	<42
m/p-xylene	<9.9	<21	<990	**5.6**	**8**	<300	**7.1**	<5.2	<340	<3.5	<5.6	<83
o-Xylene	<4.9	<10	<490	<2.1	<2.6	<150	<2.8	<2.6	<170	<1.8	<2.8	<42
Tetrachloroethene	**3.1**	**3.7**	**7.4D**	**12**	**7.5**	**14**	**3.8**	**3.1**	**4.2D**	**0.78**	**1**	<3.5
trans-1,2-Dichloroethene	<2.3	<4.8	<230	<1.0	<1.2	<69	<1.3	<1.2	<77	<0.81	<1.3	<19
Trans-1,3-Dichloropropene	<2.6	<5.5	<260	<1.1	<1.3	<79	<1.5	<1.4	<88	<0.92	<1.5	<22
Trichloroethene	**5.6**	**5.1**	**8.9D**	**14**	**8.4**	**17**	**12**	**17**	**33**	**2.9**	**2.1**	<2.6
Trichlorofluoromethane	<3.2	<6.8	<320	**8.2**	**4**	<97	**2.9**	**2.1**	<110	**1.7**	<1.8	<27
Vinyl chloride	<0.31	<0.66	<31	<0.14	<0.16	<9.4	<0.17	<0.16	<11	<0.11	<0.18	<2.6
Xylene (total)	<9.9	<21	<990	**5.6**	**8**	<300	**7.1**	<5.2	<340	<3.5	<5.6	<83

Notes:
ug/m3 = Micrograms per cubic meter
--- = Not sampled for
Detections are shown in **bold**
<3.1 = not detected above listed detection limit

Table 5
Soil Vapor Analytical Results
Building 5 SVE Pilot Test
Former Varian Facility Site
150 Sohier Road
Beverly, Massachusetts

	BLDG5-SVE1 9/8/2012 ug/m3	BLDG5-SVE1 9/8/2012 ppm	BLDG5-SVE2 9/8/2012 ug/m3	BLDG5-SVE2 9/8/2012 ppm
VOCs by TO-15				
1,1,1-Trichloroethane	<3400	ND	<71	ND
1,1,2,2-Tetrachloroethane	<860	ND	<18	ND
1,1,2-Trichloroethane	<3400	ND	<71	ND
1,1-Dichloroethane	<2600	ND	<53	ND
1,1-Dichloroethene	<2500	ND	<52	ND
1,2-Dichloroethane	<2600	ND	<53	ND
1,2-Dichloropropane	<2900	ND	<60	ND
Acetone	<29000	ND	790	0.33
Bromodichloromethane	<860	ND	<18	ND
Bromoform	<6500	ND	<130	ND
Bromomethane	<2500	ND	<51	ND
Carbontetrachloride	<400	ND	<8.3	ND
Chlorobenzene	<2900	ND	<60	ND
Chloroethane	<3300	ND	<68	ND
Chloroform	<3100	ND	<64	ND
Chloromethane	<2600	ND	<53	ND
cis-1,2-Dichloroethene	<2500	ND	<52	ND
cis-1,3-Dichloropropene	<5700	ND	<120	ND
Dibromochloromethane	<1100	ND	<22	ND
Dichloromethane	14000	3.9	<45	ND
Ethylbenzene	<5400	ND	<110	ND
m/p-xylene	<11000	ND	<230	ND
o-Xylene	<5400	ND	<110	ND
Tetrachloroethene	26000	3.8	1700	0.26
trans-1,2-Dichloroethene	<2500	ND	<52	ND
Trans-1,3-Dichloropropene	<2900	ND	<59	ND
Trichloroethene	240000	44	5800	1.1
Trichlorofluoromethane	<3600	ND	<73	ND
Vinyl chloride	<340	ND	<7.1	ND
Xylenes (total)	<11000	ND	<230	ND
Field Screening				
Total VOC	--	55	--	2.6

Notes:
ug/m^3=micrograms per cubic meter
ppm = parts per million
Field Screening conducted with photoionization detector

Table 6A

Summary of Soil Vapor Extraction Tests Results at SVE1 and Vacuum Influence at Surrounding Vapor Monitoring Points September 8, 2012

Former Varian Facility
150 Sohier Road
Beverly, MA

Test Time, Soil Vapor Extraction Rate (scfm), and Vacuum at the Extraction Well Bldg5 SVE-1 (" W.C.)	Soil Vapor Monitoring Point	Distance from SVE-5 (feet)	Vacuum (" W.C.)	Measured VOC Concentration (ppm) at SVE blower effluent (prior to carbon treatment)	Measured VOC Concentration (ppm) at carbon effluent (post treatment)
12:45 PM 58 scfm, 45 " W.C.	TempSV-1	6.0	0.08	62.4	ND
	TempSV-2	10.0	0.15		
	TempSV-3	3.0	0.67		
	BLDG5-SV2	20.0	0.03		
1:00 PM 58 scfm, 45 " W.C.	TempSV-1	6.0	0.09	55.2	ND
	TempSV-2	10.0	0.15		
	TempSV-3	3.0	0.63		
	BLDG5-SV2	20.0	0.02		
1:15 PM 42 scfm, 28 " W.C.	TempSV-1	6.0	0.06	33	ND
	TempSV-2	10.0	0.08		
	TempSV-3	3.0	0.40		
	BLDG5-SV2	20.0	0.01		
1:30 PM 43 scfm, 28 " W.C.	TempSV-1	6.0	0.06	33	ND
	TempSV-2	10.0	0.09		
	TempSV-3	3.0	0.40		
	BLDG5-SV2	20.0	0.01		

Notes:
" W.C. = inches of water column vacuum
scfm = standard cubic feet per minute
VOC = volatile organic compouns measured with a photoionization detector
ND = non-detect

Table 6B

Summary of Soil Vapor Extraction Tests Results at SVE2 and Vacuum Influence at Surrounding Vapor Monitoring Points September 8, 2012

Former Varian Facility
150 Sohier Road
Beverly, MA

Test Time, Soil Vapor Extraction Rate (scfm), and Vacuum at the Extraction Well Bldg5 SVE-2 (" W.C.)	Soil Vapor Monitoring Point	Distance from SVE-5 (feet)	Vacuum (" W.C.)	Measured VOC Concentration (ppm) at SVE blower effluent (prior to carbon treatment)	Measured VOC Concentration (ppm) at carbon effluent (post treatment)
2:00 PM 63 scfm, 45 " W.C.	TempSV-4	2.5	2.76	ND	ND
	TempSV-5	4.5	4.18		
	TempSV-6	7.5	0.48		
2:15 PM 64 scfm, 45 " W.C.	TempSV-4	2.5	2.81	ND	ND
	TempSV-5	4.5	4.16		
	TempSV-6	7.5	0.59		
2:30 PM 65 scfm, 45 " W.C.	TempSV-4	2.5	3.20	2.6	ND
	TempSV-5	4.5	4.14		
	TempSV-6	7.5	0.52		
2:45 PM 46 scfm, 33 " W.C.	TempSV-4	2.5	0.82	ND	ND
	TempSV-5	4.5	2.06		
	TempSV-6	7.5	0.33		
3:00 PM 47 scfm, 33 " W.C.	TempSV-4	2.5	0.78	ND	ND
	TempSV-5	4.5	2.06		
	TempSV-6	7.5	0.26		
3:15 PM 46 scfm, 33 " W.C.	TempSV-4	2.5	0.92	ND	ND
	TempSV-5	4.5	2.18		
	TempSV-6	7.5	0.27		

Notes:
" W.C. = inches of water column vacuum
scfm = standard cubic feet per minute
VOC = volatile organic compounds measured with a photoionization detector
ND = non-detect(<0.1 ppm)

TABLE 7
DETAILED EVALUATION OF RETAINED REMEDIAL ALTERNATIVES

Modified Phase III Remedial Action Plan
Former Varian Facility Site, Beverly, Massachusetts

Evaluation Criteria	Alternative 1 Soil Vapor Extraction System	Alternative 2 Soil Vapor Extraction with Air Sparging	Alternative 3 Soil Vapor Extraction with In Situ Chemical Oxidation	Alternative 4 Sub-Slab Depressurization System
1. Effectiveness (E) Scored from 1 to 5				
a) Ability to Achieve a Permanent or Temporary Solution	• This alternative has the potential to achieve a Permanent Solution through active treatment.	• This alternative has the potential to achieve a Permanent Solution through active treatment.	• This alternative has the potential to achieve a Permanent Solution through active treatment.	• This alternative is not expected to reach a Permanent Solution. • Alternative is likely to achieve a Temporary Solution.
b) Ability to Reuse, Recycle, Destroy, Detoxify, or Treat	• Vadose zone contamination captured by the SVE system and destroyed by off-site carbon regeneration.	• Dissolved and vadose zone contamination captured by the SVE system and destroyed by off-site carbon regeneration.	• Dissolved contamination destroyed by permanganate contact, vadose zone contamination captured by the SVE system and destroyed by off-site carbon regeneration.	• Natural attenuation processes may reduce contaminants on site.
c) Ability to Achieve or Approach Background Conditions	• This alternative is anticipated to approach background.	• This alternative is anticipated to approach background.	• This alternative is anticipated to approach background.	• This alternative is not anticipated to achieve or approach background.
Effectiveness Rating	**4**	**4**	**5**	**3**
2. Reliability - Short-Term & Long Term (R1) Scored from 1 to 3				
a) Certainty of Success	• This alternative has a high certainty of success in reducing soil concentrations and controlling potential indoor air emissions.	• This alternative has a moderate certainty of success in reducing soil and groundwater concentrations, but may be limited by the ability to adequately locate SVE wells to maintain control of soil vapor.	• This alternative has a high certainty of success in reducing soil and groundwater concentrations and controlling potential indoor air emissions.	• This alternative has a moderate certainty of success in reducing potential indoor air exposures.
b) Measures to Manage Residues	• Special measures are required to manage granular activated carbon (hazardous waste).	• Special measures are required to manage granular activated carbon (hazardous waste).	• Special measures are required to manage granular activated carbon (hazardous waste).	• No special measures are anticipated to manage residues. Unlike other alternatives, hazardous wastes will not be generated.
c) Measures to Control Emissions or Discharges	• Vapor phase carbon effectively treats VOC emissions from system.	• Vapor phase carbon effectively treats VOC emissions from system.	• Vapor phase carbon effectively treats VOC emissions from system.	• No special measures are anticipated to control emissions. Off-gas emissions are anticipated to be less than 100 pounds per year; therefore off-gas treatment is not required.
Reliability Rating	**3**	**2**	**3**	**2**

TABLE 7
DETAILED EVALUATION OF RETAINED REMEDIAL ALTERNATIVES

Modified Phase III Remedial Action Plan
Former Varian Facility Site, Beverly, Massachusetts

Evaluation Criteria	Alternative 1 Soil Vapor Extraction System	Alternative 2 Soil Vapor Extraction with Air Sparging	Alternative 3 Soil Vapor Extraction with In Situ Chemical Oxidation	Alternative 4 Sub-Slab Depressurization System
3. Difficulty (D) Scored from 1 to 3				
a) Technical Complexity	• Moderate complexity to install piping and equipment.	• Moderate to high complexity to install sparge wells, piping and equipment due to existing facility operations and underground utilities.	• Low complexity if existing SVE wells used.	• Moderate complexity to install sub-slab depressurization wells and piping due to existing facility operations and underground utilities.
b) Integration with Facility Operations	• Temporary disruption to facility operations is anticipated during system installation. Minor disruption to facility operations is anticipated during system operation.	• Moderate disruption to facility operations is anticipated during drilling and system construction for sparge portion of the system.	• Temporary disruption to facility operations is anticipated during system installation. Minor disruption if existing SVE wells used to inject permanganate.	• Moderate disruption to facility operations is anticipated during drilling and system construction.
c) Operation, Maintenance and Monitoring (OM&M) or Site Access Requirements/ Limitations	• Site access for OM&M, groundwater and indoor air monitoring will be required for 2 to 3 years.	• Site access for OM&M, groundwater and indoor air monitoring will be required for 4 to 6 years.	• Site access for OM&M, groundwater and indoor air monitoring will be required for 4 to 5 years.	• Site access for OM&M, groundwater and indoor air monitoring will be required for long period of time.
d) Availability of Services, Materials, Equipment or Specialists.	• The services, materials, equipment, and specialists needed are readily available.	• The services, materials, equipment, and specialists needed are readily available.	• The services, materials, equipment, and specialists needed are readily available.	• The services, materials, equipment, and specialists needed are readily available.
e) Availability, Capacity and Location of Off-Site Treatment, Storage, and Disposal Facilities	• Off-site facilities are available for handling carbon waste.	• Off-site facilities are available for handling carbon waste.	• Off-site facilities are available for handling carbon waste.	• No off-site facilities are required.
f) Permits	• No special permits are anticipated to be required.	• No special permits are anticipated to be required.	• No special permits are anticipated to be required.	• No special permits are anticipated to be required.
Difficulty Rating	**3**	**1**	**2**	**2**
4. Cost (C) Scored from 1 to 4				
a) Estimated Cost of Implementation	• Moderate initial investment. • Moderate annual O&M for 2 to 3 years. • Lowest present worth due to lower initial cost and lower O&M.	• High initial investment. • Moderate to high annual O&M for 4 to 6 years. • Moderate present worth due to initial investment in air sparging equipment and cost for system operation and monitoring.	• Moderate initial investment. • Moderate annual O&M for 4 to 6 years. • Moderate present worth due to high cost for system operation and monitoring.	• Moderate initial investment. • Low annual O&M (monitoring only). • High present worth due to many years of O&M and monitoring required.
b) Cost of Environmental Restoration and Potential Damages to Natural Resources	• No further environmental restoration is anticipated to be necessary.	• No further environmental restoration is anticipated to be necessary.	• No further environmental restoration is anticipated to be necessary.	• No further environmental restoration is anticipated to be necessary.
c) Cost of Energy Consumption	• Moderate energy costs for remedial system (electrical).	• Moderate to high energy costs for remedial system (electrical).	• Moderate energy costs for remedial system (electrical).	• Low energy costs for mitigation system (electrical).
Cost Rating	**4**	**2**	**3**	**1**

TABLE 7
DETAILED EVALUATION OF RETAINED REMEDIAL ALTERNATIVES

Modified Phase III Remedial Action Plan
Former Varian Facility Site, Beverly, Massachusetts

Evaluation Criteria	Alternative 1 Soil Vapor Extraction System	Alternative 2 Soil Vapor Extraction with Air Sparging	Alternative 3 Soil Vapor Extraction with In Situ Chemical Oxidation	Alternative 4 Sub-Slab Depressurization System
5. Risk (R2) Scored from 1 to 3				
a) Relative Risk During Implementation	• Limited risk associated with potential vapor emissions.	• Moderate risk associated with drilling & system installation activities and limited risk from potential vapor emissions.	• Limited risk if existing SVE wells used and limited risk from potential vapor emissions.	• Moderate risk associated with drilling & system installation activities and potential vapor emissions.
b) Relative Risk During Operations	• Limited risk associated with operating system at an active facility.	• Moderate risk associated with operating system at an active facility. • Physical limitations in locating SVE wells to present risk in maintaining control of soil vapor.	• Moderate risk during permanganate treatment.	• Limited risk associated with operating system at an active facility.
c) Relative Risk Associated with Remaining Oil and Hazardous Materials (OHM)	• Moderate risk associated with residual OHM (would not treat groundwater).	• Limited risk associated with residual OHM.	• Limited risk associated with residual OHM.	• Moderate to high risk associated with residual OHM (would not treat soil or groundwater).
Risk Rating	**3**	**1**	**2**	**1**
6. Benefits (B) Scored from 1 to 3				
a) Achieves Productive Reuse of Site	• Will not impact current productive use of site.	• Will not impact current productive use of site.	• Will not impact current productive use of site.	• Will not impact current productive use of site.
b) Avoids Cost of Relocation or Provision of Alternate Water Supply	• No requirement for relocation or the provision of an alternate water supply.	• No requirement for relocation or the provision of an alternate water supply.	• No requirement for relocation or the provision of an alternate water supply.	• No requirement for relocation or the provision of an alternate water supply.
c) Avoids Lost Value of Site	• This alternative avoids property value loss.	• This alternative avoids property value loss.	• This alternative avoids property value loss.	• This alternative potentially devalues property due to long-term system operational and additional Activity and Use Limitation requirements.
Benefits Rating	**2**	**2**	**2**	**1**
7. Timeliness (T) Scored from 1 to 3				
a) Time to Achieve Remedial Objective	• Moderate alternative.	• Moderate alternative.	• Moderate alternative.	• Long-term monitoring needed for length of building occupancy.
Timeliness Rating	**3**	**2**	**2**	**1**

TABLE 7
DETAILED EVALUATION OF RETAINED REMEDIAL ALTERNATIVES

Modified Phase III Remedial Action Plan
Former Varian Facility Site, Beverly, Massachusetts

Evaluation Criteria	Alternative 1 Soil Vapor Extraction System	Alternative 2 Soil Vapor Extraction with Air Sparging	Alternative 3 Soil Vapor Extraction with In Situ Chemical Oxidation	Alternative 4 Sub-Slab Depressurization System
8. Green Benefits (G) Scored from 1 to 3				
a) Minimizes energy use or uses renewable energy	• Moderate energy use (electricity to operate SVE blower).	• Highest energy use (electricity to operate both SVE and air sparge blowers).	• Moderate energy use (electricity to operate SVE blower and pumps).	• Lowest energy use (could be passive, but likely will require electricity to operate blower)
b) Minimizes air pollution or greenhouse gas emissions	• Low potential air pollution due to off gas treatment.	• Low potential air pollution due to off gas treatment.	• Low potential air pollution due to off gas treatment.	• Moderate potential air pollution if off gas treatment not used.
c) Reduce, reuse and recycle waste	• Vadose zone treatment will generate a moderate amount of carbon waste that will be recycled.	• Vadose zone and groundwater treatment will generate a moderate to high amount of carbon waste that will be recycled.	• Vadose zone treatment will generate a moderate amount of carbon waste that will be recycled. Groundwater treatment will not generate additional waste.	• Does not reduce, reuse or recycle waste.
d) Protects land and ecosystem	• Moderately protective, removes VOCs from soil, but does not treat groundwater.	• Most protective, removes VOCs from soil and GW.	• Moderately protective, removes VOCs from soil and GW, but may temporally influence groundwater chemistry.	• Least protective, primarily address vapor migration and provides limited treatment.
e) Minimizes adverse visual and aesthetic impacts on receptors outside of the property	• Limited visual impact to this industrial site.	• Limited visual impact to this industrial site.	• Limited visual impact to this industrial site.	• Limited visual impact to this industrial site.
Benefits Rating	**2**	**2**	**2**	**1**

TABLE 7
DETAILED EVALUATION OF RETAINED REMEDIAL ALTERNATIVES

Modified Phase III Remedial Action Plan
Former Varian Facility Site, Beverly, Massachusetts

Evaluation Criteria	Alternative 1 Soil Vapor Extraction System	Alternative 2 Soil Vapor Extraction with Air Sparging	Alternative 3 Soil Vapor Extraction with In Situ Chemical Oxidation	Alternative 4 Sub-Slab Depressurization System

Notes:

E Effectiveness
- 1 = Not widely used and probably not effective
- 2 = Widely used but probably not effective, or not widely used and may not be effective
- 3 = Widely used but may not be effective, or not widely used but probably effective
- 4 = Widely used and probably effective, or not widely used but proven and effective
- 5 = Widely used, proven, and effective

R1 Reliability (short and long term)
- 1 = Low reliability and/or high maintenance
- 2 = Average reliability and/or average maintenance
- 3 = High reliability and/or low maintenance

D Difficulty (comparative technical complexity, permitting, and disruptions to current operations)
- 1 = Most difficult to implement
- 2 = Moderate difficulty to implement
- 3 = Easiest to implement

C Cost
- 1 = Highest relative cost compared to other alternatives
- 4 = Lowest relative cost compared to other alternatives

R2 Risk (relative risk associated with implementation)
- 1 = Highest risks associated with implementation
- 2 = Moderate risk associated with implementation
- 3 = Lowest risk associated with implementation

B Benefits (reuse of site, avoided costs, and avoided lost value)
- 1 = Least beneficial
- 2 = Moderately beneficial
- 3 = Most beneficial

T Time (comparative timeliness to eliminate uncontrolled sources and achieve a level of No Significant Risk)
- 1 = Extended treatment time
- 2 = Acceptable treatment time
- 3 = Rapid treatment

G Green Benefits
- 1 = Least beneficial
- 2 = Moderately beneficial
- 3 = Most beneficial

Score = E + R1 + D + C + R2 + B + T + R; Possible scores are 8 to 27

Table 8
DETAILED EVALUATION AND SCORING MATRIX FOR RETAINED REMEDIAL ALTERNATIVES

Modified Phase III Remedial Action Plan
Former Varian Facility Site, Beverly, Massachusetts

Alternative #	Alternative Description	E	R1	D	C	R2	B	T	G	Score	Overall Ranking
1	Soil Vapor Extraction	4	3	3	4	3	2	3	2	24	1
2	Soil Vapor Extraction with Air Sparging	4	2	1	2	1	2	2	2	16	3
3	Soil Vapor Extraction with In Situ Chemical Oxidation	5	3	2	3	2	2	2	2	21	2
4	Sub-slab Depressurization System	3	2	2	1	1	1	1	1	12	4

Notes:

E Effectiveness
- 1 = Not widely used and probably not effective
- 2 = Widely used but probably not effective, or not widely used and may not be effective
- 3 = Widely used but may not be effective, or not widely used but probably effective
- 4 = Widely used and probably effective, or not widely used but proven and effective
- 5 = Widely used, proven, and effective

R1 Reliability (short and long term)
- 1 = Low reliability and/or high maintenance
- 2 = Average reliability and/or average maintenance
- 3 = High reliability and/or low maintenance

D Difficulty (comparative technical complexity, permitting, and disruptions to current operations)
- 1 = Most difficult to implement
- 2 = Moderate difficulty to implement
- 3 = Easiest to implement

C Cost
- 1 = Highest relative cost compared to other alternatives
- 4 = Lowest relative cost compared to other alternatives

R2 Risk (relative risk associated with implementation)
- 1 = Highest risks associated with implementation
- 2 = Moderate risk associated with implementation
- 3 = Lowest risk associated with implementation

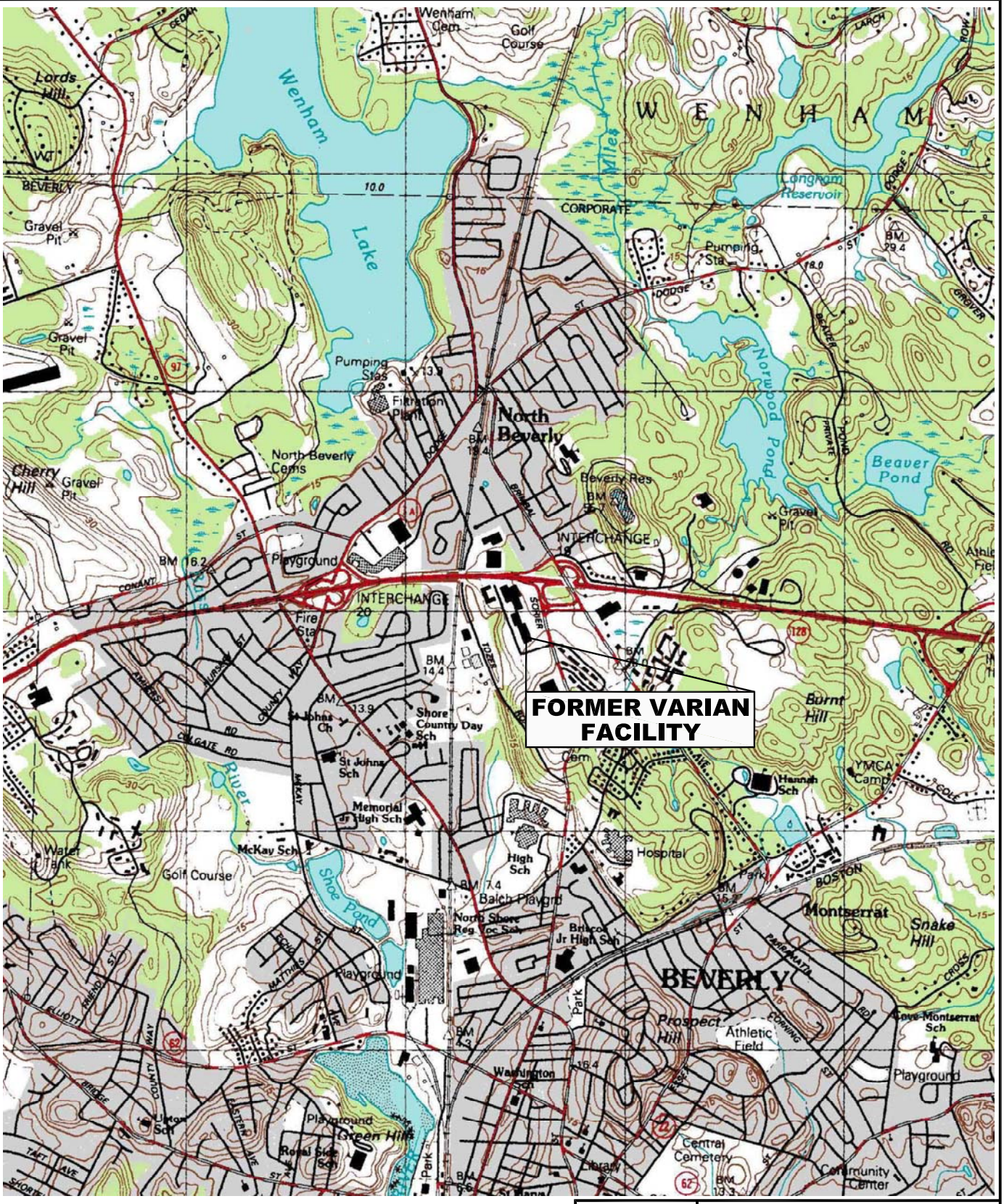
B Benefits (reuse of site, avoided costs, and avoided lost value)
- 1 = Least beneficial
- 2 = Moderately beneficial
- 3 = Most beneficial

T Time (comparative timeliness to eliminate uncontrolled sources and achieve a level of No Significant Risk)
- 1 = Extended treatment time
- 2 = Acceptable treatment time
- 3 = Rapid treatment

G Green Benefits
- 1 = Least beneficial
- 2 = Moderately beneficial
- 3 = Most beneficial

Score = E + R1 + D + C + R2 + B + T + R; Possible scores are 8 to 27

FIGURES



SOURCE:

USGS 7.5 MIN. SERIES TARGET QUAD, 1985
SCALE: 1:25,000
X = 250750 m
Y = 925017 m
MA STATE PLANE GRID (meters)

Shaw Environmental Inc.

150 ROYALL STREET
CANTON, MASSACHUSETTS
(617) 589-5111

FIGURE 1
SITE LOCATION MAP

FORMER VARIAN FACILITY
150 SOHIER ROAD
BEVERLY, MASSACHUSETTS

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
CANTON, MA	CD 05/01/12	RC 05/01/12	-- --	139340-01SITELOC

File: N:\MISC\Varian\Beverly, Ma\139340-01SITELOC.dwg Layout: Layout1 User: chris.desiata Oct 31, 2012 - 8:57am

XREF Files: SITE_XREF33 IMAGE Files:
File: N:\MISC\Varian\Beverly, Ma\Phase 4\Rev2\SITE_PLAN22b.dwg Layout: Layout1 User: chris.desiata Dec 11, 2012 – 8:28am

DRAWN BY	CD	CHECKED BY	RC	12/10/12	DRAWING NAME SITE_PLAN22b
	12/10/12	APPROVED BY	RC	12/10/12	

SEE DETAIL

DETAIL

BUILDING 5 AREA

24" STORM WATER DRAIN LINE

UNNAMED STREAM

SHORT POND

SAM'S DRY CLEANERS

FLAIR CLEANERS

NORTH BEVERLY FOOD MART

STREAM A

STREAM A SCDS

MARSH

COLRD CULVERT

CULVERT OUTFALL

16 TOZER ROAD

25 TOZER ROAD

27 TOZER ROAD

29 TOZER ROAD

31 TOZER ROAD

39 TOZER ROAD

HIGH SCHOOL 100 SOHIER ROAD

LEGEND:

- TEMPORARY PERMANGANATE INJECTION POINT
- ABANDONED OR DESTROYED WELL
- PIEZOMETER (P)
- BENCHMARK LOCATION (MSL)
- RECOVERY WELL (RW)
- MONITORING WELL (MW)
- SHALLOW BIOREMEDIATION BARRIER WELL (BW)
- SURFACE WATER STREAM (STR) SAMPLE LOCATION
- CONE PENETROMETER TESTPOINT (CPT)
- HAND AUGER SAMPLE LOCATION (HA) ADJACENT TO A STREAM (STRHA)
- STRMH MANHOLE ACCESS TO THE STREAM LOCATED WITHIN A CULVERT
- APPROXIMATE BUILDING LOCATION
- APPROXIMATE DRAIN MANHOLE LOCATION
- APPROXIMATE LOCATION OF STREAM IN CULVERT
- APPROXIMATE STREAM LOCATION
- WATER AND MARSH AREA

⊕ CL4–BR – WELL IDENTIFICATION

PAST AND CURRENT PERMANGANATE INJECTION WELLS SHOWN IN PURPLE

⊕ BIOREMEDIATION INJECTION WELLS INJECTION LOCATIONS SHOWN IN GREEN

CL–9 CLUSTER WELL NUMBER
S=SHALLOW
DO=DEEP OVERBURDEN
BR=BEDROCK

STR–6	STREAM SAMPLE LOCATION NUMBER
STRHA–1	STREAM/SURFACE WATER SAMPLE
HA–1	HAND AUGER WELL LOCATION NUMBER
STRMH–1	STREAM/MANHOLE LOCATION NUMBER
MW–5	MONITORING WELL NUMBER
GZ–1	MONITORING WELL NUMBER
PLMW–1	MONITORING WELL NUMBER
BR–1	BEDROCK WELL NUMBER

BEDROCK WELLS BR–1 THROUGH BR–8 AND CL9–BR HAVE MULTILEVEL GROUNDWATER MONITORING SYSTEMS PRESENT WITHIN THE BEDROCK. ZONE 1 REFERS TO THE DEEPEST SAMPLING ZONE, ZONE 2 REFERS IS THE MIDDLE SAMPLING INTERVAL, AND ZONE 3 CLOSEST TO THE GROUND SURFACE.

THIS MAP HAS BEEN COMPILED FROM SURVEY DATA COLLECTED IN JULY 1994, MARCH 1995, OCTOBER 1995, SEPTEMBER 1996, MARCH 1997, DECEMBER 1997, SEPTEMBER 1998, JANUARY 2000, FEBRUARY 2001, JUNE 2002, SEPTEMBER 2002, JULY 2003, FEBRUARY 2004, OCTOBER 2004; 2005, JULY 2012, FROM VARIOUS EXISTING PLANS, AND OBSERVATIONS MADE IN THE FIELD BY SHAW ENVIRONMENTAL.

FIGURE 2
EXPANDED SITE PLAN FOR RTN 3–0485
FORMER VARIAN FACILITY SITE – BEVERLY, MA.

PREPARED FOR: VARIAN MEDICAL FACILITY, INC.
PALO ALTO, CALIFORNIA

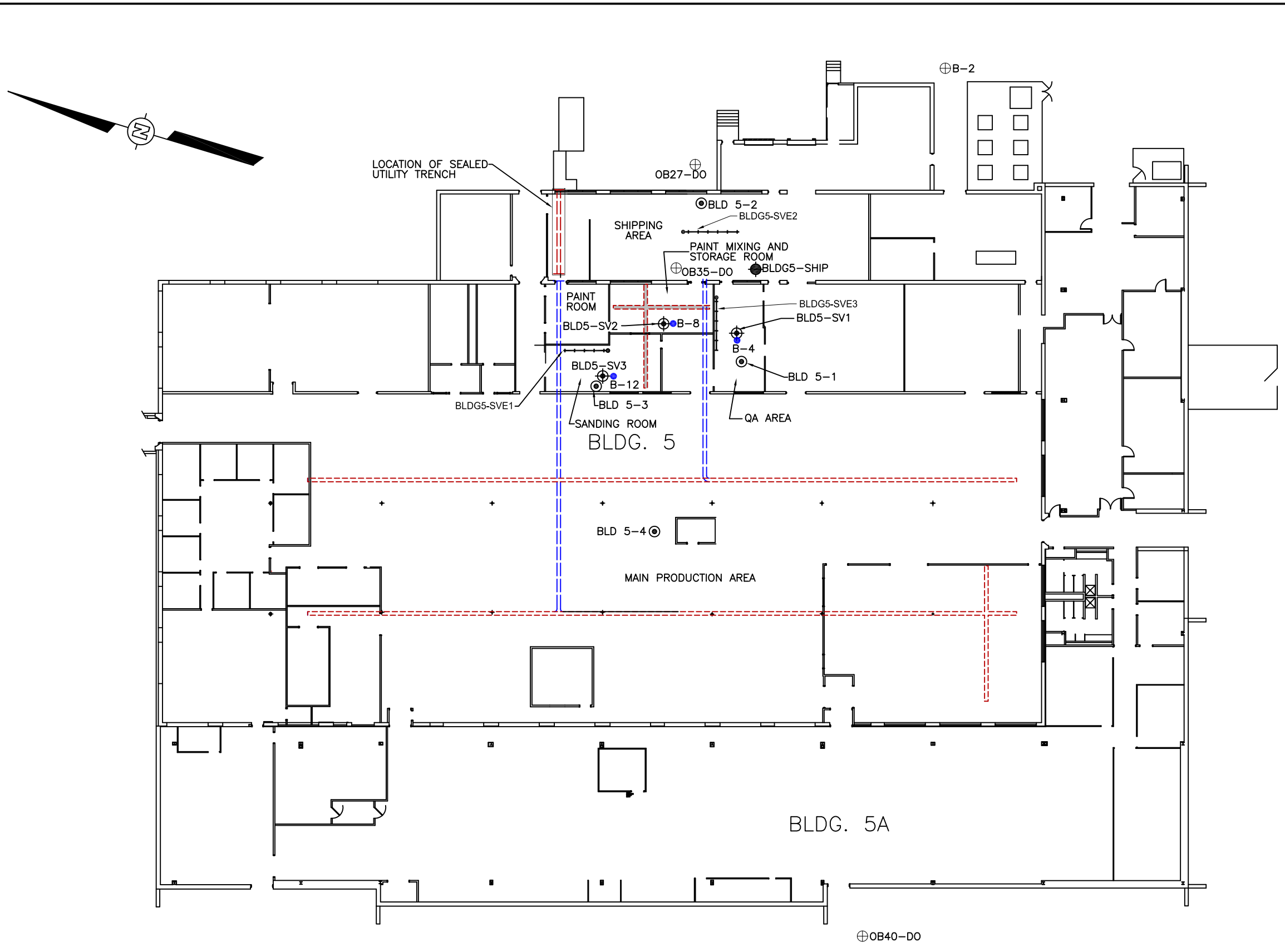
SCALE
0 250 500 FEET

DRAFTED BY: CD

DATE: 10 DECEMBER 2012

PROJECT NO.: 146899

PREPARED BY: Shaw Environmental & Infrastructure, Inc.



LEGEND

- SUB-SLAB SOIL VAPOR SAMPLE LOCATION (2011-2012)
- INDOOR AIR SAMPLE LOCATION (2011-2012)
- SUB-SLAB SOIL VAPOR SAMPLE LOCATION (1995)
- MONITORING WELL
- SOIL BORING
- FORMER UTILITY TRENCH FILLED WITH CONCRETE
- UTILITY TRENCH BENEATH CONCRETE FLOOR
- UTILITY TRENCH (COVERED WITH STEEL PLATE)
- SVE TRENCH WELL INSTALLED JULY 2012

INDOOR AIR SAMPLE ID RTN 3-0485	ROOM
BLD 5-1	FINAL INSPECTION ROOM
BLD 5-2	SHIPPING
BLD 5-3	SAND BLASTING ROOM
BLD 5-4	PRODUCTION AREA

REFERENCE:

PLAN DERIVED FROM COMMUNICATIONS & POWER INDUSTRIES MAP, DATED 07/11/03, CLEAN HARBORS ENVIRONMENTAL SERVICES, INC. MAP TITLED "1962-BUILDING 5", AND SHAW ENVIRONMENTAL FIELD RECONNAISSANCE, JULY 2012.

SCALE
0 30 60 FEET

Shaw Environmental & Infrastructure, Inc.

150 ROYALL STREET
CANTON, MASSACHUSETTS

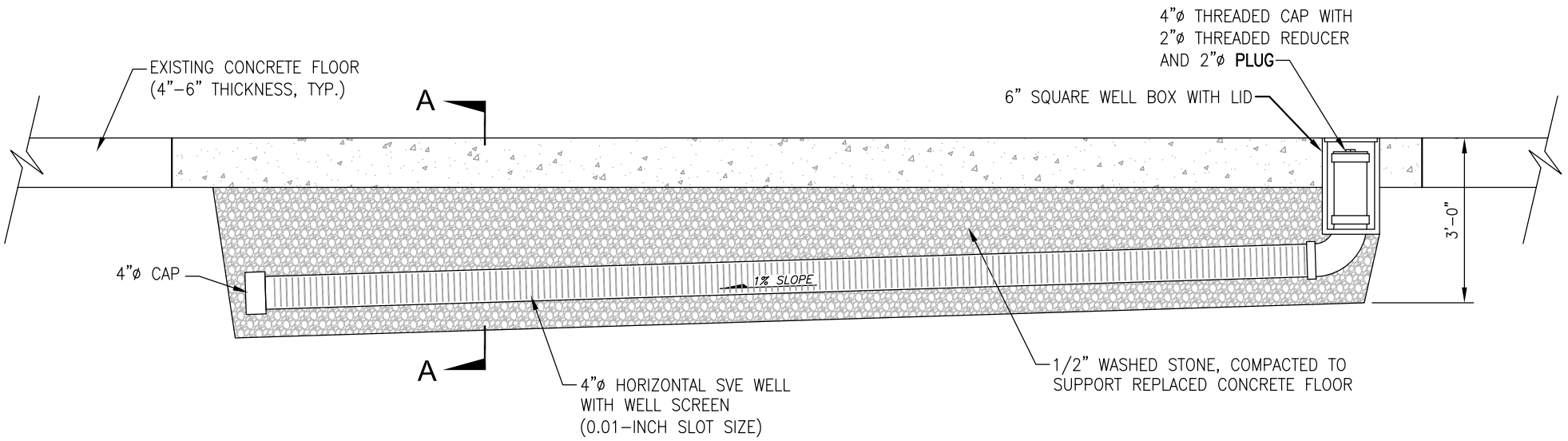
FIGURE 3
BUILDING 5 PLAN
FORMER VARIAN FACILITY
150 SOHIER ROAD
BEVERLY, MASSACHUSETTS

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	OFFICE
146898-SITE PLAN	--	PH 12/10/12	CD 12/10/12	CANTON, MA

XREF Files: IMAGE Files:
File: N:\MISC\Varian\Beverly, Ma\Phase 4\BUILDING 5 SYSTEM\146898-SITE PLAN.dwg
Plot Date/Time: Dec 10, 2012 - 3:15pm
Plotted By: chris.desiato

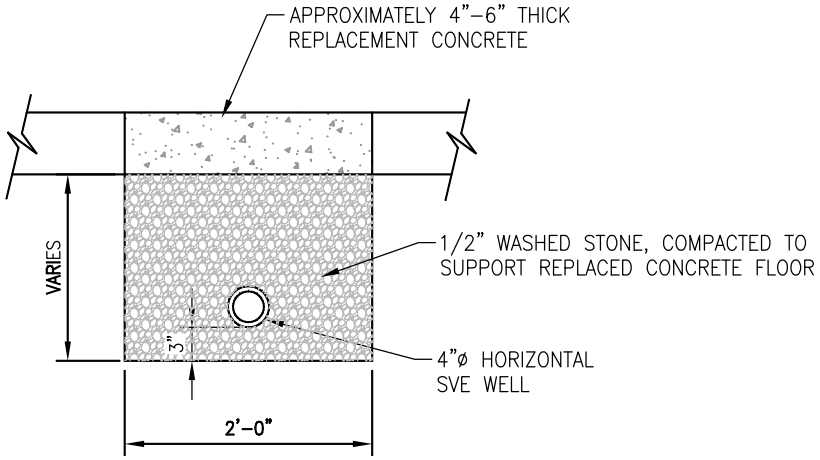
File: N:\MISC\Varian\Beverly, Ma\Phase 4\BUILDING 5 SYSTEM\143276-A1.dwg
User: chris.desiata Dec 11, 2012 – 8:20am Layout: 11 x 8.5

DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
7/3/12	--	A. Smith	P. Farrington	--	143276-A1



PROFILE ALONG HORIZONTAL SVE WELL (TYP)

NOTE:
TRENCH LENGTH VARIES.
SEE BUILDING 5
TREATMENT AREA PLAN.



CROSS SECTION A-A

"DRAWING NOT TO SCALE"

Shaw Environmental & Infrastructure, Inc.

150 ROYALL STREET
CANTON, MASSACHUSETTS

FIGURE 4
SVE TRENCH WELL DETAIL
FORMER VARIAN FACILITY
150 SOHIER ROAD
BEVERLY, MASSACHUSETTS

PARKING LOT

SIDEWALK

TEMP SV5

BLDG5-SVE2

SHIPPING AREA

TEMP SV4

PAINT MIXING AND STORAGE ROOM

TEMP SV6

BLDG5-SVE3

PAINT ROOM

BLD5-SV2

TEMP SV3

BLD5-SV1

BLD5-SV3

TEMP SV2

TEMP SV1

BLDG5-SVE1

SANDING ROOM

QA AREA

BLDG. 5

LEGEND

- SVE TRENCH WELL
- TEMPORARY SVE SAMPLING POINT
- SUB-SLAB SOIL VAPOR SAMPLE LOCATION
- FORMER UTILITY TRENCH FILLED WITH CONCRETE
- UTILITY TRENCH
- APPROXIMATE 20' RADIUS OF INFLUENCE

SCALE

0 20 40 FEET

REFERENCE:

PLAN DERIVED FROM COMMUNICATIONS & POWER INDUSTRIES MAP, DATED 07/11/03, CLEAN HARBORS ENVIRONMENTAL SERVICES, INC. MAP TITLED "1962-BUILDING 5", AND SHAW ENVIRONMENTAL FIELD RECONNAISSANCE, JULY 2012.

Shaw Environmental & Infrastructure, Inc.

150 ROYALL STREET
CANTON, MASSACHUSETTS

FIGURE 5
BUILDING 5 SVE TREATMENT AREA
FORMER VARIAN FACILITY
150 SOHIER ROAD
BEVERLY, MASSACHUSETTS

DRAWING NUMBER	146898-SITE PLAN		
APPROVED BY	--	--	
CHECKED BY	PH	12/10/12	
DRAWN BY	CD	12/10/12	
OFFICE	CANTON, MA		

XREF Files: IMAGE Files:
File: N:\MISC\Varian\Beverly, Ma\Phase 4\BUILDING 5 SYSTEM\146898-SITE PLAN.dwg
Plot Date/Time: Dec 10, 2012 - 3:09pm
Plotted By: chris.desiata

APPENDIX A

BWSC FORM

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC108

Release Tracking Number
3 - 485

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

A. SITE LOCATION:

1. Site Name: VARIAN-MICROWAVE DIV
2. Street Address: 150 SOHIER RD
3. City/Town: BEVERLY 4. ZIP Code: 019150000
5. ☑ Check here if a Tier Classification Submittal has been provided to DEP for this disposal site.
   ☐ a. Tier IA ☑ b. Tier IB ☐ c. Tier IC ☐ d. Tier II
6. If applicable, provide the Permit Number: P23730

B. THIS FORM IS BEING USED (check all that apply)

☐ 1. Submit a **Phase I Completion Statement**, pursuant to 310 CMR 40.0484.

☐ 2. Submit a **Revised Phase I Completion Statement**, pursuant to 310 CMR 40.0484.

☐ 3. Submit a **Phase II Scope of Work**, pursuant to 310 CMR 40.0834.

☐ 4. Submit an **interim Phase II Report**. This report does not satisfy the response action deadline requirements in 310 CMR 40.0500.

☐ 5. Submit a **final Phase II Report and Completion Statement**, pursuant to 310 CMR 40.0836.

☐ 6. Submit a **Revised Phase II Report and Completion Statement**, pursuant to 310 CMR 40.0836.

☐ 7. Submit a **Phase III Remedial Action Plan and Completion Statement**, pursuant to 310 CMR 40.0862.

☑ 8. Submit a **Revised Phase III Remedial Action Plan and Completion Statement**, pursuant to 310 CMR 40.0862.

☐ 9. Submit a **Phase IV Remedy Implementation Plan**, pursuant to 310 CMR 40.0874.

☑ 10. Submit a **Modified Phase IV Remedy Implementation Plan**, pursuant to 310 CMR 40.0874.

☐ 11. Submit an **As-Built Construction Report**, pursuant to 310 CMR 40.0875.

☐ 12. Submit a **Phase IV Status Report**, pursuant to 310 CMR 40.0877.

☐ 13. Submit a **Phase IV Completion Statement**, pursuant to 310 CMR 40.0878 and 40.0879.

Specify the outcome of Phase IV activities: (check one)

☐ a. Phase V Operation, Maintenance or Monitoring of the Comprehensive Remedial Action is necessary to achieve a Response Action Outcome.

☐ b. The requirements of a Class A Response Action Outcome have been met. No additional Operation, Maintenance or Monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement and Report (BWSC104) will be submitted to DEP.

☐ c. The requirements of a Class C Response Action Outcome have been met. No additional Operation, Maintenance or Monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement and Report (BWSC104) has been or will be submitted to DEP.

☐ d. The requirements of a Class C Response Action Outcome have been met. Further Operation, Maintenance or Monitoring of the remedial action is necessary to ensure that conditions are maintained and that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement and Report (BWSC104) has been or will be submitted to DEP.

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

B. THIS FORM IS BEING USED TO (cont.):(check all that apply)

☐ 14. Submit a **Revised Phase IV Completion Statement**, pursuant to 310 CMR 40.0878 and 40.0879.

☐ 15. Submit a **Phase V Status Report**, pursuant to 310 CMR 40.0892.

☐ 16. Submit a **Remedial Monitoring Report**. (This report can only be submitted through eDEP.)

a. Type of Report: (check one) ☐ i. Initial Report ☐ ii. Interim Report ☐ iii. Final Report

b. Frequency of Submittal: (check all that apply)

☐ i. A Remedial Monitoring Report(s) submitted monthly to address an Imminent Hazard.

☐ ii. A Remedial Monitoring Report(s) submitted monthly to address a Condition of Substantial Release Migration.

☐ iii. A Remedial Monitoring Report(s) submitted concurrent with a Status Report.

c. Status of Site: (check one) ☐ i. Phase IV ☐ ii. Phase V ☐ iii. Remedy Operation Status ☐ iv. Class C RAO

d. Number of Remedial Systems and/or Monitoring Programs: ____

A separate BWSC108A, CRA Remedial Monitoring Report, must be filled out for each Remedial System and/or Monitoring Program addressed by this transmittal form.

☐ 17. Submit a **Remedy Operation Status**, pursuant to 310 CMR 40.0893.

☐ 18. Submit a **Status Report to maintain a Remedy Operation Status**, pursuant to 310 CMR 40.0893(2).

☐ 19. Submit a **Transfer and/or a Modification of Persons Maintaining a Remedy Operation Status (ROS)** , pursuant to 310 CMR 40.0893(5) (check one, or both, if applicable).

☐ a. Submit a Transfer of Persons Maintaining an ROS (the transferee should be the person listed in Section D, "Person Undertaking Response Actions").

☐ b. Submit a Modification of Persons Maintaining an ROS (the primary representative should be the person listed in Section D, "Person Undertaking Response Actions").

c. Number of Persons Maintaining an ROS not including the primary representative: ____

☐ 20. Submit a **Termination of a Remedy Operation Status**, pursuant to 310 CMR 40.0893(6).(check one)

☐ a. Submit a notice indicating ROS performance standards have not been met. A plan and timetable pursuant to 310 CMR 40.0893(6)(b) for resuming the ROS are attached.

☐ b. Submit a notice of Termination of ROS.

☐ 21. Submit a **Phase V Completion Statement**, pursuant to 310 CMR 40.0894.

Specify the outcome of Phase V activities: (check one)

☐ a. The requirements of a Class A Response Action Outcome have been met. No additional Operation, Maintenance or Monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement (BWSC104) will be submitted to DEP.

☐ b. The requirements of a Class C Response Action Outcome have been met. No additional Operation, Maintenance or Monitoring is necessary to ensure the integrity of the Response Action Outcome. A completed Response Action Outcome Statement and Report (BWSC104) will be submitted to DEP.

☐ c. The requirements of a Class C Response Action Outcome have been met. Further Operation, Maintenance or Monitoring of the remedial action is necessary to ensure that conditions are maintained and/or that further progress is made toward a Permanent Solution. A completed Response Action Outcome Statement and Report (BWSC104) will be submitted to DEP.

☐ 22. Submit a **Revised Phase V Completion Statement**, pursuant to 310 CMR 40.0894.

☐ 23. Submit a **Post-Class C Response Action Outcome Status Report**, pursuant to 310 CMR 40.0898.

C. LSP SIGNATURE AND STAMP:

I attest under the pains and penalties of perjury that I have personally examined and am familiar with this transmittal form, including any and all documents accompanying this submittal. In my professional opinion and judgment based upon application of (i) the standard of care in 309 CMR 4.02(1), (ii) the applicable provisions of 309 CMR 4.02(2) and (3), and 309 CMR 4.03(2), and (iii) the provisions of 309 CMR 4.03(3), to the best of my knowledge, information and belief,

> *if Section B indicates that a* ***Phase I, Phase II, Phase III, Phase IV or Phase V Completion Statement*** *and/or a* ***Termination of a Remedy Operation Status*** *is being submitted*, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed and implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B indicates that a* ***Phase II Scope of Work*** *or a* ***Phase IV Remedy Implementation Plan*** *is being submitted*, the response action(s) that is (are) the subject of this submittal (i) has (have) been developed in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal;

> *if Section B indicates that an* ***As-Built Construction Report,*** *a* ***Remedy Operation Status,*** *a* ***Phase IV, Phase V or Post-Class C RAO Status Report,*** *a* ***Status Report to Maintain a Remedy Operation Status,*** *a* ***Transfer or Modification of Persons Maintaining a Remedy Operation Status*** *and/or a* ***Remedial Monitoring Report*** *is being submitted*, the response action(s) that is (are) the subject of this submittal (i) is (are) being implemented in accordance with the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, (ii) is (are) appropriate and reasonable to accomplish the purposes of such response action(s) as set forth in the applicable provisions of M.G.L. c. 21E and 310 CMR 40.0000, and (iii) comply(ies) with the identified provisions of all orders, permits, and approvals identified in this submittal.

I am aware that significant penalties may result, including, but not limited to, possible fines and imprisonment, if I submit information which I know to be false, inaccurate or materially incomplete.

1. LSP #: 9070
2. First Name: TIMOTHY W
3. Last Name: KEMPER
4. Telephone: 6175896162
5. Ext.:
6. FAX: 6175892223
7. Signature:
8. Date: (mm/dd/yyyy)
9. LSP Stamp:

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC108

Release Tracking Number
3 - 485

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

D. PERSON UNDERTAKING RESPONSE ACTIONS:

1. Check all that apply: ☐ a. change in contact name ☐ b. change of address ☐ c. change in the person undertaking response actions

2. Name of Organization: VARIAN MEDICAL SYSTEMS INC

3. Contact First Name: JOHN R 4. Last Name: BUCHANAN

5. Street: 3120 HANSEN WAY M/S G-100 6. Title: ENVMTL AFFAIRS MGR

7. City/Town: PALO ALTO 8. State: CA 9. ZIP Code: 943041030

10. Telephone: 6504246103 11. Ext.: 12. FAX:

E. RELATIONSHIP TO SITE OF PERSON UNDERTAKING RESPONSE ACTIONS: ☐ Check here to change relationship

☑ 1. RP or PRP ☐ a. Owner ☐ b. Operator ☐ c. Generator ☐ d. Transporter

☑ e. Other RP or PRP Specify: OTHER PRPS

☐ 2. Fiduciary, Secured Lender or Municipality with Exempt Status (as defined by M.G.L. c. 21E, s. 2)

☐ 3. Agency or Public Utility on a Right of Way (as defined by M.G.L. c. 21E, s. 5(j))

☐ 4. Any Other Person Undertaking Response Actions Specify Relationship:

F. REQUIRED ATTACHMENT AND SUBMITTALS:

☐ 1. Check here if the Response Action(s) on which this opinion is based, if any, are (were) subject to any order(s), permit(s) and/or approval(s) issued by DEP or EPA. If the box is checked, you MUST attach a statement identifying the applicable provisions thereof.

☑ 2. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the submittal of any Phase Reports to DEP.

☑ 3. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the availability of a Phase III Remedial Action Plan.

☑ 4. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of the availability of a Phase IV Remedy Implementation Plan.

☑ 5. Check here to certify that the Chief Municipal Officer and the Local Board of Health have been notified of any field work involving the implementation of a Phase IV Remedial Action.

☐ 6. If submitting a Transfer of a Remedy Operation Status (as per 310 CMR 40.0893(5)), check here to certify that a statement detailing the compliance history for the person making this submittal (transferee) is attached.

☐ 7. If submitting a Modification of a Remedy Operation Status (as per 310 CMR 40.0893(5)), check here to certify that a statement detailing the compliance history for each new person making this submittal is attached.

☐ 8. Check here if any non-updatable information provided on this form is incorrect, e.g. Site Name. Send corrections to: BWSC.eDEP@state.ma.us.

☑ 9. Check here to certify that the LSP Opinion containing the material facts, data, and other information is attached.

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup

BWSC108

Release Tracking Number
3 - 485

COMPREHENSIVE RESPONSE ACTION TRANSMITTAL FORM & PHASE I COMPLETION STATEMENT

Pursuant to 310 CMR 40.0484 (Subpart D) and 40.0800 (Subpart H)

G. CERTIFICATION OF PERSON UNDERTAKING RESPONSE ACTIONS:

1. I, _____, attest under the pains and penalties of perjury (i) that I have personally examined and am familiar with the information contained in this submittal, including any and all documents accompanying this transmittal form, (ii) that, based on my inquiry of those individuals immediately responsible for obtaining the information, the material information contained in this submittal is, to the best of my knowledge and belief, true, accurate and complete, and (iii) that I am fully authorized to make this attestation on behalf of the entity legally responsible for this submittal. I/the person or entity on whose behalf this submittal is made am/is aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate, or incomplete information.

>*if Section B indicates that this is a* **Modification of a Remedy Operation Status (ROS)**, I attest under the pains and penalties of perjury that I am fully authorized to act on behalf of all persons performing response actions under the ROS as stated in 310 CMR 40.0893(5)(d) to receive oral and written correspondence from MassDEP with respect to performance of response actions under the ROS, and to receive a statement of fee amount as per 4.03(3).

I understand that any material received by the Primary Representative from MassDEP shall be deemed received by all the persons perform ing response actions under the ROS, and I am aware that there are significant penalties, including, but not limited to, possible fines and imprisonment, for willfully submitting false, inaccurate or incomplete information.

2. By: _____ (Signature) 3. Title: ENVMTL AFFAIRS MGR

4. For: VARIAN MEDICAL SYSTEMS INC (Name of person or entity recorded in Section D) 5. Date: _____ (mm/dd/yyyy)

☐ 6. Check here if the address of the person providing certification is different from address recorded in Section D.

7. Street: _____

8. City/Town: _____ 9. State: _____ 10. ZIP Code: _____

11. Telephone: _____ 12. Ext.: _____ 13. FAX: _____

YOU ARE SUBJECT TO AN ANNUAL COMPLIANCE ASSURANCE FEE OF UP TO $10,000 PER BILLABLE YEAR FOR THIS DISPOSAL SITE. YOU MUST LEGIBLY COMPLETE ALL RELEVANT SECTIONS OF THIS FORM OR DEP MAY RETURN THE DOCUMENT AS INCOMPLETE. IF YOU SUBMIT AN INCOMPLETE FORM, YOU MAY BE PENALIZED FOR MISSING A REQUIRED DEADLINE.

Date Stamp (DEP USE ONLY:)

APPENDIX B

Laboratory Analytical Reports

August 27, 2012 Service Request No: R1205125

Mr. Ray Cadorette
Shaw Environmental & Infrastructure, Inc.
100 Technology Center
Stoughton, MA 02072

Laboratory Results for: Varian Beverly - Soil/146898

Dear Mr. Cadorette:

Enclosed are the results of the sample(s) submitted to our laboratory on August 8, 2012. For your reference, these analyses have been assigned our service request number **R1205125**.

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7469. You may also contact me via email at Mike.Perry@alsglobal.com.

Respectfully submitted,

Columbia Analytical Services, Inc. dba ALS Environmental

Michael Perry
Laboratory Manager

Report Date:
21-Aug-12 11:32

☑ Final Report
☐ Re-Issued Report
☐ Revised Report

SPECTRUM ANALYTICAL, INC.
Featuring
HANIBAL TECHNOLOGY

Laboratory Report

ALS Environmental
1565 Jefferson Road, Building 300 Suite 360
Rochester York, NY 14623
Attn: Michael Perry

Project: See Chain of Custody
Project #: R1205125

Laboratory ID	Client Sample ID	Matrix	Date Sampled	Date Received
SB54305-01	Roll Off	Soil	03-Aug-12 13:20	09-Aug-12 10:00

I attest that the information contained within the report has been reviewed for accuracy and checked against the quality control requirements for each method. These results relate only to the sample(s) as received.
All applicable NELAC requirements have been met.

Massachusetts # M-MA138/MA1110
Connecticut # PH-0777
Florida # E87600/E87936
Maine # MA138
New Hampshire # 2538
New Jersey # MA011/MA012
New York # 11393/11840
Pennsylvania # 68-04426/68-02924
Rhode Island # 98
USDA # S-51435

Authorized by:

Nicole Leja
Laboratory Director

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Please contact the Laboratory or Technical Director at 800-789-9115 with any questions regarding the data contained in this laboratory report.

The following outlines the condition of all EPH samples contained within this report upon laboratory receipt.

Matrices	Soil			
Containers	✓ Satisfactory			
Aqueous Preservative	✓ N/A	pH≤2	pH>2	pH adjusted to <2 in lab
Temperature	✓ Received on ice	Received at 4 ± 2 °C	✓ Other: 0.8°C	

Were all QA/QC procedures followed as required by the EPH method? *Yes*
Were any significant modifications made to the EPH method as specified in Section 11.3? *No*
Were all performance/acceptance standards for required QA/QC procedures achieved? *Yes*

I attest that based upon my inquiry of those individuals immediately responsible for obtaining the information, the material contained in this report is, to the best of my knowledge and belief, accurate and complete.

Authorized by:

Nicole Leja
Laboratory Director

CASE NARRATIVE:

The samples were received 0.8 degrees Celsius, please refer to the Chain of Custody for details specific to temperature upon receipt. An infrared thermometer with a tolerance of +/- 1.0 degrees Celsius was used immediately upon receipt of the samples.

If a Matrix Spike (MS), Matrix Spike Duplicate (MSD) or Duplicate (DUP) was not requested on the Chain of Custody, method criteria may have been fulfilled with a source sample not of this Sample Delivery Group.

There is no relevant protocol-specific QC and/or performance standards non-conformances to report.

Sample Identification	Client Project #	Matrix	Collection Date/Time	Received
Roll Off	R1205125	Soil	03-Aug-12 13:20	09-Aug-12
SB54305-01				

CAS No.	Analyte(s)	Result	Flag	Units	*RDL	MDL	Dilution	Method Ref.	Prepared	Analyzed	Analyst	Batch	Cert.
Extractable Petroleum Hydrocarbons													
EPH Aliphatic/Aromatic Ranges													
Prepared by method SW846 3545A													
	C9-C18 Aliphatic Hydrocarbons	**192**		mg/kg dry	11.2	1.64	1	MADEP EPH 5/2004 R	13-Aug-12	15-Aug-12	MP	1219314	
	C19-C36 Aliphatic Hydrocarbons	**139**		mg/kg dry	11.2	5.46	1	"	"	"	"	"	
	C11-C22 Aromatic Hydrocarbons	**140**		mg/kg dry	11.2	4.04	1	"	"	"	"	"	
	Unadjusted C11-C22 Aromatic Hydrocarbons	**144**		mg/kg dry	11.2	4.04	1	"	"	"	"	"	
	Total Petroleum Hydrocarbons	**471**		mg/kg dry	33.5	11.1	1	"	"	"	"	"	
	Unadjusted Total Petroleum Hydrocarbons	**475**		mg/kg dry	33.5	11.1	1	"	"	"	"	"	
EPH Target PAH Analytes													
Prepared by method SW846 3545A													
91-20-3	Naphthalene	< 0.372		mg/kg dry	0.372	0.194	1	"	"	"	"	"	
91-57-6	2-Methylnaphthalene	**1.33**		mg/kg dry	0.372	0.194	1	"	"	"	"	"	
208-96-8	Acenaphthylene	< 0.372		mg/kg dry	0.372	0.218	1	"	"	"	"	"	
83-32-9	Acenaphthene	< 0.372		mg/kg dry	0.372	0.217	1	"	"	"	"	"	
86-73-7	Fluorene	**0.490**		mg/kg dry	0.372	0.220	1	"	"	"	"	"	
85-01-8	Phenanthrene	**1.76**		mg/kg dry	0.372	0.253	1	"	"	"	"	"	
120-12-7	Anthracene	< 0.372		mg/kg dry	0.372	0.275	1	"	"	"	"	"	
206-44-0	Fluoranthene	< 0.372		mg/kg dry	0.372	0.249	1	"	"	"	"	"	
129-00-0	Pyrene	< 0.372		mg/kg dry	0.372	0.268	1	"	"	"	"	"	
56-55-3	Benzo (a) anthracene	< 0.372		mg/kg dry	0.372	0.269	1	"	"	"	"	"	
218-01-9	Chrysene	< 0.372		mg/kg dry	0.372	0.289	1	"	"	"	"	"	
205-99-2	Benzo (b) fluoranthene	< 0.372		mg/kg dry	0.372	0.331	1	"	"	"	"	"	
207-08-9	Benzo (k) fluoranthene	< 0.372		mg/kg dry	0.372	0.310	1	"	"	"	"	"	
50-32-8	Benzo (a) pyrene	< 0.372		mg/kg dry	0.372	0.250	1	"	"	"	"	"	
193-39-5	Indeno (1,2,3-cd) pyrene	< 0.372		mg/kg dry	0.372	0.330	1	"	"	"	"	"	
53-70-3	Dibenzo (a,h) anthracene	< 0.372		mg/kg dry	0.372	0.269	1	"	"	"	"	"	
191-24-2	Benzo (g,h,i) perylene	< 0.372		mg/kg dry	0.372	0.278	1	"	"	"	"	"	
Surrogate recoveries:													
3386-33-2	*1-Chlorooctadecane*	*78*			*40-140 %*			"	"	"	"	"	
84-15-1	*Ortho-Terphenyl*	*87*			*40-140 %*			"	"	"	"	"	
321-60-8	*2-Fluorobiphenyl*	*76*			*40-140 %*			"	"	"	"	"	
General Chemistry Parameters													
	% Solids	**85.0**		%			1	SM2540 G Mod.	15-Aug-12	16-Aug-12	DT	1219574	

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch 1219314 - SW846 3545A										
Blank (1219314-BLK1)						Prepared: 13-Aug-12 Analyzed: 14-Aug-12				
C9-C18 Aliphatic Hydrocarbons	< 10.0		mg/kg wet	10.0						
C19-C36 Aliphatic Hydrocarbons	< 10.0		mg/kg wet	10.0						
C11-C22 Aromatic Hydrocarbons	< 10.0		mg/kg wet	10.0						
Unadjusted C11-C22 Aromatic Hydrocarbons	< 10.0		mg/kg wet	10.0						
Total Petroleum Hydrocarbons	< 30.0		mg/kg wet	30.0						
Unadjusted Total Petroleum Hydrocarbons	< 30.0		mg/kg wet	30.0						
Naphthalene	< 0.333		mg/kg wet	0.333						
2-Methylnaphthalene	< 0.333		mg/kg wet	0.333						
Acenaphthylene	< 0.333		mg/kg wet	0.333						
Acenaphthene	< 0.333		mg/kg wet	0.333						
Fluorene	< 0.333		mg/kg wet	0.333						
Phenanthrene	< 0.333		mg/kg wet	0.333						
Anthracene	< 0.333		mg/kg wet	0.333						
Fluoranthene	< 0.333		mg/kg wet	0.333						
Pyrene	< 0.333		mg/kg wet	0.333						
Benzo (a) anthracene	< 0.333		mg/kg wet	0.333						
Chrysene	< 0.333		mg/kg wet	0.333						
Benzo (b) fluoranthene	< 0.333		mg/kg wet	0.333						
Benzo (k) fluoranthene	< 0.333		mg/kg wet	0.333						
Benzo (a) pyrene	< 0.333		mg/kg wet	0.333						
Indeno (1,2,3-cd) pyrene	< 0.333		mg/kg wet	0.333						
Dibenzo (a,h) anthracene	< 0.333		mg/kg wet	0.333						
Benzo (g,h,i) perylene	< 0.333		mg/kg wet	0.333						
n-Nonane (C9)	< 0.333		mg/kg wet	0.333						
n-Decane	< 0.333		mg/kg wet	0.333						
n-Dodecane	< 0.333		mg/kg wet	0.333						
n-Tetradecane	< 0.333		mg/kg wet	0.333						
n-Hexadecane	< 0.333		mg/kg wet	0.333						
n-Octadecane	< 0.333		mg/kg wet	0.333						
n-Nonadecane	< 0.333		mg/kg wet	0.333						
n-Eicosane	< 0.333		mg/kg wet	0.333						
n-Docosane	< 0.333		mg/kg wet	0.333						
n-Tetracosane	< 0.333		mg/kg wet	0.333						
n-Hexacosane	< 0.333		mg/kg wet	0.333						
n-Octacosane	< 0.333		mg/kg wet	0.333						
n-Triacontane	< 0.333		mg/kg wet	0.333						
n-Hexatriacontane	< 0.333		mg/kg wet	0.333						
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet							
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet							
Surrogate: 1-Chlorooctadecane	*2.29*		mg/kg wet		*3.33*		*69*	*40-140*		
Surrogate: Ortho-Terphenyl	*2.39*		mg/kg wet		*3.33*		*72*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*1.73*		mg/kg wet		*2.67*		*65*	*40-140*		
LCS (1219314-BS1)						Prepared: 13-Aug-12 Analyzed: 14-Aug-12				
C9-C18 Aliphatic Hydrocarbons	**29.1**		mg/kg wet	10.0	40.0		73	40-140		
C19-C36 Aliphatic Hydrocarbons	**36.5**		mg/kg wet	10.0	53.3		68	40-140		
C11-C22 Aromatic Hydrocarbons	**69.3**		mg/kg wet	10.0	113		61	40-140		
Naphthalene	**3.04**		mg/kg wet	0.333	6.67		46	40-140		
2-Methylnaphthalene	**3.17**		mg/kg wet	0.333	6.67		48	40-140		
Acenaphthylene	**3.66**		mg/kg wet	0.333	6.67		55	40-140		
Acenaphthene	**3.84**		mg/kg wet	0.333	6.67		58	40-140		
Fluorene	**4.11**		mg/kg wet	0.333	6.67		62	40-140		

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch 1219314 - SW846 3545A										
LCS (1219314-BS1)						Prepared: 13-Aug-12 Analyzed: 14-Aug-12				
Phenanthrene	**4.43**		mg/kg wet	0.333	6.67		66	40-140		
Anthracene	**4.30**		mg/kg wet	0.333	6.67		64	40-140		
Fluoranthene	**4.40**		mg/kg wet	0.333	6.67		66	40-140		
Pyrene	**4.33**		mg/kg wet	0.333	6.67		65	40-140		
Benzo (a) anthracene	**4.91**		mg/kg wet	0.333	6.67		74	40-140		
Chrysene	**4.49**		mg/kg wet	0.333	6.67		67	40-140		
Benzo (b) fluoranthene	**4.95**		mg/kg wet	0.333	6.67		74	40-140		
Benzo (k) fluoranthene	**4.39**		mg/kg wet	0.333	6.67		66	40-140		
Benzo (a) pyrene	**4.57**		mg/kg wet	0.333	6.67		69	40-140		
Indeno (1,2,3-cd) pyrene	**5.30**		mg/kg wet	0.333	6.67		79	40-140		
Dibenzo (a,h) anthracene	**5.57**		mg/kg wet	0.333	6.67		84	40-140		
Benzo (g,h,i) perylene	**5.17**		mg/kg wet	0.333	6.67		78	40-140		
n-Nonane (C9)	**2.10**		mg/kg wet	0.333	6.67		31	30-140		
n-Decane	**2.99**		mg/kg wet	0.333	6.67		45	40-140		
n-Dodecane	**3.07**		mg/kg wet	0.333	6.67		46	40-140		
n-Tetradecane	**3.52**		mg/kg wet	0.333	6.67		53	40-140		
n-Hexadecane	**3.98**		mg/kg wet	0.333	6.67		60	40-140		
n-Octadecane	**4.24**		mg/kg wet	0.333	6.67		64	40-140		
n-Nonadecane	**4.27**		mg/kg wet	0.333	6.67		64	40-140		
n-Eicosane	**4.36**		mg/kg wet	0.333	6.67		65	40-140		
n-Docosane	**4.22**		mg/kg wet	0.333	6.67		63	40-140		
n-Tetracosane	**4.19**		mg/kg wet	0.333	6.67		63	40-140		
n-Hexacosane	**4.31**		mg/kg wet	0.333	6.67		65	40-140		
n-Octacosane	**4.39**		mg/kg wet	0.333	6.67		66	40-140		
n-Triacontane	**4.30**		mg/kg wet	0.333	6.67		65	40-140		
n-Hexatriacontane	**4.38**		mg/kg wet	0.333	6.67		66	40-140		
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet					0-200		
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet					0-200		
Surrogate: 1-Chlorooctadecane	*2.16*		mg/kg wet		*3.33*		*65*	*40-140*		
Surrogate: Ortho-Terphenyl	*2.25*		mg/kg wet		*3.33*		*67*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*1.89*		mg/kg wet		*2.67*		*71*	*40-140*		
Naphthalene Breakthrough	0.00		%					0-5		
2-Methylnaphthalene Breakthrough	0.00		%					0-5		
LCS (1219314-BS2)						Prepared: 13-Aug-12 Analyzed: 14-Aug-12				
C9-C18 Aliphatic Hydrocarbons	**36.7**		mg/kg wet	10.0	40.0		92	40-140		
C19-C36 Aliphatic Hydrocarbons	**33.1**		mg/kg wet	10.0	53.3		62	40-140		
C11-C22 Aromatic Hydrocarbons	**97.3**		mg/kg wet	10.0	113		86	40-140		
Naphthalene	**4.60**		mg/kg wet	0.333	6.67		69	40-140		
2-Methylnaphthalene	**4.67**		mg/kg wet	0.333	6.67		70	40-140		
Acenaphthylene	**5.11**		mg/kg wet	0.333	6.67		77	40-140		
Acenaphthene	**5.27**		mg/kg wet	0.333	6.67		79	40-140		
Fluorene	**5.41**		mg/kg wet	0.333	6.67		81	40-140		
Phenanthrene	**5.34**		mg/kg wet	0.333	6.67		80	40-140		
Anthracene	**5.04**		mg/kg wet	0.333	6.67		76	40-140		
Fluoranthene	**5.21**		mg/kg wet	0.333	6.67		78	40-140		
Pyrene	**5.15**		mg/kg wet	0.333	6.67		77	40-140		
Benzo (a) anthracene	**5.68**		mg/kg wet	0.333	6.67		85	40-140		
Chrysene	**5.30**		mg/kg wet	0.333	6.67		79	40-140		
Benzo (b) fluoranthene	**5.78**		mg/kg wet	0.333	6.67		87	40-140		
Benzo (k) fluoranthene	**5.09**		mg/kg wet	0.333	6.67		76	40-140		
Benzo (a) pyrene	**5.30**		mg/kg wet	0.333	6.67		79	40-140		

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch 1219314 - SW846 3545A										
LCS (1219314-BS2)						Prepared: 13-Aug-12 Analyzed: 14-Aug-12				
Indeno (1,2,3-cd) pyrene	**6.13**		mg/kg wet	0.333	6.67		92	40-140		
Dibenzo (a,h) anthracene	**6.50**		mg/kg wet	0.333	6.67		97	40-140		
Benzo (g,h,i) perylene	**5.93**		mg/kg wet	0.333	6.67		89	40-140		
n-Nonane (C9)	**2.45**		mg/kg wet	0.333	6.67		37	30-140		
n-Decane	**2.91**		mg/kg wet	0.333	6.67		44	40-140		
n-Dodecane	**3.27**		mg/kg wet	0.333	6.67		49	40-140		
n-Tetradecane	**3.51**		mg/kg wet	0.333	6.67		53	40-140		
n-Hexadecane	**3.75**		mg/kg wet	0.333	6.67		56	40-140		
n-Octadecane	**3.88**		mg/kg wet	0.333	6.67		58	40-140		
n-Nonadecane	**3.86**		mg/kg wet	0.333	6.67		58	40-140		
n-Eicosane	**3.94**		mg/kg wet	0.333	6.67		59	40-140		
n-Docosane	**3.85**		mg/kg wet	0.333	6.67		58	40-140		
n-Tetracosane	**3.83**		mg/kg wet	0.333	6.67		58	40-140		
n-Hexacosane	**4.00**		mg/kg wet	0.333	6.67		60	40-140		
n-Octacosane	**4.02**		mg/kg wet	0.333	6.67		60	40-140		
n-Triacontane	**3.94**		mg/kg wet	0.333	6.67		59	40-140		
n-Hexatriacontane	**4.04**		mg/kg wet	0.333	6.67		61	40-140		
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet					0-200		
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet					0-200		
Surrogate: 1-Chlorooctadecane	*1.88*		mg/kg wet		*3.33*		*56*	*40-140*		
Surrogate: Ortho-Terphenyl	*2.64*		mg/kg wet		*3.33*		*79*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*2.24*		mg/kg wet		*2.67*		*84*	*40-140*		
Naphthalene Breakthrough	0.00		%					0-5		
2-Methylnaphthalene Breakthrough	0.00		%					0-5		
LCS Dup (1219314-BSD1)						Prepared: 13-Aug-12 Analyzed: 14-Aug-12				
C9-C18 Aliphatic Hydrocarbons	**30.0**		mg/kg wet	10.0	40.0		75	40-140	3	25
C19-C36 Aliphatic Hydrocarbons	**40.0**		mg/kg wet	10.0	53.3		75	40-140	9	25
C11-C22 Aromatic Hydrocarbons	**76.0**		mg/kg wet	10.0	113		67	40-140	9	25
Naphthalene	**3.45**		mg/kg wet	0.333	6.67		52	40-140	12	25
2-Methylnaphthalene	**3.53**		mg/kg wet	0.333	6.67		53	40-140	11	25
Acenaphthylene	**3.90**		mg/kg wet	0.333	6.67		58	40-140	6	25
Acenaphthene	**4.05**		mg/kg wet	0.333	6.67		61	40-140	5	25
Fluorene	**4.19**		mg/kg wet	0.333	6.67		63	40-140	2	25
Phenanthrene	**4.33**		mg/kg wet	0.333	6.67		65	40-140	2	25
Anthracene	**4.16**		mg/kg wet	0.333	6.67		62	40-140	3	25
Fluoranthene	**4.16**		mg/kg wet	0.333	6.67		62	40-140	6	25
Pyrene	**4.08**		mg/kg wet	0.333	6.67		61	40-140	6	25
Benzo (a) anthracene	**4.47**		mg/kg wet	0.333	6.67		67	40-140	9	25
Chrysene	**4.20**		mg/kg wet	0.333	6.67		63	40-140	7	25
Benzo (b) fluoranthene	**4.99**		mg/kg wet	0.333	6.67		75	40-140	0.9	25
Benzo (k) fluoranthene	**3.97**		mg/kg wet	0.333	6.67		60	40-140	10	25
Benzo (a) pyrene	**4.25**		mg/kg wet	0.333	6.67		64	40-140	7	25
Indeno (1,2,3-cd) pyrene	**4.87**		mg/kg wet	0.333	6.67		73	40-140	8	25
Dibenzo (a,h) anthracene	**5.16**		mg/kg wet	0.333	6.67		77	40-140	8	25
Benzo (g,h,i) perylene	**4.76**		mg/kg wet	0.333	6.67		71	40-140	8	25
n-Nonane (C9)	**2.05**		mg/kg wet	0.333	6.67		31	30-140	2	25
n-Decane	**2.77**		mg/kg wet	0.333	6.67		41	40-140	8	25
n-Dodecane	**3.32**		mg/kg wet	0.333	6.67		50	40-140	8	25
n-Tetradecane	**3.77**		mg/kg wet	0.333	6.67		57	40-140	7	25
n-Hexadecane	**4.19**		mg/kg wet	0.333	6.67		63	40-140	5	25
n-Octadecane	**4.38**		mg/kg wet	0.333	6.67		66	40-140	3	25

Extractable Petroleum Hydrocarbons - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch 1219314 - SW846 3545A										
LCS Dup (1219314-BSD1)					Prepared: 13-Aug-12 Analyzed: 14-Aug-12					
n-Nonadecane	**4.38**		mg/kg wet	0.333	6.67		66	40-140	3	25
n-Eicosane	**4.46**		mg/kg wet	0.333	6.67		67	40-140	2	25
n-Docosane	**4.32**		mg/kg wet	0.333	6.67		65	40-140	2	25
n-Tetracosane	**4.30**		mg/kg wet	0.333	6.67		64	40-140	3	25
n-Hexacosane	**4.47**		mg/kg wet	0.333	6.67		67	40-140	4	25
n-Octacosane	**4.53**		mg/kg wet	0.333	6.67		68	40-140	3	25
n-Triacontane	**4.44**		mg/kg wet	0.333	6.67		67	40-140	3	25
n-Hexatriacontane	**4.54**		mg/kg wet	0.333	6.67		68	40-140	4	25
Naphthalene (aliphatic fraction)	**0.00**		mg/kg wet					0-200		200
2-Methylnaphthalene (aliphatic fraction)	**0.00**		mg/kg wet					0-200		200
Surrogate: 1-Chlorooctadecane	*2.19*		mg/kg wet		*3.33*		*66*	*40-140*		
Surrogate: Ortho-Terphenyl	*2.17*		mg/kg wet		*3.33*		*65*	*40-140*		
Surrogate: 2-Fluorobiphenyl	*1.98*		mg/kg wet		*2.67*		*74*	*40-140*		
Naphthalene Breakthrough	0.00		%					0-5		
2-Methylnaphthalene Breakthrough	0.00		%					0-5		

General Chemistry Parameters - Quality Control

Analyte(s)	Result	Flag	Units	*RDL	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit
Batch 1219574 - General Preparation										
Duplicate (1219574-DUP1)			Source: SB54305-01			Prepared: 15-Aug-12 Analyzed: 16-Aug-12				
% Solids	82.1		%			85.0			3	20

Notes and Definitions

dry	Sample results reported on a dry weight basis
NR	Not Reported
RPD	Relative Percent Difference

A Matrix Spike and Matrix Spike Duplicate (MS/MSD) for MADEP EPH CAM may not have been analyzed with the samples in this work order. According to the method these spikes are performed only when requested by the client. If requested the spike recoveries are included in the batch QC data.

Laboratory Control Sample (LCS): A known matrix spiked with compound(s) representative of the target analytes, which is used to document laboratory performance.

Matrix Duplicate: An intra-laboratory split sample which is used to document the precision of a method in a given sample matrix.

Matrix Spike: An aliquot of a sample spiked with a known concentration of target analyte(s). The spiking occurs prior to sample preparation and analysis. A matrix spike is used to document the bias of a method in a given sample matrix.

Method Blank: An analyte-free matrix to which all reagents are added in the same volumes or proportions as used in sample processing. The method blank should be carried through the complete sample preparation and analytical procedure. The method blank is used to document contamination resulting from the analytical process.

Method Detection Limit (MDL): The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix type containing the analyte.

Reportable Detection Limit (RDL): The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. For many analytes the RDL analyte concentration is selected as the lowest non-zero standard in the calibration curve. While the RDL is approximately 5 to 10 times the MDL, the RDL for each sample takes into account the sample volume/weight, extract/digestate volume, cleanup procedures and, if applicable, dry weight correction. Sample RDLs are highly matrix-dependent.

Surrogate: An organic compound which is similar to the target analyte(s) in chemical composition and behavior in the analytical process, but which is not normally found in environmental samples. These compounds are spiked into all blanks, standards, and samples prior to analysis. Percent recoveries are calculated for each surrogate.

Continuing Calibration Verification: The calibration relationship established during the initial calibration must be verified at periodic intervals. Concentrations, intervals, and criteria are method specific.

Validated by:
Kimberly Wisk

ALS Environmental Chain of Custody

1565 Jefferson Rd. Building 300 • Rochester, NY 14623 • 585-288-5380 • FAX 585-288-8475

ALS Contact: Michael Perry

SB 51205

Project Number: R1205125
Project Manager: Michael Perry

Lab Code	Sample ID	# of Cont.	Matrix	Sample Date	Sample Time	Lab ID	MA EPH MADEP EPH
R1205125-003	Roll Off	1	Soil	8/3/12	1320	RJ Analytical	X

SB 51205-01

Special Instructions/Comments	Turnaround Requirements	Report Requirements	Invoice Information
	___ RUSH (Surcharges Apply) PLEASE CIRCLE WORK DAYS 1 2 3 4 5 X STANDARD Requested FAX Date: _____ Requested Report Date: 08/20/12	___ I. Results Only X II. Results + QC Summaries ___ III. Results + QC and Calibration Summaries ___ IV. Data Validation Report with Raw Data PQL/MDL/J N EDD Y	PO# R1205125 Bill to

Relinquished By: [signature] 8/8/12 FEDEX UPS

Received By: [signature] 8/9/12 @ 10:00

Airbill Number:

SMC
(585) 288-5380
ALS ENVIRONMENTAL
1565 JEFFERSON RD
ROCHESTER, NY 14623-3190

8 LBS

1 OF 2

SHIP TO:
SMPLE RECEIPT
SPECTRUM ANALYTICAL
11 ALMGREN DR
AGAWAM MA 01001

MA 011 9-06

UPS NEXT DAY AIR

1

TRACKING #: 1Z 17W 436 01 4931 4789

BILLING: P/P

WS 15.0 16 LP2844 30.0A 07/2012

Mike Perry

From: Lisa Chaffee [Agawam] [lchaffee@spectrum-analytical.com]
Sent: Wednesday, August 22, 2012 4:38 PM
To: Mike Perry
Cc: Jim Stadelmaier [Warwick]
Subject: SB54305 - Report from Spectrum Analytical, Inc. for Project: See Chain of Custody
Attachments: SB54305 FINAL 21 Aug 12 1132.PDF

From: online@spectrum-analytical.com [mailto:online@spectrum-analytical.com]
Posted At: Friday, August 10, 2012 6:00 PM
Posted To: Sample Confirmations
Conversation: SB54305 - Sample confirmation from Spectrum Analytical, Inc. for Project: See Chain of Custody
Subject: SB54305 - Sample confirmation from Spectrum Analytical, Inc. for Project: See Chain of Custody

SPECTRUM ANALYTICAL, INC.
Featuring
HANIBAL TECHNOLOGY

This message is to notify you that your samples have been received by Spectrum Analytical, Inc. The Chain of Custody is attached. Please review the attached Sample Acknowledgment form for sample details. Please respond to this email to resolve any discrepancies or you may contact the Sample Department at (413) 789-9018 to discuss.

Work Order #:	SB54305
Project:	See Chain of Custody
Project #:	R1205125
Received:	08/09/2012 10:00 AM
Estimated completion:	08/23/2012 5:00 PM
Sample temperature:	0.8°C

You may track the status of your samples and view results on Spectrum's eServices website at **http://www.spectrum-analytical.com/eservices/**. If you do not have an online account, you may sign up for one by completing the Internet Access Agreement form located at the bottom of the login page.

If you have any questions or concerns about your samples, please reply to this message.

To ensure delivery of laboratory report notices, please add **online@spectrum-analytical.com** to your address book.

COLUMBIA ANALYTICAL SERVICES, INC.

Client:	Shaw Environmental, Inc	**Service Request No.:**	R1205125
Project:	Varian Beverly	**Project Number:**	146898
Sample Matrix:	Waste Solid	**Date Received:**	8/08/12

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for samples designated for Tier II, deliverables. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt

Waste samples were collected on 8/02/12 and 8/03/12 received at CAS in good condition on 8/08/12 at a cooler temperature of 2.6 °C as noted on the cooler receipt and preservation check form. The samples were stored in a refrigerator at 1 - 6 °C upon receipt at the laboratory. See the CAS cross-reference sheet for Client ID and CAS Lab ID #.

Volatile Organics

Three solid samples were analyzed for the Mass. CAM list of Volatile Organics by SW-846 Method 8260C. The samples were initially analyzed as medium level waste dilutions since the samples were collected in Terra Core vials.

All initial and continuing calibrations were compliant.

All Surrogate Standard recoveries were within QC limits.

The Blank Spike/Blank Spike Duplicates (LCS/LCSD) recoveries were all within the QC limits except the LCSD recovery for Diethyl Ether (134 %) and 1,1-Dichloroethene (68 %) were outside limits have been flagged with an "*".

All samples were analyzed within the required holding times except as noted above.

No other analytical or QC problems were encountered with these analyses.

Semivolatile Organics

One soil sample was analyzed for the TCL list of SVOAs by SW-846 method 8270D.

All the initial and continuing calibration criteria were met for all analytes.

All internal standard areas were within QC limits.

All surrogate standard recoveries were within QC limits.

All blank spike recoveries (LCS/LCSD) were within QC limits.

The Method Blanks associated with these samples were free of contamination.

All sample extractions were done within the 14 day extraction holding time.

No other analytical or QC problems were encountered.

PCB Analysis

One soil sample was analyzed for the TCL list of PCBs using SW-846 method 8082A.

All the initial and continuing calibration criteria were met for all analytes.

The Laboratory blanks associated with these samples were free of contamination.

All PCB surrogate standard recoveries were all with QC limits.

The Blank Spike (LCS/LCSD) recoveries were within QC limits.

All sample extractions were done within the 14 day extraction holding time.

No other analytical or QC problems were encountered.

Metals Analysis

One solid waste sample was analyzed for TCLP Metals using methods 6010C/7470 following the TCLP Extraction by method 1311. One solid waste sample was analyzed for RCRA Metals using methods 6010C/7471B.

All blank spike recoveries (LCS) were within QC limits of 80 – 120 %.

No other analytical or QC problems were encountered.

EPH Analysis

One soil sample was analyzed for MA EPH by the subcontract laboratory Spectrum Analytical, Inc. Their complete report is attached.

CASE NARRATIVE

This report contains analytical results for the following samples:
Service Request Number: R1205125

Lab ID	Client ID
R1205125-001	Trench 1 (Sanding Room)
R1205125-002	Trench 2 (Shipping)
R1205125-003	Roll Off
R1205125-004	Roll Off

Columbia Analytical Services

Now part of the ALS Group

REPORT QUALIFIERS

U	Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.
J	Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Arclors).
B	Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.
E	Inorganics- Concentration is estimated due to the serial dilution was outside control limits.
E	Organics- Concentration has exceeded the calibration range for that specific analysis.
D	Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.
*	Indicates that a quality control parameter has exceeded laboratory limits. Under the "Notes" column of the Form I, this qualifier denotes analysis was performed out of Holding Time.
H	Analysis was performed out of hold time for tests that have an "immediate" hold time criteria.
#	Spike was diluted out.
+	Correlation coefficient for MSA is <0.995.
N	Inorganics- Matrix spike recovery was outside laboratory limits.
N	Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.
S	Concentration has been determined using Method of Standard Additions (MSA).
W	Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.
P	Concentration >40% (25% for CLP) difference between the two GC columns.
C	Confirmed by GC/MS
Q	DoD reports: indicates a pesticide/Aroclor is not confirmed (≥100% Difference between two GC columns).
X	See Case Narrative for discussion.

ACCREDITED IN ACCORDANCE WITH nelac

CAS/Rochester Lab ID # for State Certifications[1]

NELAP Accredited	Nevada ID # NY-00032
Connecticut ID # PH0556	New Jersey ID # NY004
Delaware Accredited	New York ID # 10145
DoD ELAP #65817	New Hampshire ID # 294100 A/B
Florida ID # E87674	North Carolina #676
Illinois ID #200047	Pennsylvania ID# 68-786
Maine ID #NY0032	Rhode Island ID # 158
Nebraska Accredited	Virginia #460167

[1] Analyses were performed according to our laboratory's NELAP-approved quality assurance program and any applicable state requirements. The test results meet requirements of the current NELAP standards or state requirements, where applicable, except as noted in the laboratory case narrative provided. For a specific list of accredited analytes, refer to the certifications section at www.caslab.com.

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 2/12 1000
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
Sample Name:	Trench 1 (Sanding Room)		
Lab Code:	R1205125-001	**Basis:**	NA

General Chemistry Parameters

Analyte Name	Method	Result	Q	Units	MRL	Dilution Factor	Date Extracted	Date Analyzed	Note
Solids, Total	160.3 Modified	**89.0**		Percent	1.0	1	NA	8/10/12 14:32	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 2/12 1000
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Analyzed:	8/13/12 17:05
Sample Name:	Trench 1 (Sanding Room)	**Units:**	µg/Kg
Lab Code:	R1205125-001	**Basis:**	Dry
		Percent Solids:	89.0

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	304683
Data File Name:	J:\ACQUDATA\msvoa10\data\081312\E2504.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	122

CAS No.	Analyte Name	Result	Q	MRL	Note
630-20-6	1,1,1,2-Tetrachloroethane	690	U	690	
71-55-6	1,1,1-Trichloroethane (TCA)	690	U	690	
79-34-5	1,1,2,2-Tetrachloroethane	690	U	690	
79-00-5	1,1,2-Trichloroethane	690	U	690	
75-34-3	1,1-Dichloroethane (1,1-DCA)	690	U	690	
75-35-4	1,1-Dichloroethene (1,1-DCE)	690	U	690	
563-58-6	1,1-Dichloropropene	690	U	690	
87-61-6	1,2,3-Trichlorobenzene	690	U	690	
96-18-4	1,2,3-Trichloropropane	690	U	690	
120-82-1	1,2,4-Trichlorobenzene	690	U	690	
95-63-6	1,2,4-Trimethylbenzene	690	U	690	
96-12-8	1,2-Dibromo-3-chloropropane (DBCP)	690	U	690	
106-93-4	1,2-Dibromoethane	690	U	690	
95-50-1	1,2-Dichlorobenzene	690	U	690	
107-06-2	1,2-Dichloroethane	690	U	690	
78-87-5	1,2-Dichloropropane	690	U	690	
108-67-8	1,3,5-Trimethylbenzene	690	U	690	
541-73-1	1,3-Dichlorobenzene	690	U	690	
142-28-9	1,3-Dichloropropane	690	U	690	
106-46-7	1,4-Dichlorobenzene	690	U	690	
123-91-1	1,4-Dioxane	14000	U	14000	
594-20-7	2,2-Dichloropropane	690	U	690	
78-93-3	2-Butanone (MEK)	690	U	690	
95-49-8	2-Chlorotoluene	690	U	690	
591-78-6	2-Hexanone	690	U	690	
106-43-4	4-Chlorotoluene	690	U	690	
99-87-6	p-Isopropyltoluene	690	U	690	
108-10-1	4-Methyl-2-pentanone	690	U	690	
67-64-1	Acetone	690	U	690	
71-43-2	Benzene	690	U	690	
108-86-1	Bromobenzene	690	U	690	
74-97-5	Bromochloromethane	690	U	690	
75-27-4	Bromodichloromethane	690	U	690	
75-25-2	Bromoform	690	U	690	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 2/12 1000
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Analyzed:	8/13/12 17:05
Sample Name:	Trench 1 (Sanding Room)	**Units:**	µg/Kg
Lab Code:	R1205125-001	**Basis:**	Dry
		Percent Solids:	89.0

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	304683
Data File Name:	J:\ACQUDATA\msvoa10\data\081312\E2504.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	122

CAS No.	Analyte Name	Result	Q	MRL	Note
74-83-9	Bromomethane	690	U	690	
75-15-0	Carbon Disulfide	690	U	690	
56-23-5	Carbon Tetrachloride	690	U	690	
108-90-7	Chlorobenzene	690	U	690	
75-00-3	Chloroethane	690	U	690	
67-66-3	Chloroform	690	U	690	
74-87-3	Chloromethane	690	U	690	
124-48-1	Dibromochloromethane	690	U	690	
74-95-3	Dibromomethane	690	U	690	
75-71-8	Dichlorodifluoromethane (CFC 12)	690	U	690	
75-09-2	Dichloromethane	690	U	690	
60-29-7	Diethyl Ether	690	U	690	
108-20-3	Diisopropyl Ether	690	U	690	
637-92-3	Ethyl tert-Butyl Ether	690	U	690	
100-41-4	Ethylbenzene	690	U	690	
87-68-3	Hexachlorobutadiene	690	U	690	
98-82-8	Isopropylbenzene (Cumene)	690	U	690	
1634-04-4	Methyl tert-Butyl Ether	690	U	690	
91-20-3	Naphthalene	690	U	690	
100-42-5	Styrene	690	U	690	
127-18-4	Tetrachloroethene (PCE)	690	U	690	
109-99-9	Tetrahydrofuran (THF)	690	U	690	
108-88-3	Toluene	690	U	690	
79-01-6	Trichloroethene (TCE)	690	U	690	
75-69-4	Trichlorofluoromethane (CFC 11)	690	U	690	
75-01-4	Vinyl Chloride	690	U	690	
156-59-2	cis-1,2-Dichloroethene	690	U	690	
10061-01-5	cis-1,3-Dichloropropene	690	U	690	
179601-23-1	m,p-Xylenes	1400	U	1400	
104-51-8	n-Butylbenzene	690	U	690	
103-65-1	n-Propylbenzene	690	U	690	
95-47-6	o-Xylene	690	U	690	
135-98-8	sec-Butylbenzene	690	U	690	
994-05-8	tert-Amyl Methyl Ether	690	U	690	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 2/12 1000
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Analyzed:	8/13/12 17:05
Sample Name:	Trench 1 (Sanding Room)	**Units:**	µg/Kg
Lab Code:	R1205125-001	**Basis:**	Dry
		Percent Solids:	89.0

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	304683
Data File Name:	J:\ACQUDATA\msvoa10\data\081312\E2504.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	122

CAS No.	Analyte Name	Result	Q	MRL	Note
98-06-6	tert-Butylbenzene	690	U	690	
156-60-5	trans-1,2-Dichloroethene	690	U	690	
10061-02-6	trans-1,3-Dichloropropene	690	U	690	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	105	70-130	8/13/12 17:05	
Dibromofluoromethane	98	70-130	8/13/12 17:05	
Toluene-d8	101	70-130	8/13/12 17:05	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 2/12 1200
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
Sample Name:	Trench 2 (Shipping)		
Lab Code:	R1205125-002	**Basis:**	NA

General Chemistry Parameters

Analyte Name	Method	Result	Q	Units	MRL	Dilution Factor	Date Extracted	Date Analyzed	Note
Solids, Total	160.3 Modified	**92.7**		Percent	1.0	1	NA	8/10/12 14:32	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 2/12 1200
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Analyzed:	8/13/12 17:35
Sample Name:	Trench 2 (Shipping)	**Units:**	µg/Kg
Lab Code:	R1205125-002	**Basis:**	Dry
		Percent Solids:	92.7

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	304683
Data File Name:	J:\ACQUDATA\msvoa10\data\081312\E2505.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	86

CAS No.	Analyte Name	Result	Q	MRL	Note
630-20-6	1,1,1,2-Tetrachloroethane	460	U	460	
71-55-6	1,1,1-Trichloroethane (TCA)	460	U	460	
79-34-5	1,1,2,2-Tetrachloroethane	460	U	460	
79-00-5	1,1,2-Trichloroethane	460	U	460	
75-34-3	1,1-Dichloroethane (1,1-DCA)	460	U	460	
75-35-4	1,1-Dichloroethene (1,1-DCE)	460	U	460	
563-58-6	1,1-Dichloropropene	460	U	460	
87-61-6	1,2,3-Trichlorobenzene	460	U	460	
96-18-4	1,2,3-Trichloropropane	460	U	460	
120-82-1	1,2,4-Trichlorobenzene	460	U	460	
95-63-6	1,2,4-Trimethylbenzene	460	U	460	
96-12-8	1,2-Dibromo-3-chloropropane (DBCP)	460	U	460	
106-93-4	1,2-Dibromoethane	460	U	460	
95-50-1	1,2-Dichlorobenzene	460	U	460	
107-06-2	1,2-Dichloroethane	460	U	460	
78-87-5	1,2-Dichloropropane	460	U	460	
108-67-8	1,3,5-Trimethylbenzene	460	U	460	
541-73-1	1,3-Dichlorobenzene	460	U	460	
142-28-9	1,3-Dichloropropane	460	U	460	
106-46-7	1,4-Dichlorobenzene	460	U	460	
123-91-1	1,4-Dioxane	9300	U	9300	
594-20-7	2,2-Dichloropropane	460	U	460	
78-93-3	2-Butanone (MEK)	460	U	460	
95-49-8	2-Chlorotoluene	460	U	460	
591-78-6	2-Hexanone	460	U	460	
106-43-4	4-Chlorotoluene	460	U	460	
99-87-6	p-Isopropyltoluene	460	U	460	
108-10-1	4-Methyl-2-pentanone	460	U	460	
67-64-1	Acetone	460	U	460	
71-43-2	Benzene	460	U	460	
108-86-1	Bromobenzene	460	U	460	
74-97-5	Bromochloromethane	460	U	460	
75-27-4	Bromodichloromethane	460	U	460	
75-25-2	Bromoform	460	U	460	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 2/12 1200
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Analyzed:	8/13/12 17:35
Sample Name:	Trench 2 (Shipping)	**Units:**	µg/Kg
Lab Code:	R1205125-002	**Basis:**	Dry
		Percent Solids:	92.7

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	304683
Data File Name:	J:\ACQUDATA\msvoa10\data\081312\E2505.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	86

CAS No.	Analyte Name	Result	Q	MRL	Note
74-83-9	Bromomethane	460	U	460	
75-15-0	Carbon Disulfide	460	U	460	
56-23-5	Carbon Tetrachloride	460	U	460	
108-90-7	Chlorobenzene	460	U	460	
75-00-3	Chloroethane	460	U	460	
67-66-3	Chloroform	460	U	460	
74-87-3	Chloromethane	460	U	460	
124-48-1	Dibromochloromethane	460	U	460	
74-95-3	Dibromomethane	460	U	460	
75-71-8	Dichlorodifluoromethane (CFC 12)	460	U	460	
75-09-2	Dichloromethane	460	U	460	
60-29-7	Diethyl Ether	460	U	460	
108-20-3	Diisopropyl Ether	460	U	460	
637-92-3	Ethyl tert-Butyl Ether	460	U	460	
100-41-4	Ethylbenzene	460	U	460	
87-68-3	Hexachlorobutadiene	460	U	460	
98-82-8	Isopropylbenzene (Cumene)	460	U	460	
1634-04-4	Methyl tert-Butyl Ether	460	U	460	
91-20-3	Naphthalene	460	U	460	
100-42-5	Styrene	460	U	460	
127-18-4	Tetrachloroethene (PCE)	460	U	460	
109-99-9	Tetrahydrofuran (THF)	460	U	460	
108-88-3	Toluene	460	U	460	
79-01-6	Trichloroethene (TCE)	460	U	460	
75-69-4	Trichlorofluoromethane (CFC 11)	460	U	460	
75-01-4	Vinyl Chloride	460	U	460	
156-59-2	cis-1,2-Dichloroethene	460	U	460	
10061-01-5	cis-1,3-Dichloropropene	460	U	460	
179601-23-1	m,p-Xylenes	930	U	930	
104-51-8	n-Butylbenzene	460	U	460	
103-65-1	n-Propylbenzene	460	U	460	
95-47-6	o-Xylene	460	U	460	
135-98-8	sec-Butylbenzene	460	U	460	
994-05-8	tert-Amyl Methyl Ether	460	U	460	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 2/12 1200
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Analyzed:	8/13/12 17:35
Sample Name:	Trench 2 (Shipping)	**Units:**	µg/Kg
Lab Code:	R1205125-002	**Basis:**	Dry
		Percent Solids:	92.7

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	304683
Data File Name:	J:\ACQUDATA\msvoa10\data\081312\E2505.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	86

CAS No.	Analyte Name	Result	Q	MRL	Note
98-06-6	tert-Butylbenzene	460	U	460	
156-60-5	trans-1,2-Dichloroethene	460	U	460	
10061-02-6	trans-1,3-Dichloropropene	460	U	460	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	105	70-130	8/13/12 17:35	
Dibromofluoromethane	97	70-130	8/13/12 17:35	
Toluene-d8	101	70-130	8/13/12 17:35	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 3/12 1320
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
Sample Name:	Roll Off		
Lab Code:	R1205125-003	**Basis:**	As Received

General Chemistry Parameters

Analyte Name	Method	Result	Q	Units	MRL	Dilution Factor	Date Extracted	Date Analyzed	Note
Solids, Total	160.3 Modified	**82.7**		Percent	1.0	1	NA	8/10/12 14:32	

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Collected: 8/ 3/12 1320
Date Received: 8/ 8/12

Sample Name: Roll Off
Lab Code: R1205125-003

Basis: Dry
Percent Solids: 82.7

Inorganic Parameters

Analyte Name	Method	Result	Q	Units	MRL	Dilution Factor	Date Extracted	Date Analyzed	Note
Arsenic, Total	6010C	**6.7**		mg/Kg	1.2	1	8/16/12	8/22/12 14:17	
Barium, Total	6010C	**27.7**		mg/Kg	2.4	1	8/16/12	8/22/12 14:17	
Cadmium, Total	6010C	0.60	U	mg/Kg	0.60	1	8/16/12	8/22/12 14:17	
Chromium, Total	6010C	**15.7**		mg/Kg	1.2	1	8/16/12	8/22/12 14:17	
Lead, Total	6010C	**7.4**		mg/Kg	6.0	1	8/16/12	8/22/12 14:17	
Mercury, Total	7471B	0.040	U	mg/Kg	0.040	1	8/21/12	8/22/12 09:01	
Selenium, Total	6010C	1.2	U	mg/Kg	1.2	1	8/16/12	8/22/12 14:17	
Silver, Total	6010C	1.2	U	mg/Kg	1.2	1	8/16/12	8/22/12 14:17	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 3/12 1320
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Analyzed:	8/16/12 18:24
Sample Name:	Roll Off	**Units:**	µg/Kg
Lab Code:	R1205125-003	**Basis:**	Dry
		Percent Solids:	82.7

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	305295
Data File Name:	J:\ACQUDATA\msvoa10\data\081612\E2603.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	133.5

CAS No.	Analyte Name	Result	Q	MRL	Note
630-20-6	1,1,1,2-Tetrachloroethane	810	U	810	
71-55-6	1,1,1-Trichloroethane (TCA)	810	U	810	
79-34-5	1,1,2,2-Tetrachloroethane	810	U	810	
79-00-5	1,1,2-Trichloroethane	810	U	810	
75-34-3	1,1-Dichloroethane (1,1-DCA)	810	U	810	
75-35-4	1,1-Dichloroethene (1,1-DCE)	810	U	810	
563-58-6	1,1-Dichloropropene	810	U	810	
87-61-6	1,2,3-Trichlorobenzene	810	U	810	
96-18-4	1,2,3-Trichloropropane	810	U	810	
120-82-1	1,2,4-Trichlorobenzene	810	U	810	
95-63-6	1,2,4-Trimethylbenzene	**6700**		810	
96-12-8	1,2-Dibromo-3-chloropropane (DBCP)	810	U	810	
106-93-4	1,2-Dibromoethane	810	U	810	
95-50-1	1,2-Dichlorobenzene	810	U	810	
107-06-2	1,2-Dichloroethane	810	U	810	
78-87-5	1,2-Dichloropropane	810	U	810	
108-67-8	1,3,5-Trimethylbenzene	**1700**		810	
541-73-1	1,3-Dichlorobenzene	810	U	810	
142-28-9	1,3-Dichloropropane	810	U	810	
106-46-7	1,4-Dichlorobenzene	810	U	810	
123-91-1	1,4-Dioxane	16000	U	16000	
594-20-7	2,2-Dichloropropane	810	U	810	
78-93-3	2-Butanone (MEK)	810	U	810	
95-49-8	2-Chlorotoluene	810	U	810	
591-78-6	2-Hexanone	810	U	810	
106-43-4	4-Chlorotoluene	810	U	810	
99-87-6	p-Isopropyltoluene	810	U	810	
108-10-1	4-Methyl-2-pentanone	810	U	810	
67-64-1	Acetone	810	U	810	
71-43-2	Benzene	810	U	810	
108-86-1	Bromobenzene	810	U	810	
74-97-5	Bromochloromethane	810	U	810	
75-27-4	Bromodichloromethane	810	U	810	
75-25-2	Bromoform	810	U	810	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 3/12 1320
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Analyzed:	8/16/12 18:24
Sample Name:	Roll Off	**Units:**	µg/Kg
Lab Code:	R1205125-003	**Basis:**	Dry
		Percent Solids:	82.7

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	305295
Data File Name:	J:\ACQUDATA\msvoa10\data\081612\E2603.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	133.5

CAS No.	Analyte Name	Result	Q	MRL	Note
74-83-9	Bromomethane	810	U	810	
75-15-0	Carbon Disulfide	810	U	810	
56-23-5	Carbon Tetrachloride	810	U	810	
108-90-7	Chlorobenzene	810	U	810	
75-00-3	Chloroethane	810	U	810	
67-66-3	Chloroform	810	U	810	
74-87-3	Chloromethane	810	U	810	
124-48-1	Dibromochloromethane	810	U	810	
74-95-3	Dibromomethane	810	U	810	
75-71-8	Dichlorodifluoromethane (CFC 12)	810	U	810	
75-09-2	Dichloromethane	810	U	810	
60-29-7	Diethyl Ether	810	U	810	
108-20-3	Diisopropyl Ether	810	U	810	
637-92-3	Ethyl tert-Butyl Ether	810	U	810	
100-41-4	Ethylbenzene	810	U	810	
87-68-3	Hexachlorobutadiene	810	U	810	
98-82-8	Isopropylbenzene (Cumene)	810	U	810	
1634-04-4	Methyl tert-Butyl Ether	810	U	810	
91-20-3	Naphthalene	**6200**		810	
100-42-5	Styrene	810	U	810	
127-18-4	Tetrachloroethene (PCE)	810	U	810	
109-99-9	Tetrahydrofuran (THF)	810	U	810	
108-88-3	Toluene	810	U	810	
79-01-6	Trichloroethene (TCE)	810	U	810	
75-69-4	Trichlorofluoromethane (CFC 11)	810	U	810	
75-01-4	Vinyl Chloride	810	U	810	
156-59-2	cis-1,2-Dichloroethene	810	U	810	
10061-01-5	cis-1,3-Dichloropropene	810	U	810	
179601-23-1	m,p-Xylenes	**1700**		1600	
104-51-8	n-Butylbenzene	**1500**		810	
103-65-1	n-Propylbenzene	810	U	810	
95-47-6	o-Xylene	**980**		810	
135-98-8	sec-Butylbenzene	810	U	810	
994-05-8	tert-Amyl Methyl Ether	810	U	810	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 3/12 1320
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Analyzed:	8/16/12 18:24
Sample Name:	Roll Off	**Units:**	µg/Kg
Lab Code:	R1205125-003	**Basis:**	Dry
		Percent Solids:	82.7

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	305295
Data File Name:	J:\ACQUDATA\msvoa10\data\081612\E2603.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	133.5

CAS No.	Analyte Name	Result	Q	MRL	Note
98-06-6	tert-Butylbenzene	810	U	810	
156-60-5	trans-1,2-Dichloroethene	810	U	810	
10061-02-6	trans-1,3-Dichloropropene	810	U	810	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	102	70-130	8/16/12 18:24	
Dibromofluoromethane	95	70-130	8/16/12 18:24	
Toluene-d8	101	70-130	8/16/12 18:24	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 3/12 1320
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Extracted:	8/9/12
		Date Analyzed:	8/10/12 15:36
Sample Name:	Roll Off	**Units:**	µg/Kg
Lab Code:	R1205125-003	**Basis:**	Dry
		Percent Solids:	82.7

Semivolatile Organic Compounds by GC/MS

Analytical Method:	8270D	**Analysis Lot:**	304562
Prep Method:	EPA 3541	**Extraction Lot:**	164317
Data File Name:	J:\ACQUDATA\5973D\DATA\081012\AL227.D\	**Instrument Name:**	R-MS-54
		Dilution Factor:	1

CAS No.	Analyte Name	Result	Q	MRL	Note
120-82-1	1,2,4-Trichlorobenzene	400	U	400	
95-50-1	1,2-Dichlorobenzene	400	U	400	
541-73-1	1,3-Dichlorobenzene	400	U	400	
106-46-7	1,4-Dichlorobenzene	400	U	400	
95-95-4	2,4,5-Trichlorophenol	400	U	400	
88-06-2	2,4,6-Trichlorophenol	400	U	400	
120-83-2	2,4-Dichlorophenol	400	U	400	
105-67-9	2,4-Dimethylphenol	400	U	400	
51-28-5	2,4-Dinitrophenol	2100	U	2100	
121-14-2	2,4-Dinitrotoluene	400	U	400	
606-20-2	2,6-Dinitrotoluene	400	U	400	
91-58-7	2-Chloronaphthalene	400	U	400	
95-57-8	2-Chlorophenol	400	U	400	
91-57-6	2-Methylnaphthalene	**4500**		400	
95-48-7	2-Methylphenol	400	U	400	
88-74-4	2-Nitroaniline	2100	U	2100	
88-75-5	2-Nitrophenol	400	U	400	
91-94-1	3,3'-Dichlorobenzidine	400	U	400	
	3- and 4-Methylphenol Coelution	400	U	400	
99-09-2	3-Nitroaniline	2100	U	2100	
534-52-1	4,6-Dinitro-2-methylphenol	2100	U	2100	
101-55-3	4-Bromophenyl Phenyl Ether	400	U	400	
59-50-7	4-Chloro-3-methylphenol	400	U	400	
106-47-8	4-Chloroaniline	400	U	400	
7005-72-3	4-Chlorophenyl Phenyl Ether	400	U	400	
100-01-6	4-Nitroaniline	2100	U	2100	
100-02-7	4-Nitrophenol	2100	U	2100	
83-32-9	Acenaphthene	**600**		400	
208-96-8	Acenaphthylene	400	U	400	
120-12-7	Anthracene	400	U	400	
56-55-3	Benz(a)anthracene	400	U	400	
50-32-8	Benzo(a)pyrene	400	U	400	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 3/12 1320
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Extracted:	8/9/12
		Date Analyzed:	8/10/12 15:36
Sample Name:	Roll Off	**Units:**	µg/Kg
Lab Code:	R1205125-003	**Basis:**	Dry
		Percent Solids:	82.7

Semivolatile Organic Compounds by GC/MS

Analytical Method:	8270D	**Analysis Lot:**	304562
Prep Method:	EPA 3541	**Extraction Lot:**	164317
Data File Name:	J:\ACQUDATA\5973D\DATA\081012\AL227.D\	**Instrument Name:**	R-MS-54
		Dilution Factor:	1

CAS No.	Analyte Name	Result	Q	MRL	Note
205-99-2	Benzo(b)fluoranthene	400	U	400	
191-24-2	Benzo(g,h,i)perylene	400	U	400	
207-08-9	Benzo(k)fluoranthene	400	U	400	
100-51-6	Benzyl Alcohol	400	U	400	
108-60-1	2,2'-Oxybis(1-chloropropane)	400	U	400	
111-91-1	Bis(2-chloroethoxy)methane	400	U	400	
111-44-4	Bis(2-chloroethyl) Ether	400	U	400	
117-81-7	Bis(2-ethylhexyl) Phthalate	400	U	400	
85-68-7	Butyl Benzyl Phthalate	400	U	400	
86-74-8	Carbazole	400	U	400	
218-01-9	Chrysene	400	U	400	
84-74-2	Di-n-butyl Phthalate	400	U	400	
117-84-0	Di-n-octyl Phthalate	400	U	400	
53-70-3	Dibenz(a,h)anthracene	400	U	400	
132-64-9	Dibenzofuran	400	U	400	
84-66-2	Diethyl Phthalate	400	U	400	
131-11-3	Dimethyl Phthalate	400	U	400	
206-44-0	Fluoranthene	400	U	400	
86-73-7	Fluorene	**920**		400	
118-74-1	Hexachlorobenzene	400	U	400	
87-68-3	Hexachlorobutadiene	400	U	400	
77-47-4	Hexachlorocyclopentadiene	400	U	400	
67-72-1	Hexachloroethane	400	U	400	
193-39-5	Indeno(1,2,3-cd)pyrene	400	U	400	
78-59-1	Isophorone	400	U	400	
621-64-7	N-Nitrosodi-n-propylamine	400	U	400	
62-75-9	N-Nitrosodimethylamine	400	U	400	
86-30-6	N-Nitrosodiphenylamine	400	U	400	
91-20-3	Naphthalene	400	U	400	
98-95-3	Nitrobenzene	400	U	400	
87-86-5	Pentachlorophenol (PCP)	2100	U	2100	
85-01-8	Phenanthrene	**2700**		400	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 3/12 1320
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Extracted:	8/9/12
		Date Analyzed:	8/10/12 15:36
Sample Name:	Roll Off	**Units:**	µg/Kg
Lab Code:	R1205125-003	**Basis:**	Dry
		Percent Solids:	82.7

Semivolatile Organic Compounds by GC/MS

Analytical Method:	8270D	**Analysis Lot:**	304562
Prep Method:	EPA 3541	**Extraction Lot:**	164317
Data File Name:	J:\ACQUDATA\5973D\DATA\081012\AL227.D\	**Instrument Name:**	R-MS-54
		Dilution Factor:	1

CAS No.	Analyte Name	Result	Q	MRL	Note
108-95-2	Phenol	400	U	400	
129-00-0	Pyrene	400	U	400	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	85	30-130	8/10/12 15:36	
2-Fluorobiphenyl	75	30-130	8/10/12 15:36	
2-Fluorophenol	75	30-130	8/10/12 15:36	
Nitrobenzene-d5	78	30-130	8/10/12 15:36	
Phenol-d6	87	30-130	8/10/12 15:36	
p-Terphenyl-d14	111	30-130	8/10/12 15:36	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	8/ 3/12 1320
Sample Matrix:	Soil	**Date Received:**	8/ 8/12
		Date Extracted:	8/13/12
		Date Analyzed:	8/15/12 02:03
Sample Name:	Roll Off	**Units:**	µg/Kg
Lab Code:	R1205125-003	**Basis:**	Dry
		Percent Solids:	82.7

Polychlorinated Biphenyls (PCBs) by GC

Analytical Method:	8082A	**Analysis Lot:**	305036
Prep Method:	EPA 3541	**Extraction Lot:**	164560
Data File Name:	J:\ACQUDATA\6890G\DATA\081412\AS185.D\	**Instrument Name:**	R-GC-58
		Dilution Factor:	1

CAS No.	Analyte Name	Result	Q	MRL	Note
12674-11-2	Aroclor 1016	40	U	40	
11104-28-2	Aroclor 1221	81	U	81	
11141-16-5	Aroclor 1232	40	U	40	
53469-21-9	Aroclor 1242	40	U	40	
12672-29-6	Aroclor 1248	40	U	40	
11097-69-1	Aroclor 1254	40	U	40	
11096-82-5	Aroclor 1260	40	U	40	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
Decachlorobiphenyl	59	30-150	8/15/12 02:03	
Tetrachloro-m-xylene	44	30-150	8/15/12 02:03	

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Collected: 8/ 3/12 1320
Date Received: 8/ 8/12
Pre-Prep Date: 8/10/12

Sample Name: Roll Off
Lab Code: R1205125-004

Basis: As Received

Toxicity Characteristics Leachate Procedure (TCLP)
Inorganic Parameters

Pre-Prep Method: EPA 1311

Analyte Name	Method	Result	Q	Units	MRL	Dilution Factor	Date Extracted	Date Analyzed	Note
Arsenic	6010C	0.50	U	mg/L	0.50	1	8/16/12	8/22/12 16:06	
Barium	6010C	1.0	U	mg/L	1.0	1	8/16/12	8/22/12 16:06	
Cadmium	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 16:06	
Chromium	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 16:06	
Lead	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 16:06	
Mercury	7470A	0.00030	U	mg/L	0.00030	1	8/17/12	8/17/12 15:05	
Selenium	6010C	0.50	U	mg/L	0.50	1	8/16/12	8/22/12 16:06	
Silver	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 16:06	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank		
Lab Code:	R1205125-MB	**Basis:**	As Received

General Chemistry Parameters

Analyte Name	Method	Result	Q	Units	MRL	Dilution Factor	Date Extracted	Date Analyzed	Note
Solids, Total	160.3 Modified	1.0	U	Percent	1.0	1	NA	8/10/12 14:32	

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Collected: NA
Date Received: NA
Pre-Prep Date: 8/10/12

Sample Name: Method Blank
Lab Code: R1205125-MB1

Basis: As Received

Toxicity Characteristics Leachate Procedure (TCLP)
Inorganic Parameters

Pre-Prep Method: EPA 1311

Analyte Name	Method	Result	Q	Units	MRL	Dilution Factor	Date Extracted	Date Analyzed	Note
Arsenic	6010C	0.50	U	mg/L	0.50	1	8/16/12	8/22/12 15:37	
Barium	6010C	1.0	U	mg/L	1.0	1	8/16/12	8/22/12 15:37	
Cadmium	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 15:37	
Chromium	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 15:37	
Lead	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 15:37	
Mercury	7470A	0.00030	U	mg/L	0.00030	1	8/17/12	8/17/12 15:03	
Selenium	6010C	0.50	U	mg/L	0.50	1	8/16/12	8/22/12 15:37	
Silver	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 15:37	

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Collected: NA
Date Received: NA

Sample Name: Method Blank
Lab Code: R1205125-MB2

Basis: As Received

Inorganic Parameters

Analyte Name	Method	Result	Q	Units	MRL	Dilution Factor	Date Extracted	Date Analyzed	Note
Arsenic	6010C	0.50	U	mg/L	0.50	1	8/16/12	8/22/12 15:43	
Barium	6010C	1.0	U	mg/L	1.0	1	8/16/12	8/22/12 15:43	
Cadmium	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 15:43	
Chromium	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 15:43	
Lead	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 15:43	
Mercury	7470A	0.00030	U	mg/L	0.00030	1	8/17/12	8/17/12 14:59	
Selenium	6010C	0.50	U	mg/L	0.50	1	8/16/12	8/22/12 15:43	
Silver	6010C	0.10	U	mg/L	0.10	1	8/16/12	8/22/12 15:43	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
Sample Name:	Method Blank		
Lab Code:	R1205125-MB2	**Basis:**	Dry

Inorganic Parameters

Analyte Name	Method	Result	Q	Units	MRL	Dilution Factor	Date Extracted	Date Analyzed	Note
Arsenic, Total	6010C	1.0	U	mg/Kg	1.0	1	8/16/12	8/22/12 13:33	
Barium, Total	6010C	2.0	U	mg/Kg	2.0	1	8/16/12	8/22/12 13:33	
Cadmium, Total	6010C	0.50	U	mg/Kg	0.50	1	8/16/12	8/22/12 13:33	
Chromium, Total	6010C	1.0	U	mg/Kg	1.0	1	8/16/12	8/22/12 13:33	
Lead, Total	6010C	5.0	U	mg/Kg	5.0	1	8/16/12	8/22/12 13:33	
Mercury, Total	7471B	0.033	U	mg/Kg	0.033	1	8/21/12	8/22/12 08:58	
Selenium, Total	6010C	1.0	U	mg/Kg	1.0	1	8/16/12	8/22/12 13:33	
Silver, Total	6010C	1.0	U	mg/Kg	1.0	1	8/16/12	8/22/12 13:33	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	8/13/12 13:06
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209521-01	**Basis:**	Dry

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	304683
Data File Name:	J:\ACQUDATA\msvoa10\data\081312\E2496.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	50

CAS No.	Analyte Name	Result	Q	MRL	Note
630-20-6	1,1,1,2-Tetrachloroethane	250	U	250	
71-55-6	1,1,1-Trichloroethane (TCA)	250	U	250	
79-34-5	1,1,2,2-Tetrachloroethane	250	U	250	
79-00-5	1,1,2-Trichloroethane	250	U	250	
75-34-3	1,1-Dichloroethane (1,1-DCA)	250	U	250	
75-35-4	1,1-Dichloroethene (1,1-DCE)	250	U	250	
563-58-6	1,1-Dichloropropene	250	U	250	
87-61-6	1,2,3-Trichlorobenzene	250	U	250	
96-18-4	1,2,3-Trichloropropane	250	U	250	
120-82-1	1,2,4-Trichlorobenzene	250	U	250	
95-63-6	1,2,4-Trimethylbenzene	250	U	250	
96-12-8	1,2-Dibromo-3-chloropropane (DBCP)	250	U	250	
106-93-4	1,2-Dibromoethane	250	U	250	
95-50-1	1,2-Dichlorobenzene	250	U	250	
107-06-2	1,2-Dichloroethane	250	U	250	
78-87-5	1,2-Dichloropropane	250	U	250	
108-67-8	1,3,5-Trimethylbenzene	250	U	250	
541-73-1	1,3-Dichlorobenzene	250	U	250	
142-28-9	1,3-Dichloropropane	250	U	250	
106-46-7	1,4-Dichlorobenzene	250	U	250	
123-91-1	1,4-Dioxane	5000	U	5000	
594-20-7	2,2-Dichloropropane	250	U	250	
78-93-3	2-Butanone (MEK)	250	U	250	
95-49-8	2-Chlorotoluene	250	U	250	
591-78-6	2-Hexanone	250	U	250	
106-43-4	4-Chlorotoluene	250	U	250	
99-87-6	p-Isopropyltoluene	250	U	250	
108-10-1	4-Methyl-2-pentanone	250	U	250	
67-64-1	Acetone	250	U	250	
71-43-2	Benzene	250	U	250	
108-86-1	Bromobenzene	250	U	250	
74-97-5	Bromochloromethane	250	U	250	
75-27-4	Bromodichloromethane	250	U	250	
75-25-2	Bromoform	250	U	250	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	8/13/12 13:06
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209521-01	**Basis:**	Dry

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	304683
Data File Name:	J:\ACQUDATA\msvoa10\data\081312\E2496.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	50

CAS No.	Analyte Name	Result	Q	MRL	Note
74-83-9	Bromomethane	250	U	250	
75-15-0	Carbon Disulfide	250	U	250	
56-23-5	Carbon Tetrachloride	250	U	250	
108-90-7	Chlorobenzene	250	U	250	
75-00-3	Chloroethane	250	U	250	
67-66-3	Chloroform	250	U	250	
74-87-3	Chloromethane	250	U	250	
124-48-1	Dibromochloromethane	250	U	250	
74-95-3	Dibromomethane	250	U	250	
75-71-8	Dichlorodifluoromethane (CFC 12)	250	U	250	
75-09-2	Dichloromethane	250	U	250	
60-29-7	Diethyl Ether	250	U	250	
108-20-3	Diisopropyl Ether	250	U	250	
637-92-3	Ethyl tert-Butyl Ether	250	U	250	
100-41-4	Ethylbenzene	250	U	250	
87-68-3	Hexachlorobutadiene	250	U	250	
98-82-8	Isopropylbenzene (Cumene)	250	U	250	
1634-04-4	Methyl tert-Butyl Ether	250	U	250	
91-20-3	Naphthalene	250	U	250	
100-42-5	Styrene	250	U	250	
127-18-4	Tetrachloroethene (PCE)	250	U	250	
109-99-9	Tetrahydrofuran (THF)	250	U	250	
108-88-3	Toluene	250	U	250	
79-01-6	Trichloroethene (TCE)	250	U	250	
75-69-4	Trichlorofluoromethane (CFC 11)	250	U	250	
75-01-4	Vinyl Chloride	250	U	250	
156-59-2	cis-1,2-Dichloroethene	250	U	250	
10061-01-5	cis-1,3-Dichloropropene	250	U	250	
179601-23-1	m,p-Xylenes	500	U	500	
104-51-8	n-Butylbenzene	250	U	250	
103-65-1	n-Propylbenzene	250	U	250	
95-47-6	o-Xylene	250	U	250	
135-98-8	sec-Butylbenzene	250	U	250	
994-05-8	tert-Amyl Methyl Ether	250	U	250	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	8/13/12 13:06
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209521-01	**Basis:**	Dry

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	304683
Data File Name:	J:\ACQUDATA\msvoa10\data\081312\E2496.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	50

CAS No.	Analyte Name	Result	Q	MRL	Note
98-06-6	tert-Butylbenzene	250	U	250	
156-60-5	trans-1,2-Dichloroethene	250	U	250	
10061-02-6	trans-1,3-Dichloropropene	250	U	250	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	104	70-130	8/13/12 13:06	
Dibromofluoromethane	99	70-130	8/13/12 13:06	
Toluene-d8	102	70-130	8/13/12 13:06	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	8/16/12 15:55
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209639-01	**Basis:**	Dry

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	305295
Data File Name:	J:\ACQUDATA\msvoa10\data\081612\E2598.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	50

CAS No.	Analyte Name	Result	Q	MRL	Note
630-20-6	1,1,1,2-Tetrachloroethane	250	U	250	
71-55-6	1,1,1-Trichloroethane (TCA)	250	U	250	
79-34-5	1,1,2,2-Tetrachloroethane	250	U	250	
79-00-5	1,1,2-Trichloroethane	250	U	250	
75-34-3	1,1-Dichloroethane (1,1-DCA)	250	U	250	
75-35-4	1,1-Dichloroethene (1,1-DCE)	250	U	250	
563-58-6	1,1-Dichloropropene	250	U	250	
87-61-6	1,2,3-Trichlorobenzene	250	U	250	
96-18-4	1,2,3-Trichloropropane	250	U	250	
120-82-1	1,2,4-Trichlorobenzene	250	U	250	
95-63-6	1,2,4-Trimethylbenzene	250	U	250	
96-12-8	1,2-Dibromo-3-chloropropane (DBCP)	250	U	250	
106-93-4	1,2-Dibromoethane	250	U	250	
95-50-1	1,2-Dichlorobenzene	250	U	250	
107-06-2	1,2-Dichloroethane	250	U	250	
78-87-5	1,2-Dichloropropane	250	U	250	
108-67-8	1,3,5-Trimethylbenzene	250	U	250	
541-73-1	1,3-Dichlorobenzene	250	U	250	
142-28-9	1,3-Dichloropropane	250	U	250	
106-46-7	1,4-Dichlorobenzene	250	U	250	
123-91-1	1,4-Dioxane	5000	U	5000	
594-20-7	2,2-Dichloropropane	250	U	250	
78-93-3	2-Butanone (MEK)	250	U	250	
95-49-8	2-Chlorotoluene	250	U	250	
591-78-6	2-Hexanone	250	U	250	
106-43-4	4-Chlorotoluene	250	U	250	
99-87-6	p-Isopropyltoluene	250	U	250	
108-10-1	4-Methyl-2-pentanone	250	U	250	
67-64-1	Acetone	250	U	250	
71-43-2	Benzene	250	U	250	
108-86-1	Bromobenzene	250	U	250	
74-97-5	Bromochloromethane	250	U	250	
75-27-4	Bromodichloromethane	250	U	250	
75-25-2	Bromoform	250	U	250	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	8/16/12 15:55
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209639-01	**Basis:**	Dry

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	305295
Data File Name:	J:\ACQUDATA\msvoa10\data\081612\E2598.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	50

CAS No.	Analyte Name	Result	Q	MRL	Note
74-83-9	Bromomethane	250	U	250	
75-15-0	Carbon Disulfide	250	U	250	
56-23-5	Carbon Tetrachloride	250	U	250	
108-90-7	Chlorobenzene	250	U	250	
75-00-3	Chloroethane	250	U	250	
67-66-3	Chloroform	250	U	250	
74-87-3	Chloromethane	250	U	250	
124-48-1	Dibromochloromethane	250	U	250	
74-95-3	Dibromomethane	250	U	250	
75-71-8	Dichlorodifluoromethane (CFC 12)	250	U	250	
75-09-2	Dichloromethane	250	U	250	
60-29-7	Diethyl Ether	250	U	250	
108-20-3	Diisopropyl Ether	250	U	250	
637-92-3	Ethyl tert-Butyl Ether	250	U	250	
100-41-4	Ethylbenzene	250	U	250	
87-68-3	Hexachlorobutadiene	250	U	250	
98-82-8	Isopropylbenzene (Cumene)	250	U	250	
1634-04-4	Methyl tert-Butyl Ether	250	U	250	
91-20-3	Naphthalene	250	U	250	
100-42-5	Styrene	250	U	250	
127-18-4	Tetrachloroethene (PCE)	250	U	250	
109-99-9	Tetrahydrofuran (THF)	250	U	250	
108-88-3	Toluene	250	U	250	
79-01-6	Trichloroethene (TCE)	250	U	250	
75-69-4	Trichlorofluoromethane (CFC 11)	250	U	250	
75-01-4	Vinyl Chloride	250	U	250	
156-59-2	cis-1,2-Dichloroethene	250	U	250	
10061-01-5	cis-1,3-Dichloropropene	250	U	250	
179601-23-1	m,p-Xylenes	500	U	500	
104-51-8	n-Butylbenzene	250	U	250	
103-65-1	n-Propylbenzene	250	U	250	
95-47-6	o-Xylene	250	U	250	
135-98-8	sec-Butylbenzene	250	U	250	
994-05-8	tert-Amyl Methyl Ether	250	U	250	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Analyzed:	8/16/12 15:55
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209639-01	**Basis:**	Dry

Volatile Organic Compounds by GC/MS

Analytical Method:	8260C	**Analysis Lot:**	305295
Data File Name:	J:\ACQUDATA\msvoa10\data\081612\E2598.D\	**Instrument Name:**	R-MS-10
		Dilution Factor:	50

CAS No.	Analyte Name	Result	Q	MRL	Note
98-06-6	tert-Butylbenzene	250	U	250	
156-60-5	trans-1,2-Dichloroethene	250	U	250	
10061-02-6	trans-1,3-Dichloropropene	250	U	250	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
4-Bromofluorobenzene	101	70-130	8/16/12 15:55	
Dibromofluoromethane	97	70-130	8/16/12 15:55	
Toluene-d8	100	70-130	8/16/12 15:55	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Extracted:	8/9/12
		Date Analyzed:	8/10/12 13:25
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209159-01	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS

Analytical Method:	8270D	**Analysis Lot:**	304562
Prep Method:	EPA 3541	**Extraction Lot:**	164317
Data File Name:	J:\ACQUDATA\5973D\DATA\081012\AL224.D\	**Instrument Name:**	R-MS-54
		Dilution Factor:	1

CAS No.	Analyte Name	Result	Q	MRL	Note
120-82-1	1,2,4-Trichlorobenzene	330	U	330	
95-50-1	1,2-Dichlorobenzene	330	U	330	
541-73-1	1,3-Dichlorobenzene	330	U	330	
106-46-7	1,4-Dichlorobenzene	330	U	330	
95-95-4	2,4,5-Trichlorophenol	330	U	330	
88-06-2	2,4,6-Trichlorophenol	330	U	330	
120-83-2	2,4-Dichlorophenol	330	U	330	
105-67-9	2,4-Dimethylphenol	330	U	330	
51-28-5	2,4-Dinitrophenol	1700	U	1700	
121-14-2	2,4-Dinitrotoluene	330	U	330	
606-20-2	2,6-Dinitrotoluene	330	U	330	
91-58-7	2-Chloronaphthalene	330	U	330	
95-57-8	2-Chlorophenol	330	U	330	
91-57-6	2-Methylnaphthalene	330	U	330	
95-48-7	2-Methylphenol	330	U	330	
88-74-4	2-Nitroaniline	1700	U	1700	
88-75-5	2-Nitrophenol	330	U	330	
91-94-1	3,3'-Dichlorobenzidine	330	U	330	
	3- and 4-Methylphenol Coelution	330	U	330	
99-09-2	3-Nitroaniline	1700	U	1700	
534-52-1	4,6-Dinitro-2-methylphenol	1700	U	1700	
101-55-3	4-Bromophenyl Phenyl Ether	330	U	330	
59-50-7	4-Chloro-3-methylphenol	330	U	330	
106-47-8	4-Chloroaniline	330	U	330	
7005-72-3	4-Chlorophenyl Phenyl Ether	330	U	330	
100-01-6	4-Nitroaniline	1700	U	1700	
100-02-7	4-Nitrophenol	1700	U	1700	
83-32-9	Acenaphthene	330	U	330	
208-96-8	Acenaphthylene	330	U	330	
120-12-7	Anthracene	330	U	330	
56-55-3	Benz(a)anthracene	330	U	330	
50-32-8	Benzo(a)pyrene	330	U	330	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Extracted:	8/9/12
		Date Analyzed:	8/10/12 13:25
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209159-01	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS

Analytical Method:	8270D	**Analysis Lot:**	304562
Prep Method:	EPA 3541	**Extraction Lot:**	164317
Data File Name:	J:\ACQUDATA\5973D\DATA\081012\AL224.D\	**Instrument Name:**	R-MS-54
		Dilution Factor:	1

CAS No.	Analyte Name	Result	Q	MRL	Note
205-99-2	Benzo(b)fluoranthene	330	U	330	
191-24-2	Benzo(g,h,i)perylene	330	U	330	
207-08-9	Benzo(k)fluoranthene	330	U	330	
100-51-6	Benzyl Alcohol	330	U	330	
108-60-1	2,2'-Oxybis(1-chloropropane)	330	U	330	
111-91-1	Bis(2-chloroethoxy)methane	330	U	330	
111-44-4	Bis(2-chloroethyl) Ether	330	U	330	
117-81-7	Bis(2-ethylhexyl) Phthalate	330	U	330	
85-68-7	Butyl Benzyl Phthalate	330	U	330	
86-74-8	Carbazole	330	U	330	
218-01-9	Chrysene	330	U	330	
84-74-2	Di-n-butyl Phthalate	330	U	330	
117-84-0	Di-n-octyl Phthalate	330	U	330	
53-70-3	Dibenz(a,h)anthracene	330	U	330	
132-64-9	Dibenzofuran	330	U	330	
84-66-2	Diethyl Phthalate	330	U	330	
131-11-3	Dimethyl Phthalate	330	U	330	
206-44-0	Fluoranthene	330	U	330	
86-73-7	Fluorene	330	U	330	
118-74-1	Hexachlorobenzene	330	U	330	
87-68-3	Hexachlorobutadiene	330	U	330	
77-47-4	Hexachlorocyclopentadiene	330	U	330	
67-72-1	Hexachloroethane	330	U	330	
193-39-5	Indeno(1,2,3-cd)pyrene	330	U	330	
78-59-1	Isophorone	330	U	330	
621-64-7	N-Nitrosodi-n-propylamine	330	U	330	
62-75-9	N-Nitrosodimethylamine	330	U	330	
86-30-6	N-Nitrosodiphenylamine	330	U	330	
91-20-3	Naphthalene	330	U	330	
98-95-3	Nitrobenzene	330	U	330	
87-86-5	Pentachlorophenol (PCP)	1700	U	1700	
85-01-8	Phenanthrene	330	U	330	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Extracted:	8/9/12
		Date Analyzed:	8/10/12 13:25
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209159-01	**Basis:**	Dry

Semivolatile Organic Compounds by GC/MS

Analytical Method:	8270D	**Analysis Lot:**	304562
Prep Method:	EPA 3541	**Extraction Lot:**	164317
Data File Name:	J:\ACQUDATA\5973D\DATA\081012\AL224.D\	**Instrument Name:**	R-MS-54
		Dilution Factor:	1

CAS No.	Analyte Name	Result	Q	MRL	Note
108-95-2	Phenol	330	U	330	
129-00-0	Pyrene	330	U	330	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
2,4,6-Tribromophenol	83	30-130	8/10/12 13:25	
2-Fluorobiphenyl	72	30-130	8/10/12 13:25	
2-Fluorophenol	67	30-130	8/10/12 13:25	
Nitrobenzene-d5	71	30-130	8/10/12 13:25	
Phenol-d6	71	30-130	8/10/12 13:25	
p-Terphenyl-d14	94	30-130	8/10/12 13:25	

Client:	Shaw Environmental & Infrastructure, Inc.	**Service Request:**	R1205125
Project:	Varian Beverly - Soil/146898	**Date Collected:**	NA
Sample Matrix:	Soil	**Date Received:**	NA
		Date Extracted:	8/13/12
		Date Analyzed:	8/14/12 20:24
Sample Name:	Method Blank	**Units:**	µg/Kg
Lab Code:	RQ1209282-01	**Basis:**	Dry

Polychlorinated Biphenyls (PCBs) by GC

Analytical Method:	8082A	**Analysis Lot:**	305036
Prep Method:	EPA 3541	**Extraction Lot:**	164560
Data File Name:	J:\ACQUDATA\6890G\DATA\081412\AS175.D\	**Instrument Name:**	R-GC-58
		Dilution Factor:	1

CAS No.	Analyte Name	Result	Q	MRL	Note
12674-11-2	Aroclor 1016	33	U	33	
11104-28-2	Aroclor 1221	67	U	67	
11141-16-5	Aroclor 1232	33	U	33	
53469-21-9	Aroclor 1242	33	U	33	
12672-29-6	Aroclor 1248	33	U	33	
11097-69-1	Aroclor 1254	33	U	33	
11096-82-5	Aroclor 1260	33	U	33	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Q
Decachlorobiphenyl	69	30-150	8/14/12 20:24	
Tetrachloro-m-xylene	78	30-150	8/14/12 20:24	

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/17/12 - 8/22/12

Lab Control Sample Summary
Inorganic Parameters

Units: mg/L
Basis: As Received

Analyte Name	Method	Lab Control Sample R1205125-LCS Result	Spike Amount	% Rec	% Rec Limits
Arsenic	6010C	4.62	5.0	92	80 - 120
Barium	6010C	5.26	5.0	105	80 - 120
Cadmium	6010C	0.973	1.00	97	80 - 120
Chromium	6010C	5.13	5.00	103	80 - 120
Lead	6010C	5.40	5.00	108	80 - 120
Mercury	7470A	0.000932	0.00100	93	80 - 120
Selenium	6010C	0.928	1.00	93	80 - 120
Silver	6010C	5.20	5.00	104	80 - 120

Results flagged with an asterisk (*) indicate values outside control criteria.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/22/12

Lab Control Sample Summary
Inorganic Parameters

Units: mg/Kg
Basis: Dry

Analyte Name	Method	Lab Control Sample R1205125-LCS Result	Spike Amount	% Rec	% Rec Limits
Arsenic, Total	6010C	91.7	94.5	97	82.3 - 117
Barium, Total	6010C	176	167	105	83.8 - 115
Cadmium, Total	6010C	60.1	60.5	99	83.1 - 116
Chromium, Total	6010C	72.9	70.4	104	81.8 - 118
Lead, Total	6010C	91.1	91.8	99	82.2 - 117
Mercury, Total	7471B	3.32	3.73	89	71.6 - 128
Selenium, Total	6010C	80.6	86.4	93	80.1 - 120
Silver, Total	6010C	36.1	34.4	105	66.3 - 134

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/13/12

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 304683

	Lab Control Sample RQ1209521-02			Duplicate Lab Control Sample RQ1209521-03					
Analyte Name	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
1,1,1,2-Tetrachloroethane	18.6	20.0	93	19.3	20.0	96	70 - 130	4	20
1,1,1-Trichloroethane (TCA)	19.0	20.0	95	20.0	20.0	100	70 - 130	5	20
1,1,2,2-Tetrachloroethane	21.3	20.0	107	22.5	20.0	112	70 - 130	5	20
1,1,2-Trichloroethane	20.3	20.0	101	21.2	20.0	106	70 - 130	5	20
1,1-Dichloroethane (1,1-DCA)	21.6	20.0	108	22.6	20.0	113	70 - 130	5	20
1,1-Dichloroethene (1,1-DCE)	21.1	20.0	106	21.3	20.0	107	70 - 130	<1	20
1,1-Dichloropropene	17.6	20.0	88	18.2	20.0	91	70 - 130	4	20
1,2,3-Trichlorobenzene	19.1	20.0	96	19.4	20.0	97	70 - 130	1	20
1,2,3-Trichloropropane	19.5	20.0	98	21.7	20.0	109	70 - 130	11	20
1,2,4-Trichlorobenzene	19.1	20.0	95	19.6	20.0	98	70 - 130	3	20
1,2,4-Trimethylbenzene	19.7	20.0	98	20.0	20.0	100	70 - 130	2	20
1,2-Dibromo-3-chloropropane (DBCP)	19.3	20.0	97	21.3	20.0	106	70 - 130	10	20
1,2-Dibromoethane	20.7	20.0	103	22.1	20.0	111	70 - 130	7	20
1,2-Dichlorobenzene	19.2	20.0	96	20.1	20.0	101	70 - 130	5	20
1,2-Dichloroethane	22.2	20.0	111	23.6	20.0	118	70 - 130	6	20
1,2-Dichloropropane	21.1	20.0	106	22.0	20.0	110	70 - 130	4	20
1,3,5-Trimethylbenzene	19.4	20.0	97	19.7	20.0	99	70 - 130	2	20
1,3-Dichlorobenzene	19.2	20.0	96	19.8	20.0	99	70 - 130	3	20
1,3-Dichloropropane	20.8	20.0	104	22.1	20.0	110	70 - 130	6	20
1,4-Dichlorobenzene	19.3	20.0	96	19.8	20.0	99	70 - 130	3	20
1,4-Dioxane	516	400	129	522	400	130	40 - 160	1	20
2,2-Dichloropropane	20.0	20.0	100	20.1	20.0	101	70 - 130	<1	20
2-Butanone (MEK)	21.4	20.0	107	24.3	20.0	122	40 - 160	13	20
2-Chlorotoluene	19.7	20.0	99	20.0	20.0	100	70 - 130	1	20
2-Hexanone	19.0	20.0	95	20.8	20.0	104	40 - 160	9	20
4-Chlorotoluene	20.2	20.0	101	20.9	20.0	104	70 - 130	3	20
p-Isopropyltoluene	19.5	20.0	97	19.6	20.0	98	70 - 130	<1	20
4-Methyl-2-pentanone	19.4	20.0	97	22.4	20.0	112	40 - 160	14	20
Acetone	24.1	20.0	120	25.7	20.0	129	40 - 160	7	20
Benzene	19.3	20.0	96	19.8	20.0	99	70 - 130	3	20
Bromobenzene	19.0	20.0	95	19.8	20.0	99	70 - 130	4	20
Bromochloromethane	20.9	20.0	105	22.4	20.0	112	70 - 130	7	20

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Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/13/12

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 304683

Analyte Name	Lab Control Sample RQ1209521-02 Result	Spike Amount	% Rec	Duplicate Lab Control Sample RQ1209521-03 Result	Spike Amount	% Rec		% Rec Limits	RPD	RPD Limit
Bromodichloromethane	20.9	20.0	104	21.7	20.0	109		70 - 130	4	20
Bromoform	19.4	20.0	97	20.3	20.0	102		70 - 130	5	20
Bromomethane	29.2	20.0	146	29.0	20.0	145		40 - 160	<1	20
Carbon Disulfide	17.3	20.0	87	22.2	20.0	111		70 - 130	24	* 20
Carbon Tetrachloride	18.1	20.0	91	18.9	20.0	95		70 - 130	4	20
Chlorobenzene	19.0	20.0	95	19.8	20.0	99		70 - 130	4	20
Chloroethane	21.8	20.0	109	21.7	20.0	108		70 - 130	<1	20
Chloroform	21.2	20.0	106	22.0	20.0	110		70 - 130	4	20
Chloromethane	22.2	20.0	111	22.0	20.0	110		40 - 160	<1	20
Dibromochloromethane	20.7	20.0	103	21.9	20.0	109		70 - 130	6	20
Dibromomethane	20.9	20.0	105	22.2	20.0	111		70 - 130	6	20
Dichlorodifluoromethane (CFC 12)	17.3	20.0	86	18.2	20.0	91		40 - 160	6	20
Dichloromethane	20.4	20.0	102	21.5	20.0	107		70 - 130	5	20
Diethyl Ether	25.4	20.0	127	26.7	20.0	134	*	70 - 130	5	20
Diisopropyl Ether	22.9	20.0	114	23.5	20.0	118		70 - 130	3	20
Ethyl tert-Butyl Ether	21.6	20.0	108	22.6	20.0	113		70 - 130	4	20
Ethylbenzene	18.2	20.0	91	19.0	20.0	95		70 - 130	4	20
Hexachlorobutadiene	19.9	20.0	100	17.9	20.0	90		70 - 130	11	20
Isopropylbenzene (Cumene)	18.9	20.0	94	19.6	20.0	98		70 - 130	4	20
Methyl tert-Butyl Ether	22.8	20.0	114	24.7	20.0	123		70 - 130	8	20
Naphthalene	20.3	20.0	101	21.3	20.0	106		70 - 130	5	20
Styrene	19.6	20.0	98	20.1	20.0	100		70 - 130	3	20
Tetrachloroethene (PCE)	17.4	20.0	87	18.3	20.0	91		70 - 130	5	20
Tetrahydrofuran (THF)	22.7	20.0	113	24.9	20.0	124		70 - 130	9	20
Toluene	19.3	20.0	96	20.1	20.0	100		70 - 130	4	20
Trichloroethene (TCE)	18.4	20.0	92	19.0	20.0	95		70 - 130	3	20
Trichlorofluoromethane (CFC 11)	21.4	20.0	107	21.7	20.0	108		70 - 130	1	20
Vinyl Chloride	20.9	20.0	104	21.1	20.0	105		70 - 130	1	20
cis-1,2-Dichloroethene	20.5	20.0	103	21.7	20.0	108		70 - 130	5	20
cis-1,3-Dichloropropene	19.5	20.0	97	20.8	20.0	104		70 - 130	7	20
m,p-Xylenes	38.1	40.0	95	39.5	40.0	99		70 - 130	4	20
n-Butylbenzene	20.4	20.0	102	20.2	20.0	101		70 - 130	1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/13/12

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 304683

Analyte Name	Lab Control Sample RQ1209521-02 Result	Spike Amount	% Rec	Duplicate Lab Control Sample RQ1209521-03 Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
n-Propylbenzene	19.6	20.0	98	19.7	20.0	99	70 - 130	<1	20
o-Xylene	19.0	20.0	95	19.9	20.0	100	70 - 130	5	20
sec-Butylbenzene	19.0	20.0	95	19.3	20.0	96	70 - 130	2	20
tert-Amyl Methyl Ether	20.4	20.0	102	21.9	20.0	110	70 - 130	7	20
tert-Butylbenzene	18.8	20.0	94	18.9	20.0	94	70 - 130	<1	20
trans-1,2-Dichloroethene	20.2	20.0	101	20.8	20.0	104	70 - 130	3	20
trans-1,3-Dichloropropene	20.1	20.0	100	21.4	20.0	107	70 - 130	6	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/16/12

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 305295

	Lab Control Sample RQ1209639-02			Duplicate Lab Control Sample RQ1209639-03					
Analyte Name	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
1,1,1,2-Tetrachloroethane	16.9	20.0	84	16.1	20.0	81	70 - 130	5	20
1,1,1-Trichloroethane (TCA)	15.4	20.0	77	14.9	20.0	74	70 - 130	3	20
1,1,2,2-Tetrachloroethane	19.2	20.0	96	18.3	20.0	91	70 - 130	5	20
1,1,2-Trichloroethane	18.5	20.0	93	17.3	20.0	87	70 - 130	7	20
1,1-Dichloroethane (1,1-DCA)	16.8	20.0	84	16.4	20.0	82	70 - 130	3	20
1,1-Dichloroethene (1,1-DCE)	16.2	20.0	81	16.0	20.0	80	70 - 130	2	20
1,1-Dichloropropene	14.3	20.0	71	13.7	20.0	68 *	70 - 130	4	20
1,2,3-Trichlorobenzene	17.7	20.0	88	16.0	20.0	80	70 - 130	10	20
1,2,3-Trichloropropane	19.4	20.0	97	18.4	20.0	92	70 - 130	5	20
1,2,4-Trichlorobenzene	17.8	20.0	89	16.9	20.0	84	70 - 130	5	20
1,2,4-Trimethylbenzene	17.3	20.0	86	16.8	20.0	84	70 - 130	3	20
1,2-Dibromo-3-chloropropane (DBCP)	20.0	20.0	100	17.2	20.0	86	70 - 130	15	20
1,2-Dibromoethane	19.5	20.0	98	18.5	20.0	92	70 - 130	5	20
1,2-Dichlorobenzene	17.3	20.0	86	17.0	20.0	85	70 - 130	2	20
1,2-Dichloroethane	18.2	20.0	91	17.4	20.0	87	70 - 130	4	20
1,2-Dichloropropane	17.9	20.0	89	17.1	20.0	85	70 - 130	4	20
1,3,5-Trimethylbenzene	16.5	20.0	83	16.2	20.0	81	70 - 130	2	20
1,3-Dichlorobenzene	16.7	20.0	84	16.6	20.0	83	70 - 130	1	20
1,3-Dichloropropane	18.6	20.0	93	17.6	20.0	88	70 - 130	5	20
1,4-Dichlorobenzene	17.1	20.0	85	16.4	20.0	82	70 - 130	4	20
1,4-Dioxane	329	400	82	319	400	80	40 - 160	3	20
2,2-Dichloropropane	16.2	20.0	81	16.3	20.0	82	70 - 130	<1	20
2-Butanone (MEK)	20.1	20.0	101	18.3	20.0	92	40 - 160	9	20
2-Chlorotoluene	16.1	20.0	81	16.0	20.0	80	70 - 130	1	20
2-Hexanone	20.7	20.0	103	18.1	20.0	91	40 - 160	13	20
4-Chlorotoluene	16.7	20.0	84	16.5	20.0	83	70 - 130	1	20
p-Isopropyltoluene	16.7	20.0	84	16.5	20.0	82	70 - 130	1	20
4-Methyl-2-pentanone	22.0	20.0	110	19.7	20.0	98	40 - 160	11	20
Acetone	18.7	20.0	93	15.5	20.0	77	40 - 160	19	20
Benzene	15.8	20.0	79	15.6	20.0	78	70 - 130	1	20
Bromobenzene	17.5	20.0	87	16.9	20.0	84	70 - 130	3	20
Bromochloromethane	18.5	20.0	92	17.4	20.0	87	70 - 130	6	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/16/12

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 305295

	Lab Control Sample RQ1209639-02			Duplicate Lab Control Sample RQ1209639-03					
Analyte Name	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Bromodichloromethane	17.7	20.0	88	16.9	20.0	84	70 - 130	5	20
Bromoform	20.7	20.0	103	18.3	20.0	91	70 - 130	13	20
Bromomethane	13.5	20.0	67	16.4	20.0	82	40 - 160	20	20
Carbon Disulfide	19.2	20.0	96	20.5	20.0	102	70 - 130	6	20
Carbon Tetrachloride	15.2	20.0	76	14.7	20.0	73	70 - 130	3	20
Chlorobenzene	17.1	20.0	85	16.0	20.0	80	70 - 130	6	20
Chloroethane	15.4	20.0	77	15.3	20.0	76	70 - 130	<1	20
Chloroform	16.8	20.0	84	16.4	20.0	82	70 - 130	2	20
Chloromethane	15.6	20.0	78	15.5	20.0	77	40 - 160	<1	20
Dibromochloromethane	19.4	20.0	97	17.8	20.0	89	70 - 130	9	20
Dibromomethane	18.6	20.0	93	17.8	20.0	89	70 - 130	4	20
Dichlorodifluoromethane (CFC 12)	12.2	20.0	61	12.3	20.0	61	40 - 160	<1	20
Dichloromethane	17.6	20.0	88	17.1	20.0	85	70 - 130	3	20
Diethyl Ether	20.4	20.0	102	19.4	20.0	97	70 - 130	5	20
Diisopropyl Ether	21.2	20.0	106	21.0	20.0	105	70 - 130	1	20
Ethyl tert-Butyl Ether	21.4	20.0	107	20.4	20.0	102	70 - 130	5	20
Ethylbenzene	16.2	20.0	81	15.5	20.0	78	70 - 130	4	20
Hexachlorobutadiene	15.0	20.0	75	15.0	20.0	75	70 - 130	<1	20
Isopropylbenzene (Cumene)	16.4	20.0	82	15.8	20.0	79	70 - 130	3	20
Methyl tert-Butyl Ether	20.0	20.0	100	18.8	20.0	94	70 - 130	6	20
Naphthalene	20.0	20.0	100	18.3	20.0	91	70 - 130	9	20
Styrene	17.8	20.0	89	16.9	20.0	84	70 - 130	6	20
Tetrachloroethene (PCE)	15.5	20.0	77	15.1	20.0	75	70 - 130	3	20
Tetrahydrofuran (THF)	19.1	20.0	95	17.6	20.0	88	70 - 130	8	20
Toluene	16.4	20.0	82	15.9	20.0	79	70 - 130	4	20
Trichloroethene (TCE)	16.0	20.0	80	15.5	20.0	78	70 - 130	3	20
Trichlorofluoromethane (CFC 11)	15.2	20.0	76	15.3	20.0	76	70 - 130	<1	20
Vinyl Chloride	15.3	20.0	77	15.5	20.0	77	70 - 130	<1	20
cis-1,2-Dichloroethene	17.1	20.0	85	16.5	20.0	83	70 - 130	3	20
cis-1,3-Dichloropropene	17.1	20.0	86	16.6	20.0	83	70 - 130	3	20
m,p-Xylenes	33.7	40.0	84	31.8	40.0	80	70 - 130	6	20
n-Butylbenzene	16.8	20.0	84	16.7	20.0	84	70 - 130	<1	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/16/12

Lab Control Sample Summary
Volatile Organic Compounds by GC/MS

Analytical Method: 8260C

Units: µg/Kg
Basis: Dry

Analysis Lot: 305295

Analyte Name	Lab Control Sample RQ1209639-02 Result	Spike Amount	% Rec	Duplicate Lab Control Sample RQ1209639-03 Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
n-Propylbenzene	16.3	20.0	82	16.2	20.0	81	70 - 130	<1	20
o-Xylene	17.2	20.0	86	16.2	20.0	81	70 - 130	6	20
sec-Butylbenzene	16.2	20.0	81	16.2	20.0	81	70 - 130	<1	20
tert-Amyl Methyl Ether	21.6	20.0	108	20.1	20.0	100	70 - 130	7	20
tert-Butylbenzene	16.1	20.0	80	16.1	20.0	80	70 - 130	<1	20
trans-1,2-Dichloroethene	16.1	20.0	80	15.5	20.0	77	70 - 130	4	20
trans-1,3-Dichloropropene	18.4	20.0	92	17.3	20.0	86	70 - 130	6	20

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/10/12

Lab Control Sample Summary
Semivolatile Organic Compounds by GC/MS

Analytical Method: 8270D
Prep Method: EPA 3541

Units: µg/Kg
Basis: Dry

Extraction Lot: 164317

Analyte Name	Lab Control Sample RQ1209159-02 Result	Spike Amount	% Rec	Duplicate Lab Control Sample RQ1209159-03 Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
1,2,4-Trichlorobenzene	2930	3330	88	2960	3330	89	40 - 140	<1	30
1,2-Dichlorobenzene	2700	3330	81	2740	3330	82	40 - 140	1	30
1,3-Dichlorobenzene	2600	3330	78	2640	3330	79	40 - 140	2	30
1,4-Dichlorobenzene	2630	3330	79	2670	3330	80	40 - 140	2	30
2,4,5-Trichlorophenol	3180	3330	95	3480	3330	104	30 - 130	9	30
2,4,6-Trichlorophenol	3320	3330	100	3550	3330	107	30 - 130	7	30
2,4-Dichlorophenol	3320	3330	100	3380	3330	101	30 - 130	2	30
2,4-Dimethylphenol	2770	3330	83	2820	3330	85	30 - 130	2	30
2,4-Dinitrophenol	1120	3330	34	1660	3330	50	15 - 140	39 *	30
2,4-Dinitrotoluene	3960	3330	119	4160	3330	125	40 - 140	5	30
2,6-Dinitrotoluene	3800	3330	114	3990	3330	120	40 - 140	5	30
2-Chloronaphthalene	2970	3330	89	3080	3330	92	40 - 140	4	30
2-Chlorophenol	2980	3330	89	3070	3330	92	30 - 130	3	30
2-Methylnaphthalene	3130	3330	94	3160	3330	95	40 - 140	<1	30
2-Methylphenol	2920	3330	88	3030	3330	91	30 - 130	4	30
2-Nitroaniline	3170	3330	95	3290	3330	99	40 - 140	4	30
2-Nitrophenol	3740	3330	112	3870	3330	116	30 - 130	3	30
3,3'-Dichlorobenzidine	3020	3330	91	3320	3330	100	40 - 140	10	30
3- and 4-Methylphenol Coelution	6120	6670	92	6350	6670	95	30 - 130	4	30
3-Nitroaniline	2970	3330	89	3070	3330	92	40 - 140	3	30
4,6-Dinitro-2-methylphenol	1890	3330	57	3040	3330	91	30 - 130	47 *	30
4-Bromophenyl Phenyl Ether	3360	3330	101	3540	3330	106	40 - 140	5	30
4-Chloro-3-methylphenol	3330	3330	100	3480	3330	105	30 - 130	4	30
4-Chloroaniline	2930	3330	88	3020	3330	90	15 - 140	3	30
4-Chlorophenyl Phenyl Ether	3280	3330	98	3410	3330	102	40 - 140	4	30
4-Nitroaniline	2960	3330	89	3160	3330	95	40 - 140	7	30
4-Nitrophenol	2180	3330	65	2680	3330	80	15 - 140	21	30
Acenaphthene	3250	3330	98	3380	3330	101	40 - 140	4	30
Acenaphthylene	3490	3330	105	3620	3330	109	40 - 140	4	30
Anthracene	3360	3330	101	3540	3330	106	40 - 140	5	30
Benz(a)anthracene	3250	3330	97	3440	3330	103	40 - 140	6	30
Benzo(a)pyrene	3150	3330	95	3320	3330	99	40 - 140	5	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/10/12

Lab Control Sample Summary
Semivolatile Organic Compounds by GC/MS

Analytical Method: 8270D
Prep Method: EPA 3541

Units: µg/Kg
Basis: Dry

Extraction Lot: 164317

	Lab Control Sample RQ1209159-02			Duplicate Lab Control Sample RQ1209159-03					
Analyte Name	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Benzo(b)fluoranthene	3360	3330	101	3540	3330	106	40 - 140	5	30
Benzo(g,h,i)perylene	3400	3330	102	3580	3330	107	40 - 140	5	30
Benzo(k)fluoranthene	3360	3330	101	3500	3330	105	40 - 140	4	30
Benzyl Alcohol	3330	3330	100	3430	3330	103	40 - 140	3	30
2,2'-Oxybis(1-chloropropane)	3260	3330	98	3320	3330	99	40 - 140	2	30
Bis(2-chloroethoxy)methane	2950	3330	89	2980	3330	89	40 - 140	<1	30
Bis(2-chloroethyl) Ether	2840	3330	85	2840	3330	85	40 - 140	<1	30
Bis(2-ethylhexyl) Phthalate	3250	3330	97	3440	3330	103	40 - 140	6	30
Butyl Benzyl Phthalate	3120	3330	94	3290	3330	99	40 - 140	5	30
Carbazole	3080	3330	92	3260	3330	98	40 - 140	6	30
Chrysene	3260	3330	98	3460	3330	104	40 - 140	6	30
Di-n-butyl Phthalate	3260	3330	98	3440	3330	103	40 - 140	5	30
Di-n-octyl Phthalate	3320	3330	100	3540	3330	106	40 - 140	6	30
Dibenz(a,h)anthracene	3380	3330	101	3550	3330	106	40 - 140	5	30
Dibenzofuran	3100	3330	93	3240	3330	97	40 - 140	5	30
Diethyl Phthalate	3200	3330	96	3360	3330	101	40 - 140	5	30
Dimethyl Phthalate	3150	3330	95	3330	3330	100	40 - 140	5	30
Fluoranthene	3400	3330	102	3620	3330	109	40 - 140	6	30
Fluorene	3340	3330	100	3520	3330	106	40 - 140	5	30
Hexachlorobenzene	3340	3330	100	3580	3330	107	40 - 140	7	30
Hexachlorobutadiene	2990	3330	90	2970	3330	89	40 - 140	<1	30
Hexachlorocyclopentadiene	2710	3330	81	2830	3330	85	40 - 140	5	30
Hexachloroethane	2510	3330	75	2540	3330	76	40 - 140	1	30
Indeno(1,2,3-cd)pyrene	3280	3330	98	3450	3330	104	40 - 140	5	30
Isophorone	3120	3330	94	3190	3330	96	40 - 140	2	30
N-Nitrosodi-n-propylamine	2930	3330	88	3040	3330	91	40 - 140	4	30
N-Nitrosodimethylamine	2630	3330	79	2680	3330	81	40 - 140	2	30
N-Nitrosodiphenylamine	3440	3330	103	3630	3330	109	40 - 140	5	30
Naphthalene	3040	3330	91	3050	3330	92	40 - 140	<1	30
Nitrobenzene	2930	3330	88	2910	3330	87	40 - 140	<1	30
Pentachlorophenol (PCP)	2080	3330	62	2800	3330	84	30 - 130	30	30
Phenanthrene	3400	3330	102	3560	3330	107	40 - 140	5	30

Results flagged with an asterisk (*) indicate values outside control criteria.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/10/12

Lab Control Sample Summary
Semivolatile Organic Compounds by GC/MS

Analytical Method: 8270D
Prep Method: EPA 3541

Units: µg/Kg
Basis: Dry

Extraction Lot: 164317

Analyte Name	Lab Control Sample RQ1209159-02 Result	Spike Amount	% Rec	Duplicate Lab Control Sample RQ1209159-03 Result	Spike Amount	% Rec	% Rec Limits	RPD	RPD Limit
Phenol	2920	3330	88	3040	3330	91	15 - 140	4	30
Pyrene	3360	3330	101	3530	3330	106	40 - 140	5	30

Results flagged with an asterisk (*) indicate values outside control criteria.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Client: Shaw Environmental & Infrastructure, Inc.
Project: Varian Beverly - Soil/146898
Sample Matrix: Soil

Service Request: R1205125
Date Analyzed: 8/14/12

Lab Control Sample Summary
Polychlorinated Biphenyls (PCBs) by GC

Analytical Method: 8082A
Prep Method: EPA 3541

Units: µg/Kg
Basis: Dry

Extraction Lot: 164560

	Lab Control Sample RQ1209282-02			Duplicate Lab Control Sample RQ1209282-03					
Analyte Name	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Aroclor 1260	124	167	75	120	167	72	40 - 140	3	30

Results flagged with an asterisk (*) indicate values outside control criteria.
Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Columbia Analytical Services

CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

~~1 Mustard Street, Suite 250~~, Rochester, NY 14609 | 585.288.5380 | 800.695.7222 | 585.288.8475 (fax) PAGE 1 OF 2

Project Name: VARIAN	Project Number: 146898
Project Manager: Raymond Cadorette	Report CC: Raymond Cadorette
Company/Address: SHAW E+I 100 Tech Ctr Drive Stoughton MA 02072	
Phone #: 617 589-6102	E-mail: Raymond.Cadorette@SHAWgrp.com
Sampler's Signature:	Sampler's Printed Name: KEVIN COTE

ANALYSIS REQUESTED *(Include Method Number and Container Preservative)*

PRESERVATIVE: MEOH 4°C

CLIENT SAMPLE ID	FOR OFFICE USE ONLY LAB ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NUMBER OF CONTAINERS	GC/MS VOA's ☐8260 ☐624 ☐CLP	GC/MS SVOA's ☐8270 ☐625	GC VOA's ☐8021 ☐601/602	PESTICIDES ☐8081 ☐608	PCB's ☐8082 ☐608	METALS, TOTAL (List in comments below)	METALS, DISSOLVED (List in comments below)	REMARKS/ ALTERNATE DESCRIPTION
Trench 1 (Sanding Room)		8/2/12	10:00	SOIL	3	X							2 MEOH 40mL VOA 1 20Z Teflon Lined Jar
Trench 2 (Shipping)		8/2/12	12:00	SOIL	3	X							" "

Preservative Key
0. NONE
1. HCL
2. HNO_3
3. H_2SO_4
4. NaOH
5. Zn. Acetate
6. MeOH
7. $NaHSO_4$
8. Other _____

SPECIAL INSTRUCTIONS/COMMENTS
Metals

See QAPP ☐

TURNAROUND REQUIREMENTS
_____ RUSH (SURCHARGES APPLY)
_____ 1 day _____ 2 day _____ 3 day
_____ 4 day _____ 5 day
✓ Standard

REQUESTED REPORT DATE
_____

REPORT REQUIREMENTS
_____ I. Results Only
_____ II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
_____ III. Results + QC and Calibration Summaries
_____ IV. Data Validation Report with Raw Data

Edata _____ Yes _____ N

INVOICE INFORMATION
PO #:
BILL TO:
SHAW E+I
100 Tech Ctr Dr
Stoughton MA

STATE WHERE SAMPLES WERE COLLECTED: VARIAN MEDICAL Beverly MA

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY
Signature:	Signature:	Signature:	Signature:	Signature:
Printed Name: KEVIN COTE	Printed Name: Amy Hentschke	Printed Name:	Printed Name:	Printed Name:
Firm: SHAW	Firm: STL	Firm:	Firm:	Firm:
Date/Time: 8/7/12 12:00	Date/Time: 8/8/12 0945	Date/Time:	Date/Time:	Date/Time:

R1205125 7 Y
Shaw Environmental & Infrastructure, Inc.
Varian Beverly - Soil

50 of 52

Distribution: White - Lab Copy; Yellow - Return To Originator

SCOC Rev. 10/2010

Columbia Analytical Services™ CHAIN OF CUSTODY/LABORATORY ANALYSIS REQUEST FORM

~~1 Mustard Street, Suite 250~~, Rochester, NY 14609 | 585.288.5380 | 800.695.7222 | 585.288.8475 (fax) PAGE 2 OF 2

Project Name: VARIAN	Project Number: 146898
Project Manager: Raymond Cadorette	Report CC:
Company/Address: SHAW E+I 100 Tech Ctr Drive Stoughton MA 02072	
Phone #: 617-589-6102	E-mail:
Sampler's Signature:	Sampler's Printed Name: KEVIN COTE

ANALYSIS REQUESTED (Include Method Number and Container Preservative)

CLIENT SAMPLE ID	FOR OFFICE USE ONLY LAB ID	SAMPLING DATE	SAMPLING TIME	MATRIX	NUMBER OF CONTAINERS	GC/MS VOA's ☐8260 ☐624 ☐CLP	GC/MS SVOA's ☐8270 ☐625	GC VOA's ☐8021 ☐601/602	PESTICIDES ☐8081 ☐608	PCB's ☐8082 ☐608	METALS, TOTAL (List in comments below)	METALS, DISSOLVED (List in comments below)	METALS 5 TCLP	TPH (MADEP ETPH)	REMARKS/ ALTERNATE DESCRIPTION
PRESERVATIVE						4°	4°			4°	4°		4°	4°	
Rolloff		8/3/12	13:20	Soil	6	X	X			X	X		X	X	

Preservative Key
0. NONE
1. HCL
2. HNO_3
3. H_2SO_4
4. NaOH
5. Zn. Acetate
6. MeOH
7. $NaHSO_4$
8. Other _____

SPECIAL INSTRUCTIONS/COMMENTS
Metals
RCRA 8 METALS

See QAPP ☐

TURNAROUND REQUIREMENTS
____ RUSH (SURCHARGES APPLY)
____ 1 day ____ 2 day ____ 3 day
____ 4 day ____ 5 day
✓ Standard
REQUESTED REPORT DATE
_____

REPORT REQUIREMENTS
____ I. Results Only
____ II. Results + QC Summaries (LCS, DUP, MS/MSD as required)
____ III. Results + QC and Calibration Summaries
____ IV. Data Validation Report with Raw Data
Edata ____ Yes ____ No

INVOICE INFORMATION
PO #:
BILL TO: SHAW E+I
100 Tech Ctr Dr
Stoughton MA

STATE WHERE SAMPLES WERE COLLECTED: Varian Medical Beverly MA

RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY	RELINQUISHED BY	RECEIVED BY
Signature:	Signature: Amy Hentschke	Signature:	Signature:	Signature:	Signature:
Printed Name: KEVIN COTE	Printed Name: Amy Hentschke	Printed Name:	Printed Name:	Printed Name:	Printed Name:
Firm: SHAW	Firm: AES	Firm:	Firm:	Firm:	Firm:
Date/Time: 8/7/12 12:00	Date/Time: 8/8/12 0945	Date/Time:	Date/Time:	Date/Time:	Date/Time:

Distribution: White - Lab Copy; Yellow - Return To Originator

SCOC Rev. 10/2010

Cooler Receipt and Preservation Check Form

Project/Client Shaw Folder Number 212-5125

Cooler received on 8/8/12 by: AWA COURIER: ALS (UPS) FEDEX VELOCITY CLIENT

1.	Were custody seals on outside of cooler?	(YES)	NO			
2.	Were custody papers properly filled out (ink, signed, etc.)?	(YES)	NO			
3.	Did all bottles arrive in good condition (unbroken)?	(YES)	NO			
4.	Did VOA vials, Alkalinity, or Sulfide have significant* air bubbles?	YES	NO	(N/A)		
5.	Were **Ice** or **Ice packs** present?	(YES)	NO			
6.	Where did the bottles originate?	(ALS/ROC)	CLIENT			
7.	Temperature of cooler(s) upon receipt:	2.6°				
	Is the temperature within 0° - 6° C?:	(Yes)	Yes	Yes	Yes	Yes
	If No, Explain Below	No	No	No	No	No

Date/Time Temperatures Taken: 8/8/12 1034

Thermometer ID: (IR GUN#3) / IR GUN#4 Reading From: (Temp Blank) / Sample Bottle

If out of Temperature, note packing/ice condition &Client Approval to Run Samples:

All Samples held in storage location R-002 by AWA on 8/8/12 at 1039

5035 samples placed in storage location R005 by AWA on 8/8/12 at 1036

PC Secondary Review: MM 8/8/12

Cooler Breakdown: Date: 8/8/12 Time: 1545 by: AP

1.	Were all bottle labels complete (*i.e.* analysis, preservation, etc.)?	(YES)	NO
2.	Did all bottle labels and tags agree with custody papers?	(YES)	NO
3.	Were correct containers used for the tests indicated?	(YES)	NO
4.	Air Samples: Cassettes / Tubes Intact Canisters Pressurized Tedlar® Bags Inflated	(N/A)	

Explain any discrepancies:

pH	Reagent	YES	NO	Lot Received	Exp	Sample ID	Vol. Added	Lot Added	Final pH
≥12	NaOH								
≤2	HNO_3								
≤2	H_2SO_4								
<4	$NaHSO_4$								
Residual Chlorine (-)	For TCN Phenol and 522			If present, contact PM to add ascorbic acid Or sodium sulfite (522)					
	$Na_2S_2O_3$	-	-						
	Zn Aceta	-	-						
	HCl	*	*						

*Not to be tested before analysis – pH tested and recorded by VOAs or GenChem on a separate worksheet

Yes = All samples OK

No = Samples were preserved at lab as listed

PM OK to Adjust: _____

Bottle lot numbers:

Other Comments:

PC Secondary Review: MM 8/27/12

*significant air bubbles: VOA > 5-6 mm : WC >1 in. diameter

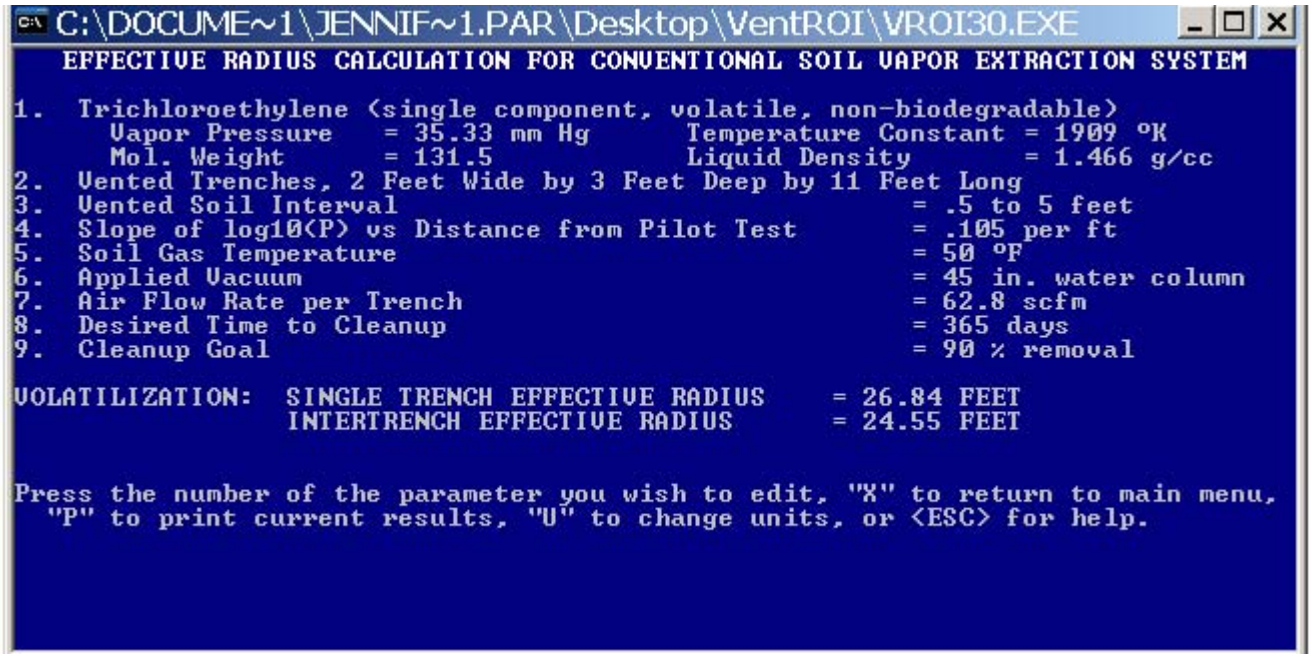
H:\SMODOCS\Cooler Receipt 5.doc

APPENDIX C

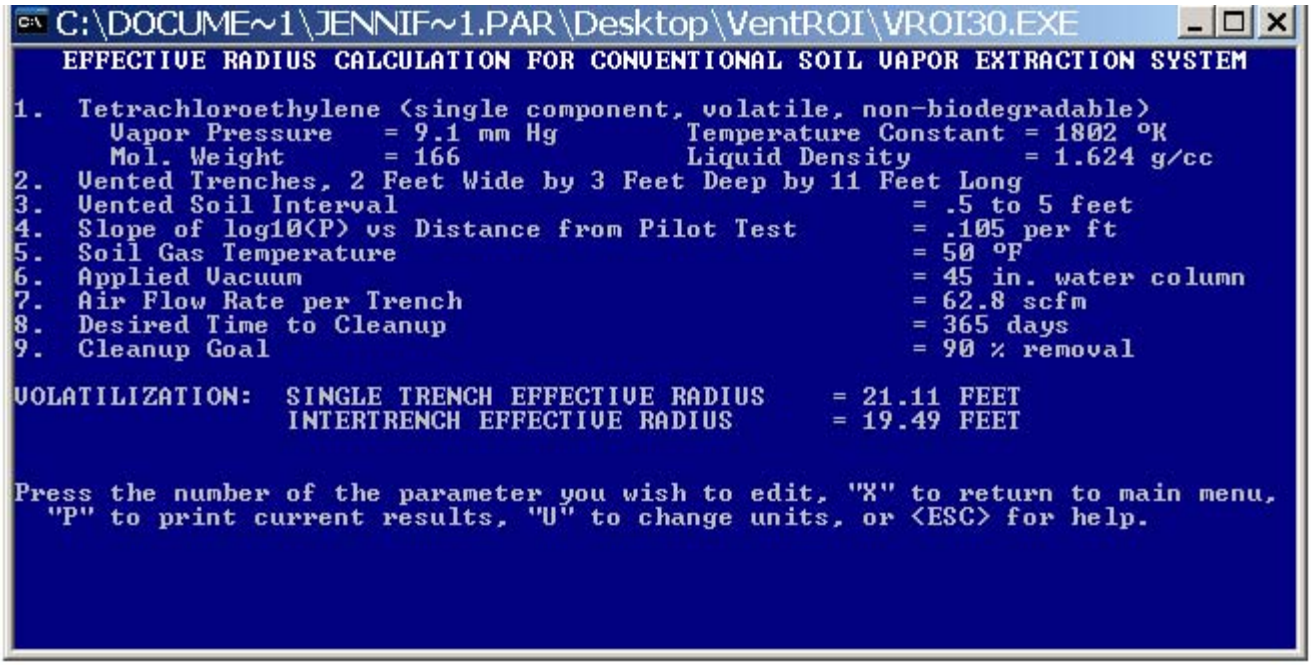
Vent ROI Model Results

Former Varian Facility
150 Sohier Road
Beverly, Massachusetts
VENT-ROI Results

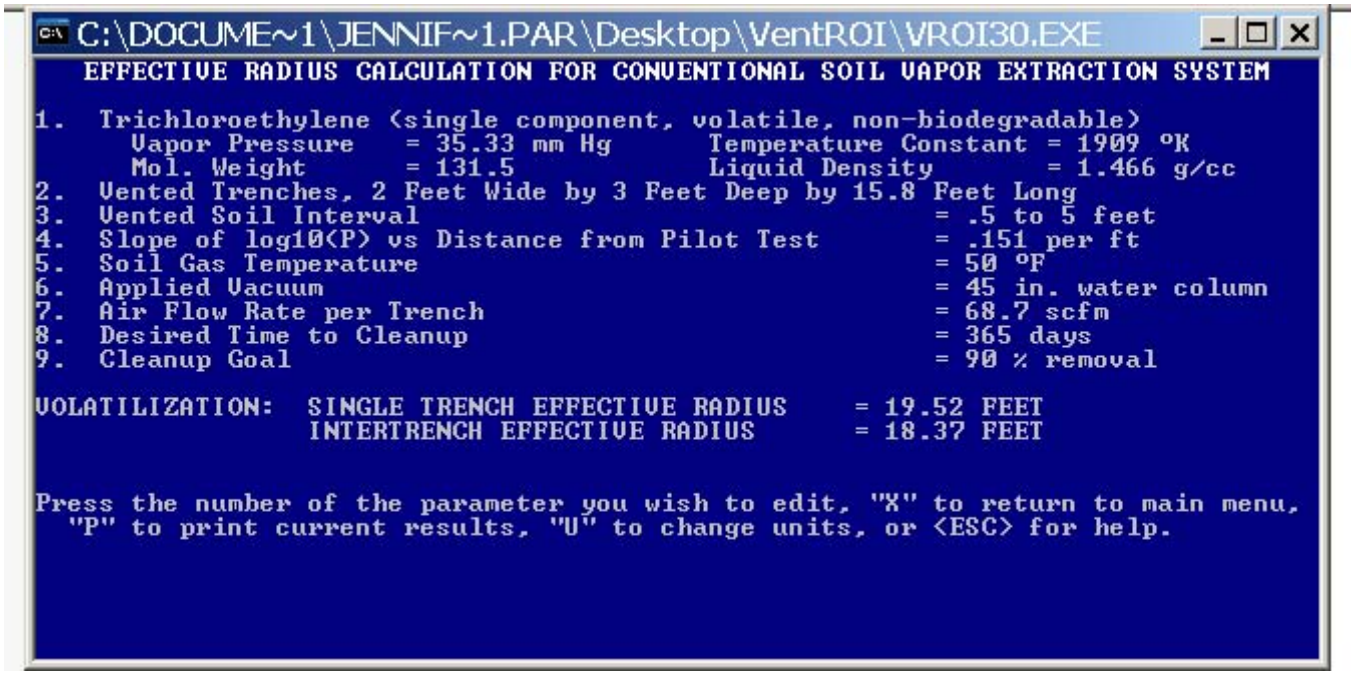
Extraction Well: BLDG5 -SVE-1 Contaminate of Concern: TCE



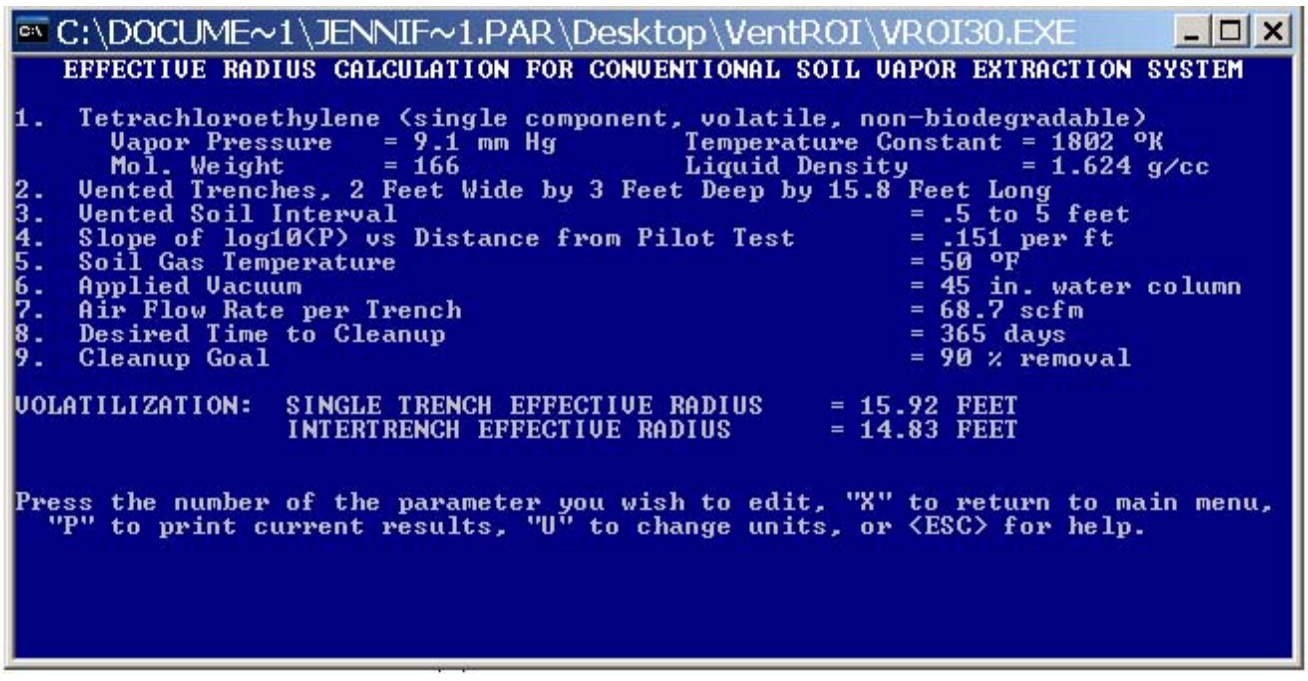
Extraction Well: BLDG5 -SVE-1 Contaminate of Concern: PCE



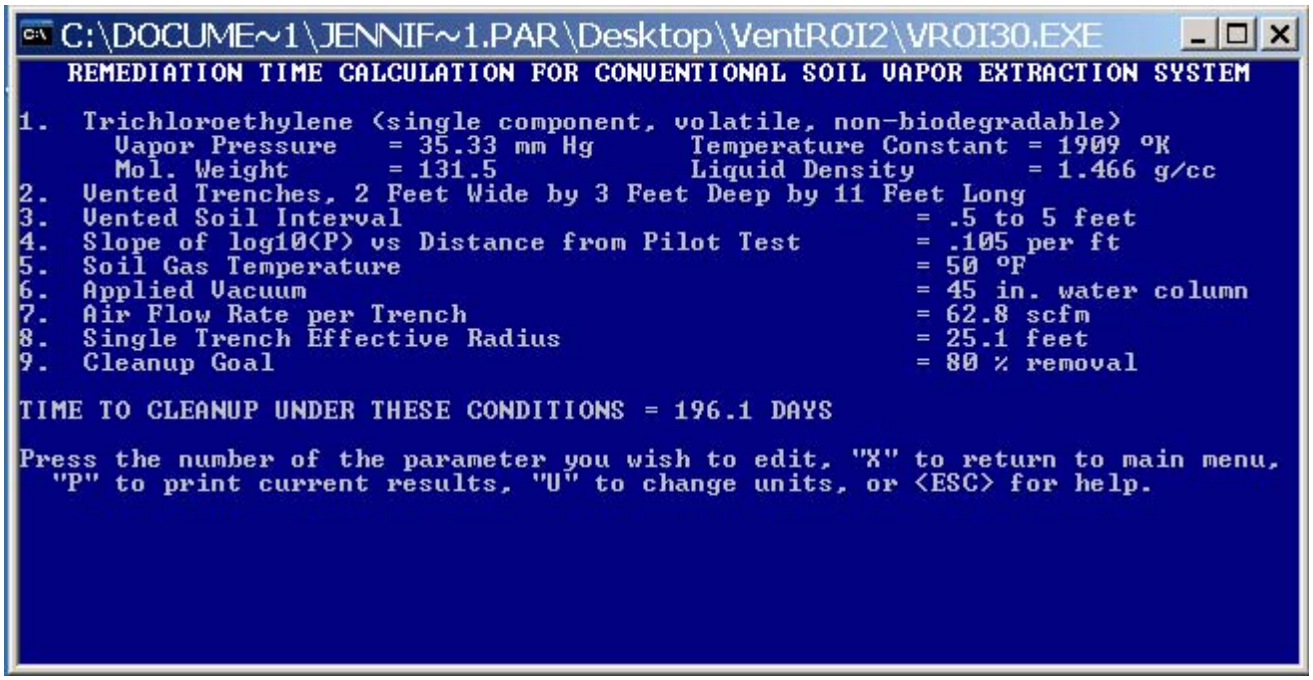
Extraction Well: BLDG5 -SVE-2 Contaminate of Concern: TCE

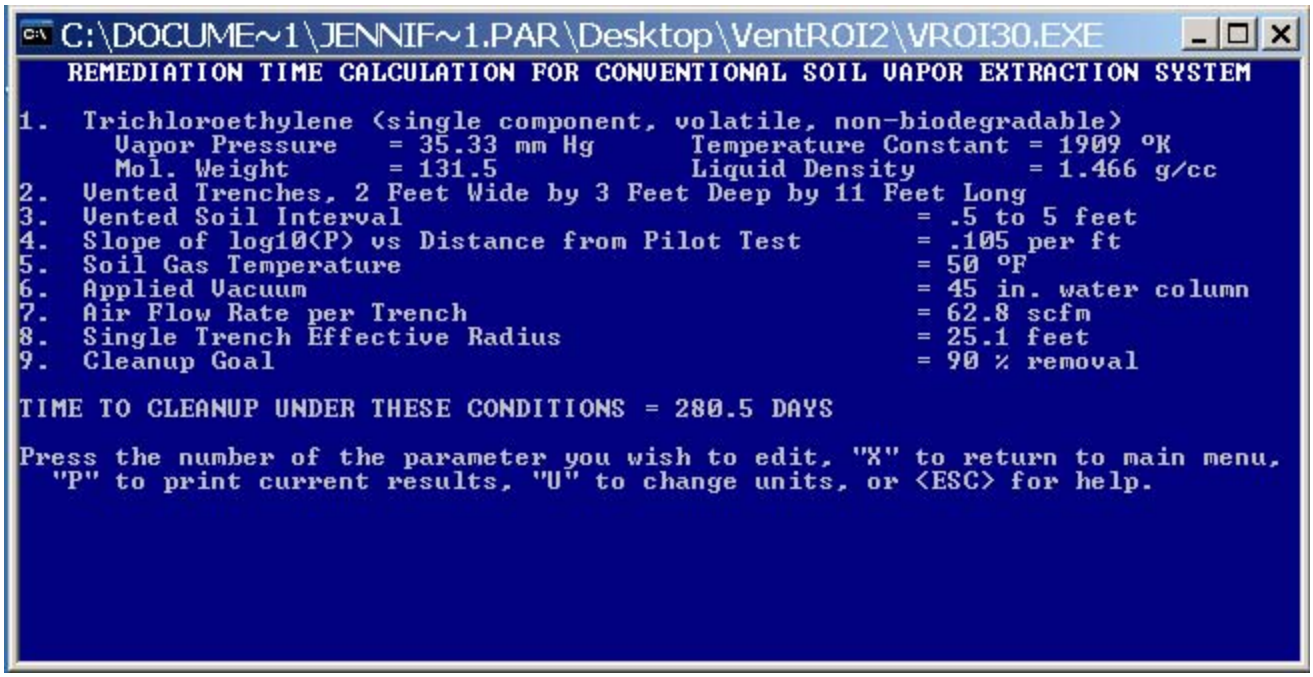


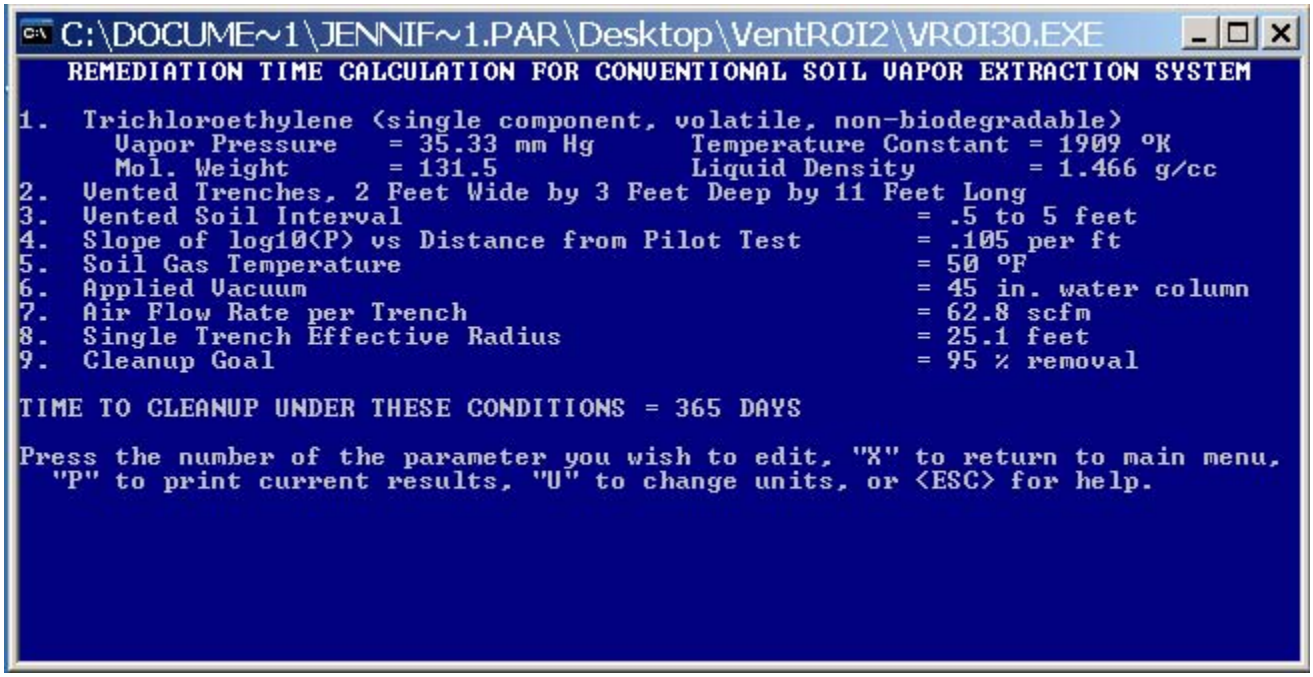
Extraction Well: BLDG5 -SVE-2 Contaminate of Concern: PCE

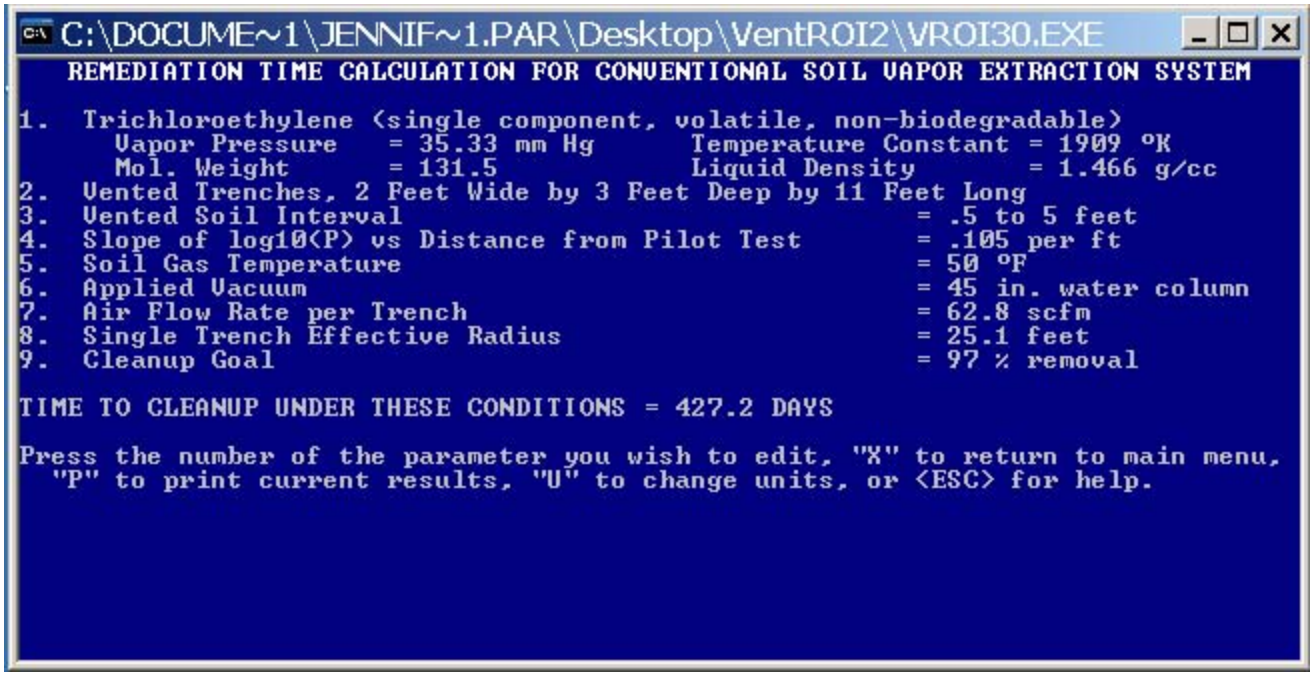


Extraction Well: BLDG5 -SVE-1 Contaminate of Concern: TCE

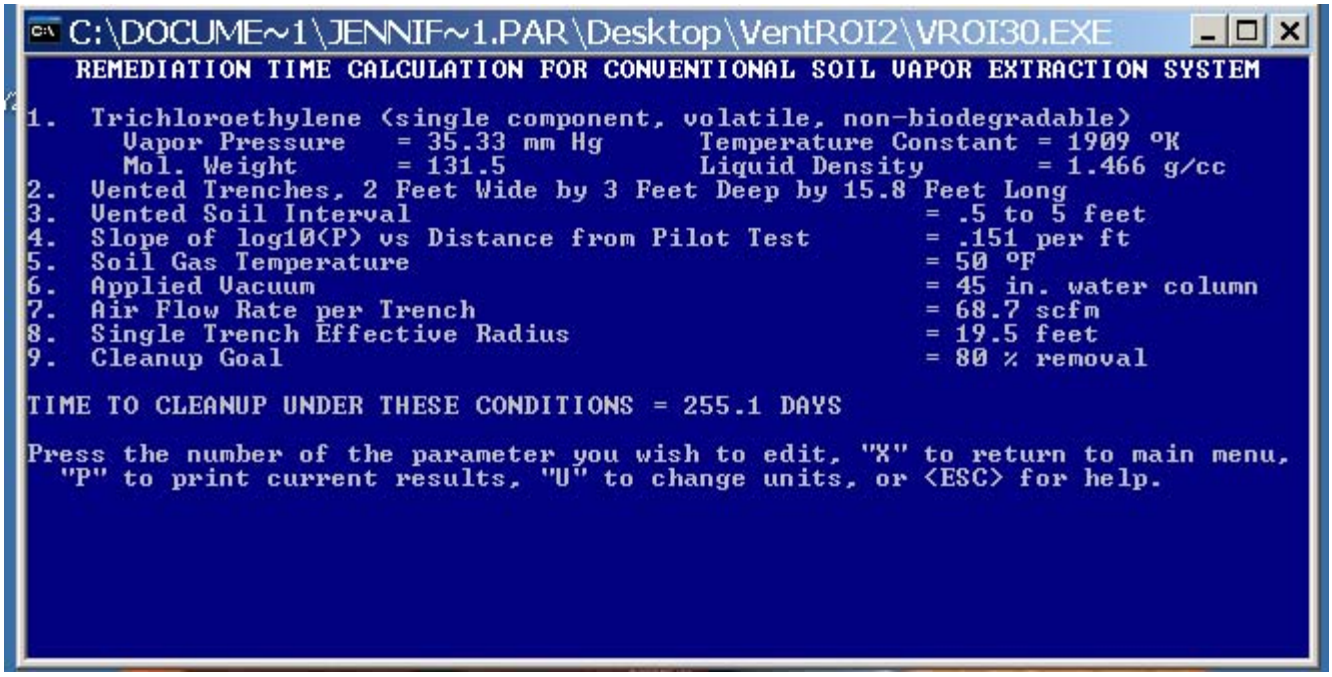


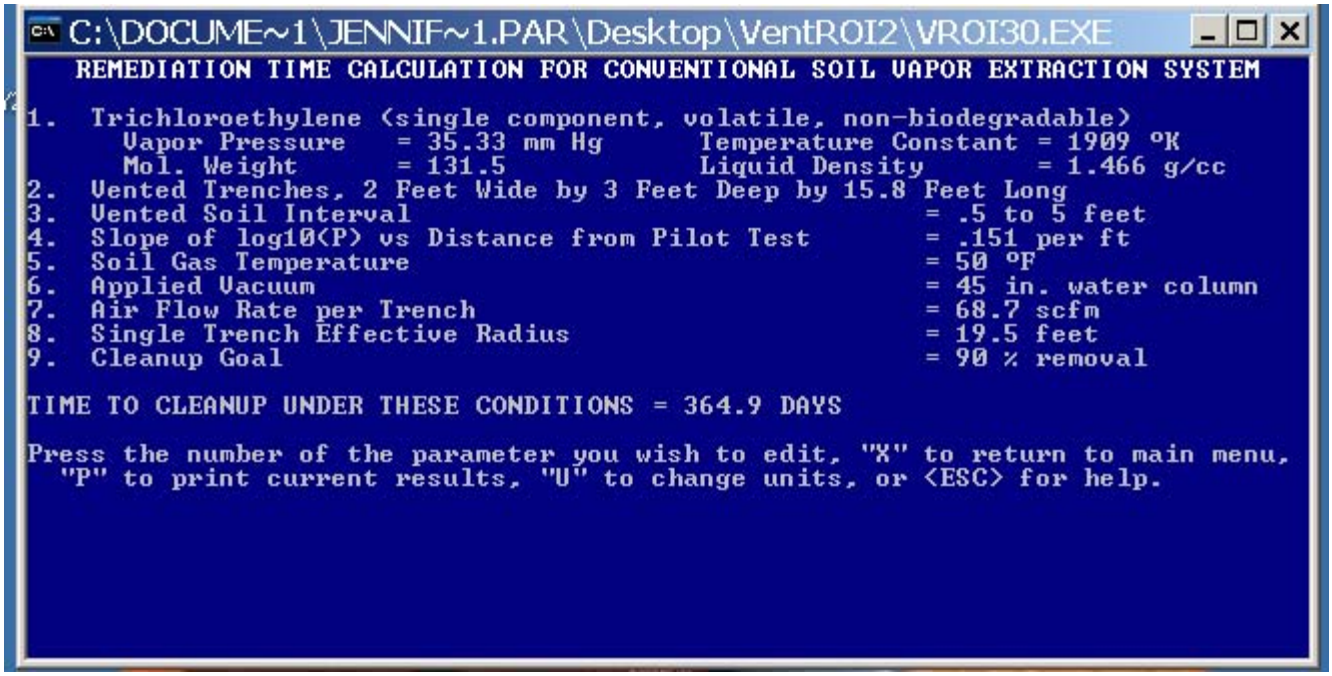


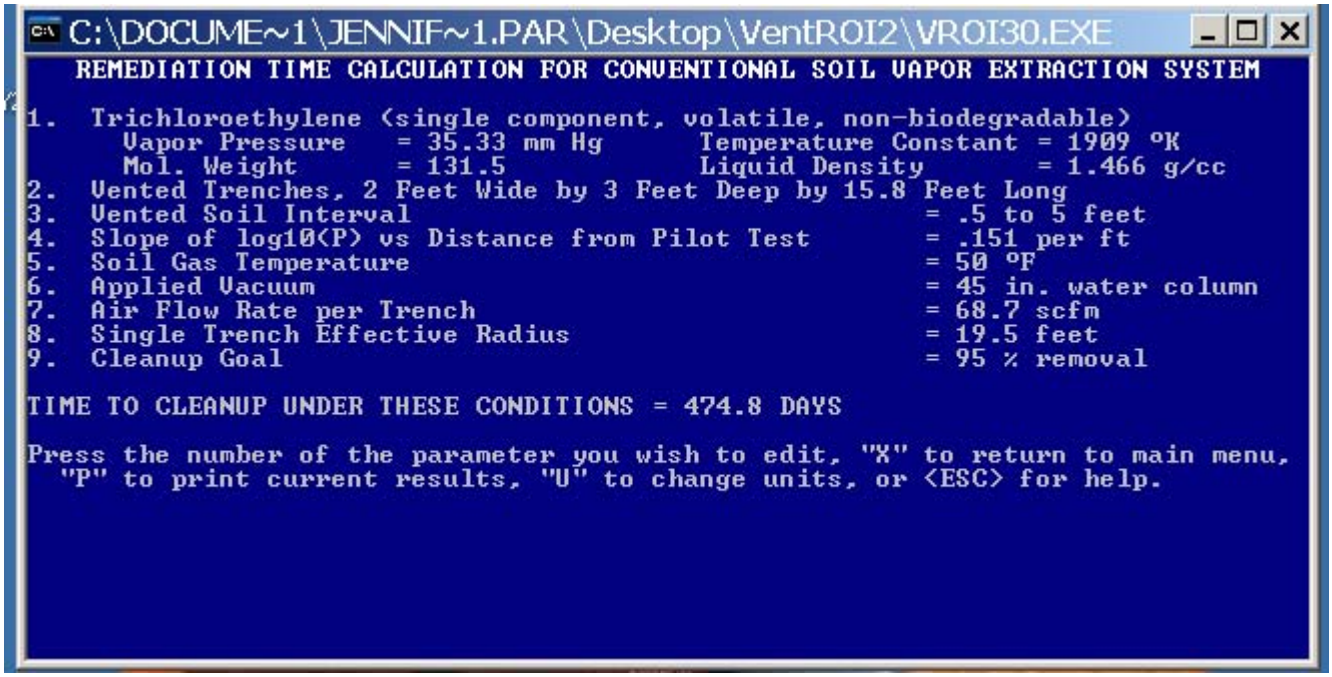

C:\DOCUME~1\JENNIF~1.PAR\Desktop\VentROI2\VROI30.EXE
REMEDIATION TIME CALCULATION FOR CONVENTIONAL SOIL VAPOR EXTRACTION SYSTEM
1. Trichloroethylene (single component, volatile, non-biodegradable)
Vapor Pressure = 35.33 mm Hg
Temperature Constant = 1909 °K
Mol. Weight = 131.5
Liquid Density = 1.466 g/cc
2. Vented Trenches, 2 Feet Wide by 3 Feet Deep by 11 Feet Long
3. Vented Soil Interval = .5 to 5 feet
4. Slope of log10(P) vs Distance from Pilot Test = .105 per ft
5. Soil Gas Temperature = 50 °F
6. Applied Vacuum = 45 in. water column
7. Air Flow Rate per Trench = 62.8 scfm
8. Single Trench Effective Radius = 25.1 feet
9. Cleanup Goal = 95 % removal
TIME TO CLEANUP UNDER THESE CONDITIONS = 365 DAYS
Press the number of the parameter you wish to edit, "X" to return to main menu,
"P" to print current results, "U" to change units, or <ESC> for help.

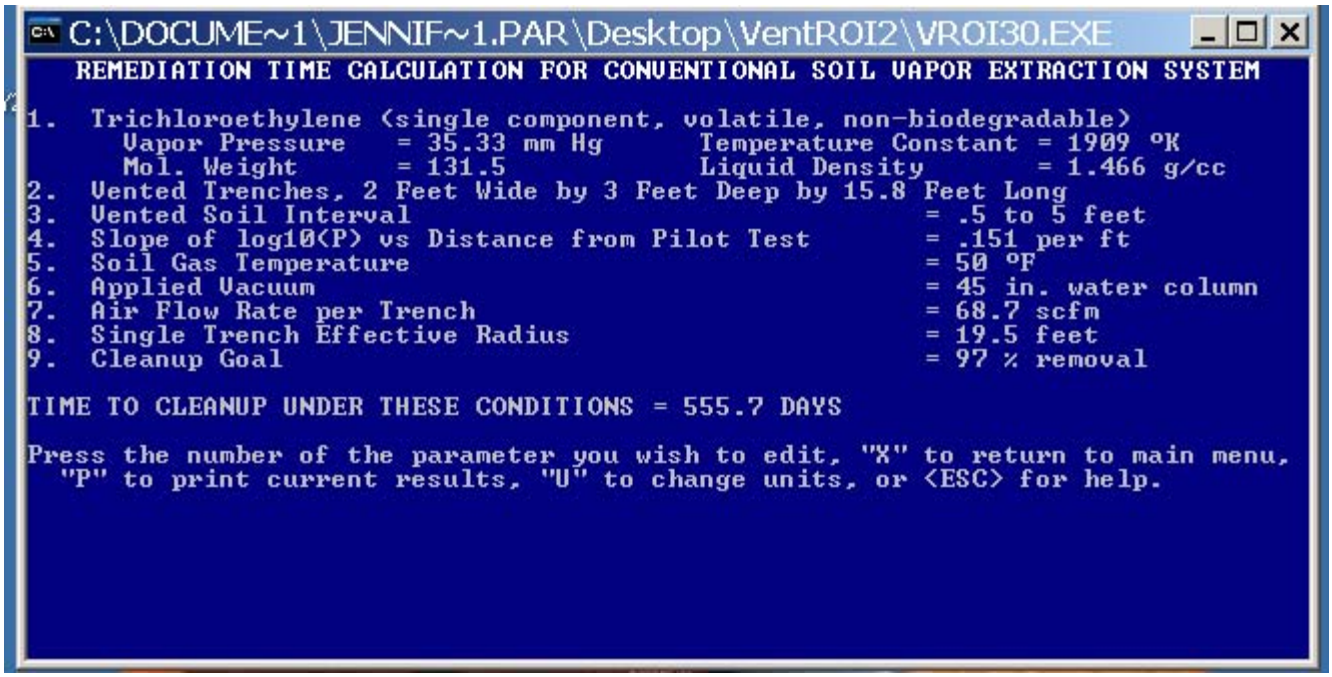

C:\DOCUME~1\JENNIF~1.PAR\Desktop\VentROI2\VROI30.EXE
REMEDIATION TIME CALCULATION FOR CONVENTIONAL SOIL VAPOR EXTRACTION SYSTEM
1. Trichloroethylene (single component, volatile, non-biodegradable)
Vapor Pressure = 35.33 mm Hg
Temperature Constant = 1909 °K
Mol. Weight = 131.5
Liquid Density = 1.466 g/cc
2. Vented Trenches, 2 Feet Wide by 3 Feet Deep by 11 Feet Long
3. Vented Soil Interval = .5 to 5 feet
4. Slope of log10(P) vs Distance from Pilot Test = .105 per ft
5. Soil Gas Temperature = 50 °F
6. Applied Vacuum = 45 in. water column
7. Air Flow Rate per Trench = 62.8 scfm
8. Single Trench Effective Radius = 25.1 feet
9. Cleanup Goal = 97 % removal
TIME TO CLEANUP UNDER THESE CONDITIONS = 427.2 DAYS
Press the number of the parameter you wish to edit, "X" to return to main menu,
"P" to print current results, "U" to change units, or <ESC> for help.

Extraction Well: BLDG5 -SVE-2 Contaminate of Concern: TCE






C:\DOCUME~1\JENNIF~1.PAR\Desktop\VentROI2\VROI30.EXE
REMEDIATION TIME CALCULATION FOR CONVENTIONAL SOIL VAPOR EXTRACTION SYSTEM
1. Trichloroethylene (single component, volatile, non-biodegradable)
Vapor Pressure = 35.33 mm Hg
Temperature Constant = 1909 °K
Mol. Weight = 131.5
Liquid Density = 1.466 g/cc
2. Vented Trenches, 2 Feet Wide by 3 Feet Deep by 15.8 Feet Long
3. Vented Soil Interval = .5 to 5 feet
4. Slope of log10(P) vs Distance from Pilot Test = .151 per ft
5. Soil Gas Temperature = 50 °F
6. Applied Vacuum = 45 in. water column
7. Air Flow Rate per Trench = 68.7 scfm
8. Single Trench Effective Radius = 19.5 feet
9. Cleanup Goal = 95 % removal
TIME TO CLEANUP UNDER THESE CONDITIONS = 474.8 DAYS
Press the number of the parameter you wish to edit, "X" to return to main menu,
"P" to print current results, "U" to change units, or <ESC> for help.


C:\DOCUME~1\JENNIF~1.PAR\Desktop\VentROI2\VROI30.EXE
REMEDIATION TIME CALCULATION FOR CONVENTIONAL SOIL VAPOR EXTRACTION SYSTEM
1. Trichloroethylene (single component, volatile, non-biodegradable)
Vapor Pressure = 35.33 mm Hg
Temperature Constant = 1909 °K
Mol. Weight = 131.5
Liquid Density = 1.466 g/cc
2. Vented Trenches, 2 Feet Wide by 3 Feet Deep by 15.8 Feet Long
3. Vented Soil Interval = .5 to 5 feet
4. Slope of log10(P) vs Distance from Pilot Test = .151 per ft
5. Soil Gas Temperature = 50 °F
6. Applied Vacuum = 45 in. water column
7. Air Flow Rate per Trench = 68.7 scfm
8. Single Trench Effective Radius = 19.5 feet
9. Cleanup Goal = 97 % removal
TIME TO CLEANUP UNDER THESE CONDITIONS = 555.7 DAYS
Press the number of the parameter you wish to edit, "X" to return to main menu,
"P" to print current results, "U" to change units, or <ESC> for help.

APPENDIX D

Public Notice Documents

December 17, 2012 Project #: 146898 - 25

Dr. Frank Carbone
Director of Board of Health
90 Colon Street
Beverly, MA 01915

Subject: Modification of Phase III and IV Plans – Building 5
Former Varian Facility Site
150 Sohier Road, Beverly, Massachusetts
MADEP # 3-0485

Dear Mr. Burke:

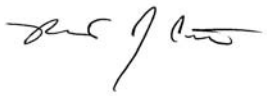
This letter is being provided to fulfill the public involvement provisions established by the Massachusetts Contingency Plan (MCP - 310 CMR 40.0000). Shaw Environmental & Infrastructure, Inc., on behalf of Varian Medical System, Inc., has submitted a report titled *Modification of Phase III Remedial Action Plan and Phase IV Remedy Implementation Plan* for the Building 5 area at the above reference Site.

The public involvement provisions of the MCP (310 CMR 40.1400) require that the Chief Municipal Officer and the Board of Health in the community in which a disposal site is located be notified that a Phase III Remedial Action Plan and Phase IV Remedy Implementation Plan reports will be submitted to the Department of Environmental Protection (DEP). In addition, Massachusetts regulations (310 CMR 1403(3)(e)) governing the cleanup of contaminated sites require that a summary of findings and conclusions of the Phase III report be provided to public officials. For a Phase IV Plan, a description of the comprehensive response action is required. A summary of findings and conclusions of the Phase III report and a description of the selected remedy from the Phase IV Plan are attached. Field work associated with implementing the selected soil vapor extraction (SVE) remedy is expected to begin in late December 2012.

As with other submittals for the subject Site, an e-copy of this report is attached for your files, a hard copy has been provided to the Varian Public Involvement Plan (PIP) repository at the Beverly City Library, and an e-copy has been provided to the Beverly Conservation Commission. A notice of availability for this document has also been issued to the PIP mailing list established for this Site.

If you have any questions regarding these reports, please do not hesitate to contact me.

Sincerely,
Shaw Environmental & Infrastructure, Inc.



Raymond J. Cadorette.
Project Manager

Enclosure

cc: Mayor William Scanlon, Beverly City Hall, 191 Cabot Street
Mr. John Buchanan, Varian Medical System, Inc.

Summary of Findings and Conclusions of the Phase III Report and Description of the Selected Remedy from the Phase IV Plan

Former Varian Facility Site
150 Sohier Road, Beverly, Massachusetts
MADEP # 3-0485

The following is a summary of the pertinent findings and conclusions of this Modified Phase III Remedial Action Plan submitted for the Former Varian Facility Site located at 150 Sohier Road in Beverly, Massachusetts:

- As part of the Phase II assessment, the indoor air pathway was assessed and determined to present No Significant Risk (IT, 2000). To confirm this conclusion of the Phase II report, additional indoor air sampling was conducted in 2011 and 2012.
- Indoor air sampling results from 2011 and 2012 in Building 5 suggest that indoor air concentrations are variable and the estimated hazards are at, but do not exceed, the MCP risk limits. However, it is likely that a Permanent Solution for the Building 5 area may not be achieved without some VOC remediation at Building 5 to reduce potential risk to site workers (Shaw, 2011 and Shaw, 2012b).
- This modification to the Phase III RAP identifies, evaluates, and selects a remedial action alternative to address potential risk associated with indoor air exposure recently identified in the Building 5 area. Specifically, this document modifies applicable sections of the original RAP for RTN 3-0485 to include technologies that are reasonably likely to achieve a Permanent Solution for the Building 5 area.
- In accordance with the MCP, an initial screening was conducted to identify remedial action alternatives that are reasonably likely to be feasible based on the OHM present, impacted media, and site characteristics. The focus of the remedies screened in this Phase III is to control exposures and/or eliminate VOC remaining in shallow soil and soil vapor that have the potential to migrate into the indoor air of Building 5.
- The initial screening process identified a short-list of applicable and available alternatives that are expected to effectively achieve a Permanent or Temporary Solution for the Site. These included: Alternative 1 – Soil Vapor Extraction, Alternative 2 – Soil Vapor Extraction with Air Sparging, Alternative 3 – Soil Vapor Extraction with In situ Chemical Oxidation, and Alternative 4 – Sub-slab Depressurization.
- Based upon the results of the detailed evaluation presented in this report, Alternative 1 - Soil Vapor Extraction was selected as the preferred remedial alternative.
- Soil Vapor Extraction with In Situ Chemical Oxidation (Alternative 3), ranked second and provides groundwater treatment, if needed, to abate indoor air impacts. Permanganate treatment has been shown to effectively treat VOC impacts in groundwater in at the Site. Therefore, Soil Vapor Extraction with In Situ Chemical Oxidation has been selected as a contingent remedial alternative.

The following sections from the Modified Phase IV Plan provide a description of the Comprehensive Response Action submitted for the Former Varian Facility Site located at 150 Sohier Road in Beverly, Massachusetts:

Description of Selected Remedial Action Alternative

The selected remedial action alternative includes operation of a SVE system. The SVE system will include three trench extraction wells, a moisture knock-out drum, regenerative vapor blower, and vapor phase granular activated carbon (GAC) vessels for removal of VOC prior to atmospheric discharge. The SVE system also includes appropriate instrumentation, controls and alarms to notify the system operator of key operating conditions. Refer to **Appendix E** for system design drawings.

Should indoor air concentrations not be reduced adequately by the proposed SVE system to achieve and maintain a condition of No Significant Risk, then modifications will be made to the system (e.g. additional SVE wells). If after SVE system modification a condition of No Significant Risk cannot be achieved, then permanganate treatment may be implemented to reduce groundwater and/or soil concentrations such that a Permanent Solution may be achieved. Permanganate treatment would be conducted by the injection of an approximate 20 percent sodium permanganate solution to the subsurface through the existing trench SVE wells. If determined to be necessary, new shallow permanganate application wells may be installed and used to treat VOC impacts in the Building 5 area. As required by the MCP, periodic monitoring of groundwater will be conducted to evaluate the application of sodium permanganate to the subsurface as remedial additive. Consistent with permanganate treatment already conducted at the Site, this monitoring will likely include monitoring parameters like oxidation reduction potential, conductivity, chloride and manganese in groundwater to ensure that treatment does not create adverse impacts to groundwater.

Environmental Impact Mitigation Measures

Environmental impact mitigation measures are precautions incorporated into the design, construction and operation of the remedial action alternative to avoid deleterious impacts on environmental receptors and natural resource areas.

The closest surface water body, the Unnamed Stream, is located in a culvert approximately 130 feet to the north of the Building 5. Given that the SVE system equipment is housed inside a trailer it is unlikely that the proposed SVE system will have deleterious impacts on environmental receptors or natural resource areas. Given its distance from the treatment area and the groundwater flow direction (to the west), is unlikely that permanganate application in the Building 5 treatment area would impact the Unnamed Stream. However, consistent with current permanganate treatment practices at other areas of the Site, field monitoring will conducted to ensure control of this remedial additive is maintained.

NOTICE OF AVAILABLIITY

MODIFICATION OF
PHASE III – REMEDIAL ACTION PLAN AND
PHASE IV REMEDY IMPLEMENTATION PLAN

FORMER VARIAN FACILITY SITE
150 SOHIER ROAD, BEVERLY, MASSACHUSETTS
MADEP SITE #3-0485

On December 17, 2012, a report titled *Modification of Phase III Remedial Action Plan and Phase IV Remedy Implementation Plan* was provided to the Massachusetts Department of Environmental Protection for the former Varian facility Site in Beverly, Massachusetts. This report documents an evaluation of remedial alternatives that are likely to achieve a Permanent Solution for potential indoor air impacts. In addition, the report presents modifications to the existing Phase IV Plan, including a detail engineering design, waste management plans and initial operation and maintenance activities for the selected remedial action alternative.

A copy of the *Modification of Phase III Remedial Action Plan and Phase IV Remedy Implementation Plan* is on file and available for review at the Beverly Board of Health (90 Colon Street), the Beverly Conservation Commission (Beverly Town Hall) and the local information repository established for this Site at the Beverly Public Library:

Beverly Public Library – Reference Desk
32 Essex Street
Beverly, MA 01915
978.921.6062
HOURS: Monday -Thursday 9 am to 9 pm
Friday and Saturday 9 am to 5 pm

Copy: PIP Mailing List

APPENDIX E

Sub-Slab SVE System Design – Building 5

IMAGE	X-REF	OFFICE	DRAWING NUMBER
---	---	CANTON	146898-T1

INDEX OF DRAWINGS

SHAW DRAWING NUMBER	SHEET REFERENCE NUMBER	DESCRIPTION
146898-T1	T-1	TITLE SHEET
146898-SITE PLAN	Y-1	SITE PLAN
146898-SITE DETAIL	Y-2	SITE DETAIL
146898-TREATMENT	Y-3	SUB-SLAB SVE SYSTEM EQUIPMENT PLAN
146898-DETAIL	Y-4	CONSTRUCTION DETAILS-SVE PIPING, MONITORING, PIPE SUPPORT AND ELECTRICAL SCHEMATIC DETAIL
146898-PID LEGEND	P-1	PIPING AND INSTRUMENTATION LEGEND
146898-PID	P-2	SUB-SLAB SVE SYSTEM PIPING AND INSTRUMENTATION DIAGRAM

SUB-SLAB SOIL VAPOR EXTRACTION SYSTEM

BUILDING 5
FORMER VARIAN FACILITY
150 SOHIER ROAD
BEVERLY, MASSACHUSETTS

PREPARED FOR:

VARIAN MEDICAL SYSTEMS, INC.
3120 HANSEN WAY
PALO ALTO, CALIFORNIA

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	11/20/12	CD	–	–	DRAFT #1

Shaw Environmental Inc.

SUB-SLAB SVE SYSTEM BUILDING 5
FORMER VARIAN FACILITY
BEVERLY, MASSACHUSETTS

TITLE SHEET

DESIGNED BY	PF	11/20/12	CHECKED BY	--	--
DRAWN BY	CD	11/20/12	APPROVED BY		

SCALE:	DRAWING NO.	SHEET NO.	REVISION NO.
NONE	146898-T1	T-1	–

VERIFY SCALE 0 1"

XREF Files: IMAGE Files:
File: K:\MSC\Varian\Beverly, MA\Phase A\BUILDING 5 SYSTEM\146898-T1.dwg Layout: Model User: chris.desoto Dec 10, 2012 - 11:50am

PARKING LOT

INSTALL LEVEL GRAVEL AREA
18' WIDE, 25' LONG WITH MIN.
4" BLUESTONE SURFACE WITH
SLOPED EXTENSION TO PARKING LOT

2000 # VAPOR CARBON
VESSELS BY OTHERS (TYP.)

SVE SYSTEM TRAILER

SVE SYSTEM PIPING

SIDEWALK

SVE PIPE IN TRENCH

BUSHES

BREAKER PANEL

SHRUBS

UNDERGROUND
GAS PIPING

BLDG5-SVE2

SHIPPING
AREA

PAINT MIXING AND
STORAGE ROOM

BLDG5-SVE3

PAINT
ROOM

BLD5-SV2

BLD5-SV1

BLD5-SV3

BLDG5-SVE1

SANDING ROOM

QA AREA

BLDG. 5

MAIN PRODUCTION AREA

LEGEND

- FORMER UTILITY TRENCH FILLED WITH CONCRETE
- UTILITY TRENCH
- SVE TRENCH WELL
- SVE PIPING
- APPROXIMATE 20' RADIUS OF INFLUENCE
- SUB-SLAB SOIL VAPOR SAMPLE LOCATION
- PROPOSED NEW SOIL VAPOR MONITORING POINT (DETAIL 1-4)

SCALE

0 20 40 FEET

TAB	X-REF	OFFICE	DRAWING NUMBER
ENG	---	CANTON	146898-SITE PLAN

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	11/20/12	CD	PF	PF	DRAFT #1

Shaw Environmental Inc.

SUB-SLAB SVE SYSTEM BUILDING 5
FORMER VARIAN FACILTY
BEVERLY, MASSACHUSETTS

SITE PLAN

DESIGNED BY	PF	11/20/12	CHECKED BY	--	--
DRAWN BY	CD	11/20/12	APPROVED BY	--	--

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--	146898-SITE PLAN	Y-1	-

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2000 # VAPOR CARBON VESSELS BY OTHERS (TYP.)

INSTALL LEVEL GRAVEL AREA 18' WIDE, 25' LONG WITH MIN. 4" BLUESTONE SURFACE WITH SLOPED EXTENSION TO PARKING LOT

SIDEWALK

SVE SYSTEM TRAILER

DUMPSTER

3'

10'

BUSH

BUSH

NOTE 4

GAS PIPING

BREAKER PANEL FOR ELECTRICAL CONNECTION

INSTALL DRAIN PLUG IN BOTTOM LEG OF TEE WHERE HORIZONTAL PIPE MEETS VERTICAL PIPE

INSTALL VERTICAL SVE PIPE AT WALL FROM HORIZONTAL UP TO MANIFOLD

INSTALL SVE PIPING ABOVE FLOOR AND BELOW STEAM RETURN PIPE

INSTALL ELECTRICAL CONDUIT ALONG WINDOWS FROM PANEL TO WALL PENETRATION

INSTALL SVE PIPE IN TRENCH FROM WELL END TO WALL

BLDG5-SVE2

INSTALL PIPE IN VEE OF OWBJ (NOTE 5)

SHIPPING AREA

NOTE 5

NOTE 5

NOTE 4

ROUTE SVE VERTICAL PIPING THROUGH SPACE IN EXISTING GAS PIPING TO OWBJ

NOTE 6

PAINT MIXING AND STORAGE ROOM

INSTALL SVE PIPE IN TRENCH

BLDG5-SVE3 (UNDER FILING CABINETS– MOVE CABINETS AS NEEDED)

NOTE 4

PAINT ROOM

CEILING VENT

GAS PIPING

QA AREA

SANDING ROOM

BLDG5-SVE1

LEGEND

- SVE MONITORING POINT (DETAIL 1–4)
- FORMER UTILITY TRENCH FILLED WITH CONCRETE
- UTILITY TRENCH
- SVE TRENCH WELL
- SVE PIPING
- APPROXIMATE 20' RADIUS OF INFLUENCE

ROOM

BLD 5–1	FINAL INSPECTION ROOM
BLD 5–2	SHIPPING
BLD 5–3	SAND BLASTING ROOM
BLD 5–4	PRODUCTION AREA

NOTES:

1.] SAW CUT TRENCHES IN CONCRETE FLOOR.
2.] DISPOSE OF ASBESTOS CONTAINING FLOOR TILES IN ACCORDANCE WITH APPLICABLE REGULATIONS.
3.] ROOF FRAMING IS OPEN WEB BAR JOISTS (OWBJ).
4.] CORE CMU BLOCK OR BRICK AND BLOCK WALL AFTER VERIFYING PIPE ROUTE BOTH SIDES OF WALL. SEAL SPACE BETWEEN SVE PIPE AND WALL WITH FIRE RESISTANT FLEXIBLE CAULK.
5.] SUPPORT SVE PIPES FROM ADJACENT WALLS OR OWBJ.
6.] STORAGE SHELVING LOCATION ABOVE DOORS EXTENDS UP TO OWBJ.
7.] ELECTRICAL CONNECTION FOR SVE TRAILER TO FOLLOW SVE PIPING ALONG INSIDE OF EXTERIOR WALL.

SCALE

0 10 20 FEET

TAB	X-REF	OFFICE	DRAWING NUMBER
ENG	---	CANTON	146898–SITE DETAIL

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
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Shaw Environmental Inc.

SUB–SLAB SVE SYSTEM BUILDING 5
FORMER VARIAN FACILTY
BEVERLY, MASSACHUSETTS

SITE DETAIL

DESIGNED BY	PF	11/20/12	CHECKED BY	--	--
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--	146898–SITE DETAIL	Y–2	–

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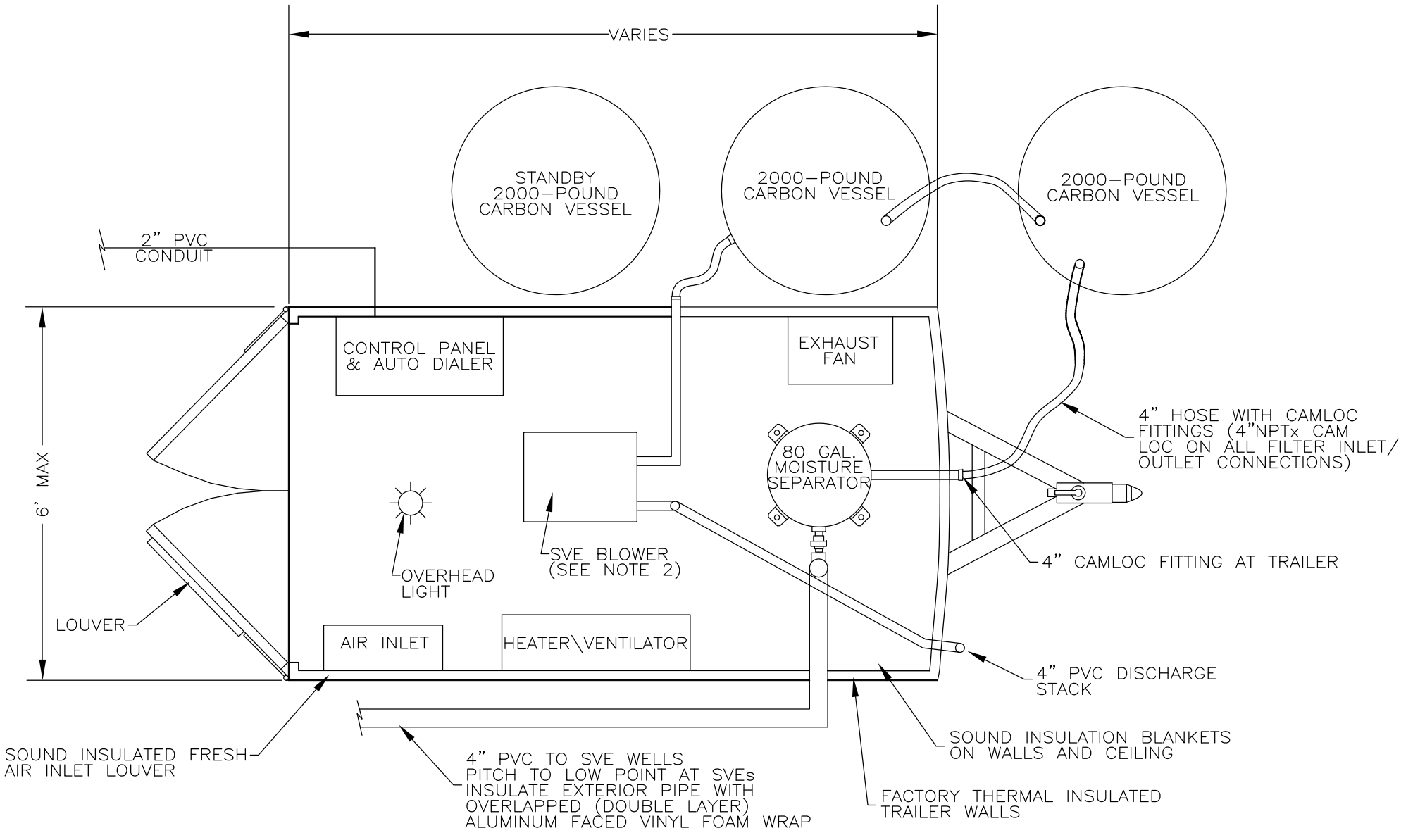


NOTES:

1. PIPING LOCATIONS ARE GENERAL AND MAY BE ADJUSTED TO SUIT.

2. SVE BLOWER
   - 200 CFM
   - ESTIMATED 60" H2O LOSS WELLS TO INLET
   - REQUIRE 45" H2O VACUUM AT WELLS

3. FURNISH JACK STANDS ON TRAILER.

4. PROVIDE CORNER TIE-DOWN EYE BOLTS.

5. PROVIDE SOUND INSULATED FAN HOOD.

6. PROVIDE HEAT, VENT AND LIGHT TO MAINTAIN MINIMUM 50° TEMP MAX 90° WITH BLOWER OPERATING.

BUILDING 5 SYSTEM LAYOUT

N.T.S.

NOTE: ELECTRIC CONDUIT AND SVE PIPING/HOSES ABOVEGRADE

NOTE: DRAWING NOT TO SCALE

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	11/20/12	CD	PF	PF	DRAFT #1

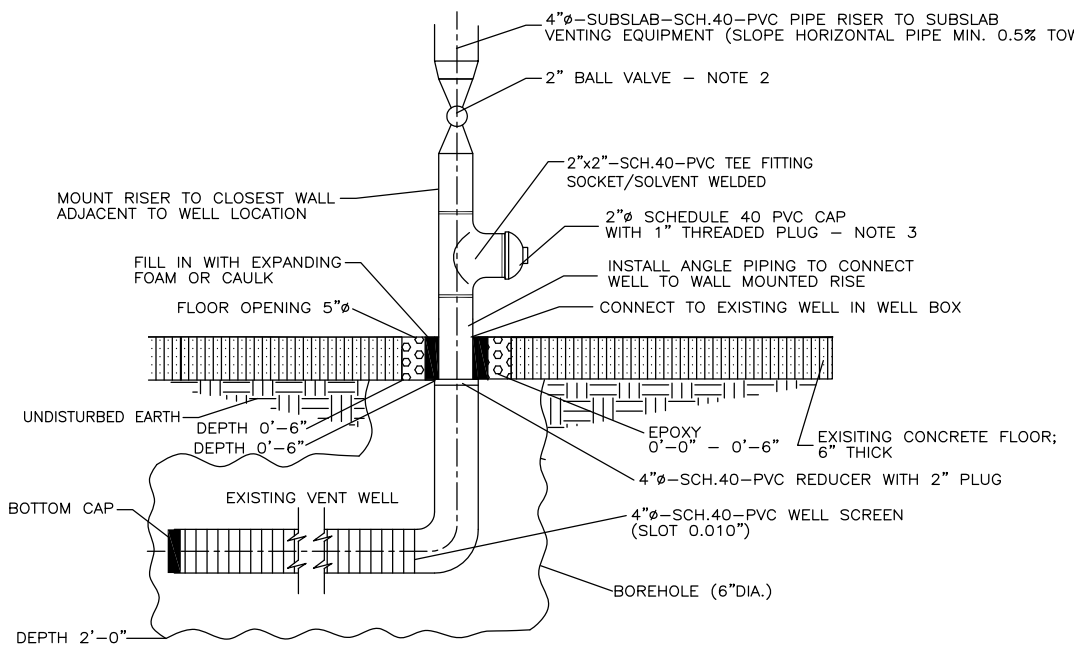
Shaw Environmental Inc.

SUB-SLAB SVE SYSTEM BUILDING 5
FORMER VARIAN FACILTY
BEVERLY, MASSACHUSETTS

SUB-SLAB SVE
SYSTEM EQUIPMENT PLAN

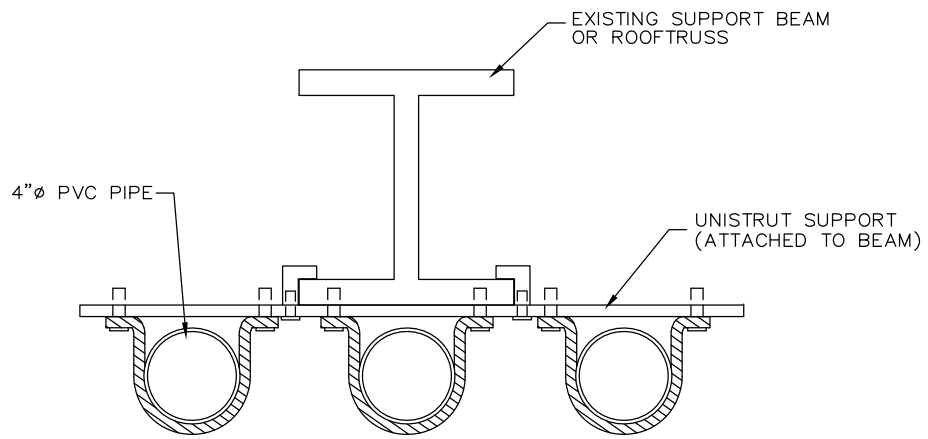
DESIGNED BY	PF	11/20/12	CHECKED BY	--	--
DRAWN BY	CD	11/20/12	APPROVED BY	--	--

SCALE:	DRAWING NO.	SHEET NO.	REVISION NO.
--	146898-TREATMENT	Y-3	-

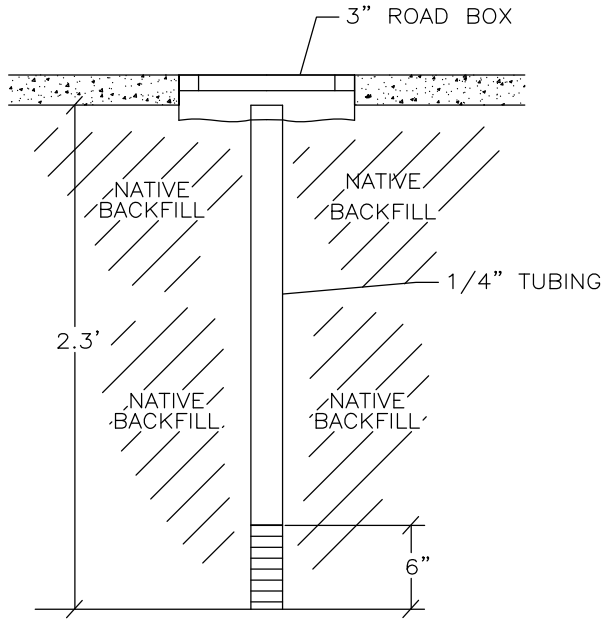


SUBSLAB VENTING WELL CONNECTION (TYPICAL)
NOT TO SCALE
ALL DEPTHS ARE APPROXIMATE

NOTES:
1.] INSTALL SOLID PIPE IN TRENCH TO CONNECT SVE–2 AND SVE–3 TO RISER PIPE AT ADJACENT WALL. TRENCH INSTALLATION INCLUDES CUTTING AND REPLACING CONCRETE FLOOR IN KIND. BACKFILL TRENCH WITH 3/8" WASHED STONE.
2.] INSTALL BALL VALVE ON RISER AS CLOSE TO FLOOR AS POSSIBLE. ON SVE–2 INSTALL BALL VALVE ON FIRST SUITIBLE VERTICAL PIPE.
3.] FACE AWAY FROM WALL.

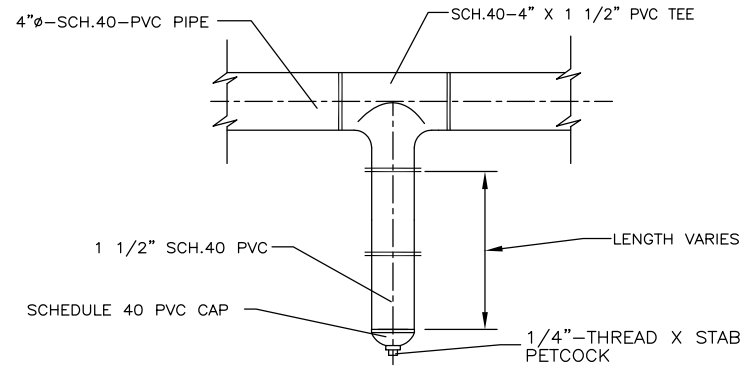


OVERHEAD PIPE SUPPORT (TYPICAL)
(VARIES BY NUMBER OF PIPES ATTACHED)
NOT TO SCALE

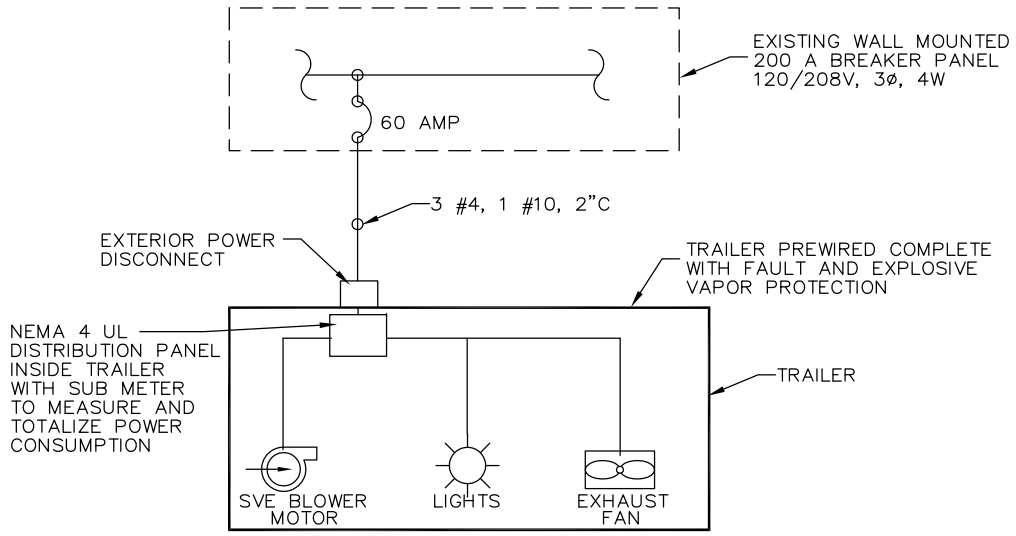


BUILDING 5
SOIL VAPOR MONITORING POINT (TYPICAL)
NOT TO SCALE
ALL DEPTHS ARE APPROXIMATE

DETAIL 1



DRAIN DETAIL
NOT TO SCALE



ELECTRICAL SCHEMATICS POWER
SOURCE FEED TO TRAILER
NOT TO SCALE

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
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Shaw Environmental Inc.

SUB–SLAB SVE SYSTEM BUILDING 5
FORMER VARIAN FACILTIY
BEVERLY, MASSACHUSETTS

CONSTRUCTION DETAILS –
SVE PIPING, MONITORING WELL, PIPE
SUPPORT, AND ELECTRICAL SCHEMATIC DETAIL

DESIGNED BY	PF	11/20/12	CHECKED BY	--	--
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OFFICE CANTON
X–REF ---
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VALVE AND PIPING SYMBOLS

- GLOBE VALVE
- GATE VALVE (NORMALLY OPEN)
- GATE VALVE (NORMALLY CLOSED)
- BUTTERFLY VALVE
- SPRING CHECK VALVE
- CHECK VALVE
- PLUG VALVE
- 3-WAY VALVE
- ANGLE VALVE
- RELIEF OR SAFETY VALVE
- DIAPHRAGM VALVE
- SAMPLE PORT
- BALL VALVE NC (NORMALLY CLOSED)
- BALL VALVE THROTTLED
- BALL VALVE NO (NORMALLY OPEN)
- SELF-CONTAINED PRESSURE REGULATING VALVE W/RELIEF
- SELF-CONTAINED PRESSURE REGULATING VALVE AND FILTER W/RELIEF
- FILTER
- KNIFE GATE VALVE
- BACKFLOW PREVENTER (BP)
- FLEXIBLE HOSE
- CAPPED LINE
- 90° ELBOW
- EXPANSION JOINT
- BASKET TYPE STRAINER
- Y-TYPE STRAINER
- STEAM TRAP (T)
- DUPLEX STRAINER
- SLEEVE COUPLING (SC)
- FLOOR DRAIN
- EQUIPMENT DRAIN
- CLEANOUT (CO)
- REMOVABLE PLUG
- REMOVABLE CAP
- BLIND FLANGE (BF)
- EXHAUST TO ATMOSPHERE (INSIDE)
- EXHAUST TO ATMOSPHERE (OUTSIDE)
- REDUCER
- UNION
- QUICK DISCONNECT COUPLING (C)
- GAUGE SEAL
- DAMPER
- SILENCER
- VACCUM BREAK
- TEE

VALVE OPERATOR SYMBOLS

- SOLENOID (S)
- MOTOR, ELECTRIC (M)
- DIAPHRAGM
- DIAPHRAGM WITH POSITIONER
- HANDWHEEL OR LEVER
- CHAINWHEEL

PRIMARY ELEMENT SYMBOLS – FLOW

- ORIFICE PLATE
- PITOT TUBE
- AVERAGING PITOT TUBE
- SIGHT TUBE
- TOTALIZING FLOWMETER
- FLOW SWITCH
- POSITIVE DISPLACEMENT FLOW METER
- WEIR
- TURBINE OR PROPELLER TYPE METER
- MAGNETIC FLOW METER
- ROTAMETER

GENERAL INSTRUMENT SYMBOLS

- FIELD MOUNTED
- PANEL MOUNTED
- REAR-OF-PANEL MOUNTED
- INTERLOCK (WHERE N = INTERLOCK NUMBER) (N)
- PURGE (P)
- TWO INSTRUMENTS PHYSICALLY CONNECTED
- INTERNAL PLC INSTRUMENT OR FUNCTION
- INDICATOR LIGHT
- PISTON ACTUATOR

LINE SYMBOLS

- PROCESS PIPES OR CHANNELS
- ELECTRICAL SIGNAL
- ELECTRICAL INTERCONNECTION
- PNEUMATIC SIGNAL
- CAPILLARY TUBING (FILLED SYSTEM)
- HYDRAULIC SIGNAL
- ELECTROMAGNETIC OR SONIC SIGNAL NO WIRING OR TUBING

EQUIPMENT SYMBOLS

- AIR SPARGING WELL
- SUBMERSIBLE PUMP
- PUMP
- PNEUMATIC DOUBLE DIAPHRAGM PUMP
- CATALYST
- SIGHT TUBE
- HORIZONTAL SOIL VAPOR EXTRACTION WELL
- BLOWER
- AIR COMPRESSOR
- FLAME ARRESTOR
- BURNER
- HEAT EXCHANGER

SERVICE ABBREVIATIONS

AIR	AIR, ATMOSPHERIC PRESSURE
ASP	AIR SPARGE
BW	BACKWASH
CA	COMPRESSED AIR
CDS	CONDENSATE
CGW	CONTAMINATED GROUNDWATER
D	DRAIN
EFF	EFFLUENT
EXH	EXHAUST
GW	GROUNDWATER
NPW	NON-POTABLE WATER
P	PRODUCT
PW	POTABLE WATER
S	SANITARY
SC	SECONDARY CONTAINMENT
SL	SLUDGE
SMC	STEAM MIGRATION CONTROL
SP	SAMPLE PORT
SS	STORM SEWER
STM	STEAM
SV	SUB-SLAB VENTING
SVE	SOIL VAPOR EXTRACTION
TF	TOTAL FLUIDS
V	VENT
VAP	VAPOR

PIPING MATERIAL IDENTIFICATION

CIP	CAST IRON PIPE
CMP	CORRUGATED METAL PIPE
COP	COPPER
CPVC	CHLORINATED POLYVINYL CHLORIDE
CSP	CARBON STEEL PIPE
DIP	DUCTILE IRON PIPE
ESP	EPOXY-COATED STEEL PIPE
FLX	FLEXIBLE HOSE
GAL	GALVANIZED STEEL PIPE
PE	POLYETHYLENE PIPE
PP	POLYPROPYLENE PIPE
PVC	POLYVINYL CHLORIDE PIPE
RCP	REINFORCED CONCRETE PIPE
RUB	RUBBER HOSE
SS	STAINLESS STEEL PIPE
VCP	VITRIFIED CLAY PIPE

INSULATION/FINISH CLASS

I	INSULATED
H	HEAT TRACED
P	PAINTED
N	NO FINISH

PROCESS PIPING IDENTIFICATION

PIPE DIAMETER (INCHES) – PROCESS PIPE – SERVICE – PIPING MATERIAL IDENTIFICATION – PROCESS NUMBER (REFER TO PROJECT SPECIFICATIONS) – INSULATION/FINISH CLASS

2"-WWW-XXX-YY-Z

INSTRUMENT IDENTIFICATION

FIT 1-100

FIT-1-100
- 100: LOOP NUMBER
- 1: AREA NUMBER
- FIT: SEE BELOW

F	FILTER
FE	FLOW ELEMENT
FI	FLOW INDICATOR
FIT	FLOW INDICATOR AND TRANSMITTER
FIQ	FLOW INDICATOR AND TOTALIZER
FN	FAN
FQ	FLOW TOTALIZER
FR	FILTER REGULATOR
FSL	FLOW SWITCH LOW
HOA	HAND-OFF-AUTOMATIC
HS	HAND SWITCH
KY	TIMER
LAH	LEVEL ALARM HIGH
LAHH	LEVEL ALARM HIGH-HIGH
LEL	LOWER EXPLOSIVE LIMIT
LI	LEVEL INDICATOR
LSL	LEVEL SWITCH LOW
LSH	LEVEL SWITCH HIGH
LSHH	LEVEL SWITCH HIGH-HIGH
LT	RUN LIGHT
MV	MOTORIZED VALVE
OCA	OPEN(MOMENTARY)-CLOSE-AUTO
PAH	PRESSURE ALARM HIGH
PCV	PRESSURE CONTROL VALVE
PI	PRESSURE INDICATOR
PS	PRESSURE SWITCH
PSH	PRESSURE SWITCH HIGH
RV	RELIEF VALVE
SV	SOLENOID VALVE
TA	TEMPERATURE ANALYZER
TE	TEMPERATURE ELEMENT
TI	TEMPERATURE INDICATOR
TSH	TEMPERATURE SWITCH HIGH
TT	TEMPERATURE TRANSMITTER
VI	VACUUM INDICATOR

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	11/20/12	CD	PF	PF	DRAFT #1

SUB-SLAB SVE SYSTEM BUILDING 5
FORMER VARIAN FACILITY
BEVERLY, MASSACHUSETTS

Shaw Environmental Inc.

PIPING AND INSTRUMENTATION LEGEND

DESIGNED BY	PF	11/20/12	CHECKED BY	--	--
DRAWN BY	CD	11/20/12	APPROVED BY	--	--

SCALE:	DRAWING NO.	SHEET NO.	REVISION NO.
NONE	146898-PID_LEGEND	P-1	1

VERIFY SCALE 0 1"

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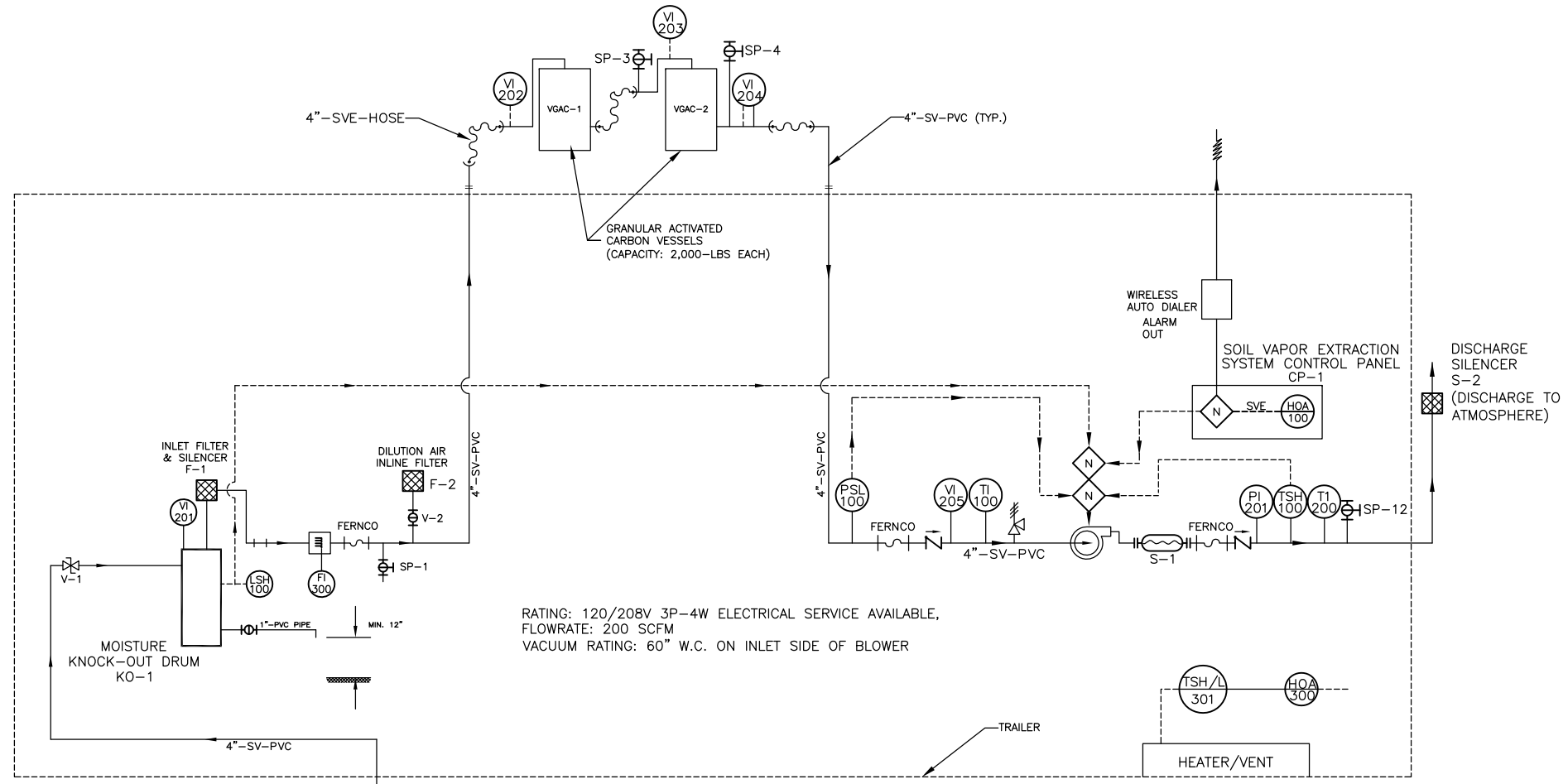
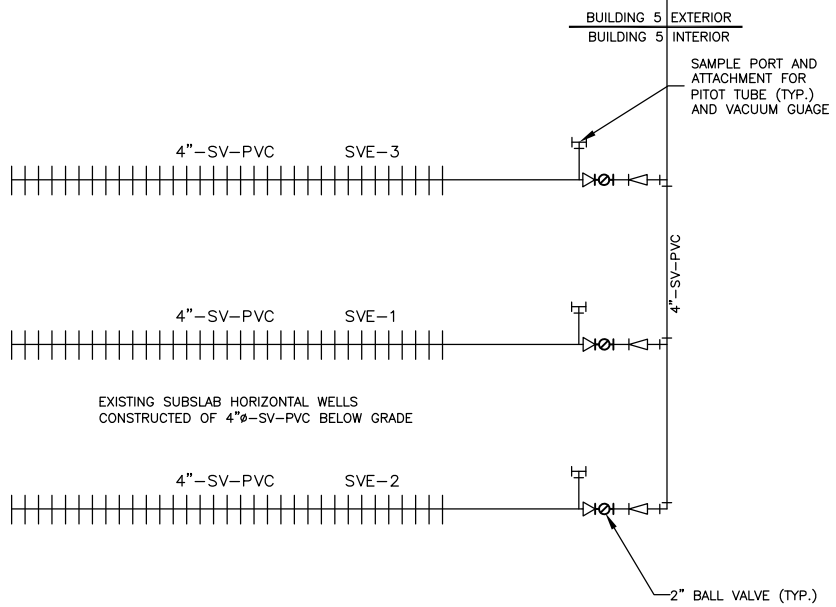
XREF Files: IMAGE Files:

OFFICE CANTON | DRAWING NUMBER 146898-PID





NOTES:

1. PVC PIPE SCH 80.
2. PROVIDE VACUUM RELIEF VALVE ON BLOWER INTAKE.
3. CONTROL PANEL REQUIRES CONTROL VOLTAGE TRANSFORMER.
4. PROVIDE EMERGENCY STOP BUTTON AT BLOWER.
5. PROVIDE WIRELESS AUTODIALER.
6. PROVIDE RUN TIME METER FOR BLOWER.
7. PROVIDE ALARM LIGHTS WITH INTERLOCKS IN PANEL.
8. PROVIDE LOCAL METER ON ELECTRICAL SERVICE BETWEEN DISCONNECT AND BREAKER PANEL.
9. ROUTE SVE PIPING ON ADJACENT WALLS AND COLUMNS OUT OF WORKING AREAS AND ON FLOORS, WALLS AND OVERHEAD FRAMING. SEAL ALL PENETRATIONS.

REFERENCE:

PLAN DERIVED FROM SHAW ENVIRONMENTAL FIELD RECONNAISSANCE.

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION/ISSUE
0	11/20/12	CD	LN	LN	DRAFT #1

Shaw Environmental Inc.

SUB-SLAB SVE SYSTEM BUILDING 5
FORMER VARIAN FACILITY
BEVERLY, MASSACHUSETTS

SUB-SLAB SVE SYSTEM PIPING AND INSTRUMENTATION DIAGRAM

DESIGNED BY	PF	11/20/12	CHECKED BY	--	
DRAWN BY	CD	11/20/12	APPROVED BY		

SCALE:	DRAWING NO.	SHEET NO.	REVISION NO.
NONE	146898-PID	P-2	-

VERIFY SCALE 0 1"

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Plotted By: chris.diedrich