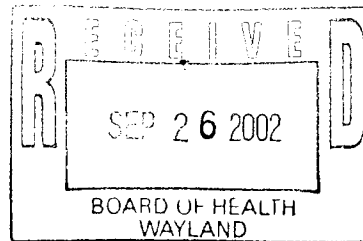




COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Metropolitan Boston – Northeast Regional Office

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MEMORANDUM FOR THE RECORD

To: Baldwin Pond Wellfield Site Discovery File
Thru: Stephen Johnson, Section Chief
From: Larry Immerman, Environmental Analyst
Subject: DEP Field Work-Split Sampling Round
August 07, 2002
Date: August 30, 2002

Introduction

Since November 2001, the Department of Environmental Protection's Site Discovery group (DEP/SD) has been conducting a groundwater quality investigation within the Town of Wayland's Baldwin Pond wellfield. The work is being conducted to locate the source(s) of volatile organic compound (VOC) contamination which has impacted the Baldwin Pond supply wells since 1997. As part of this work, from December 2001 to July 2002, DEP/SD has installed over thirty driven wellpoints within the Zone I and Zone II of the Baldwin Pond wellfield and collected groundwater samples for VOC screening by gas chromatography at DEP's Northeast Regional Office (NERO). On August 07, 2002, twelve wellpoints were re-sampled by DEP/SD and the samples collected in duplicate to be split with DEP's Wall Experiment Station (WES) for quality assurance purposes. The wellpoints were selected due to their previous detection of VOCs and/or their proximity to the supply wells. The remainder of this Memorandum describes the sample collection procedure and results of the split-sampling effort.

August 07, 2002 DEP/SD Wellpoint Sampling

On August 7, 2002, the writer collected split-groundwater samples from twelve wellpoints installed by DEP/SD. The wellpoints selected by the writer for sampling were: DEP-20, DEP-21, DEP-19M, DEP-10S, DEP-12D, DEP-8, DEP-7, DEP-6, DEP-22, DEP-29, DEP-30, and DEP-23. A trip blank was

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also brought during the entire sampling round for quality assurance purposes. All groundwater samples were manually collected by surging the wellpoints with a mini-foot valve attached to a length of ½" o.d. high density polyethylene tubing and pumping the groundwater into a 40 ml VOC-type vial. Approximately 3 well volumes were removed from each wellpoint prior to collecting a sample. The samples were received by Wall under Chain Of Custody on August 8, 2002.

August 09, 2002 DEP/NERO and Wall Results

On August 09, 2002, groundwater samples were screened at DEP/NERO by the writer for VOCs using a gas chromatograph (GC) equipped with photo-ionization and dry-electrolytic conductivity detectors, in series (PID/ELCD). The PID is sensitive to aromatic-type compounds (e.g. benzene, toluene) and some chlorine-substituted compounds (e.g. DCE, TCE, PCE). The ELCD is sensitive to all chlorine-substituted VOCs, only. Groundwater samples were stored in a refrigerator and screened within 14 days of their collection. At the time of screening, each groundwater sample was prepared using a "jar headspace" type sampling procedure by decanting approximately 20 milliliters of sample to produce a 1:1 ratio of headspace to aqueous phase in the 40 ml VOC vial. Upon development of the headspace, a gas-tight syringe was used to pierce the vial's septum and evacuate one milliliter of headspace from within the vial. The syringe contents were then directly injected into the GC. Peak signal output from the GC detectors was normalized using PeakSimple® software. Final groundwater results were reported as an estimated microgram per liter (ug/l) concentration. Duplicate groundwater samples were analyzed at Wall on August 08 and 09, 2002, by GC mass spectroscopy (MS) using EPA Method 8260. See "August 2002 Split Sample Results" in the Appendix section of this Memorandum for a complete list of the GC results.

It is the opinion of the writer that the results of the testing demonstrated an acceptable correlation between the chlorinated VOCs included with DEP/NERO's GC VOC screening method and those reported by WES using EPA's Method 8260 GC/MS. The DEP/NERO GC target compounds include: cis(1,2)-dichloroethene, trichloroethene, tetrachloroethene, (1,1,1)-trichloroethane, and (1,1)-dichloroethane. Additional chlorinated VOCs reported by WES which were not included with DEP/NERO's method were trans(1,2)-dichloroethene, chloroform, vinyl chloride, and (1,1)-dichloroethene. The presence of various chlorinated compounds was confirmed by WES at DEP-21, DEP-19M, DEP-10S, DEP-8, DEP-7, and DEP-30. The only exception was at DEP-29, where DEP had identified trace levels of TCA and WES reported non-detect. A list of the identified chlorinated VOCs and their respective sampling locations are presented in Table 1. Table 2 provides a comparison of the chlorinated VOC results from August 2002 to their original groundwater concentrations when collected from each wellpoint at the time of their installation. DEP/NERO's data for August 2002 was used for the comparison. In addition to chlorinated VOCs, trace levels for methyl(t)butylether, benzene, toluene, and ethylbenzene were identified in some of the samples reported by DEP/NERO. However, with the exception of the M(t)BE confirmation at DEP-22, WES did not confirm M(t)BE or BTEX detections from the additional well locations due to the very low concentrations of these contaminants present in the samples and subsequent inability of the mass spectra associated with these peaks to meet EPA's positive identification criteria for these compounds.

Writer's Comments

Petroleum related VOCs: VOCs associated with a light-end petroleum fraction were confirmed by WES at DEP-22, only. Specifically, the gasoline additive M(t)BE was detected in groundwater sampled at DEP-22, at a concentration of 4.3 ug/l. Wellpoint DEP-22 is located approximately 36 feet

to the southeast of Baldwin Pond Well #3. Unconfirmed trace levels of M(t)BE and benzene, toluene, and ethylbenzene, were identified at additional wellpoint locations in the wellfield study area by DEP/NERO's screening. Unfortunately, although similar peaks may have also been during the GC/MS analysis, the contaminants were not detected at concentrations high enough to satisfy WES's reporting criteria and/or meet EPA's positive identification criteria for these compounds. DEP/SD has considered possible sources of the gasoline related contamination at the supply well but based on the work completed at this time, has not been able to identify a particular source. For example, there are numerous businesses operating along Route 20 (Boston Post Road) which are located within the Zone II of the supply wells, and that may have had gasoline releases. However, because of the distance of these locations to the supply wells (approximately 4000 feet to the south), the absence of a continuous gasoline-related plume connecting these locations to the supply wells, and the very low levels present within the wellfield, it is more probable that the Route 20 area is not the source. Instead, the sporadic and low-level concentrations of M(t)BE, BTEX, and naphthalene detected at the supply wells may be more indicative of careless handling of very small quantities of gasoline either at the Baldwin Pond facility, or at nearby residential properties. M(t)BE was confirmed by WES at DEP-22, which is located within the Zone I of the supply wells. The writer observed that DEP-22 was installed near a small, open area used by the Town for their water pipe and related supply storage, although there is no data to suggest that this storage area is a source of the gasoline related VOCs.

Chlorinated VOCs: Chlorinated VOCs were confirmed by the August 2002 split sampling round as present in groundwater at DEP wellpoints installed down-gradient of the former Raytheon Facility site, on Town Conservation land (DEP-19M and DEP-21), and abutting land used by town residents for public gardening (DEP-10S). Chlorinated VOCs were also identified at wellpoints installed along Old Sudbury Road (DEP-7 and DEP-8), but at extremely low concentrations, and within the Zone I of the supply wells (DEP-30).

- Town Conservation and Public Gardening Area: Chlorinated VOCs identified in groundwater at the Town's conservation and public gardening area included tetrachloroethene, trichloroethene, and associated break-down products, cis and trans(1,2)-dichloroethene, (1,1)-dichloroethane, and vinyl chloride. Please note that (1,1)-dichloroethane is a break-down product of (1,1,1)-trichloroethane, but (1,1,1)-trichloroethane has not been detected in groundwater at the Town's conservation land and public gardening area.

Only the contaminant TCE was identified above its respective MCP groundwater standard of 5.0 ug/l – at wellpoints DEP-19M (7.7 ug/l), DEP-10S (6.4 ug/l), and DEP-21 (5.4 ug/l). In comparison, at the time of wellpoint DEP-21's March 2002 installation, TCE was detected at a concentration of 146 ug/l, at the 35-40 foot below grade interval. The wellpoint was then advanced an additional 10 feet to 50 feet below grade in order to continue with the vertical profiling of the groundwater quality. The screen is currently set at the 45 to 50 foot interval and based on the groundwater quality results, it appears that it was advanced to a depth 10 feet deeper than where the highest contaminant levels were previously detected. Similarly, wellpoint DEP-20, was also set at a depth of 50 feet below grade, and also appears to have been set deeper than the area of its highest contaminant concentrations for this area, identified at the 25 to 30 foot below grade interval (Please See DEP/SD's July 18, 2002 "Memorandum For The Record" for more information).

- Along Sudbury Road and Zone I Area: Chlorinated VOCs identified within the Zone I of the supply wells and just upgradient along Old Sudbury Road included (1,1,1)-trichloroethane and its associated break-down products (1,1)-dichloroethane and (1,1)-dichloroethene. Please note that (1,1)-dichloroethene is also a breakdown product of tetrachloroethene and trichloroethene, but these contaminants were not detected in wells installed along Old Sudbury Road or within the Zone I during the August 2002 sampling round. However, tentative identification of tetrachloroethene was identified in December 2001 at wellpoint DEP-8 located off of Old Sudbury Road, and in July 2002 at DEP-29 and DEP-30 located within the Zone I area. (Please See DEP/SD's July 18, 2002 and August 27, 2002 "Memoranda" for more information).

Water quality records for the Baldwin Pond supply wells indicate that since 1997, (1,1,1)-trichloroethane, trichloroethene, and (1,2)-dichloroethane have all been detected at least once at a Baldwin Pond Supply well, but at levels below each of their applicable drinking water standard. Based on the results of DEP/SD's investigation thus far, it is the opinion of the writer that the former Raytheon Facility site at 430 Boston Post Road is a source of a continuous chlorinated VOC groundwater plume which extends at least 1000 feet beyond the facility's northern boundary, and onto the Town's conservation and community gardening land. In light of this, the writer recommends that further assessment work be conducted which clearly establishes the vertical and horizontal bounds of Raytheon's plume, and which produces enough information that a determination can be made on whether or not the plume is posing a threat to the water quality at the Baldwin Pond supply wells. Lastly, a continuous plume which links the chlorinated VOC contamination at the Baldwin Pond supply wells to an identifiable source(s) has not been derived at this time because of the very low concentrations of contaminants present in the groundwater sampled, and the infrequency of their detection at the wellpoints and supply wells.

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Table 1: August 2002 Chlorinated VOCs Reported by DEP/NERO and Wall

Compound	Wellpoint	Concentration (ug/l)		Location
		WES	NERO	
cis(1,2)-dichloroethene	DEP-21	31	45	Town Conservation Land
	DEP-19M	41	33	Town Conservation Land
	DEP-10S	8.7	6.5	Public Gardens Land
trichloroethene	DEP-19M	7.7	5.2	Town Conservation Land
	DEP-21	5.4	5.3	Town Conservation Land
	DEP-10S	6.4	5.4	Public Gardens Land
tetrachloroethene	DEP-21	1.0	0.94	Town Conservation Land
	DEP-19M	0.57	TR	Town Conservation Land
	DEP-10S	0.28	TR	Public Gardens Land
(1,1,1)-trichloroethane	DEP-30	11	20	Zone I – Baldwin Pond Wells
	DEP-7	1.0	1.1	Off of Old Sudbury Road
	DEP-29	ND	TR	Zone I – Baldwin Pond Wells
(1,1)-dichloroethane	DEP-30	1.0	1.2	Zone I – Baldwin Pond Wells
	DEP-10S	2.4	1.3	Public Gardens Land
	DEP-19M	0.21	ND	Town Conservation Land

Table 2: Comparison Of Chlorinated VOC Data **Results Reported as (ug/l)**

Compound Wellpoint	Sample Date	(1,1)-DCA	(1,2)-DCE	TCA	TCE	PCE
DEP-6 (75 ft. b.g.)	Dec. 19, 01	ND	ND	ND	ND	ND
	Aug. 07, 02	ND	ND	ND	ND	ND
DEP-7 (75 ft. b.g.)	Dec. 19, 01	ND	ND	TR	ND	ND
	Aug. 07, 02	ND	ND	1.1	ND	ND
DEP-8 (75 ft. b.g.)	Dec. 26, 01	ND	ND	1.2	ND	ND
	Aug. 07, 02	ND	ND	ND	ND	ND
DEP-10S (50 ft. b.g.)	Mar. 27, 02	1.4	4.8	ND	3.4	TR
	Aug. 07, 02	1.3	6.5	ND	5.4	*
DEP-12D (80 ft. b.g.)	Feb. 05, 02	ND	ND	ND	ND	ND
	Aug. 07, 02	ND	ND	ND	ND	ND
DEP-19M (40 ft. b.g.)	Mar. 29, 02	TR	36	ND	7.1	TR
	Aug. 07, 02	0.21(w)	33	ND	5.2	TR
DEP-20 (50 ft. b.g.)	Mar. 22, 02	ND	TR	ND	TR	TR
	Aug. 07, 02	ND	ND	ND	ND	ND
DEP-21 (50 ft. b.g.)	Mar. 29, 02	ND	52	ND	18	2.3
	Aug. 07, 02	ND	45	ND	5.3	0.94
DEP-22 (60 ft. b.g.)	Apr. 19, 02	ND	ND	ND	ND	ND
	Aug. 07, 02	ND	ND	ND	ND	ND
DEP-23 (60 ft. b.g.)	Apr. 19, 02	ND	ND	ND	ND	ND
	Aug. 07, 02	ND	ND	ND	ND	ND
DEP-29 (60 ft. b.g.)	July 16, 02	ND	ND	*	ND	*
	Aug. 07, 02	ND	ND	TR	ND	ND
DEP-30 (60 ft. b.g.)	July 16, 02	2.8	ND	28	ND	*
	Aug. 07, 02	1.2	ND	20	ND	ND

(w) = Wall Results (TR) = Trace Level (*) = Tentative identification (ND) = Not Detected

TOWN OF WAYLAND-BALDWIN POND DEP-SD WELLFIELD PROJECT DECEMBER 2001 THRU APRIL 2002



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