GEI Consultants

Geotechnical
Environmental and
Water Resources
Engineering

Groundwater Monitoring Report
Second Semiannual 2009 Sampling Event

Patchogue Former MGP Site

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

Submitted to:
National Grid Corporation
175 East Old Country Road
Hicksville, NY

Submitted by:
GEI Consultants, Inc.
110 Walt Whitman Road
Huntington Station, NY 11746
631-760-9300

December 2009
093210-2-1203

Table of Contents

Tables

Figures

h:\wproc\project\keyspan\patchogue\semiannual gw monitoring\q3 2009\patchogue sept-sa2 2009 gw monitoring report.docx

1. Site and Adjacent Downgradient Off-Site Areas

Second Semiannual 2009 Groundwater Monitoring Event Summary

Event Date: September 23 to September 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 **14** monitoring wells. The wells were gauged on September 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 **0.82** (MW-8S) to **5.69** (MW-1) feet below the well measuring point.
- Water table elevations in shallow wells ranged from **2.76** (MW-4S) to **5.54** (MW-1) feet above mean sea level (MSL).
- Depth to the water table in deep wells ranged from **0.66** (MW-8D) to **4.71** (MW-4D) feet below the well measuring point.
- Water table elevations in deep wells ranged from **2.86** (MW-4D) to **4.54** (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 **0.0059** feet/foot.

NAPL Thickness Data: Monitoring wells were gauged for non-aqueous phase liquid (NAPL). Light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL) were not observed in any of the wells during the second semiannual 2009 monitoring event (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 September 23 to September 25, 2009. Detections in the second semiannual 2009 sampling event were limited to MW-5 with concentrations of 1,257 micrograms per liter (ug/L) and 3,373 ug/L of BTEX and PAHs, respectively, MW-3 and MW-9D with detections of 1 and 2 ug/L, respectively for MTBE, and MW-6 with a detection of 1 ug/L for BTEX and 1 ug/l for PAHs.

The chemical data (see **Table 2**) indicate:

- Total BTEX concentrations ranged from less than method detection limits in 12 of 14 wells sampled to **1,257** ug/L in shallow monitoring well MW-5.
- Total PAH concentrations were less than method detection limits in 12 of the 14 wells sampled to **3,373** ug/L in shallow monitoring well MW-5.

Data Trend Analysis:

Generally consistent 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 four sampling events (March 2008, July 2008, March 2009, and September 2009). The sampling in March and July 2008 was conducted by Tetra Tech EC, Inc. as part of the Remedial Investigation (RI). The subsequent sampling events in March and September 2009 were conducted by GEI Consultants, Inc., as part of the semiannual groundwater monitoring program.

The second semiannual/September 2009 sampling event BTEX (1,257 ug/L) and PAH (3,373 ug/L) concentrations in MW-5 were slightly higher than the concentrations recorded during the three prior sampling events for BTEX (1,016 ug/L, 678 ug/L and 975 ug/L) and PAHs (1,774 ug/L, 1,799 ug/L and 2,730 ug/L). The detections of total BTEX (1 ug/L) and PAHs (1 ug/L) in MW-6 in the September 2009 sampling event were well below the concentrations detected in previous sampling events in this well and also below reporting limits. MTBE was detected at concentrations below reporting limits in two wells, MW-3 (1 ug/L) and MW-9D (2 ug/L), during the September 2009 sampling event.

Decreasing trends of BTEX and PAHs are indicated in several wells as evidenced by either their lack of detections or low-level detections in the first and second semiannual 2009 sampling events. Detections of BTEX in wells reported during the prior sampling events as part the RI that were detected at

low-levels or not detected in the first and second semiannual sampling event included MW-4S and MW-6. Most notable was the decrease in BTEX observed at MW-6 from 57 ug/L in March 2008 to non-detect in July 2008 and March 2009, to 1 ug/L in September 2009. Detections of PAHs in wells reported during the prior sampling events as part of the RI that were either not detected or had significantly reduced detections in the first and second semiannual 2009 sampling events included MW-2S, MW-3, MW-4S, MW-4D, MW-6, MW-7D and MW-9S. Most notable were the decreases in PAHs observed in MW-6 from 214 ug/L and 154 ug/L in March and July 2008, respectively, to non-detect and 1 ug/L in March and September 2009, respectively.

Current Plans: Continue semiannual groundwater monitoring at site.

Tables

Table 1
Water Level Measurements and Calculated Water Elevations
Patchogue Former MGP Site
Second 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)	NAPL Observations	Comments
MW-1	9/23/2009	1014	15.33	11.23	5.69	5.54	NO	--
MW-2D	9/23/2009	0957	26.61	8.23	3.69	4.54	NO	--
MW-2S	9/23/2009	0956	14.30	8.97	4.36	4.61	NO	--
MW-3	9/23/2009	1005	10.60	5.39	2.40	2.99	NO	--
MW-4D	9/23/2009	1008	26.73	7.57	4.71	2.86	NO	--
MW-4S	9/23/2009	1007	12.34	7.74	4.98	2.76	NO	--
MW-5	9/23/2009	0950	16.65	7.93	4.05	3.88	NO	--
MW-6	9/23/2009	0959	21.87	8.08	3.64	4.44	NO	--
MW-7D	9/23/2009	0952	28.28	8.09	4.24	3.85	NO	--
MW-7S	9/23/2009	0952	12.50	8.21	4.39	3.82	NO	--
MW-8D	9/23/2009	1002	26.29	4.77	0.66	4.11	NO	--
MW-8S	9/23/2009	1001	10.25	4.86	0.82	4.04	NO	--
MW-9D	9/23/2009	1004	23.51	4.66	1.45	3.21	NO	--
MW-9S	9/23/2009	1003	10.30	4.47	1.41	3.06	NO	--

ft = feet
MSL = mean sea level
NO = None Observed

Table 2
Summary of BTEX, MTBE, and PAH Results
Patchogue Former MGP Site
Second Semiannual 2009 Groundwater Monitoring Event

Sample Name: **Sample Date:**	NYS AWQS	MW-1 9/25/2009	MW-2S 9/23/2009	MW-2D 9/23/2009	MW-3 9/25/2009	MW-4S 9/25/2009	MW-4D 9/25/2009	MW-5 9/24/2009	MW-6 9/23/2009
BTEX (ug/L)									
Benzene	1	10 U	10 U	10 U	10 U	10 U	10 U	**27**	10 U
Toluene	5	10 U	10 U	10 U	10 U	10 U	10 U	**140**	10 U
Ethylbenzene	5	10 U	10 U	10 U	10 U	10 U	10 U	**500**	**1 J**
Xylene, total	5	10 U	10 U	10 U	10 U	10 U	10 U	**590**	10 U
Total BTEX	NE	ND	ND	ND	ND	ND	ND	**1257**	**1**
Other VOCs (ug/L)									
Methyl tert-butyl ether	10*	10 U	10 U	10 U	**1 J**	10 U	10 U	10 U	10 U
Total VOCs	NE	ND	ND	ND	**1**	ND	ND	**1257**	**1**
Non-carcinogenic PAHs (ug/L)									
Acenaphthene	20*	10 U	10 U	10 U	10 U	10 U	10 U	**240 J**	10 U
Acenaphthylene	NE	10 U	10 U	10 U	10 U	10 U	10 U	**3 J**	10 U
Anthracene	50*	10 U	10 U	10 U	10 U	10 U	10 U	**13**	10 U
Benzo[g,h,i]perylene	NE	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	**8**	10 U
Fluorene	50*	10 U	10 U	10 U	10 U	10 U	10 U	**60**	10 U
Methylnaphthalene,2-	NE	10 U	10 U	10 U	10 U	10 U	10 U	**330**	10 U
Naphthalene	10*	10 U	10 U	10 U	10 U	10 U	10 U	**2600**	10 U
Phenanthrene	50*	10 U	10 U	10 U	10 U	10 U	10 U	**110 J**	10 U
Pyrene	50*	10 U	10 U	10 U	10 U	10 U	10 U	**9**	**1 J**
Total Non-carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND	**3373**	**1**
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
Benzo[a]pyrene	ND	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
Benzo[k]fluoranthene	0.002*	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
Dibenz[a,h]anthracene	NE	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
Total Carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND	ND	ND
Total PAHs (ug/L)									
Total PAHs	NE	ND	ND	ND	ND	ND	ND	**3373**	**1**

Table 2
Summary of BTEX, MTBE, and PAH Results
Patchogue Former MGP Site
Second Semiannual 2009 Groundwater Monitoring Event

Sample Name: **Sample Date:**	NYS AWQS	MW-7S 9/23/2009	MW-7D 9/23/2009	MW-8S 9/24/2009	Duplicate of MW-8S 9/24/2009	MW-8D 9/24/2009	MW-9S 9/24/2009	MW-9D 9/24/2009
BTEX (ug/L)								
Benzene	1	10 U	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	10 U
Ethylbenzene	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Xylene, total	5	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Total BTEX	NE	ND	ND	ND	ND	ND	ND	ND
Other VOCs (ug/L)								
Methyl tert-butyl ether	10*	10 U	10 U	10 U	10 U	10 U	10 U	**2 J**
Total VOCs	NE	ND	ND	ND	ND	ND	ND	**2**
Non-carcinogenic PAHs (ug/L)								
Acenaphthene	20*	10 U	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	10 U
Anthracene	50*	10 U	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	10 U
Fluoranthene	50*	10 U	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	10 U
Methylnaphthalene,2-	NE	10 U	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	10 U
Phenanthrene	50*	10 U	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	10 U
Total Non-carcinogenic PAHs	NE	ND	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	10 U
Benzo[a]pyrene	ND	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
Benzo[k]fluoranthene	0.002*	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
Dibenz[a,h]anthracene	NE	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
Total Carcinogenic PAHs	NE	ND	ND	ND	ND	ND	ND	ND
Total PAHs (ug/L)								
Total PAHs	NE	ND	ND	ND	ND	ND	ND	ND

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

Well No.	Total Depth (feet)	Total BTEX Concentrations (ug/L)						
		Sampling Date						
		2008		2009				
		March*	July*	March	Sept	Min	Max	Mean
MW-1	15.2	0.00	NS	0	0	0	0	0
MW-2S	14.45	0.00	0.00	0	0	0	0	0
MW-2D	26.4	0.00	0.00	0	0	0	0	0
MW-3	10.6	0.00	0.00	0	0	0	0	0
MW-4S	12.2	3.40	0.00	0	0	0	3.40	0.85
MW-4D	26.65	0.00	0.00	0	0	0	0	0
MW-5	16.6	1,016	678	975	1,257	678	1,257	921
MW-6	21.8	57.3	0.00	0	1	0	57.3	15
MW-7S	12.39	NS	0.00	0	0	0	0	0
MW-7D	28.26	NS	0.00	1	0	0	1	0
MW-8S	10.13	NS	0.00	0	0	0	0	0
MW-8D	25.23	NS	0.00	0	0	0	0	0
MW-9S	10.26	NS	0.00	0	0	0	0	0
MW-9D	23.48	NS	0.00	0	0	0	0	0

NOTES:

BTEX - benzene, toluene, ethylbenzene, and xylenes
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

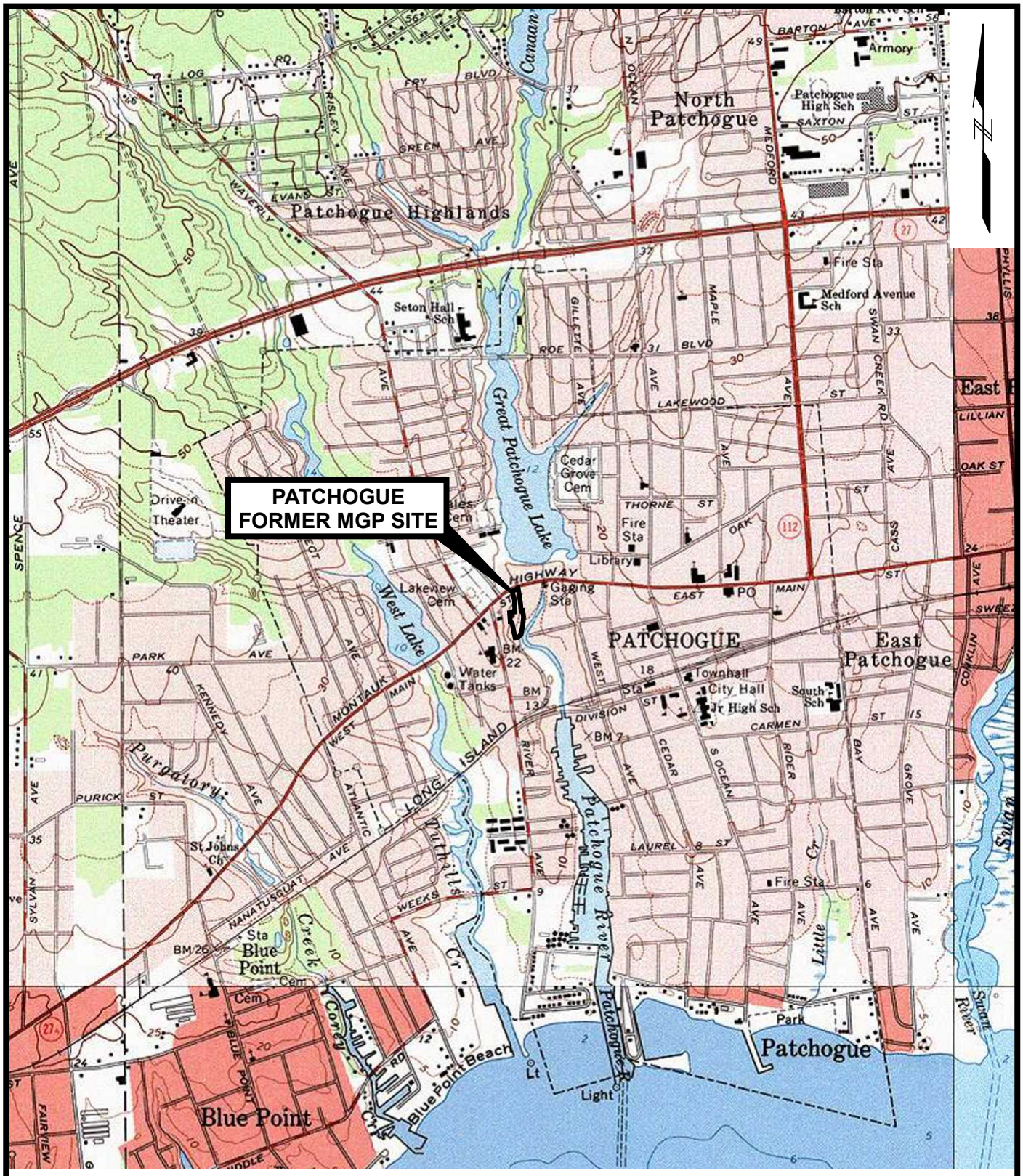
Table 4
Summary of Historical Total PAH Results
Patchogue Former MGP Site
Second Semiannual 2009 Groundwater Monitoring Event

Well No.	Total Depth (feet)	Total PAH Concentrations (ug/L)						
		Sampling Date						
		2008		2009				
		March*	July*	March	Sept	Min	Max	Mean
MW-1	15.2	0.00	NS	0	0	0.00	0	0
MW-2S	14.45	0.00	0.70	0	0	0	0.70	0
MW-2D	26.4	0.00	0.00	0	0	0	0	0
MW-3	10.6	0.76	0.00	0	0	0	0.76	0
MW-4S	12.2	0.60	7.96	0	0	0	7.96	2.14
MW-4D	26.65	4.28	0.00	0	0	0	4.28	1.07
MW-5	16.6	1,773.90	1,798.70	2,730	3,373	1,773.90	3,373	2,419
MW-6	21.8	214.18	154.20	0	1	0	214.18	92.3
MW-7S	12.39	NS	0.00	0	0	0	0	0
MW-7D	28.26	NS	0.47	0	0	0	0	0
MW-8S	10.13	NS	0.00	0	0	0	0	0
MW-8D	25.23	NS	0.00	0	0	0	0	0
MW-9S	10.26	NS	12.01	0	0	0	12.0	4.00
MW-9D	23.48	NS	0.00	0	0	0	0	0

NOTES:

PAHs - polycyclic aromatic hydrocarbons
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)

0 2000 4000

SCALE, FEET

PATCHOGUE FORMER MGP SITE
VILLAGE OF PATCHOGUE
BROOKHAVEN, NEW YORK

nationalgrid

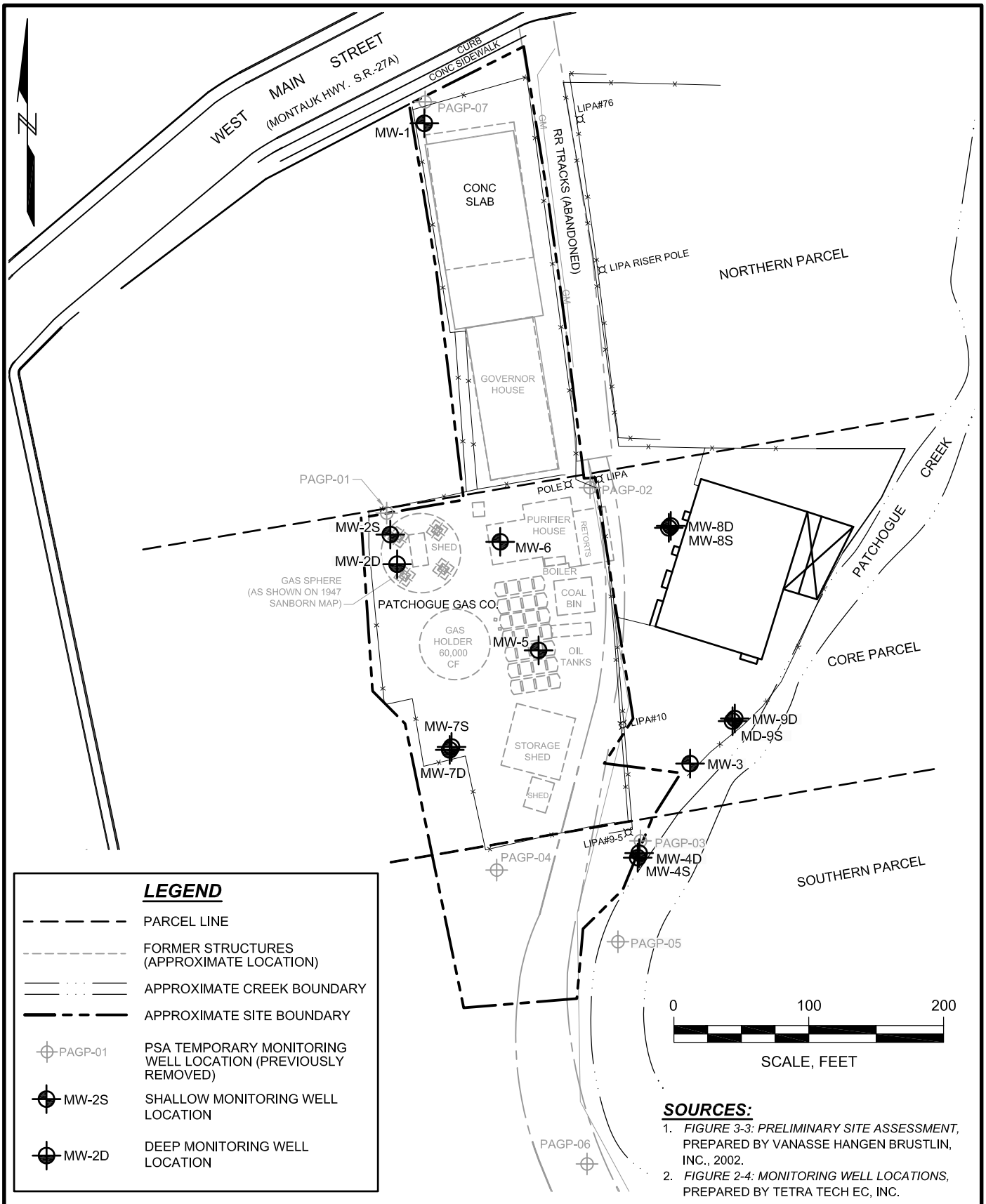
GEI Consultants

Project 093210-2-1203

SITE LOCATION MAP

December 2009 Figure 1

NATIONAL GRID\PATCHOGUE\GW Monitoring-Biennial\PATCHOGUE-LOCATION MAP.CDR



PATCHOGUE FORMER MGP SITE
VILLAGE OF PATCHOGUE
BROOKHAVEN, NEW YORK

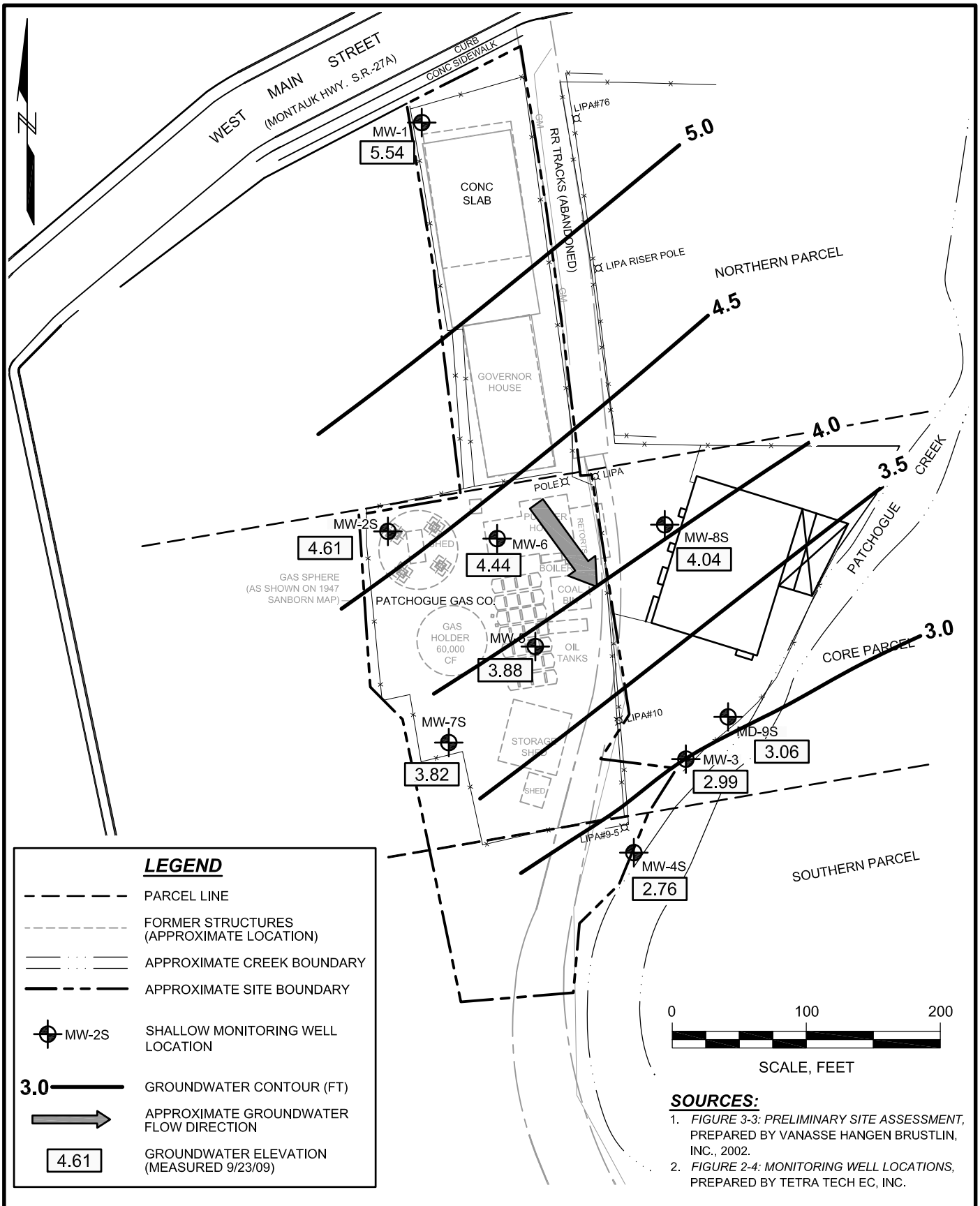
nationalgrid

GEI Consultants

MONITORING WELL LOCATIONS

Project 093210-2-1203 | December 2009 | Figure 2

I:\GEI\National Grid\Patchogue\GW Monitoring-Biennial\ Patchogue GW Contours 12-2009.dwg \Dec 03, 2009



LEGEND

- PARCEL LINE
- FORMER STRUCTURES (APPROXIMATE LOCATION)
- APPROXIMATE CREEK BOUNDARY
- APPROXIMATE SITE BOUNDARY
- MW-2S — SHALLOW MONITORING WELL LOCATION
- 3.0 — GROUNDWATER CONTOUR (FT)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- 4.61 — GROUNDWATER ELEVATION (MEASURED 9/23/09)

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.

PATCHOGUE FORMER MGP SITE
VILLAGE OF PATCHOGUE
BROOKHAVEN, NEW YORK

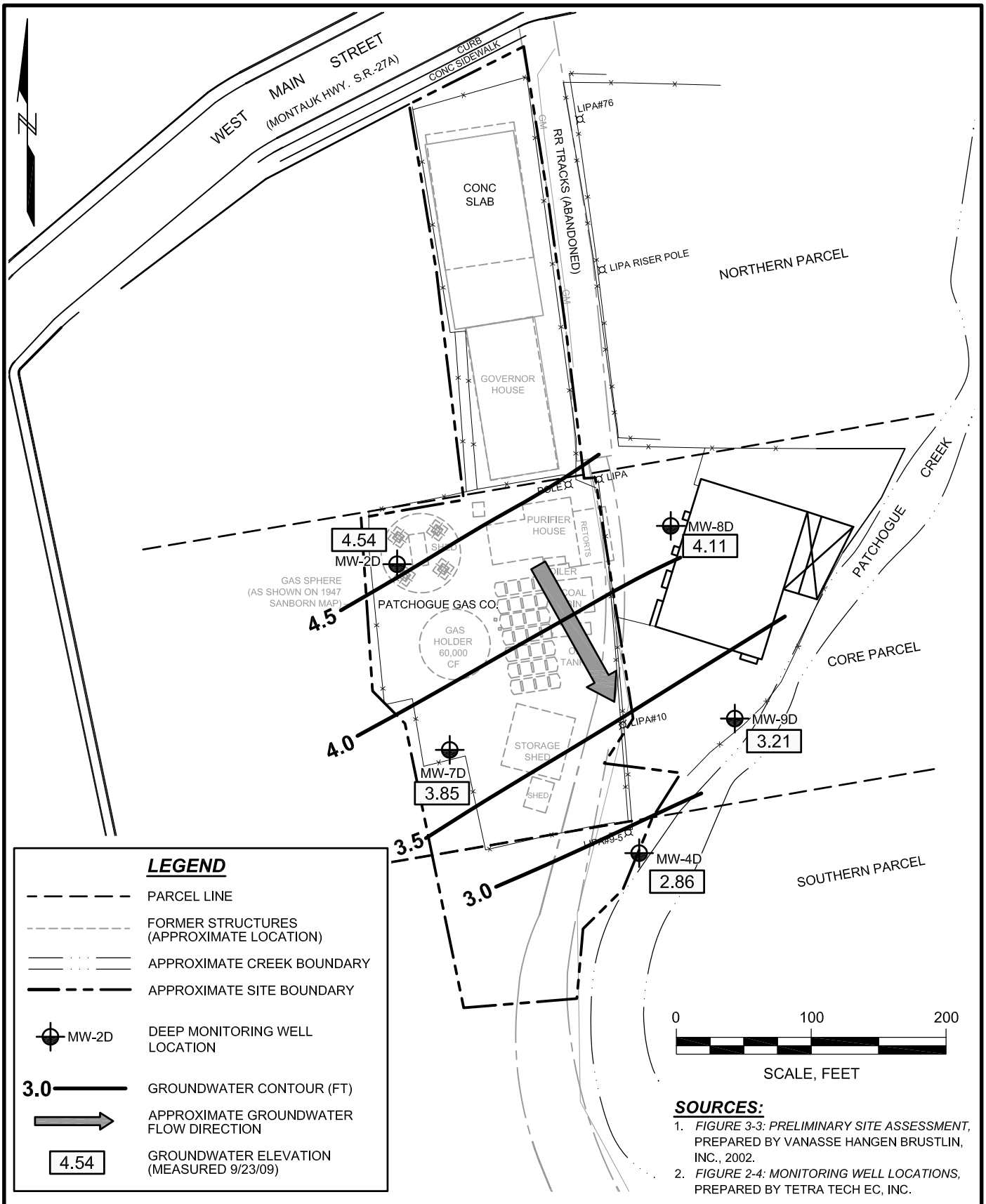
nationalgrid

GEI Consultants

SHALLOW GROUNDWATER CONTOUR MAP

Project 093210-2-1203 | December 2009 | Figure 3

I:\GEI\National Grid\Patchogue\GW Monitoring-Biennial\ Patchogue GW Contours 12-2009.dwg \Dec 03, 2009



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.

PATCHOGUE FORMER MGP SITE
VILLAGE OF PATCHOGUE
BROOKHAVEN, NEW YORK

nationalgrid

GEI Consultants

DEEP GROUNDWATER CONTOUR MAP

Project 093210-2-1203 | December 2009 | Figure 4

I:\GEI\National Grid\Patchogue\GW Monitoring-Biennial\ Patchogue GW Contours 12-2009.dwg \Dec 03, 2009