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December 4, 2002

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U.S. Environmental Protection Agency
Region 1
1 Congress Street, Suite 1100
Boston, MA 02114-2023

Mr. Daniel Keefe
Bureau of Waste Site Cleanup
MA Department of Environmental Protection
One Winter Street
Boston, MA 02108

RE: Lisa Lane and Bellantoni Drive
Private Irrigation Well Evaluation Results

Gentlemen:

This letter presents the results of an evaluation of two active private irrigation wells that were identified during the Operable Unit Three (OU-3) Phase 1 Remedial Investigation at the W.R. Grace Superfund Site in Acton, Massachusetts (the Site). The wells, which are located at 1 Lisa Lane and 5 Bellantoni Drive, are within the region of contaminated groundwater at the Site. Figure 1 shows the approximate locations of the two wells, as well as the maximum 1,1-dichloroethene (VDC) concentration, regardless of depth, detected in groundwater samples collected between July 2001 and June 2002. This VDC distribution map was previously submitted to the government parties in the August 15, 2002 Phase 1 Remedial Investigation Data Report Addendum and the August 30, 2002 Draft Remedial Investigation Report.

The two wells are within the mapped region of groundwater contamination and extend several hundred feet below the previously estimated depth of contaminated groundwater. Figure 2 is a hydrogeologic section showing the vertical distribution of VDC in groundwater to the northeast of the Grace property based on the monitoring wells along the section. The section, the location of which is shown on Figure 1, runs from the former Blowdown Pit on the Grace property to the BOC Gases property, and then to the Acton Water District School Street Wellfield. The two private wells were projected onto this section and their vertical orientation was approximated using the bedrock surface. The section shows that unlike the monitoring wells, which have short open intervals (one to ten feet in length), the private wells have long open intervals (165 and 285 feet in length). The section also indicates that the private wells are open across the shallow bedrock, which is contaminated, as well as across deeper bedrock. A hydrogeologic evaluation of the two wells was done to determine if, because of their long open intervals and past use for irrigation, the wells have caused downward migration of contaminated groundwater or could cause such migration in the future. The evaluation of the private wells, which was done to determine the location of water bearing fractures and the vertical distribution of groundwater contamination, included the following steps:

- The pumps were removed from the wells on September 19, 2002 and stored in an off-property storage unit.
- The wells were allowed to sit for several days so that the water, which was mixed within the boreholes when the pumps were removed, had a chance to re-equilibrate with the surrounding groundwater.
- Geophysical Applications, Inc. of Foxboro, Massachusetts conducted geophysical logging of the boreholes on September 24 and 25, 2002. They collected conventional logs including fluid temperature, fluid resistivity, borehole diameter, and flow within the boreholes under non-pumping and pumping conditions. Under pumping conditions, water was pumped at approximately 0.3 gpm and the pump intake was set inside the casing above the open borehole. They also collected acoustic and optical televiewer logs of the boreholes. The conventional geophysical logs prepared by Geophysical Applications are attached to this letter. The water pumped from the wells was containerized, taken to the Grace Site, run through the air stripper, and discharged to Sinking Pond with the ARS effluent.
- The geophysical logs of the boreholes were reviewed to identify water bearing fractures and the groundwater flow distribution within the boreholes under non-pumping and pumping conditions. Based on this review, intervals were selected to install diffusive groundwater samplers.
- Diffusive groundwater samplers were installed in the boreholes on October 10 and 11, 2002 to evaluate the groundwater quality distribution within the boreholes. The samplers were left in the boreholes for three weeks to allow for the water within the samplers to equilibrate with the surrounding groundwater. The samplers were removed from the wells on November 4, 2002.
- Groundwater samples were collected from seven discrete depths within the Lisa Lane well and from five discrete depths within the Bellantoni Drive well. The groundwater samples were analyzed for volatile organic compounds (VOCs). The analytical results for the Lisa Lane and Bellantoni Drive wells are included in Tables 1 and 2, respectively, which are attached to this letter.

The following sections of this letter summarize the results of the Lisa Lane and Bellantoni Drive well evaluations and presents recommendations for the future use of these wells.

Lisa Lane Well

The Lisa Lane well was installed in June 1995. The well is six inches in diameter, with steel casing to a depth of 60 feet below ground surface (bgs), and is open in bedrock from 60 to 345 feet bgs. The pump intake was set approximately 300 feet bgs. The well was used for lawn irrigation during the spring and summer. Prior to conducting this evaluation, a groundwater sample for VOC analysis was collected from this well. The sample was collected on May 6, 2002 after approximately 4,400 gallons or nine well volumes of groundwater had been pumped from the well. The pumping rate prior to sampling was approximately 6.7 gpm. VDC was detected in this groundwater sample at a concentration of 16 µg/L. Vinyl chloride, carbon disulfide, and benzene were also detected in this sample at concentrations of approximately 0.35, 0.39, and 0.52 µg/L, respectively.

The geophysical logging indicates that under ambient, or non-pumping, conditions, there is upward flow in the borehole, with water entering the borehole between 219 and 242 feet bgs at a rate of approximately 0.1 gpm and exiting the borehole between 70 feet bgs and the casing bottom at 60 feet bgs. Under pumping conditions, during the geophysical logging, water was pumped at approximately 0.3 gallons per minute (gpm) and the pump intake was set inside the casing above the open borehole. Under these conditions, flow was upward within the borehole, with most inflow occurring between 219 and 242 feet bgs.

Two-foot long diffusive groundwater samplers were installed in this well with their centers at depths of 65, 90, 125, 160, 230, 290, and 335 feet bgs. The depths of 65, 230, and 335 feet bgs were selected for sampling because the geophysical logs indicate that there may be hydraulically active fractures at those depths. The depth of 160 feet bgs was selected because it is adjacent to an enlargement in the borehole, which may indicate the presence of fractures, and the depths of 90, 125, and 290 feet bgs were selected to provide additional vertical water quality information. The VOC analytical results from these samplers are included in Table 1, attached. The data indicate that VOCs are present throughout the entire length of the open borehole at the following concentrations:

- VDC at 14 to 17 µg/L;
- Vinyl chloride at approximately 0.3 µg/L;
- Benzene at approximately 0.5 to 0.6 µg/L; and
- Acetone at approximately 3 to 36 µg/L.

There was no apparent vertical stratification of the groundwater contamination in the well.

Bellantoni Drive Well

The Bellantoni drive well was installed in March 2002. The well is six inches in diameter, with steel casing to a depth of 120 feet below ground surface (bgs), and is open in bedrock from 120 to 285 feet bgs. The pump intake was set approximately 100 feet bgs. The well was installed for lawn irrigation during the spring and summer.

The geophysical logging indicates that under ambient, or non-pumping, conditions, there is little vertical flow within the borehole. A very small amount of upward flow was detected at 128 and 160 feet bgs. The flow meter detection limit is 0.02 gpm. Under pumping conditions during the geophysical logging, with the pump intake set inside the casing above the open borehole, flow was upward, with most inflow occurring below 276 feet bgs, and additional inflow occurring between 270 and 276 feet bgs and possibly between 260 and 270 feet bgs.

Two-foot long diffusive groundwater samplers were installed in this well with their centers at depths of 125, 162, 190, 218, and 272 feet bgs. The depths of 125, 162, and 272 feet bgs were selected for sampling because the geophysical logs indicate that there may be hydraulically active fractures at those depths. The depths of 190 and 218 feet bgs were selected because they are adjacent to enlargements in the borehole, which may indicate the presence of fractures. The VOC analytical results from these samplers are included in Table 2, attached. The data indicate that VOCs are present throughout the entire length of the open borehole at the following concentrations:

- VDC at approximately 4 to 5 µg/L;
- Vinyl chloride at approximately 0.2 to 0.3 µg/L; and
- Acetone at approximately 2 to 5 µg/L.

There was no apparent vertical stratification of the groundwater contamination in the well.

Conclusions

This Conclusions section analyzes the results of this well evaluation from a technical hydrogeologic perspective. The Recommendations section below sets out suggestions for the future use of these wells in a manner to minimize the vertical and lateral migration of groundwater contamination. Overall, the data from this well evaluation effort has shown no significant vertical stratification of contamination within the two private irrigation wells. Furthermore, the concentrations of VOCs identified are relatively low.

The lack of vertical stratification of VOC contamination in the wells suggests two possible interpretations – both of which lead to the same recommendation described below. First, pumping of the private irrigation wells has caused the contaminated groundwater present in the shallow bedrock to mix with clean groundwater in the deeper bedrock resulting in a relatively homogeneous zone of contaminated groundwater along the entire length of the boreholes' open intervals. Under this hypothesis, pumping from the irrigation wells has created downward hydraulic gradients around the well, and thus pulled contaminated groundwater from shallow bedrock into deeper bedrock. In the second interpretation, the irrigation wells did not induce significant vertical mixing and the groundwater VOC contamination is deeper than the conceptual model for the Site suggests. Under this hypothesis the continued pumping and the retention of the long open interval of the wells still provide potential mechanisms for uncontrolled lateral and vertical spreading of contaminated groundwater.

For the Lisa Lane well, the borehole flow log shows that under non-pumping conditions, groundwater enters the borehole between 219 and 242 feet bgs at a rate of approximately 0.1 gpm, moves vertically upward within the borehole, and exits the borehole between 60 and 70 feet bgs. This suggests that the diffusive sampler results are mainly representative of the water quality in the 219 to 242 feet bgs depth interval. Because the water exits the borehole in the shallow bedrock under non-pumping conditions, the diffusive sampler results are likely not representative of the shallow bedrock groundwater quality and the data neither confirm nor refute the concept that the highest VOC concentrations are present in the shallow bedrock groundwater.

For the Bellantoni Drive well, the geophysical logs show little vertical movement of groundwater under non-pumping conditions and the diffusive sampler results are more likely indicative of the groundwater quality at the depth of the samplers.

The Bellantoni Drive well is located about 300 feet northeast of monitoring well MW-06. Monitoring well MW-06 has the highest VDC concentrations detected in groundwater northeast of the Grace property, with 260 µg/L of VDC detected in September 2001. While the data indicate that the current VOC concentrations at and near the Bellantoni Drive well could be relatively low, continued long-term operation of the well could pull groundwater containing higher concentrations of VOCs toward it.

Recommendations

Water quality data collected from the Lisa Lane and Bellantoni Drive wells confirm that these wells intersect contaminated groundwater and may have caused downward migration of contamination as a result of pumping. To prevent future exposure to contaminated groundwater and possible continued downward migration of contaminated groundwater, we recommend the wells be converted into monitoring well clusters with short open intervals. The long open intervals of these boreholes are not adequate for groundwater monitoring and provide conduits for contaminated groundwater that is present in one or more depth intervals to mix with clean groundwater from other depth intervals. Periodic pumping from the irrigation wells also has the potential to cause uncontrolled lateral and vertical spreading of contaminated groundwater.

If arrangements can be made with the property owners, we propose installing three, one to 1.5-inch diameter monitoring wells, with ten-foot long screens in each borehole. At Lisa Lane the screens are proposed to be set 60 to 70 feet bgs, 154 to 164 feet bgs, and 230 to 240 feet bgs. At Bellantoni Drive the screens are proposed to be set 120 to 130 feet bgs, 215 to 225 feet bgs, and 270 to 280 feet bgs. The monitoring intervals were selected to monitor the shallow, intermediate, and deeper bedrock groundwater quality adjacent to hydraulically active fractures. The wells would be constructed of PVC, with sand placed in the annular space adjacent to the screened intervals. The boreholes would be sealed below, between, and above the proposed monitoring intervals. The proposed monitoring intervals are shown on Figure 2. Following any necessary remediation of the groundwater in this area, it may be possible to drill out the monitoring wells and convert the boreholes back into irrigation wells.

Converting these two irrigation wells into monitoring wells will enhance the monitoring network located between the Grace property and the Acton Water District public water supply wells. Water quality and water level data collected from the converted irrigation wells will provide a better understanding of the direction of groundwater flow and the extent of groundwater contamination in this area. If you have any questions or comments regarding this letter, please call me at (978)-772-7557.

Sincerely,

Anne Benjamin Sheehan
Project Manager

AEB/gsk

cc: Stephen Anderson, Anderson and Kreiger
Andy Cohen, DEP Boston
Jim Deming, Acton Water District
Lydia Duff, W. R. Grace & Co. Conn.
Bob Eisengrein, ACES
Doug Halley, Town of Acton
Seth Jaffe, Esq., Foley Hoag LLP
Maryellen Johns, Remedium
Michael LeBlanc, DEP
William McInnis, Chairman Acton Board of Health
Mary Michelman, ACES
Michael Moore, Town of Concord Board of Health
Gretchen Muench, Esq. U.S. EPA
Chuck Myette, Brown & Caldwell
Mitch Obradovic, Remedium
Jim Okun, OT&O
Barbara Weir, Metcalf & Eddy
Acton Public Library

BCC: John Bellantoni
Chris Kokkinos

Table 1. VOC concentrations in groundwater at 1 Lisa Lane, diffusive groundwater samplers.

Sample Depth (feet bgs) **Date Sampled**	64-66 11/04/02	89-91 11/04/02	89-91 DUP 11/04/02	124-126 11/04/02	159-161 11/04/02	229-231 11/04/02	289-291 11/04/02	334-336 11/04/02
1,1,1-Trichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1,2,2-Tetrachloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1,2-Trichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1-Dichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1-Dichloroethene	16	16	14	16	17	16	16	16
1,2-Dichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,2-Dichloroethene (total)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,2-Dichloropropane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
2-Butanone	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Hexanone	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Methyl-2-Pentanone	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Acetone	3.7 J	28	30	3.3 J	29	29	31	36
Benzene	0.51 J	0.53 J	0.51 J	0.53 J	0.56 J	0.59 J	0.57 J	0.61 J
Bromochloromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromodichloromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromoform	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromomethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Carbon Disulfide	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Carbon Tetrachloride	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chlorobenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chloroform	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chloromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
cis-1,2-Dichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
cis-1,3-Dichloropropene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Dibromochloromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Ethylbenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
m,p-Xylenes	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Methyl tert butyl ether	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Methylene Chloride	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
o-Xylene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Styrene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Tetrachloroethene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Toluene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
trans-1,2-Dichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
trans-1,3-Dichloropropene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Trichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Trichlorofluoromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Vinyl Acetate	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Vinyl Chloride	0.3 J	0.29 J	0.26 J	0.29 J	0.3 J	0.31 J	0.3 J	0.31 J
Xylenes (total)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)

NOTES:

Concentrations in µg/L.
bgs - below ground surface.
DUP - Duplicate Sample.
ND (1) - Not detected at indicated detection limit.
J - Estimated value.

Table 2. VOC concentrations in groundwater at 5 Bellantoni Drive, diffusive groundwater samplers.

Sample Depth (feet bgs) **Date Sampled**	124-126 11/04/02	161-163 11/04/02	189-191 11/04/02	217-219 11/04/02	271-273 11/04/02
1,1,1-Trichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1,2,2-Tetrachloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1,2-Trichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1-Dichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,1-Dichloroethene	4.5	4.8	4.4	4.5	4.4
1,2-Dichloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,2-Dichloroethene (total)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
1,2-Dichloropropane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
2-Butanone	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
2-Hexanone	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
4-Methyl-2-Pentanone	ND (5)	ND (5)	ND (5)	ND (5)	ND (5)
Acetone	5	ND (5)	2.6 J	4.4 J	2.1 J
Benzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromochloromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromodichloromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromoform	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Bromomethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Carbon Disulfide	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Carbon Tetrachloride	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chlorobenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chloroethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chloroform	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Chloromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
cis-1,2-Dichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
cis-1,3-Dichloropropene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Dibromochloromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Ethylbenzene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
m,p-Xylenes	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Methyl tert butyl ether	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Methylene Chloride	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
o-Xylene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Styrene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Tetrachloroethene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Toluene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
trans-1,2-Dichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
trans-1,3-Dichloropropene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Trichloroethene	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Trichlorofluoromethane	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Vinyl Acetate	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)
Vinyl Chloride	0.23 J	0.27 J	0.26 J	0.28 J	0.25 J
Xylenes (total)	ND (1)	ND (1)	ND (1)	ND (1)	ND (1)

NOTES:

Concentrations in µg/L.
bgs - below ground surface.
DUP - Duplicate Sample.
ND (1) - Not detected at indicated detection limit.
J - Estimated value.

G:\WRG-ACT_2002\11-02_EcoMap\Pwel-loc.dwg
Nov 26 , 2002 - 1:29pm

NOTE: BASE MAP BY COL–EAST 1998. WELL LOCATIONS, W.R. GRACE PROPERTY LINE & MISC. SITE FEATURES COMPILED FROM INFORMATION PROVIDED BY CAMP DRESSER & McKEE. SURROUNDING PROPERTY LINE LOCATIONS ARE FROM THE TOWN OF ACTON AND CONCORD ASSESSORS MAPS.

TITLE: Location of Lisa Lane and Bellantoni Drive Wells

LOCATION: W.R. Grace, Acton, MA.

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CHECKED	GG AEB	FIGURE:
DRAFTED	RMK	1
FILE	Pwel-loc.dwg	
DATE	11/26/02	

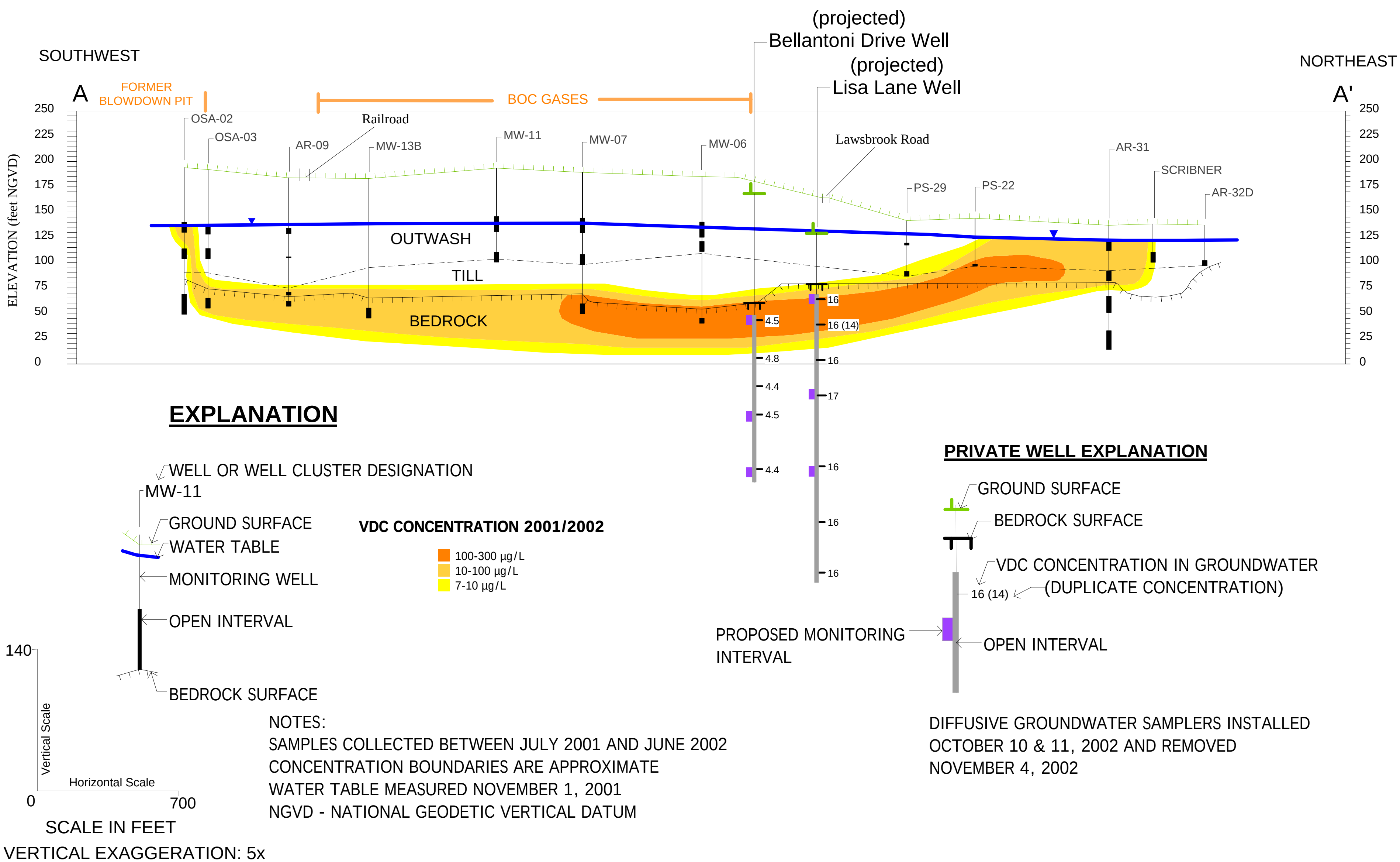
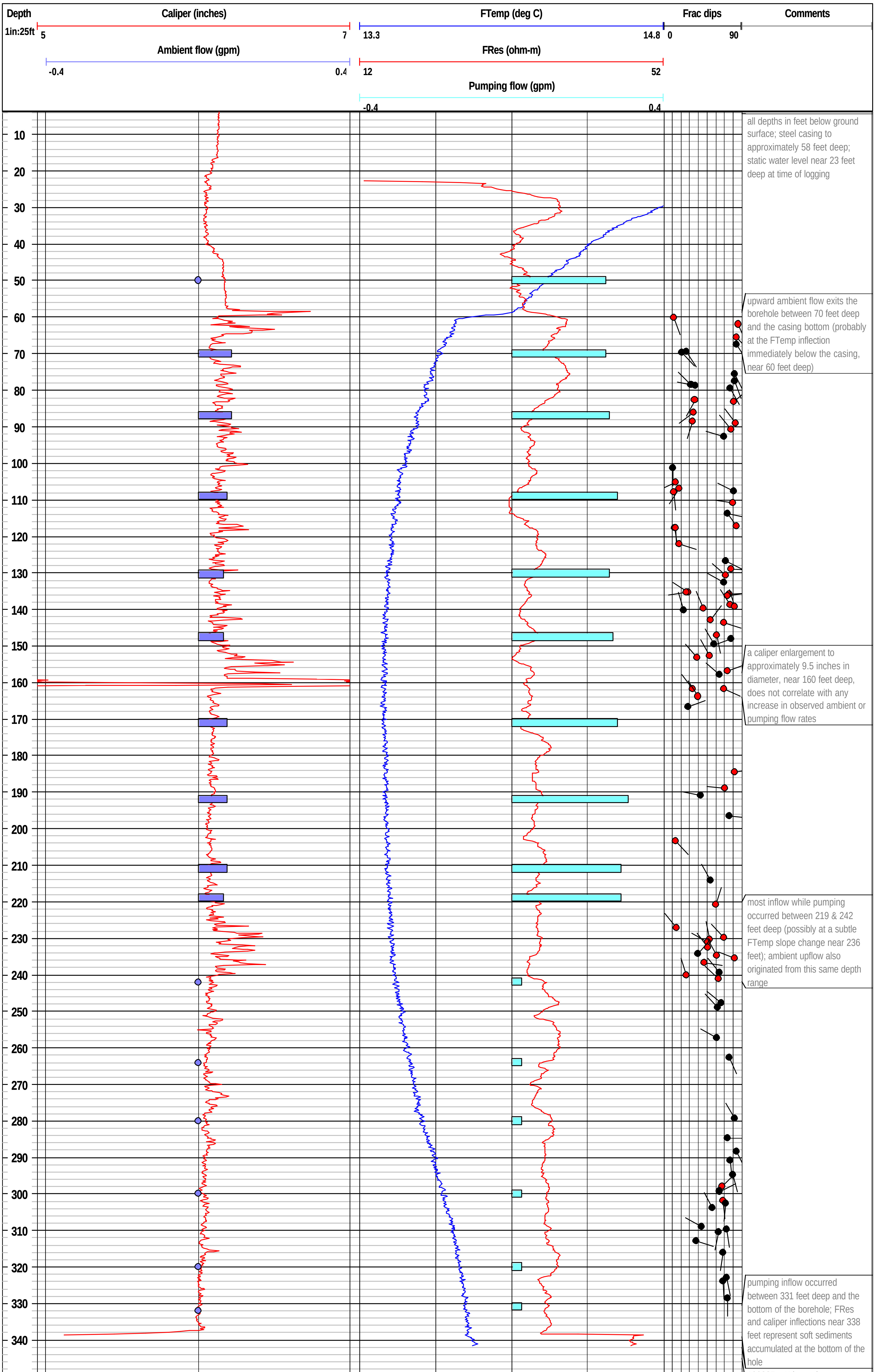


FIGURE 2. SECTION A-A'
2001/2002 VDC CONCENTRATIONS IN GROUNDWATER

Project - Well: GeoTrans/Acton, MA - 1 Lisa Lane supply well, conventional logs



Project - Well: GeoTrans/Acton, MA - 5 Bellantoni Drive supply well, conventional logs