GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

Groundwater Monitoring Report
First Semiannual 2009 Monitoring Event

Patchogue Former MGP Site

Town of Brookhaven
Suffolk County, Long Island, New York
Site ID No. 1-52-182

Submitted to:
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1. Site and Adjacent Off-Site Areas

Q1 2009 Groundwater Monitoring Event Summary

Event Date: March 23 to March 25, 2009

Site Phase: Semiannual groundwater monitoring.

Location: Patchogue former MGP site. See **Figure 1** for site location.

Monitoring Program:

Number of wells: A total of **14** monitoring wells are located on and adjacent to the site (see **Figure 2**).

Hydrological Data: Groundwater levels were collected from **13** monitoring wells. The wells were gauged on March 23, 2009. Groundwater levels and calculated elevations are presented in **Table 1**. The groundwater flow direction was to the southeast (see **Figures 3 & 4**). The ranges in depth to water and water table elevation data, as well as calculated hydraulic gradients for the shallow and deeper portions of the aquifer were as follows:

- Depth to the water table in shallow wells ranged from **1.03** (MW-8S) to **5.90** (MW-1) feet below the well measuring point.
- Water table elevations in shallow wells ranged from **2.58** (MW-4S) to **5.33** (MW-1) feet above mean sea level (MSL).
- Depth to groundwater deep wells ranged from **0.87** (MW-8D) to **4.91** (MW-4D) feet below the well measuring point.
- Groundwater elevations in deep wells ranged from **2.66** (MW-4D) to **4.32** (MW-2D) feet above mean sea level (MSL).
- The calculated shallow hydraulic gradient was **0.0049** feet/foot.
- The calculated deep hydraulic gradient for was **0.0060** feet/foot.

NAPL Thickness Data: Monitoring wells were gauged for non-aqueous phase liquid (NAPL). Light non-aqueous phase liquid (LNAPL) was not observed in any of the wells during the first semiannual 2009 monitoring event.

Evidence of dense non-aqueous phase liquid (DNAPL) was found in only one well (MW-6) during the first semiannual monitoring event. A large bleb of tar was observed at the bottom of the measuring tape (see **Table 1**).

Chemical Data:

A total of **14** wells were sampled for benzene, toluene, ethylbenzene, and xylenes (BTEX) and methyl tert-butyl ether (MTBE) via EPA Method 8260, and polycyclic aromatic hydrocarbons (PAHs) via EPA Method 8270. These wells were sampled from March 23 to March 25, 2009. The chemical data (see **Table 2**) indicate:

- Total BTEX concentrations ranged from less than method detection limits in 12 of 14 wells sampled to **975** micrograms per liter (ug/L) in shallow monitoring well MW-5.
- Total PAH concentrations were less than method detection limits in all of the wells sampled with the exception of MW-5, where the reported concentration was **2,730** ug/L.

Data Trend Analysis:

Generally consistent and/or decreasing BTEX and PAH concentrations (see historical data in **Tables 3** and **4**) have been observed in groundwater on and adjacent to the site over the past three sampling events (March 2008, July 2008 and March 2009). The samplings in March and July 2008 were conducted by Tetra Tech EC, Inc. as part of the Remedial Investigation and included MW-2S, MW-2D, MW-3, MW-4S, MW-4D, MW-5 and MW-6 in both events and also monitoring wells MW-7S, MW-7D, MW-8S, MW-8D, MW-9S and MW-9D in the July event. MW-1 was sampled during the March event.

Detections of BTEX and PAHs in the first semiannual 2009 (March 2009) sampling event were limited to MW-5 at concentrations of 975 ug/L and 2,730 ug/L, respectively, and MW-7D with a detection of 1 ug/L for BTEX. The March 2009 BTEX concentration in MW-5 was generally consistent with the concentrations recorded during the two prior sampling events in March and July 2008 (1,016 ug/L and 678 ug/L, respectively). The March 2009 PAH concentration in MW-5 was slightly higher than the two concentrations reported during the March and July 2008 sampling events (1,774 ug/L and 1,799 ug/L, respectively). The detection of BTEX (1 ug/L of ethylbenzene) in MW-7D in March 2009 represents the first detection of BTEX in this well; however, the detected concentration is below the groundwater standard.

Decreasing trends of BTEX and PAHs are indicated in several wells as evidenced by their lack of detections in the March 2009 sampling event.

Detections of BTEX in wells reported during the prior sampling events that were not detected in the March 2009 sampling event include: MW-4S (3.4 ug/L, March 2008) and MW-6 (57.3 ug/L, March 2008). Detections of PAHs in wells reported during the prior sampling events that were not detected in the March 2009 event include: MW-2S (0.7 ug/L, July 2008), MW-3 (0.76 ug/L, March 2008), MW-4S (0.6 ug/L and 7.96 ug/L, March and July 2008, respectively), MW-4D (4.28 ug/L, March 2008), MW-6 (214.18 ug/L and 154.2 ug/L, March and July 2008, respectively), MW-7D (0.47 ug/L, July 2008) and MW-9S (12.01 ug/L, July 2008).

Current Plans: Continue semiannual groundwater monitoring at the site.

Tables

Table 1
Water Level Measurements and Calculated Water Elevations
Patchogue Former MGP Site
First Semiannual 2009 Groundwater Monitoring Event

Well ID	Date of Measurement	Time of Measurement	Total Depth of Well (ft)	Top of Well Casing (ft MSL)	Depth to Water (ft)	Water Level Elevation (ft MSL)	Comments, Observations and/or Measurements
MW-1	3/23/2009	1025	15.33	11.23	5.90	5.33	
MW-2D	3/23/2009	1005	26.61	8.23	3.91	4.32	
MW-2S	3/23/2009	1004	14.30	8.97	4.55	4.42	
MW-3	3/23/2009	--	--	--	--	--	Unable to locate well during water level measurements.
MW-4D	3/23/2009	1103	26.73	7.57	4.91	2.66	
MW-4S	3/23/2009	1102	12.34	7.74	5.16	2.58	
MW-5	3/23/2009	0949	16.65	7.93	4.28	3.65	
MW-6	3/23/2009	1014	21.87	8.08	3.86	4.22	Large bleb of tar (viscous) observed at bottom of tape
MW-7D	3/23/2009	0955	28.28	8.09	4.43	3.66	
MW-7S	3/23/2009	0955	12.50	8.21	4.54	3.67	
MW-8D	3/23/2009	1040	26.29	4.77	0.87	3.90	
MW-8S	3/23/2009	1039	10.25	4.86	1.03	3.83	
MW-9D	3/23/2009	1048	23.51	4.66	1.64	3.02	
MW-9S	3/23/2009	1050	10.30	4.47	1.60	2.87	

ft = feet
MSL = mean sea level

Table 2
Groundwater Analytical Results
Patchogue Former MGP Site
First Semiannual 2009 Groundwater Monitoring Event

Sample Name: **Sample Date:**	NYS AWQS	MW-1 3/25/2009	MW-2S 3/24/2009	MW-2D 3/24/2009	Duplicate of: MW-2D 3/24/2009	MW-3 3/25/2009	MW-4S 3/25/2009	MW-4D 3/25/2009	MW-5 3/23/2009	MW-6 3/24/2009
BTEX (ug/L)										
Benzene	1	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**45**	10 U
Toluene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**110**	10 U
Ethylbenzene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**390**	10 U
Total BTEX, Total VOCs, and Total PAHs are calculated using detects only.	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**430**	10 U
Total BTEX	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**975**	10 U
Other VOCs (ug/L)										
Methyl tert-butyl ether	10*	10 U	10 U	**2 J**	**2 J**	10 U	10 U	**1 J**	10 U	10 U
Total VOCs	NE	ND	ND	**2**	**2**	ND	ND	**1**	**975**	ND
Non-carcinogenic PAHs (ug/L)										
Acenaphthene	20*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**210**	10 U
Acenaphthylene	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**5**	10 U
Anthracene	50*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**12**	10 U
Benzo[g,h,i]perylene	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	50*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**11**	10 U
Fluorene	50*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**51**	10 U
Methylnaphthalene,2-	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**260**	10 U
Naphthalene	10*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**2100**	10 U
Phenanthrene	50*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**70**	10 U
Pyrene	50*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	**11**	10 U
Total Non-carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND	ND	**2730**	ND
Carcinogenic PAHs (ug/L)										
Benz[a]anthracene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[a]pyrene	ND	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[b]fluoranthene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[k]fluoranthene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz[a,h]anthracene	NE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Indeno[1,2,3-cd]pyrene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Total Carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total PAHs (ug/L)										
Total Non-carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND	ND	**2730**	ND

Table 2
Groundwater Analytical Results
Patchogue Former MGP Site
First Semiannual 2009 Groundwater Monitoring Event

Sample Name: **Sample Date:**	NYS AWQS	MW-7S 3/23/2009	MW-7D 3/23/2009	MW-8S 3/24/2009	MW-8D 3/24/2009	MW-9S 3/25/2009	MW-9D 3/25/2009
BTEX (ug/L)							
Benzene	1	10 U	10 U	10 U	10 U	10 U	10 U
Toluene	5	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	5	10 U	**1 J**	10 U	10 U	10 U	10 U
Total BTEX, Total VOCs, and Total PAHs are calculated using detects only.	5	10 U	10 U	10 U	10 U	10 U	10 U
Total BTEX	5	10 U	**1**	10 U	10 U	10 U	10 U
Other VOCs (ug/L)							
Methyl tert-butyl ether	10*	10 U	10 U	10 U	10 U	10 U	10 U
Total VOCs	NE	ND	**1**	ND	ND	ND	ND
Non-carcinogenic PAHs (ug/L)							
Acenaphthene	20*	10 U	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	NE	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene	50*	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[g,h,i]perylene	NE	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	50*	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	50*	10 U	10 U	10 U	10 U	10 U	10 U
Methylnaphthalene,2-	NE	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	10*	10 U	10 U	10 U	10 U	10 U	10 U
Phenanthrene	50*	10 U	10 U	10 U	10 U	10 U	10 U
Pyrene	50*	10 U	10 U	10 U	10 U	10 U	10 U
Total Non-carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND
Carcinogenic PAHs (ug/L)							
Benz[a]anthracene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[a]pyrene	ND	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[b]fluoranthene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U
Benzo[k]fluoranthene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz[a,h]anthracene	NE	10 U	10 U	10 U	10 U	10 U	10 U
Indeno[1,2,3-cd]pyrene	0.002*	10 U	10 U	10 U	10 U	10 U	10 U
Total Carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND
Total PAHs (ug/L)							
Total Non-carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND

Table 2
Groundwater Analytical Results
Patchogue Former MGP Site
First Semiannual 2009 Groundwater Monitoring Event

Notes:

ug/L - micrograms per liter or parts per billion (ppb)
BTEX - benzene, toluene, ethylbenzene, and xylenes
VOCs - volatile organic compounds
PAHs - polycyclic aromatic hydrocarbons
Total BTEX, Total VOCs, and Total PAHs are calculated using detects only.
NYS AWQS - New York State Ambient Water Quality Standards and Guidance Values for GA groundwater
* indicates the value is a guidance value and not a standard

NE - not established
ND - not detected

Bolding indicates a detected concentration

Shading and bolding indicates that the detected concentration is above the NYS AWQS objective it was compared to

Validation Qualifiers:

J - estimated value
U - indicates not detected at or above the reporting limit shown.

Table 3
Summary of Historical Total BTEX Results
Patchogue Former MGP Site
First 2009 Semiannual Groundwater Monitoring Event

Well No.	Total Depth (feet)	Total BTEX Concentrations (ug/L)					
		Sampling Date					
		2008		2009			
		March*	July*	March	Min	Max	Mean
MW-1	15.2	0.00	NS	0	0	0	0
MW-2S	14.45	0.00	0.00	0	0	0	0
MW-2D	26.4	0.00	0.00	0	0	0	0
MW-3	10.6	0.00	0.00	0	0	0	0
MW-4S	12.2	3.40	0.00	0	0	3	1
MW-4D	26.65	0.00	0.00	0	0	0	0
MW-5	16.6	1016.00	678.00	975	678	1,016	890
MW-6	21.8	57.30	0.00	0	0	57	19
MW-7S	12.39	NS	0.00	0	0	0	0
MW-7D	28.26	NS	0.00	1	0	1	1
MW-8S	10.13	NS	0.00	0	0	0	0
MW-8D	25.23	NS	0.00	0	0	0	0
MW-9S	10.26	NS	0.00	0	0	0	0
MW-9D	23.48	NS	0.00	0	0	0	0

NOTES:

ug/L - Micrograms per liter

NS - Not selected for sampling as part of the sampling event

* - Samples collected by Tetra Tech EC, Inc. as part of the Remedial Investigation.

Table 4
Summary of Historical Total PAH Results
Patchogue Former MGP Site
First Semiannual 2009 Groundwater Monitoring Event

Well No.	Total Depth (feet)	Total PAH Concentrations (ug/L)					
		Sampling Date					
		2008		2009			
		March*	July*	March	Min	Max	Mean
MW-1	15.2	0.00	NS	0	0	0	0
MW-2S	14.45	0.00	0.70	0	0	1	0
MW-2D	26.4	0.00	0.00	0	0	0	0
MW-3	10.6	0.76	0.00	0	0	1	0
MW-4S	12.2	0.60	7.96	0	0	8	3
MW-4D	26.65	4.28	0.00	0	0	4	1
MW-5	16.6	1773.90	1798.70	2,730	1,774	2,730	2,101
MW-6	21.8	214.18	154.20	0	0	214	123
MW-7S	12.39	NS	0.00	0	0	0	0
MW-7D	28.26	NS	0.47	0	0	0	0
MW-8S	10.13	NS	0.00	0	0	0	0
MW-8D	25.23	NS	0.00	0	0	0	0
MW-9S	10.26	NS	12.01	0	0	12	6
MW-9D	23.48	NS	0.00	0	0	0	0

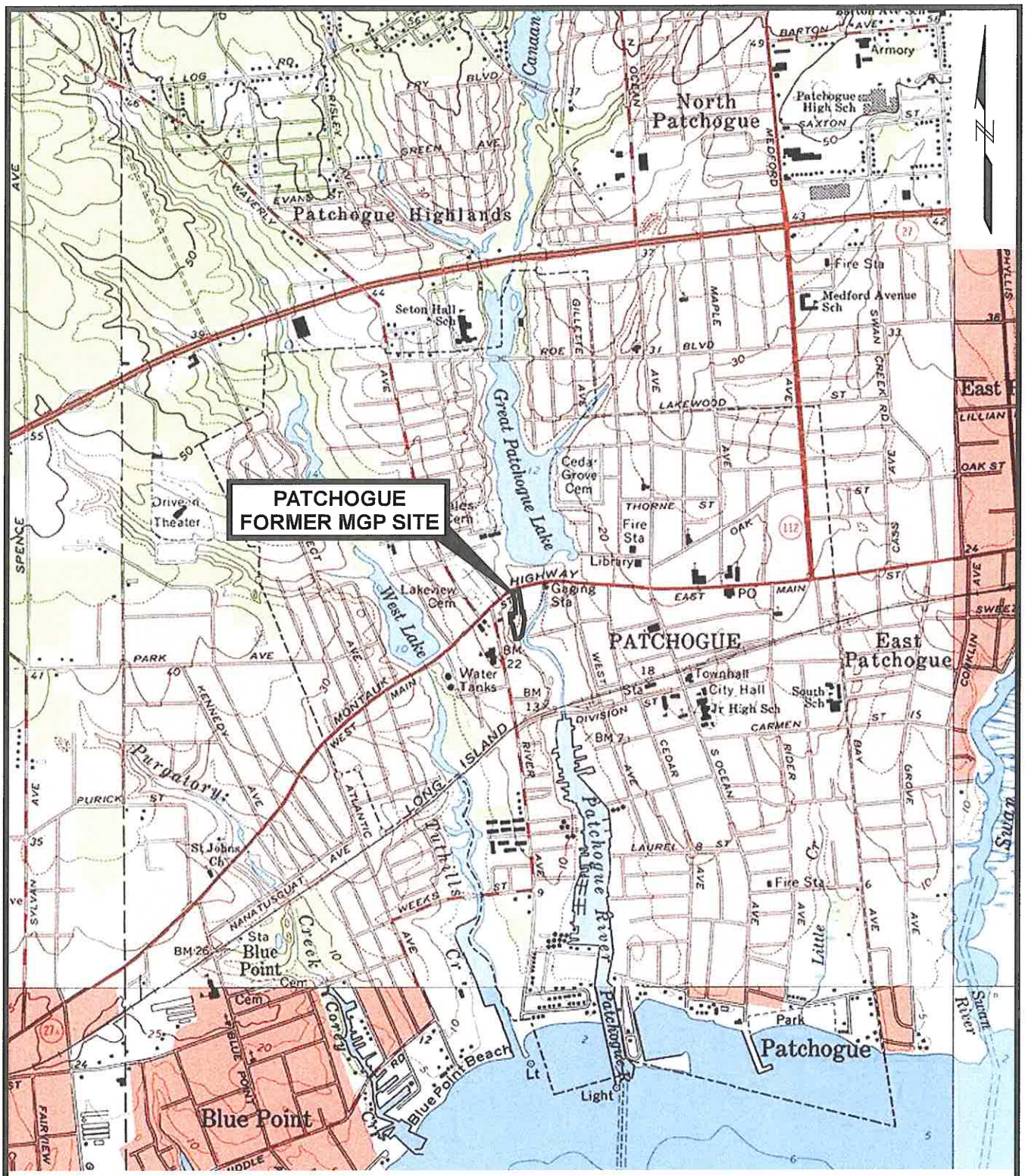
NOTES:

ug/L - Micrograms per liter

NS - Not selected for sampling as part of the sampling event

* - Samples collected by Tetra Tech EC, Inc. as part of the Remedial Investigation.

Figures



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

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SCALE, FEET

PATCHOGUE FORMER MGP SITE
VILLAGE OF PATCHOGUE
BROOKHAVEN, NEW YORK

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SITE LOCATION MAP

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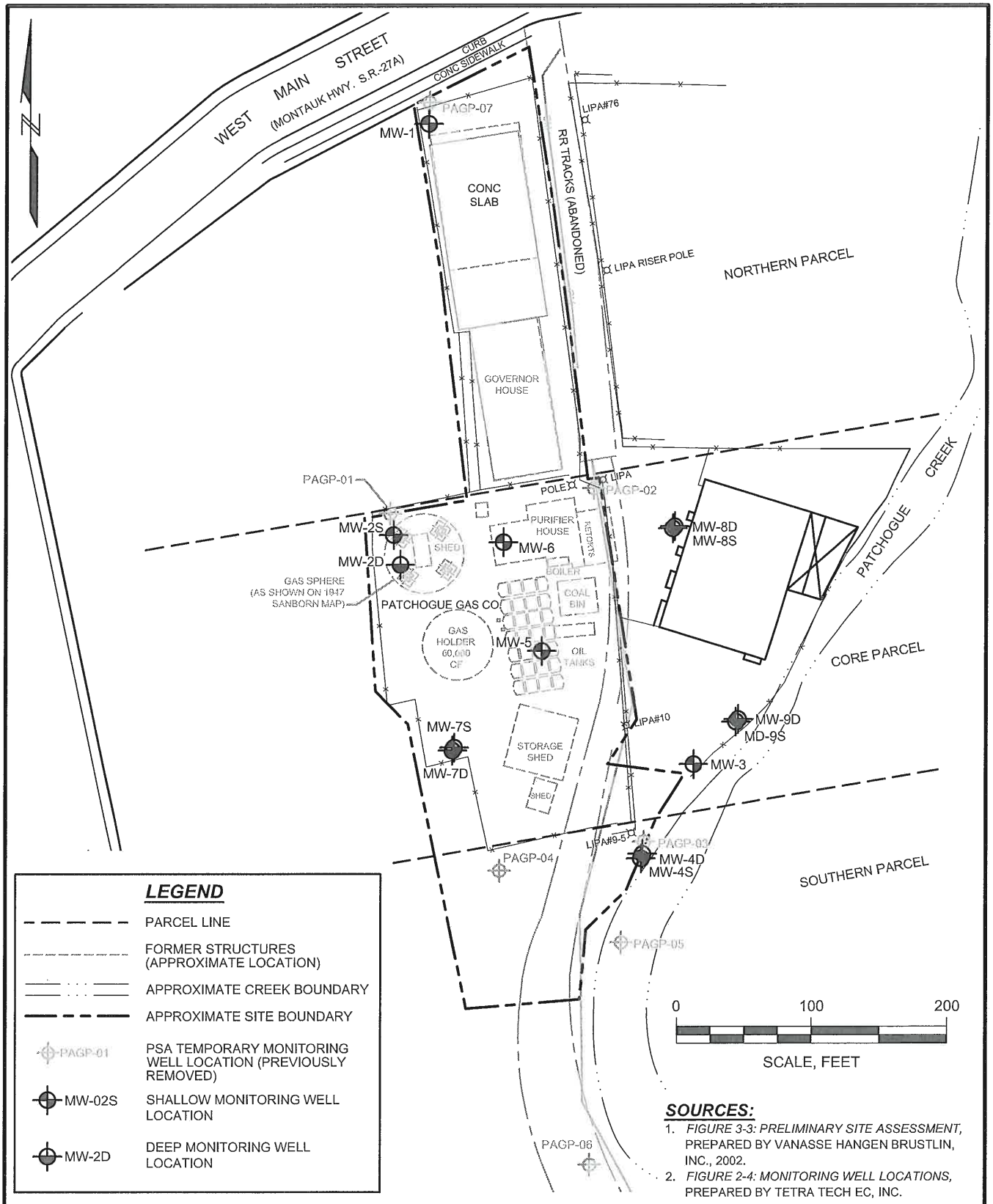

SOURCES:

1. *FIGURE 3-3: PRELIMINARY SITE ASSESSMENT,* PREPARED BY VANASSE HANGEN BRUSTLIN, INC., 2002.
2. *FIGURE 2-4: MONITORING WELL LOCATIONS,* PREPARED BY TETRA TECH EC, INC.

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MONITORING WELL LOCATIONS

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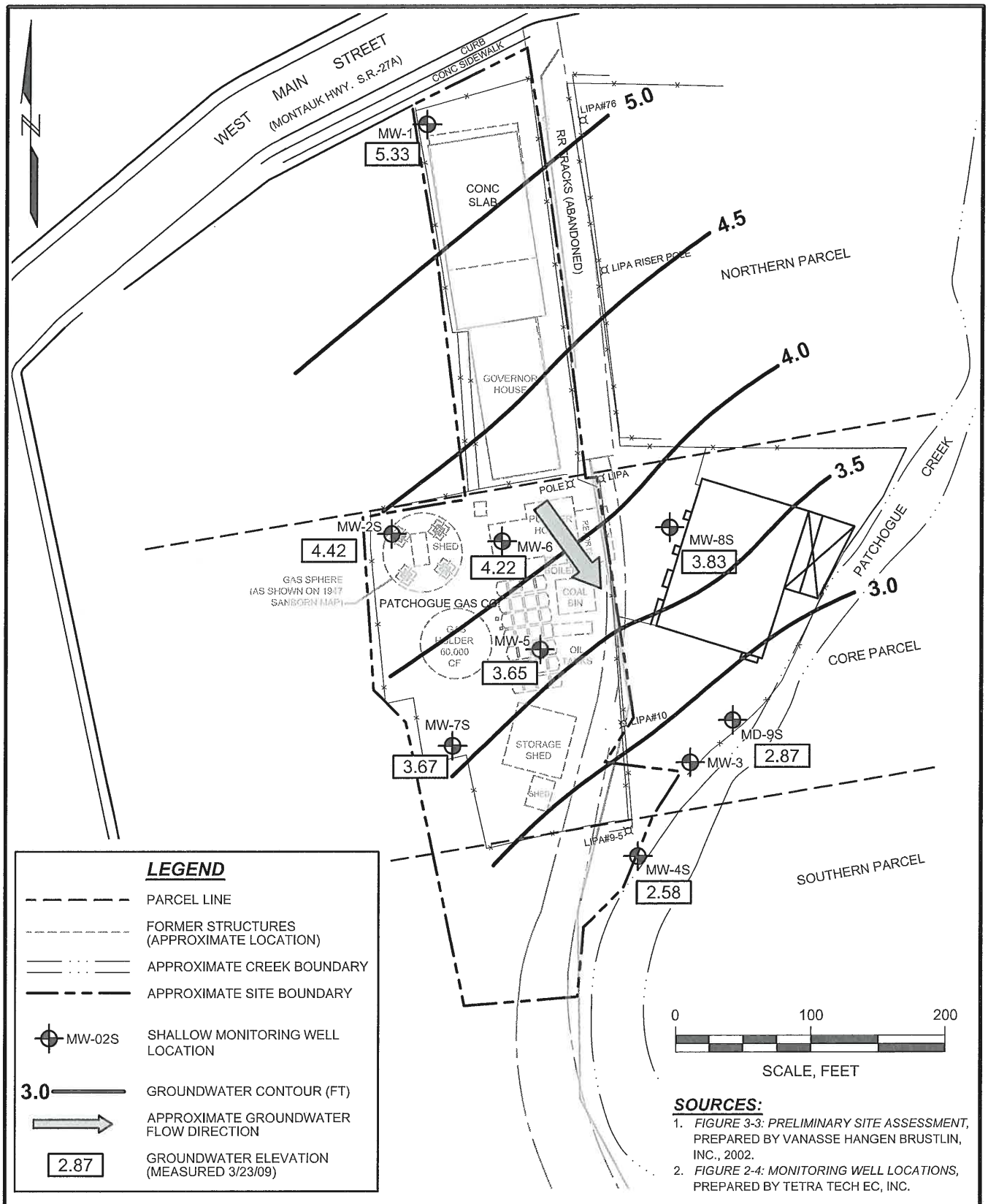

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SHALLOW GROUNDWATER CONTOUR MAP

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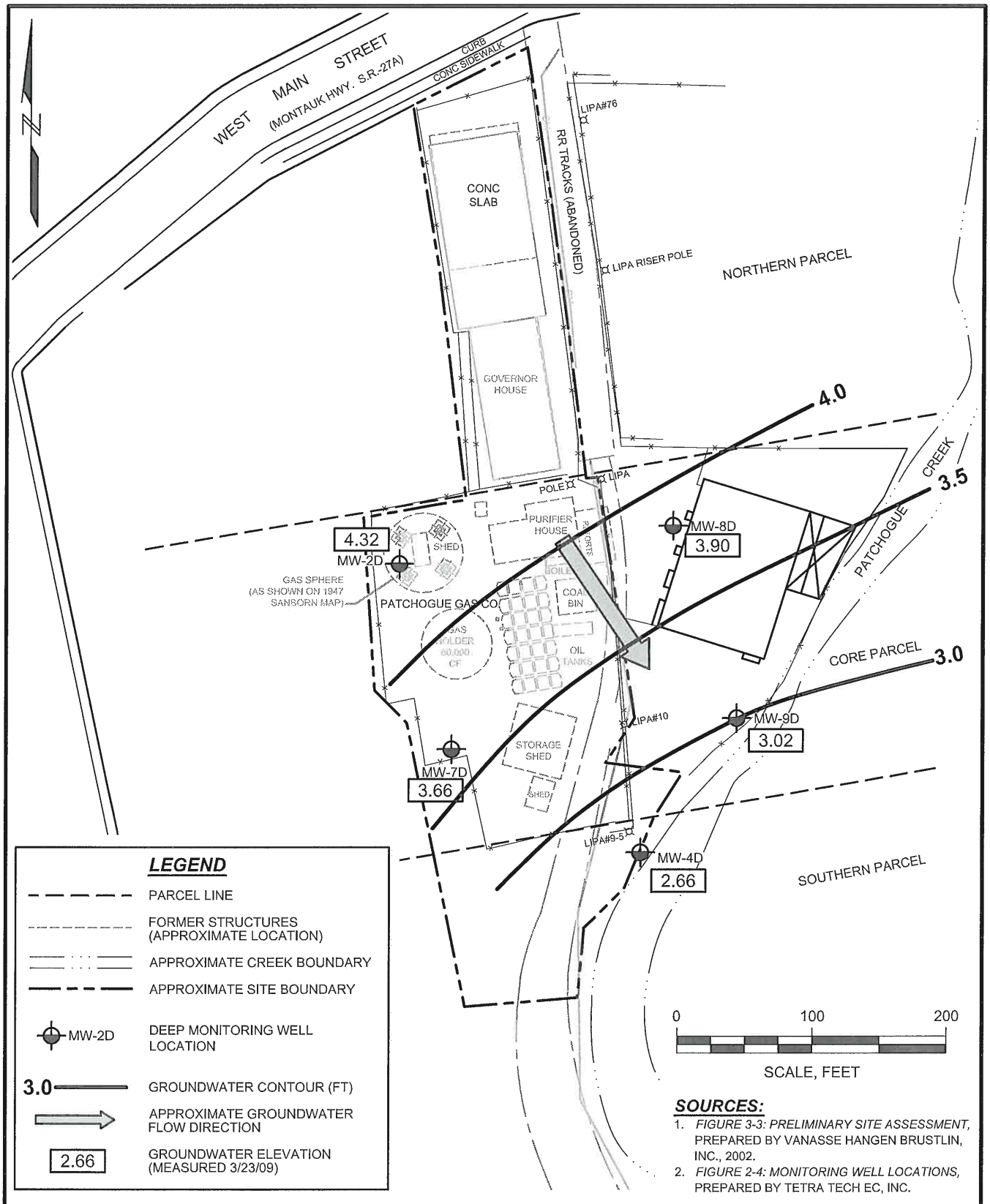

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DEEP GROUNDWATER CONTOUR MAP

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