

**Quarterly Groundwater Monitoring Report
Fourth Quarter (Q4) 2017**

Sag Harbor Former MGP Site

Village of Sag Harbor
Suffolk County, Long Island, NY
Site ID No. 1-52-159

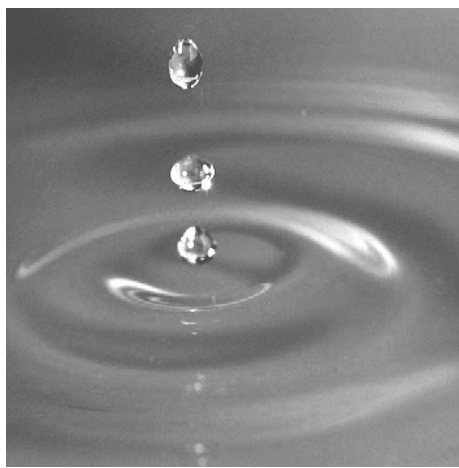
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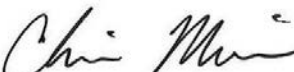
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1. Sag Harbor Site and Adjacent Offsite Areas

Fourth Quarter (Q4) 2017 Groundwater Monitoring Event Summary

Event Date: December 7 and 8, 2017

Site Phase: Quarterly groundwater monitoring

Location: The location of the Sag Harbor Former MGP site is depicted on **Figure 1**.

1.1 Monitoring Program

Criteria to reduce the scope of the groundwater monitoring program based on historical and future analytical results were proposed, and subsequently approved by the New York State Department of Environmental Conservation (NYSDEC) on March 21, 2014. The criteria and the resulting reductions to the program were detailed in a follow-up letter to NYSDCE dated May 13, 2014. NYSDCE has required that several monitoring wells in the intermediate zone be exempt from reduction criteria and be sampled annually. These wells include SHMW-03I, SHMW-05I, and SHMW-08I.

Based on the established criteria, 11 wells were eliminated from the sampling program and two shallow wells were reduced to annual sampling and quarterly sampling has resumed in one well. The reductions in the scope of work are shown in the table below. The sampling list will continue to be re-evaluated on a quarterly basis, with changes made, as appropriate.

Monitoring Well	Sampling Frequency		Monitoring Well	Sampling Frequency	
	Former	Current		Former	Current
SHMW-01SR	Annual	Eliminated	SHMW-01D	Annual	Eliminated
SHMW-02S	Quarterly	Annual	SHMW-02DR	Annual	Eliminated
SHMW-03S	Quarterly	Annual	SHMW-07IR	Annual	Eliminated
SHMW-09I	Annual	Quarterly	SHMW-10I	Annual	Eliminated
SHMW-10S	Quarterly	Eliminated	SHMW-11I	Annual	Eliminated
SHMW-13S	Quarterly	Eliminated	SHMW-12I	Annual	Eliminated
SHMW-01IR	Annual	Eliminated	SHMW-13I	Annual	Eliminated

Notes. ¹: SHMW-03I, 05IR, and 08I are exempt from reduction from annual sampling

Implementation of the reduced sampling scope began in the second quarter (Q2) 2014. Based on a review of seasonal data trends, the annual sampling rounds are to be conducted during the third quarter of each year. Seven wells were included in the fourth quarter (Q4) 2017 quarterly sampling list.

1.2 Monitoring Well Network

A total of 25 monitoring wells are currently located at or in the vicinity of the site (**Figure 2**). MW-05 was destroyed sometime between March and June 2007. Monitoring wells MW-01, MW-02, MW-03, MW-04, MW-06, SHMW-01S, SHMW-01I, SHMW-02I, SHMW-02D, SHMW-04S, SHMW-04I, SHMW-05S, SHMW-05I, SHMW-06S, and SHMW-06I were abandoned prior to the Q4 2008 sampling event due to the remediation activities being conducted at the site. Seven of the monitoring wells, including SHMW-01SR, SHMW-01IR, SHMW-02IR, SHMW-02DR, SHMW-04SR, SHMW-05SR, and SHMW-05IR, were replaced as part of the post-remediation monitoring well replacement/installation program in Q4 2010.

Monitoring wells SHMW-02IR and SHMW-04SR were installed as larger diameter wells for potential dense non-aqueous phase liquid (DNAPL) recovery. In addition to the installation of the replacement monitoring wells listed above, new monitoring wells SHMW-01D and SHMW-02S were also installed as part of this program. Monitoring wells SHMW-07S and SHMW-07I, which were damaged presumably during the remedial activities, were abandoned during the replacement well installation program and reinstalled.

1.3 Hydrological Data

Groundwater levels were measured on December 8, 2017 at all 25 monitoring wells, during low and high tides. Monitoring well SHMW-02IR was repaired during third quarter (Q3) 2011, altering the survey point. As a result, the groundwater level measurement was not calculated. Depth to groundwater measurements and calculated groundwater elevations are provided in **Table 1**. Shallow and intermediate groundwater contours for high and low tidal conditions are depicted on **Figures 3** through **6**.

The groundwater flow direction was generally to the west towards Sag Harbor Cove. The ranges in depth to water and water table elevation data, as well as calculated hydraulic gradients for the shallow and intermediate portions of the aquifer in Q4 2017, are provided in the following table:

Depth Zone	High Tide			Low Tide		
	Range		Gradient ³	Range		Gradient ³
	DTW ¹	WLE ²		DTW ¹	WLE ²	
Shallow	0.00 – 5.61	-0.58 – 4.44	0.0044	0.00 – 5.81	-0.49 – 4.44	0.0057
Intermediate	0.00 – 5.37	-0.41 – 5.71	0.0007	0.00 – 6.31	-0.68 – 5.71	0.0029

Notes:

- ¹: Depth to water - Measured as feet below top of casing
- ²: Water level elevation - Calculated as feet above mean sea level
- ³: Feet/Feet

1.4 NAPL Thickness Data

Table 2 provides a summary of historical non-aqueous phase liquid (NAPL) data. In Q4 2017, all 25 monitoring wells were monitored for NAPL as part of the groundwater monitoring program. Evidence of light non-aqueous phase liquid (LNAPL) or DNAPL in the

monitoring wells during Q4 2017 was limited to approximately two inches of DNAPL in SHMW-02IR and DNAPL blebs in SHMW-07SR.

1.5 Chemical Data

In Q4 2017, a total of six wells were sampled for benzene, toluene, ethylbenzene, total xylenes (BTEX), and methyl tert-butyl ether (MTBE) by Environmental Protection Agency (EPA) Method 8260, as well as polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270. Well sampling was performed on December 7, 2017 and included all the wells on the quarterly sampling list excluding SHMW-07SR, which was not sampled due to the presence of DNAPL blebs.

Table 3 provides the chemical data for Q4 2017. The data indicate:

- Total BTEX concentrations in the six wells ranged from 3.7 micrograms per liter (µg/L) in SHMW-08S to 250.7 µg/L in SHMW-04SR.
- Total PAH concentrations ranged from ND in SHMW-09I to 264 µg/L in SHMW-12S.
- MTBE was detected in two of the six wells sampled. The maximum MTBE detection was in SHMW-08S with a concentration of 2.8 µg/L.

1.6 Data Trend Analysis

Total BTEX and total PAH concentrations (see historical data in **Tables 4** and **5**) have been generally decreasing, but variable in shallow groundwater on and adjacent to the site. Q4 2017 concentrations are slightly higher than Q3 2017, which included several annual wells with historically low concentrations, but below Q2 2017 concentrations. Further discussion of the decreases is provided below. An analysis of the current and historical data in recent quarterly sampling events is presented in the table below.

Shallow Zone	Historical		Q2 2017		Q3 2017		Q4 2017	
	Max	Average	Max	Average	Max	Average	Max	Average
Total BTEX	25,860	699	531	144	358	62	251	71
Total PAHs	14,332	626	532	146	475	91	264	106

Note:

Concentrations in µg/L

Exceedances of the respective ambient water quality standards or guidance values (AWQS) for BTEX were identified in each of the five shallow wells sampled in Q4 2017, including SHMW-04SR (250.7 µg/L), SHMW-05SR (7.45 µg/L), SHMW-08S (3.7 µg/L), SHMW-09S (25.55 µg/L), and SHMW-12S (68.53 µg/L) and one intermediate well SHMW-09I (18.88 µg/L). Benzene exceeded the AWQS of 1 µg/L in each of the wells listed above. Total xylenes exceeded the standard of 5 µg/L in SHMW-04SR, SHMW-09S and SHMW-12S. Ethylbenzene exceedances were limited to SHMW-04SR. Total BTEX concentrations in SHMW-04SR and SHMW-12S decreased relative to Q3 2017, while the total BTEX concentrations in the remaining wells were generally similar to Q3 2017. Total BTEX concentrations in these wells were all below their respective historical mean.

MTBE was detected in two wells with a maximum of 2.8 µg/L in SHMW-08S. None of the detections were above the guidance value of 10 µg/L.

PAH exceedances of the AWQS concentrations were identified in the five shallow wells sampled in Q4 2017, including SHMW-04SR (49.4 µg/L), SHMW-05SR (61.91 µg/L), SHMW-08S (116.9 µg/L), SHMW-09S (35.6 µg/L), and SHMW-12S (264 µg/L). The compounds exceeding the AWQS included acenaphthene (in each of the wells excluding SHMW-12S). Benzo(b)fluoranthene and indeno(1,2,3-cd)pyrene each exceeded the guidance value of 0.002 µg/L in SHMW-04SR. Naphthalene exceeded the AWQS of 10 µg/L in SHMW-08S and SHMW-12S. The concentration of total PAHs in SHMW-04SR and SHMW-05S increased slightly relative to Q3 2017, while the concentrations in SHMW-08S and SHMW-12S decreased and SHMW-09S remained similar to Q3 2017 concentrations. Excluding SHMW-08S, the Q4 2017 total PAH concentrations were all below their respective historical mean concentrations. SHMW-08S was within its historical concentration range. PAH concentrations were below detections levels in intermediate well SHMW-09I.

1.7 DNAPL Occurrence

The historical NAPL data (**Table 2**) indicates that measurable quantities of NAPL have primarily been found in two onsite shallow monitoring wells (MW-02 and MW-05), one onsite intermediate well (SHMW-02I), and one offsite shallow well (SHMW-04S). Non-measurable (trace) amounts of NAPL have historically been found in two onsite shallow wells, MW-03 and MW-04, as well as in offsite shallow well SHMW-06S, and was intermittently found in SHMW-07S. All of the wells identified above in which NAPL has been historically detected were either destroyed or abandoned prior to, or during, remedial activities.

No measurable amounts of LNAPL and DNAPL had been observed in replacement monitoring wells SHMW-04SR and SHMW-07SR prior to Q4 2014. Since that time, DNAPL was measured at a thickness of approximately 0.13 feet in SHMW-04SR during first quarter (Q1) 2015 and has been measured sporadically and at a maximum thickness of approximately 0.17 feet in SHMW-07SR. During Q4 2017, no DNAPL was observed in SHMW-04SR. Blebs of DNAPL were observed in SHMW-07SR.

To date, no significant evidence of NAPL has been found in these monitoring wells or any of the remaining monitoring wells post remediation, excluding SHMW-02IR. The DNAPL thickness in SHMW-02I was approximately 4 feet immediately prior to abandonment during the Q3 2008 monitoring event. SHMW-02IR was installed as a larger diameter well for potential DNAPL recovery.

During Q4 2017, approximately two inches of DNAPL were measured in SHMW-02IR. During Q4 2015 and Q2 2017, approximately one gallon of product was removed from SHMW-02IR. Subsequent gauging events will monitor the rebound in DNAPL thickness. Additional recovery efforts will be conducted as appropriate.

1.8 Future Plans

- Continue quarterly groundwater and NAPL monitoring at onsite and offsite monitoring wells.
- Attempt to recover DNAPL from SHMW-02IR, if the measured DNAPL thickness is greater than approximately 0.33 feet.

Tables

Figures
