BEACON Report No. 2281

PASSIVE SOIL-GAS INVESTIGATION
UNIVERSAL MANUFACTURING SITE
WOODINVILLE, WA

Prepared for

CDM
11811 NE 1st Street
Suite 201
Bellevue, WA 98005

by

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

February 17, 2010

Applying Results from Soil-Gas Surveys

The utility of soil-gas surveys is directly proportional to their accuracy in reflecting and representing changes in the subsurface concentrations of source compounds. Passive soil-gas survey results are the mass collected from the vapor-phase emanating from the source. The vapor-phase is merely a fractional trace of the source, so, as a matter of convenience, the units used in reporting detection values from passive soil-gas surveys are smaller than those employed for source-compound concentrations.

The critical fact is that, whatever the relative concentrations of source and associated soil gas, best results are realized when the ratio of soil-gas measurements to actual subsurface concentrations remains as close to constant as the real world permits. It is the reliability and consistency of this ratio, not the particular units of mass (*e.g.*, nanograms) that determine usefulness. Thus, BEACON emphasizes the necessity of conducting — at minimum — follow-on intrusive sampling at one or two points that show relatively high soil-gas measurements to obtain corresponding concentrations of soil and groundwater contaminants. These correspondent values furnish the basis for approximating the required ratio. Once that ratio is established, it can be used in conjunction with the soil-gas measurements (regardless of the units adopted) to estimate subsurface contaminant concentrations across the survey field. It is important to keep in mind, however, that specific conditions at individual sample points, including soil porosity and permeability, depth to contamination, and perched ground water, can have significant impact on soil-gas measurements at those locations.

When passive soil-gas surveys are handled in this way, the data provide information that can yield substantial savings in drilling costs and in time. They furnish, among other things, a checklist of compounds expected at each survey location and help to determine how and where drilling budgets can most effectively be spent.

BEACON Report Number: 2281

Passive Soil-Gas Investigation
Universal Manufacturing Site
Woodinville, WA

This Passive Soil-Gas Investigation Report has been prepared for CDM by Beacon Environmental Services, Inc. (BEACON) in accordance with the terms of Purchase Order No.: 22080-74417.TASK 2, dated December 15, 2009. BEACON's principal technical contact at CDM for this project has been Mr. Howard Young.

1. Objectives

Passive soil-gas (PSG) samplers were collected in December 2009 to determine the presence, identity, and relative strength of targeted contaminants in the vapor phase at the Universal Manufacturing Site. During this PSG survey, weather conditions existed that caused ice to form in the shallow soils, which presented a concern that the survey results were biased at a few locations; therefore, seven PSG samples were collected in January 2010 at select locations to verify the initial results. Results from both sampling events are included in this report.

2. Target Compounds

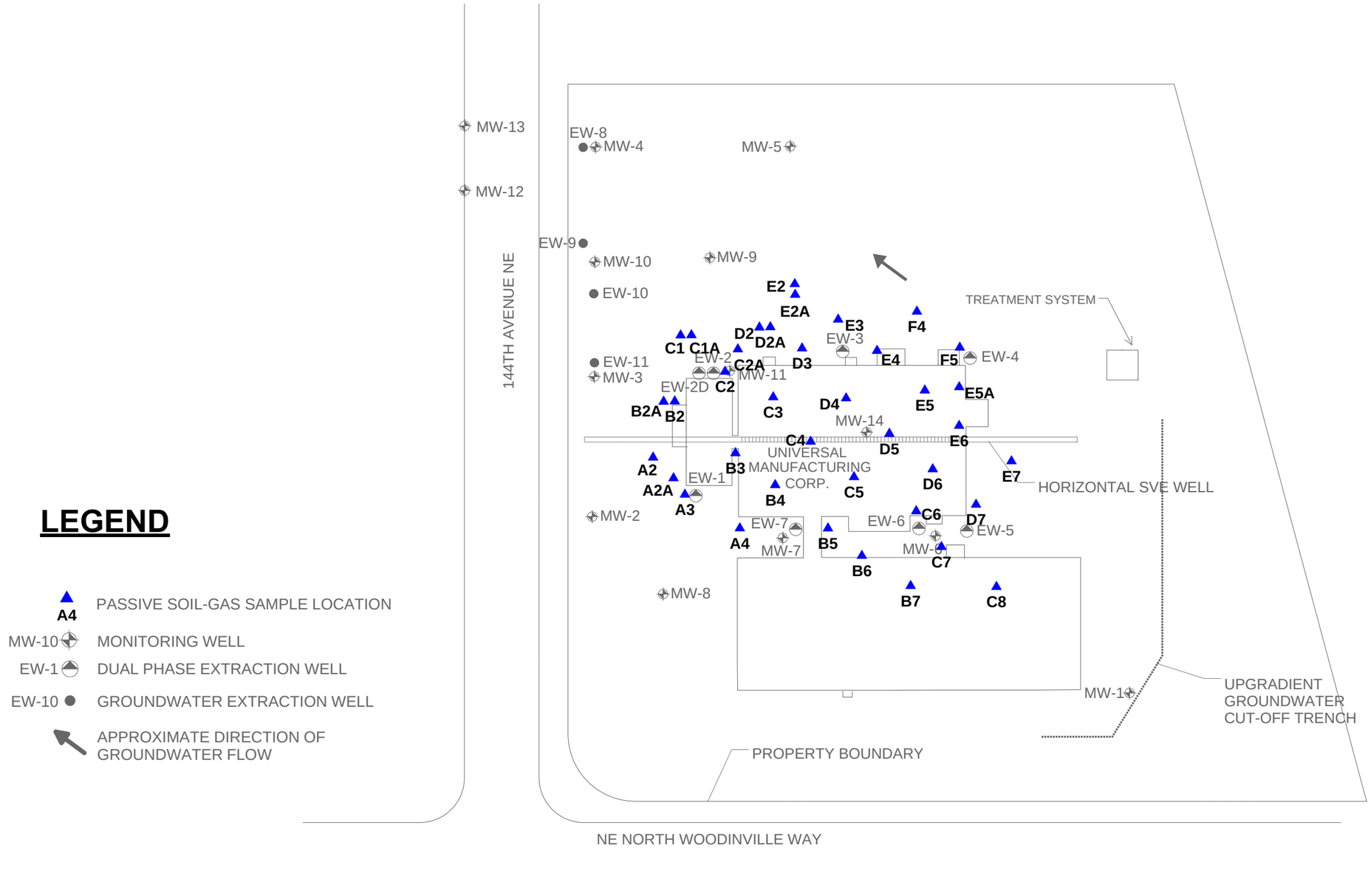
This survey targeted Vinyl Chloride, cis-1,2-Dichloroethene, Trichloroethene, and Tetrachloroethene; the resulting laboratory data from the first and second sampling events are provided in **Tables 1 and 2**, respectively, in nanograms (ng) of specific compound per cartridge.

3. Survey Description

No. of Field Samples (December 2009):	31
No. of Field Samples (January 2010) :	7
No. of Duplicate Field Samples (December 2009):	1
No. of Trip Blanks:	2
Total No. of Samples:	41

Field sample locations are shown on **Figure 1**.

Note: The sampler at location D2 was not successfully retrieved during the December 2009 PSG survey; however, this location was sampled as part of the second sampling event.



LEGEND

- A4 — PASSIVE SOIL-GAS SAMPLE LOCATION
- MW-10 — MONITORING WELL
- EW-1 — DUAL PHASE EXTRACTION WELL
- EW-10 — GROUNDWATER EXTRACTION WELL
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW

Scale in Feet

0 60 120

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Bel Air, MD, 800-878-5510
Beacon Project No. 2281, February 2010

Figure 1
Passive Soil-Gas Survey
Sample Locations

Universal Manufacturing Site
Woodinville, WA

4. Field Work

CDM deployed the PSG samplers for the first sampling event on December 7, 2009, and retrieved them on December 15, 2009. Samplers for the second sampling event were deployed by CDM on January 21, 2010, and retrieved on January 29, 2010. **Attachment 1** describes the field procedures used. Individual deployment and retrieval times will be found in the Field Deployment Report (**Attachment 2**).

5. Analysis and Reporting Dates

BEACON's laboratory received for analysis 32 samples on December 16, 2009, and eight (8) samples on February 2, 2010. Adsorbent cartridges from the passive samplers were thermally desorbed, then analyzed using gas chromatography/mass spectrometry (GC/MS) equipment, in accordance with EPA Method 8260B (Modified), as described in **Attachment 3**. Analyses of the initial set of samples were completed on December 17, 2009, analyses of the second set of samples were completed on February 2, 2010. Following a laboratory review, results from the initial set of samples were provided to CDM on December 21, 2009; results from the second set of samples were provided on February 9, 2010.

6. Report Notes and Quality Assurance/Quality Control Factors

Tables 1 and 2 provide survey results in nanograms per cartridge by sample-point number and compound name. The method detection limit (mdl) for each compound represents a baseline above which results exceed laboratory-determined limits of precision and accuracy.

Data Compatibility. It is important to note that when sample locations are covered with or near the edge of an artificial surface (*e.g.*, asphalt or concrete), the concentrations of compounds in soil gas are often significantly higher than the concentrations would be if the surfacing were not present. Thus, a reading taken below or near an impermeable surface is much higher than it would be in the absence of such a cap. Therefore, the sample location conditions should be evaluated when comparing results between locations.

The **Chain-of-Custody** form, which was shipped with the samples for this survey, is supplied as **Attachment 4**.

Laboratory QA/QC procedures included standards, surrogates, and blanks appropriate to EPA Method 8260B (Modified). Field work, analyses, and reporting were done in accordance with BEACON's Quality Assurance Program Plan.

QA/QC Contaminant Corrections. Following EPA guidelines, laboratory data are not corrected for method blank or trip blank sample contamination values; any contamination detected on QA/QC samples would be reported in **Tables 1 and 2**.

Laboratory method blanks are run each day with project samples to identify contamination present in the laboratory. If contamination is detected on a method blank, measurements of identical compounds on samples analyzed the same day are considered to be suspect and are flagged in the laboratory report. The laboratory method blanks analyzed in connection with the present samples revealed no contamination.

The **trip blank** is a sampling cartridge prepared, transported, and analyzed with other samples but intentionally not exposed. Any target compounds identified on the trip blanks are reported in the laboratory data. The analyses of the trip blanks (labeled Trip-1 and Trip-2 in **Tables 1 and 2**) reported none of the targeted compounds, indicating that the survey site itself is the source of detected contamination.

Duplicates. BEACON's passive soil-gas samplers are prepared with two sets of cartridges for subsequent duplicate or confirmatory sample analysis. At CDM's request, duplicate analysis was performed for sample C2, designated C2-D. Because of finite differences between the cartridges, and the random nature of diffusive particle movement, comparisons between duplicates and primary samples should be made on a qualitative basis, as quantitative results may be subject to random distortions. However, when comparing quantitative results, a duplicate correspondence should be considered when the relative percent difference (RPD) between the two samples is less than or equal to 100%. Also, for the purpose of calculating correspondences, all non-detections should be assigned, as a baseline value, the quantitation level for the specific contaminant. Based on these assumptions, a 100% correlation was found between the duplicate sample and its base sample.

Survey findings are relative exclusively to this project and should not routinely be compared with results of other BEACON Surveys. *To establish a relationship between reported soil-gas measurements and actual subsurface contaminant concentrations, which will indicate those detections representing significant subsurface contamination, BEACON recommends the guidelines on the inside front cover of this report.*

At the request of CDM, the following compound distribution maps have been provided:

Figure 2 — Vinyl Chloride
Figure 3 — cis-1,2-Dichloroethene
Figure 4 — Trichloroethene
Figure 5 — Tetrachloroethene

The following **Attachments** are included:

-1- Field Procedures
-2- Field Deployment Report
-3- Laboratory Procedures
-4- Chain-of-Custody Form

Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260B (Modified)

	Client Sample ID:	MB	Trip-1	A2	A3	A4
	Project Number:	2281	2281	2281	2281	2281
	Lab File ID:	09121603	09121605	09121606	09121607	09121608
	Received Date:		12/16/2009	12/16/2009	12/16/2009	12/16/2009
	Analysis Date:	12/16/2009	12/16/2009	12/16/2009	12/16/2009	12/16/2009
	Analysis Time:	15:31	16:13	16:32	16:52	17:11
	Units:	ng	ng	ng	ng	ng
COMPOUNDS						
Vinyl Chloride		<mdl	<mdl	<mdl	<mdl	<mdl
cis-1,2-Dichloroethene		<mdl	<mdl	<mdl	<mdl	**162**
Trichloroethene		<mdl	<mdl	<mdl	<mdl	**211**
Tetrachloroethene		<mdl	<mdl	**7 J**	**7 J**	**21**

Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260B (Modified)

	Client Sample ID:	B2	B3	B4	B5	B6
	Project Number:	2281	2281	2281	2281	2281
	Lab File ID:	09121609	09121610	09121611	09121612	09121613
	Received Date:	12/16/2009	12/16/2009	12/16/2009	12/16/2009	12/16/2009
	Analysis Date:	12/16/2009	12/16/2009	12/16/2009	12/16/2009	12/16/2009
	Analysis Time:	17:30	17:49	18:09	18:28	18:47
	Units:	ng	ng	ng	ng	ng
COMPOUNDS						
Vinyl Chloride		<mdl	<mdl	**5,007**	**83**	<mdl
cis-1,2-Dichloroethene		<mdl	**95**	**68,875**	**27,395**	**77**
Trichloroethene		<mdl	**377**	**16,321**	**3,013**	**581**
Tetrachloroethene		**6 J**	**14,379**	**11,791**	**91**	**245**

Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260B (Modified)

	Client Sample ID:	B7	C1	C2	C2-D	C3
	Project Number:	2281	2281	2281	2281	2281
	Lab File ID:	09121614	09121615	09121616	09121617	09121618
	Received Date:	12/16/2009	12/16/2009	12/16/2009	12/16/2009	12/16/2009
	Analysis Date:	12/16/2009	12/16/2009	12/16/2009	12/16/2009	12/16/2009
	Analysis Time:	19:07	19:26	19:45	20:05	20:24
	Units:	ng	ng	ng	ng	ng
COMPOUNDS						
Vinyl Chloride		<mdl	<mdl	<mdl	<mdl	<mdl
cis-1,2-Dichloroethene		**153**	**7**	**4 J**	**3 J**	**127**
Trichloroethene		**4,802**	**12**	**5**	**6**	**230**
Tetrachloroethene		**62**	**10**	**5 J**	**4 J**	**231**

Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260B (Modified)

	Client Sample ID:	C4	C5	C6	C7	C8
	Project Number:	2281	2281	2281	2281	2281
	Lab File ID:	09121619	09121620	09121621	09121622	09121623
	Received Date:	12/16/2009	12/16/2009	12/16/2009	12/16/2009	12/16/2009
	Analysis Date:	12/16/2009	12/16/2009	12/16/2009	12/16/2009	12/16/2009
	Analysis Time:	20:44	21:03	21:22	21:42	22:01
	Units:	ng	ng	ng	ng	ng
COMPOUNDS						
Vinyl Chloride		**1,563**	**704**	<mdl	<mdl	**80**
cis-1,2-Dichloroethene		**4,776**	**3,394**	**614**	**777**	**12,073**
Trichloroethene		**3,097**	**260**	**7,593**	**1,432**	**48,512**
Tetrachloroethene		**1,985**	**76**	**101**	**28**	**2,508**

Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260B (Modified)

	Client Sample ID:	D3	D4		D5	D6	D7
	Project Number:	2281	2281		2281	2281	2281
	Lab File ID:	09121624	09121625		09121626	09121627	09121628
	Received Date:	12/16/2009	12/16/2009		12/16/2009	12/16/2009	12/16/2009
	Analysis Date:	12/16/2009	12/16/2009		12/16/2009	12/16/2009	12/16/2009
	Analysis Time:	22:20	22:40		22:59	23:19	23:38
	Units:	ng	ng		ng	ng	ng
COMPOUNDS							
Vinyl Chloride		<mdl	**7**	**J**	**92**	**388**	<mdl
cis-1,2-Dichloroethene		**11**	**39**		**117**	**112**	**54**
Trichloroethene		**618**	**1,396**		**68**	**92**	**1,426**
Tetrachloroethene		**27**	**29**		<mdl	**12**	**23**

Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260B (Modified)

	Client Sample ID:	E2	E3	E4	E5		E6
	Project Number:	2281	2281	2281	2281		2281
	Lab File ID:	09121629	09121630	09121631	09121632		09121633
	Received Date:	12/16/2009	12/16/2009	12/16/2009	12/16/2009		12/16/2009
	Analysis Date:	12/16/2009	12/17/2009	12/17/2009	12/17/2009		12/17/2009
	Analysis Time:	23:57	12:17	12:36	12:55		1:15
	Units:	ng	ng	ng	ng		ng
COMPOUNDS							
Vinyl Chloride		<mdl	<mdl	<mdl	**26**		**19**
cis-1,2-Dichloroethene		<mdl	<mdl	**13**	**51**		**92**
Trichloroethene		**7**	**84**	**1,812**	**1,152**		**399**
Tetrachloroethene		**19**	**13**	**18**	**7**	**J**	**25**

Table 1

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260B (Modified)

	Client Sample ID:	E7	F4	F5
	Project Number:	2281	2281	2281
	Lab File ID:	09121634	09121635	09121636
	Received Date:	12/16/2009	12/16/2009	12/16/2009
	Analysis Date:	12/17/2009	12/17/2009	12/17/2009
	Analysis Time:	1:34	1:54	2:13
	Units:	ng	ng	ng
COMPOUNDS				
Vinyl Chloride		<mdl	<mdl	**16**
cis-1,2-Dichloroethene		<mdl	<mdl	**33**
Trichloroethene		**8**	<mdl	**11**
Tetrachloroethene		**20**	<mdl	<mdl

Results in nanograms (ng). J = Estimated value less than five (5) times the method detection limit. B = Detected in method blank.

Table 2

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260B (Modified)

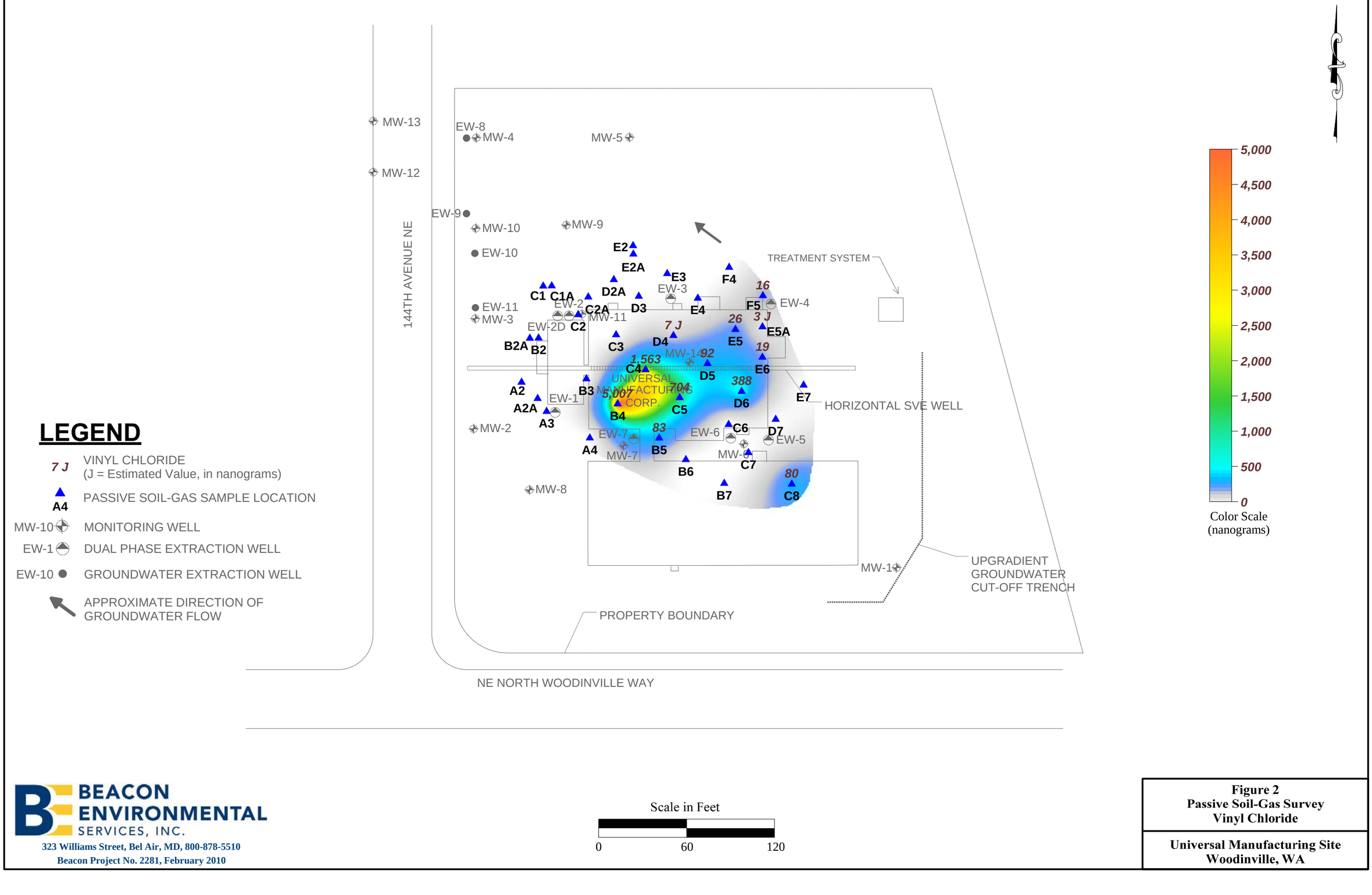
Client Sample ID:	MB	Trip-2	A2A	B2A	C1A
Project Number:	2281	2281	2281	2281	2281
Lab File ID:	10020203	10020206	10020207	10020208	10020209
Received Date:		2/1/2010	2/1/2010	2/1/2010	2/1/2010
Analysis Date:	2/2/2010	2/2/2010	2/2/2010	2/2/2010	2/2/2010
Analysis Time:	9:44	10:46	11:05	11:24	11:44
Units:	ng	ng	ng	ng	ng
COMPOUNDS					
Vinyl Chloride	<mdl	<mdl	<mdl	<mdl	<mdl
cis-1,2-Dichloroethene	<mdl	<mdl	<mdl	<mdl	<mdl
Trichloroethene	<mdl	<mdl	**2 J**	**4**	**1 J**
Tetrachloroethene	<mdl	<mdl	**4 J**	**3 J**	**5 J**

Table 2

Beacon Environmental Services, Inc.
323 Williams Street
Bel Air, MD 21014

Analysis by EPA Method 8260B (Modified)

	Client Sample ID:	C2A	D2A	E2A	E5A
	Project Number:	2281	2281	2281	2281
	Lab File ID:	10020210	10020211	10020212	10020213
	Received Date:	2/1/2010	2/1/2010	2/1/2010	2/1/2010
	Analysis Date:	2/2/2010	2/2/2010	2/2/2010	2/2/2010
	Analysis Time:	12:03	12:22	12:42	13:01
	Units:	ng	ng	ng	ng
COMPOUNDS					
Vinyl Chloride		<mdl	<mdl	<mdl	**3 J**
cis-1,2-Dichloroethene		<mdl	<mdl	<mdl	**11**
Trichloroethene		**2 J**	**7**	**1 J**	**246**
Tetrachloroethene		<mdl	<mdl	**9**	**2 J**



LEGEND

- **7 J** — VINYL CHLORIDE (J = Estimated Value, in nanograms)
- **A4** — PASSIVE SOIL-GAS SAMPLE LOCATION
- MW-10 — MONITORING WELL
- EW-1 — DUAL PHASE EXTRACTION WELL
- EW-10 — GROUNDWATER EXTRACTION WELL
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW

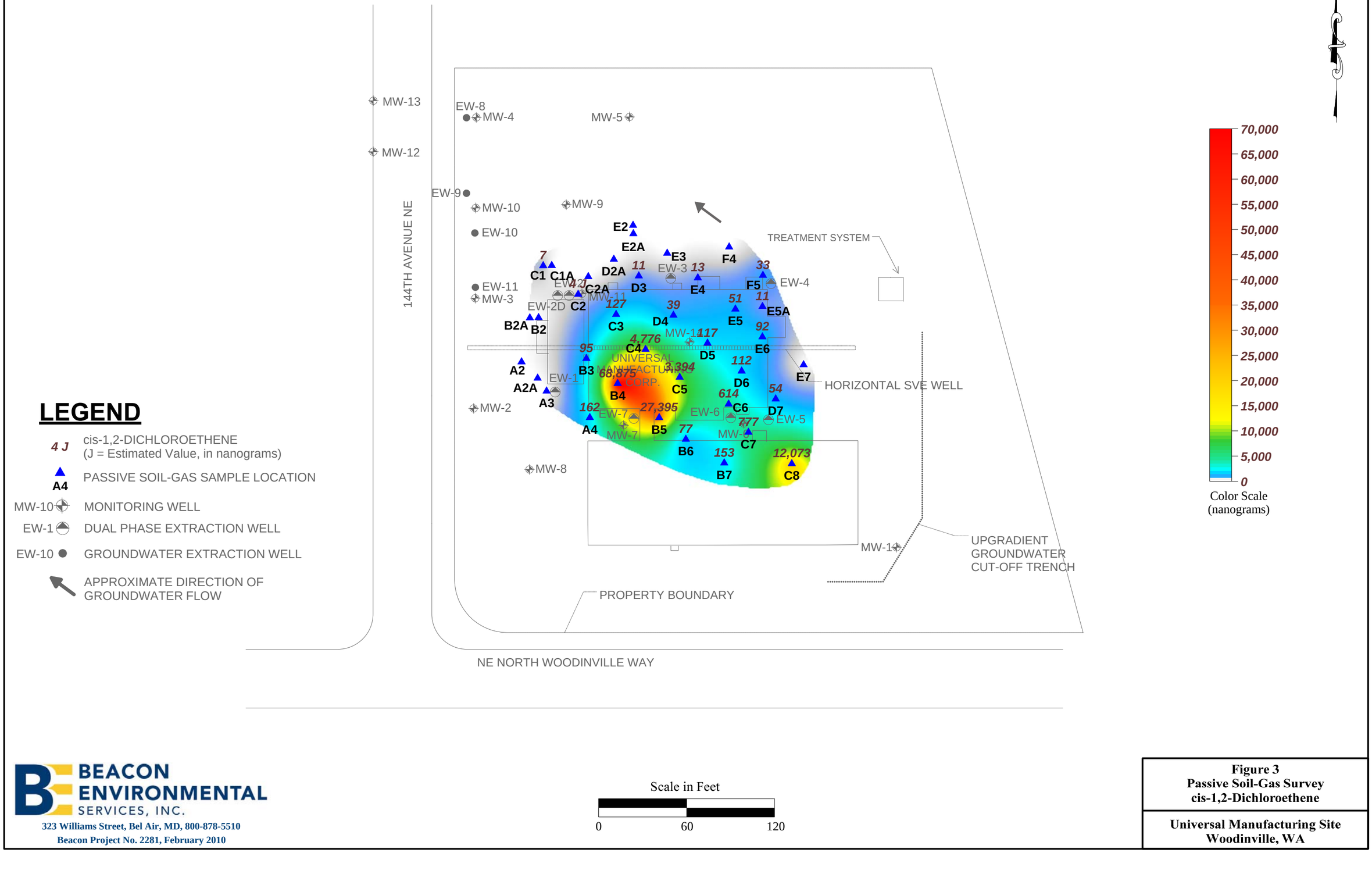
Scale in Feet

0 60 120

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Bel Air, MD, 800-878-5510
Beacon Project No. 2281, February 2010

Figure 2
Passive Soil-Gas Survey
Vinyl Chloride

Universal Manufacturing Site
Woodinville, WA



LEGEND

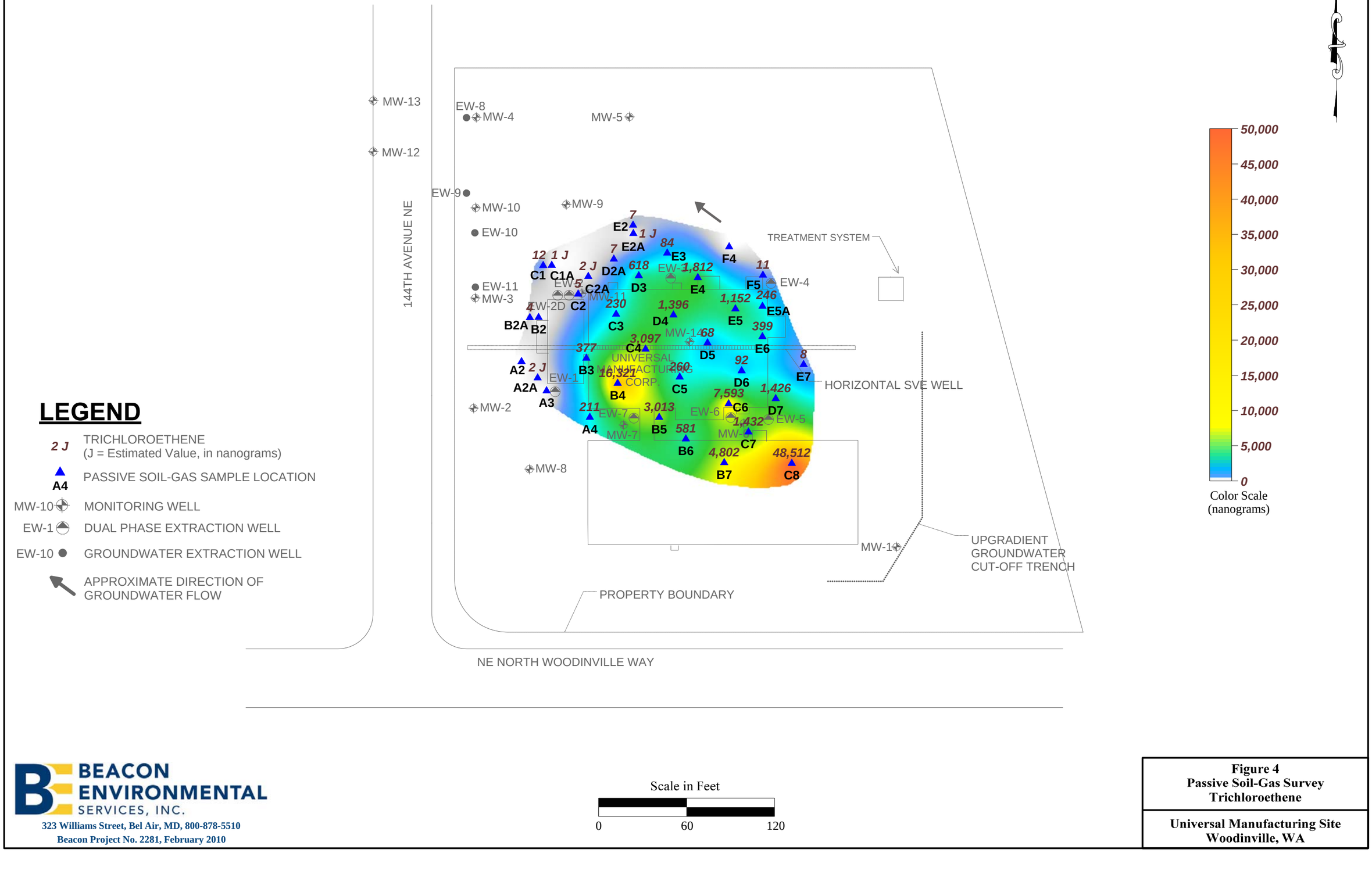
- 4 J — cis-1,2-DICHLOROETHENE (J = Estimated Value, in nanograms)
- A4 — PASSIVE SOIL-GAS SAMPLE LOCATION
- MW-10 — MONITORING WELL
- EW-1 — DUAL PHASE EXTRACTION WELL
- EW-10 — GROUNDWATER EXTRACTION WELL
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Bel Air, MD, 800-878-5510
Beacon Project No. 2281, February 2010

Scale in Feet
0 60 120

Figure 3
Passive Soil-Gas Survey
cis-1,2-Dichloroethene

Universal Manufacturing Site
Woodinville, WA



LEGEND

- 2 J — TRICHLOROETHENE (J = Estimated Value, in nanograms)
- A4 — PASSIVE SOIL-GAS SAMPLE LOCATION
- MW-10 — MONITORING WELL
- EW-1 — DUAL PHASE EXTRACTION WELL
- EW-10 — GROUNDWATER EXTRACTION WELL
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW

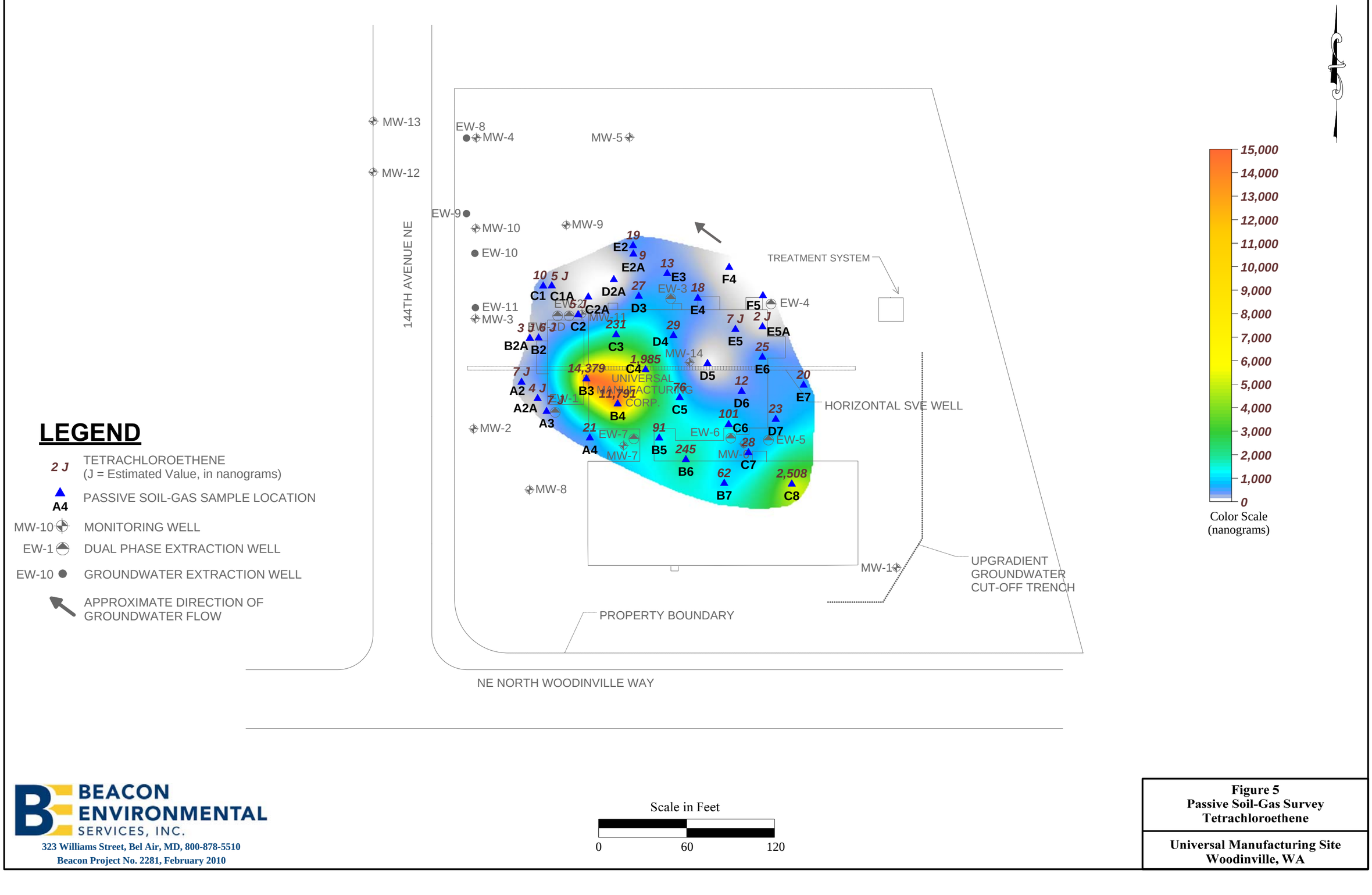
Scale in Feet

0 60 120

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Bel Air, MD, 800-878-5510
Beacon Project No. 2281, February 2010

Figure 4
Passive Soil-Gas Survey
Trichloroethene

Universal Manufacturing Site
Woodinville, WA



LEGEND

- *2 J* TETRACHLOROETHENE (J = Estimated Value, in nanograms)
- A4 PASSIVE SOIL-GAS SAMPLE LOCATION
- MW-10 MONITORING WELL
- EW-1 DUAL PHASE EXTRACTION WELL
- EW-10 GROUNDWATER EXTRACTION WELL
- APPROXIMATE DIRECTION OF GROUNDWATER FLOW

Scale in Feet

0 60 120

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Bel Air, MD, 800-878-5510
Beacon Project No. 2281, February 2010

Figure 5
Passive Soil-Gas Survey
Tetrachloroethene

Universal Manufacturing Site
Woodinville, WA

Attachments

Attachment 1

FIELD PROCEDURES FOR PASSIVE SOIL-GAS SURVEYS

The following field procedures are routinely used during a BEACON Passive Soil-Gas Survey. Modifications can be and are incorporated from time to time in response to individual project requirements. In all instances, BEACON adheres to EPA-approved Quality Assurance and Quality Control practices.

A. Field personnel carry a BESURE Sample Collection Kit™ and support equipment to the site and deploy the passive samplers in a prearranged survey pattern. A passive sampler consists of a borosilicate glass vial containing hydrophobic adsorbent cartridges with a length of wire attached to the vial for retrieval. Although samplers require only one person for emplacement and retrieval, the specific number of field personnel required depends upon the scope and schedule of the project. Each Sampler emplacement generally takes less than two minutes.

B. At each survey point a field technician clears vegetation as needed and, using a hammer drill with a 1″- to 1½″-diameter bit, creates a hole 12 to 14 inches deep. [Note: For locations covered with asphalt, concrete, or gravel surfacing, the field technician drills a 1″- to 1½″-diameter hole through the surfacing to the soils beneath]. The hole is then sleeved with a 1″-diameter metal sleeve.

C. The technician then removes the solid plastic cap from a sampler and replaces it with a Sampling Cap (a plastic cap with a hole covered by screen meshing). The technician inserts the sampler, with the Sampling Cap end facing down, into the hole (**see attached figure**). The sampler is then covered with an aluminum foil plug and soils for uncapped locations or, for capped locations, an aluminum foil plug and a concrete patch. The sampler's location, time and date of emplacement, and other relevant information are recorded on the Field Deployment Form

D. One or more trip blanks are included as part of the quality-control procedures.

E. Once all the passive samplers have been deployed, field personnel schedule sampler recovery and depart, taking all other equipment and materials with them.

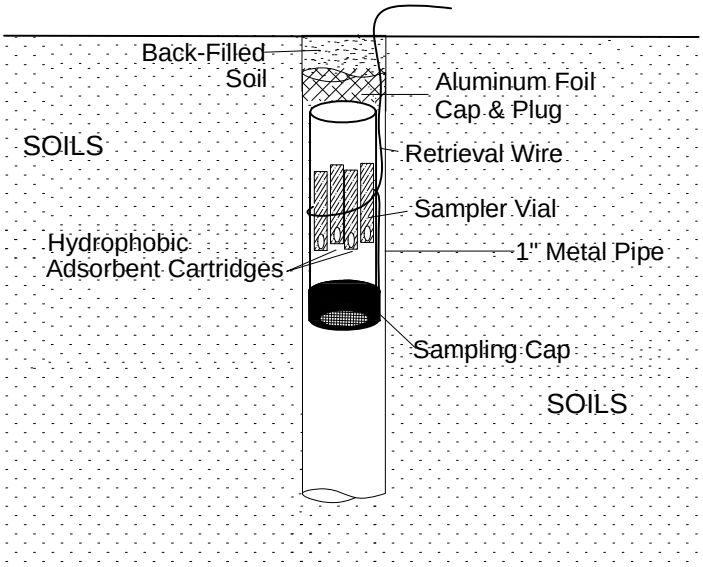
F. Field personnel retrieve the samplers at the end of the exposure period. At each location, a field technician withdraws the sampler from its hole, removes the retrieval wire, and wipes the outside of the vial clean using gauze cloth; following removal of the Sampling Cap, the threads of the vial are also cleaned. A solid plastic cap is screwed onto the vial and the sample location number is written on the label. The technician then records sample-point location, date, time, etc. on the Field Deployment Form.

G. Sampling holes are refilled with soil, sand, or other suitable material. If Samplers have been installed through asphalt or concrete, the hole is filled to grade with a plug of cold patch or cement.

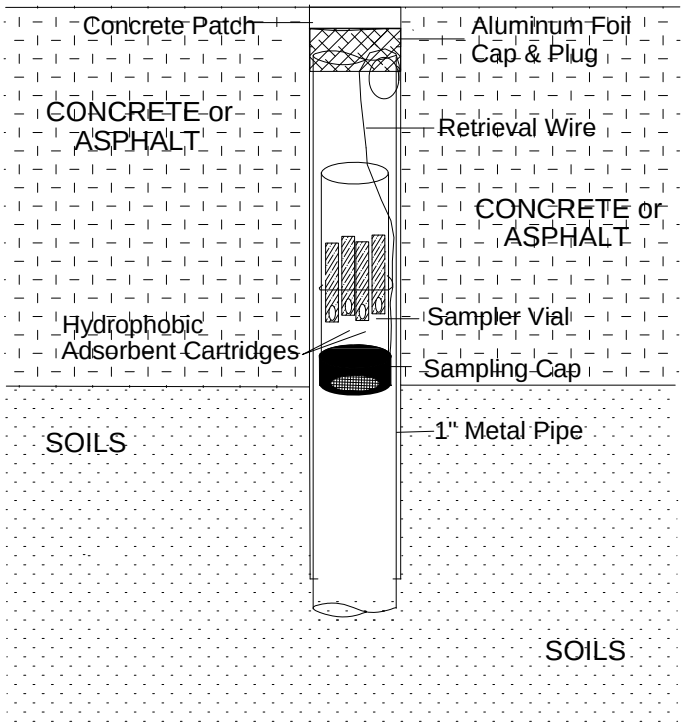
H. Following retrieval, field personnel ship or transport the passive samplers to BEACON’s laboratory.

BEACON PASSIVE SAMPLER

DEPLOYMENT THROUGH SOILS



DEPLOYMENT THROUGH AN ASPHALT/CONCRETE CAP



Attachment 2

Field Deployment Report

PASSIVE SOIL-GAS SURVEY
FIELD DEPLOYMENT REPORT

Project Information	
Beacon Project No.:	2281
Site Name:	Universal Manufacturing Site
Site Location:	Woodinville, WA

BEACON ENVIRONMENTAL SERVICES, INC
323 Williams Street Suite D Bel Air MD 21014 (410)879-5510

Client Information	
Company Name:	CDM
Office Location:	Bellevue, WA
Samples Collected By:	Kevin Lee

FIELD SAMPLE ID	Date Emplaced / Time Emplaced	Date Retrieved / Time Retrieved	Sampling Hole Depth (inches)	FIELD NOTES (e.g., asphalt/concrete/gravel, description of sample location, PID/FID readings)
A4	12/1/09 0909	12/15/09 0844	16	in asphalt, 3" thick, OVM-PID reading: 14.4 ppm, sleeve installed
A3	0925	0917	17	in gravel, OVM-PID = 235 ppm, sampler was dug out, hole froze over
A2	0933	0907	17	in asphalt, 3" thick, OVM = 2.8 ppm, sleeve installed
B2	0938	0912	17	in asphalt, 3" thick, OVM = 3.8 ppm, sleeve installed
C1	0943	1122	14	in gravel, OVM: 1.9 ppm, SAMPLER FROZEN IN ICE, WATER AROUND SAMPLER ON RETRIEVAL
C2	0949	0926	12	in gravel, OVM: 184 ppm
D2	0954	—	11	in gravel, OVM: 134 ppm, Sampler vial broken and unretrievable. 1" thick layer of surface ice and water frozen in sampler hole is the cause
E2	0958	11:40	14	in gravel, OVM: 81 ppm, SAMPLER FROZEN IN, WATER AROUND SAMPLE ON RETRIEVAL
D3	1008	0958	12	in gravel, OVM: 247 ppm
E3	1014	1011	12	in gravel, OVM: 11.5 ppm
E4	1019	1017	16	in gravel, OVM: 2.8 ppm
F5	1024	1030	17	in asphalt, 3" thick, OVM: 4.8 ppm, sleeve installed
F4	1031	1025	16	in asphalt, 3" thick, OVM: 0.9 ppm, sleeve installed
E7	1111	1035	20	in asphalt (3" thick), OVM: 5.7, sleeve installed, area near chemical storage area.
D7	1117	1040	14	in asphalt (3" thick) OVM: 1.9, "

PASSIVE SOIL-GAS SURVEY
FIELD DEPLOYMENT REPORT

Project Information	
Beacon Project No.:	2281
Site Name:	Universal Manufacturing Site
Site Location:	Woodinville, WA

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Suite D, Del Air, MD 21014 (800) 878-5510

Client Information	
Company Name:	CDM
Office Location:	Bellevue, WA
Samples Collected By:	Kevin Lee

FIELD SAMPLE ID	Date Emplaced / Time Emplaced	Date Retrieved / Time Retrieved	Sampling Hole Depth (inches)	FIELD NOTES (e.g., asphalt/concrete/gravel, description of sample location, PID/FID readings)
C7	12/7/09 1123	12/15/09 1045	16	in asphalt (3" thick), ovm 9.6ppm, tube installed
B6	1137	1056	18	in concrete (3" thick), ovm: 19.2ppm, tube installed
B5	1142	1058	17	in concrete (4" thick), ovm: 23.1 ppm, tube installed.
B3	1153	08:56	14	in vegetation, ovm: 302 ppm, hole between buildings.
C6	1220	1114	18	in concrete (4" thick), ovm: 4.8ppm, tube installed, inside building
D6	1232	1127	17	in concrete (4" thick), ovm: 1.9ppm, tube installed, inside building
E6	1241	1120	17	in concrete (4" thick), ovm: 4.9ppm, tube installed, inside building
E5	1248	1134	16	in concrete (4" thick), ovm: 1.9 ppm, tube installed, inside build
D5	1304	1148	17	in concrete (4" thick), ovm: 3.8ppm, tube installed, inside building
D4	1321	1200	17	in concrete (6" thick), ovm: 1.9ppm, tube installed, inside building
C5	1343	1217	17	in concrete (6" thick), ovm: 0.9ppm tube installed, inside bldg.
C4	1401	1207	17	in concrete (6" thick), ovm: 2.8ppm tube installed, inside bldg.
C3	1428	1230	17	in concrete (4-6" thick), ovm: 1.9ppm tube installed, inside bldg.
B4	1439	1219	16	in concrete (4-6" thick), ovm: 5.7ppm, tube installed, inside bldg.
B7	1530	1244	16.5	in concrete (4" thick), ovm: 1.9ppm, tube installed, inside bldg.

PASSIVE SOIL-GAS SURVEY
FIELD DEPLOYMENT REPORT

Project Information	
Beacon Project No.:	2281
Site Name:	Universal Manufacturing Site
Site Location:	Woodinville, WA

BEACON ENVIRONMENTAL SERVICES, INC.
325 Williams Street, Suite D, Bel Air, MD 21014 (800) 576-5510

Client Information	
Company Name:	CDM
Office Location:	Bellevue, WA
Samples Collected By:	Kevin Lee

FIELD SAMPLE ID	Date Emplaced / Time Emplaced	Date Retrieved / Time Retrieved	Sampling Hole Depth (inches)	FIELD NOTES (e.g., asphalt/concrete/gravel, description of sample location, PID/FID readings)
C8	12/7/09 15:55	12/15/09 1249	26"	IN CONCRETE (12" THICK), OVM=7.7ppm; 2 TUBE SS INSTALLED; IN BLDG. SLEEVE DEPTH 4"-16" bgs.

PASSIVE SOIL-GAS SURVEY
FIELD DEPLOYMENT REPORT

Project Information	
Beacon Project No.:	2281B
Site Name:	Universal Manufacturing Site
Site Location:	Woodinville, WA

BEACON ENVIRONMENTAL SERVICES, INC.
725 Williams Street Suite D Bel Air, MD 21014 (800) 878-5510

Client Information	
Company Name:	CDM
Office Location:	Bellevue, WA
Samples Collected By:	Kevin Lee

FIELD SAMPLE ID	Date Emplaced / Time Emplaced	Date Retrieved / Time Retrieved	Sampling Hole Depth (inches)	FIELD NOTES (e.g., asphalt/concrete/gravel, description of sample location, PID/FID readings)
A2A	01/21/2016 1018	01/29/2016 0915	16.5	~~2.5~~ 2.5" asphalt, tube installed
B2A	1023	0922	16.5	2.5" asphalt, tube installed
C1A	1028	0937	14	in gravel, tube installed
C2A	1033	0944	14	in gravel, tube installed, capping soil and Aluminum foil cap removed prior to retrieval of sampler, possible from rodent or small animal.
D2A	1038	0953	14	in gravel, tube installed
E2A	1042	0957	14	in gravel, tube installed
E5A	1047	1003	17.5	in concrete, 5" thick, tube installed

Attachment 3

LABORATORY PROCEDURES
FOR PASSIVE SOIL-GAS SAMPLES

Following are laboratory procedures used with BEACON Passive Soil-Gas Surveys, a screening technology for expedited site investigation. After exposure, adsorbent cartridges from the passive samplers are analyzed using U.S. EPA Method 8260B as described in the Solid Waste Manual (SW-846), a capillary gas chromatographic/mass spectrometric method, modified to accommodate high temperature thermal desorption of the adsorbent cartridges. This procedure is summarized as follows:

A. The adsorbent cartridges are loaded with internal standards and surrogates prior to loading the autosampler with the cartridges. The loaded cartridges are purged in a helium flow. Then the cartridges are thermally desorbed in a helium flow onto a focusing trap. Any analytes in the helium stream are adsorbed onto a focusing trap.

B. Following trap focusing, the trap is thermally desorbed onto a DB-VRX 20 m, 0.18 mm ID, 1.00 micron filament thickness capillary column.

C. The GC/MS is scanned between 35 and 270 Atomic Mass Units (AMU) at 3.12 scans per second.

D. BFB tuning criteria and the initial five-point calibration procedures are those stated in method SW846-8260B. System performance and calibration check criteria are met prior to analysis of samples. A laboratory method blank is analyzed after the daily standard to determine that the system is contaminant-free.

E. The instrumentation used for these analyses includes:

- Agilent 6890-5973 Gas Chromatograph/Mass Spectrometer;
- Markes Unity thermal desorber;
- Markes UltrA autosampler; and
- Markes Mass Flow Controller Module.

Attachment 4

Chain-of-Custody Form

CHAIN-OF-CUSTODY
PASSIVE SOIL-GAS SAMPLES

Project Information	
Beacon Project No.:	2281
Site Name:	Universal Manufacturing Site
Site Location:	Woodinville, WA
Analytical Method:	EPA Method 8260B
Target Compounds:	Beacon Project Number 2281 Target Compound List + PCE

BEACON ENVIRONMENTAL SERVICES, INC.
125 Williams Street, Suite D, Bel Air, MD 21014 (800) 676-5510

Client Information	
Company Name:	CDM
Office Location:	Bellevue, WA
Samples Submitted By:	Kevin Lee
Contact Phone No.:	425-453-8383

Field Sample ID	Lab Sample ID (for lab use only)	Comments (only necessary if problem or discrepancy) Condition of sample or vial	Date	Time	Initial
Trip-1	Trip-1		12/15/09		KL
A4	A4			0844	KL
A3	A3			0917	KL
A2	A2			0907	KL
B2	B2			0912	KL
C1	C1			1122	KL
C2	C2			0926	KL
~~D2~~		Sample and vial lost and unretrievable due to ice.		—	KL
E2	E2			1140	KL
D3	D3			0958	KL
E3	E3			1011	KL
E4	E4			1017	KL
F5	F5			1030	KL
F4	F4			1025	KL
E7	E7			1035	KL
D7	D7			1040	KL
C7	C7			1045	KL
B6	B6			1050	KL
B5	B5			1058	KL
B3	B3			0856	KL

Shipment of Field Kit to Site — Custody Seal # 1036831 Intact? (Y) N

Relinquished by:	Date/Time	Courier	Received by:	Date/Time
Ryan Scheid	12-03-2009 / 1700 Hours	FedEx	K. L	12-04-2009/1300

Shipment of Field Kit to Laboratory — Custody Seal # 1036870 Intact? (Y) N

Relinquished by:	Date/Time	Courier	Received by:	Date/Time
Kevin Lee	12-15-2009 / 1600 Hours	Fed ex	Ryan Scheid	12-16-09 / 12:30

CHAIN-OF-CUSTODY
PASSIVE SOIL-GAS SAMPLES

Project Information	
Beacon Project No.:	2281
Site Name:	Universal Manufacturing Site
Site Location:	Woodinville, WA
Analytical Method:	EPA Method 8260B
Target Compounds:	Beacon Project Number 2281 Target Compound List

BEACON ENVIRONMENTAL SERVICES, INC.
323 Williams Street, Suite D Bel Air, MD 21014 (800) 878-5510

Client Information	
Company Name:	CDM
Office Location:	Bellevue, WA
Samples Submitted By:	Kevin Lee
Contact Phone No.:	425-453-8383

Field Sample ID	Lab Sample ID (for lab use only)	Comments (only necessary if problem or discrepancy) Condition of sample or vial	Date	Time	Initial
C6	C6		12/15/09	1114	KL
D6	D6			1127	KL
E6	E6			1120	KL
E5	E5			1134	KL
D5	D5			1148	KL
D4	D4			1200	KL
C5	C5			1212	KL
C4	C4			1207	KL
C3	C3			1230	KL
B4	B4			1219	KL
B7	B7			1244	KL
C8	C8			1249	KL
C2 -D	C2-D		12/15/09	0926	KL

Shipment of Field Kit to Site — Custody Seal # 1036831 Intact? Y N

Relinquished by:	Date/Time	Courier	Received by:	Date/Time
Ryan Scheel	12-03-2009 / 1700 Hours	FedEx	Kevin Lee	12-04-2009/1300

Shipment of Field Kit to Laboratory — Custody Seal # 1036870 Intact? (Y) N

Relinquished by:	Date/Time	Courier	Received by:	Date/Time
Kevin Lee	12-15-2009/1600 Hours	FedEx	Ryan Scheel	12-16-09 / 12:30

CHAIN-OF-CUSTODY
PASSIVE SOIL-GAS SAMPLES

Project Information	
Beacon Project No.:	2281B
Site Name:	Universal Manufacturing Site
Site Location:	Woodinville, WA
Analytical Method:	EPA Method 8260B
Target Compounds:	Beacon Project Number 2281 Target Compound List

BEACON ENVIRONMENTAL SERVICES, INC.
521 Williams Street, Suite D, Bel Air, MD 21014 (800) 676-5410

Client Information	
Company Name:	CDM
Office Location:	Bellevue, WA
Samples Submitted By:	Kevin Lee
Contact Phone No.:	425-453-8383

Field Sample ID	Lab Sample ID (for lab use only)	Comments (only necessary if problem or discrepancy) Condition of sample or vial	Date	Time	Initial
Trip-2	2281B Trip-2		01/29/10		KL
A2A	2281B A2A			0915	KL
B2A	2281B B2A			0922	KL
C1A	2281B C1A			0937	KL
C2A	2281B C2A			0944	KL
D2A	2281B D2A			0953	KL
E2A	2281B E2A			0957	KL
E5A	2281B E5A		01/29/10	1003	KL

Shipment of Field Kit to Site — Custody Seal # Intact? Y N

Relinquished by:	Date/Time	Courier	Received by:	Date/Time
Ryan Sterk	01-18-2010 / 1700 Hours	FedEx	Kevin Lee	19-JAN-10/1230

Shipment of Field Kit to Laboratory — Custody Seal # Intact? Y N

Relinquished by:	Date/Time	Courier	Received by:	Date/Time
Kevin Lee	01/29/2010/1200	Fedex	Ryan Sterk	02-01-2010 / 09:45