D&B Engineers and Architects, P.C.

ACTIVE INDUSTRIAL UNIFORM SITE GROUNDWATER EXTRACTION AND TREATMENT SYSTEM

Latitude 40.677°, Longitude -73.365°

REPORT TITLE

Site Management Quarterly Report No. 47

REPORTING PERIOD

July 1, 2016 through September 30, 2016

CLIENT

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MAY 2017

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Environmental Remediation
625 Broadway, 12th Floor, Albany, New York 12233

Site

NYSDEC Site No. 152125, Active Industrial Uniform Site Groundwater Extraction and Treatment System, Village of Lindenhurst, Town of Babylon, Suffolk County, New York.

Project Background and Site Description

The Active Industrial Uniform site (the Site) groundwater extraction and treatment system (GWE&TS) was designed to recover and treat a chlorinated solvent-contaminated groundwater plume emanating from the Site, a former dry cleaning and laundry facility. Dry cleaning activities were conducted at the Site from the 1980's to 1987. The GWE&TS has been in operation since December 2001; however, D&B assumed site management duties for the Site in February 2005. Refer to *Figure 1* for a Site location map depicting the GWE&TS location.

Groundwater Extraction and Treatment System Overview

The GWE&TS consists of two, 8-inch diameter extraction wells; one located on-site in the southwest portion of the Site (RW-1), and one located off-site, approximately 1,500 feet southwest of the Site (RW-2). As per NYSDEC direction, extraction well RW-2 was shut down in April 2010 due to historically low VOC concentrations, and is now being monitored on a quarterly basis. Extracted groundwater is conveyed to the GWE&TS building via underground piping to two series-configured packed-tower air strippers. Treated groundwater is pumped via underground piping to a storm water basin located approximately 1,000 feet west of the Site, which subsequently discharges into Little Neck Creek, in accordance with all applicable discharge standards. Exhaust gas from the air stripping towers was treated utilizing two granular activated carbon (GAC) vessels in series. Based on historically low contaminant concentrations detected in the air stripper exhaust gas, the air stripper exhaust piping was reconfigured to bypass the GAC vessels and discharge directly to the atmosphere in June 2011, per the direction of the NYSDEC. The GWE&TS is equipped with instrumentation and controls which allow for automated start-up and operation, and an autodial alarm notification system. Refer to *Figure 2* for an "as-built" system layout diagram.

Regulatory Requirements/Cleanup Goals

Site-specific remedial goals have been established through the remedy selection process and are documented in the Record of Decision (ROD), dated March 1997. The site-specific goals outlined in the March 1997 ROD are provided in *Attachment A*. The overall goal is to meet all appropriate Standards, Criteria, and Guidance (SCGs) and to be protective of human health and the environment. Implementation of the GWE&TS is specifically focused on the following goals:

- Reduce, control, or eliminate contaminated media to the extent practicable.
- Eliminate the threat to surface waters by remediating groundwater to the extent practicable.

- Mitigate the impacts of contaminated groundwater to the environment.
- Prevent, to the extent possible, migration of contaminants.
- Provide for attainment of SCGs for groundwater, soil and indoor air within the limits of the affected area, to the extent practicable.
- Reduce the threat of inhalation of site-related vapor-phase contaminants to residents within homes downgradient of the Site.

Remedial System Optimization (RSO)

As part of an ongoing Remedial System Optimization (RSO) effort to improve the efficiency, effectiveness and net environmental benefit of the GWE&TS, an on-site source area assessment and temporary well plume re-delineation program was completed at the Site in February and March 2013. As per a recommendation of the following July 2013 RSO Data Summary Report, a remedial alternatives study was performed for the Site in October 2013. Following review of the remedial alternatives study and several follow-up discussions with the NYSDEC, it was determined that further plume delineation would be required prior to implementing any alternative remedial approach for the Site.

To this end, and based on D&B's recommendations, a membrane interface probe (MIP) investigation, including targeted groundwater sample collection, was completed at the Site on July 7 through 11 and July 14, 2014. It should be noted that the GWE&TS was manually shut down during the MIP Investigation in an effort to achieve static aquifer conditions. The results of the completed MIP investigation and groundwater sampling activities were summarized in a February 2015 MIP Investigation Summary Report. Based on the recommendations presented in the February 2015 MIP Investigation Summary Report, D&B prepared a draft chemical injection Pilot Study Scope of Work to address the identified remaining contamination at and downgradient of the Site. NYSDEC is currently evaluating moving forward with a chemical injection program at the Site.

It should be noted that a system repair and upgrade effort is planned to be completed at the Site in the near future. As a Baseline Investigation for the proposed chemical injection a Pilot Study was initially planned to be completed and as several system repair items were planned to be completed, the system was off-line per NYSDEC's direction following the MIP Investigation. The NYSDEC is still evaluating implementation of the chemical injection program.

As further detailed below, the GWE&TS was restarted during this reporting period in August 2016; however, the system was only operational for a few days until Transfer Pump P-2 failed. Due to ongoing issues associated with various GWE&TS components, the system has not been operating since this time pending additional troubleshooting activities.

Treatment System Operational Status

The GWE&TS was operational for only a short period of time throughout this reporting period as a result of several operational issues, as detailed below.

System Wiring and Controls

During a previous reporting period the NYSDEC Remedial Services Contractor contacted ALM Systems, a systems integrator, to assess and troubleshoot issues associated with electrical wiring and systems controls. Following their assessment, several wiring issues were noted at the systems control panel and the PLC was also noted to not be optimally programmed. ALM Systems also concluded that wiring in the VFD had been incorrectly installed and an inoperable cooling fan in the VFD was contributing to operational issues with Transfer Pump P-1. ALM Systems recommended the wiring and systems control issues be rectified. A portion of these activities have been addressed and are detailed below. These repair activities will be reported once they have been completed.

Transfer Pump P-1

On January 21, 2016, the NYSDEC Remedial Services Contractor met with ALM Systems at the site to review and troubleshoot the issues with the GWE&TS's automated controls. ALM Systems noted several wiring and controls issues, including incorrect wiring at the VFD for Transfer Pump P-1 and an inoperable cooling fan in the VFD for Transfer Pump P-1.

Based on recommendations from ALM Systems and as directed by NYSDEC, the NYSDEC Remedial Services Contractor replaced the VFD at Transfer Pump P-1, ensuring it was properly wired on February 4, 2016.

On August 10, 2016 the NYSDEC Remedial Services Contractor was on-site to complete system updates in preparation for the upcoming well redevelopment. On August 23, 2016, ALM Systems and the NYSDEC Remedial Services Contractor were on-site to complete VFD programming activities for Transfer Pump P-1. Following programming at Transfer Pump P-1, the system was successfully restarted with Transfer Pumps P-1 and P-2 operating; however, the pumps were cycling rather than maintaining a constant level in the sumps. According to the NYSDEC Remedial Services Contractor, Transfer Pump P-2 was not receiving a modulating signal from the PLC. The system was operating upon departure from the site.

On August 29, 2016, the NYSDEC Remedial Services Contractors was on-site to assess the status of the system. The system was noted to be off due to a high liquid level at Air Stripper Tower 2; however, AST-2 could not be pumped out or restarted at that time. Due to ongoing issues with Transfer Pump P-2, as discussed below, and the identification of a leaking union at the Transfer Pump P-1 effluent line, the GWE&TS has been off since this time.

Transfer Pump P-2

Transfer Pump P-2 was most recently replaced on October 28, 2015. However, it should be noted that the NYSDEC Remedial Services Contractor did not test the pump at that time as they were concerned with possibly rupturing the recently repaired effluent line and due to the reported system control issues.

Following programming at Transfer Pump P-1, the system was successfully restarted on August 23, 2016 with Transfer Pumps P-1 and P-2 operating; however, the pumps were cycling rather than maintaining a constant level in the sumps. According to the NYSDEC Remedial Services Contractor, Transfer Pump P-2 was not receiving a modulating signal from the PLC. The system was operating upon departure from the site. On August 29, 2016, the NYSDEC Remedial Services Contractor was on-site to assess the status of the system. The system was noted to be off due to a high liquid level at Air Stripper Tower 2; however, AST-2 could not be pumped out or restarted at that time.

The NYSDEC Remedial Services Contractor returned to the Site on August 30, 2016 to troubleshoot Transfer Pump P-2 and noted a crack in the pump impellor. As such, Transfer Pump P-2 has remained off since this time. Due to ongoing issues associated with various GWE&TS components, the system has not been operating since this time pending additional troubleshooting activities.

Influent and Effluent Piping

The GWE&TS is currently limited to approximately 130 gpm below its design capacity of approximately 200 gpm due to what was initially believed to be a blockage within the effluent line.

Following an unsuccessful blockage investigation in 2010, as previously reported, D&B prepared an effluent line investigation scope of work, dated January 14, 2015, for the investigation of any restrictions within the effluent piping. In addition, the January 14, 2015 scope of work also included provisions for the investigation of the influent piping for each extraction well to locate any below grade damage which may be allowing sand and gravel to enter the influent piping, as well as provisions for the installation of filter screens within each influent pipe to trap any such debris in an effort to limit damage to the system transfer pumps.

The NYSDEC Remedial Services Contractor completed the installation of the two filter screens within the influent piping on February 25, 2015. The NYSDEC Remedial Services Contractor initiated boroscoping activities on March 11, 2015 in an effort to identify any below grade damage or blockages within the effluent line. Boroscoping activities then continued at the influent and effluent lines from April 3 through April 16, 2015. The NYSDEC Remedial Services Contractor did not identify any significant or obvious blockages; however, the entire effluent line exhibited approximately 1/8 to 1/4 inches of residue and scaling throughout its entire inner diameter. This thickness of residue and scaling is not expected to greatly effect system effluent flow potential, though it is currently believed that this scaling may be contributing to any system flow limitations.

The NYSDEC Remedial Services Contractor attempted to restart the GWE&TS on April 17, 2015; however, as the Pump P-1 VFD was not allowing Transfer Pump P-1 to operate at less than 100% capacity, the system could not be placed into

routine operation at that time. The NYSDEC Remedial Services Contractor was on-site to troubleshoot the VFD on April 17 through 30, 2015 and attempted to restart the GWE&TS on April 30, 2015; however, upon restarting the system, the effluent pipe ruptured. Following two effluent pipe repair events, the effluent pipe was ultimately repaired on October 28, 2015. It should be noted that the effluent pipe was not tested following its repair due to the NYSDEC Remedial Services Contractor's concerns regarding possibly rupturing the line again.

Extraction Well Redevelopment

On August 8, 2016, the NYSDEC Remedial Services Contractor performed the following well redevelopment activities at extraction well RW-1; one round of well screen brushing, two rounds of pumping (via air lift) and surging of the well, where approximately 465 gallons were removed from the well per air lift. On August 10, 2016, the NYSDEC Remedial Services Contractor returned to site to redeploy the pump in RW-1 completing all well redevelopment activities. Additionally, on August 9, 2016, well redevelopment activities were attempted at extraction well RW-2; however, approximately 13 feet of material was identified within the well. After several attempts approximately 6 feet of the accumulated material was removed; however, NYSDEC Remedial Services Contractor was unable to successfully complete the slated well redevelopment. On August 16, 2016, the NYSDEC Remedial Services Contractor was on-site to complete boroscoping activities at extraction well RW-2 to identify any structural issues within the well. The inspection did not identify any structural issues with RW-2.

A summary of GWE&TS runtime/downtime for this reporting period is summarized below.

Treatment System Runtime/Downtime Summary		
Approximate Runtime - Current Reporting Period [1]	95 hours	4.3%
Approximate Downtime - Current Reporting Period [2]	2,113 hours	95.7%
Approximate Total Runtime to Date [3]	61,581 hours	61.2%
Approximate Total Downtime to Date [3]	39,023 hours	38.8%

1. Total elapsed time for current reporting period is 2,208 hours (July 1, 2016 through September 30, 2016). As previously discussed, the GWE&TS was restarted on August 23, 2016; however, the system shut-down shortly thereafter due to issues at Transfer Pump P-2. As such, the system was not operating throughout the vast majority of this reporting period. The date and time of the system shut-down after being restarted on August 23, 2016 was calculated based on the total flow at RW-1 and instantaneous flow rate recorded on August 24, 2016.
2. The downtime associated with this reporting period is due to on going wiring and control issues at Transfer Pump P-1, pump failure at Transfer Pump P-2 and the scheduled well development activities conducted at extraction wells RW-1 and RW-2.
3. Based on when D&B assumed O&M duties in February 2005. The GWE&TS was shut down from December 2012 to May 2013 due to elevated VOC concentrations detected in system aqueous-phase effluent samples and to allow for the completion of the field investigation portion of the RSO evaluation at the Site. Additionally, GWE&TS was manually shut down on April 30, 2014 and remained off until November 3, 2014, when it was restarted, as per NYSDEC direction. The GWE&TS remained off during this time due to anomalous elevated contaminant concentrations in aqueous-phase effluent samples, for inspection of a partially blocked discharge pipe and in an effort to achieve static aquifer conditions for the MIP Investigation program.

Treatment System Performance Summary

The GWE&TS performance during the current reporting period and since D&B assumed O&M duties in February 2005 is summarized below. The GWE&TS was not operational during this reporting period, except for a brief period in August, as detailed above.

Treatment System Performance Summary

Parameter	Quarter 47 (July 1, 2016 through September 30, 2016) [1]	Quarter 46 (April 1, 2016 through June 30, 2016) [4]	Totals to Date (February 2005 through current Quarter)
Influent[1]			
RW-1 Average Pumping Rate (gal per min)	61.0	NA	78
RW-1 Total Flow Volume (gal)	348,548	NA	386,352,612
RW-1 Maximum Influent PCE Concentration (ug/l)	16.0	NA	510
RW-2 Average Pumping Rate (gal per min)[2]	NA	NA	80
RW-2 Total Flow Volume (gal)	NA	NA	129,900,729
RW-2 Maximum Influent PCE Concentration (ug/l)	ND	NA	140
Influent Total Flow Volume (gal)	348,548	NA	516,253,341
Effluent[3]			
Effluent Total Flow Volume (gal)	192,800	NA	513,135,531
Maximum Effluent PCE Concentration (ug/l)	0.15	NA	16
VOC Removal Summary			
Total VOC Removal (lbs)	0.17	NA	1,640
Average VOC Removal Rate (lbs/hr)	1.77E-03	NA	1.51E-02
VOC Removal Efficiency Range (%)	99.74	NA	77.66 - 100

NA: Not applicable. ND: Contituent concentration below the analytical detection limit.

Notes:

1. One aqueous-phase influent sample was collected during this reporting period on August 24,2016. In addition, the NYSDEC Remedial Services Contractor collected a groundwater sample from extraction well RW-2 for VOC analysis only, during the quarterly groundwater sampling event conducted on July 6, 2016, per NYSDEC direction.
2. As described above, extraction well RW-2 was shut down in April 2010, and has generally remained off since this time, based on low historic VOC concentrations, as per NYSDEC direction. As RW-2 is not currently operating, monthly samples are not collected from this extraction well. RW-2 is currently being sampled on a quarterly basis, as part of the quarterly groundwater sampling effort.
3. The effluent flow meter was noted by the NYSDEC Remedial Services Contractor to be malfunctioning on January 1, 2014. The GWE&TS was shut down from this date until January 10, 2014. Per NYSDEC request, the GWE&TS was then operated without the effluent flow meter from January 10, 2014 to March 19, 2014, when a new meter was installed. The GWE&TS flow values were estimated based on recent effluent flow volume data from this approximate time period. As the GWE&TS was not operating throughout the vast majority of this reporting period, only one aqueous-phase effluent sample was collected throughout this reporting period.
4. As the GWE&TS was not operating, aqueous-phase influent and effluent samples were not collected throughout the previous reporting period.

Treatment System Cost Summary[1]		
COST ITEM	**CURRENT REPORTING PERIOD BUDGET EXPENDED (July 1, 2016 through September 30, 2016)**	**PREVIOUS REPORTING PERIOD BUDGET EXPENDED (April 1, 2015 through June 30, 2016)**
ENGINEERING SUPPORT		
D&B Engineers and Architects, P.C.	$20,768	$17,832
SUBCONTRACTORS		
NYSDEC Remedial Services Contractor[2] (Routine/Non-Routine Maintenance Activities)	$36,210	$4,862
Test America (Analytical Laboratory)	$1,108	$0
SUB-TOTAL	$37,318	$4,862
UTILITIES		
Electric	$760	$0
Telephone	$177	$116
Natural Gas	$97	$95
Water	$34	$0
SUB-TOTAL	$1,068	$211
TOTAL COSTS	$59,154	$22,905
AVERAGE COST/MONTH	$19,718	$7,635
COST/POUND OF VOC REMOVED	$347,965[3]	NA

NA: Not applicable.

Notes:

1. The treatment system costs include monthly utility charges, maintenance costs and engineering costs. Capital construction costs and NYSDEC project management effort are not included in this evaluation.
2. Remedial Services Contractor costs do not include utility costs.
3. Based on a total of approximately 0.17 lbs of total VOCs removed during this reporting period.

Treatment System Operation and Maintenance

It should be noted that, the GWE&TS was operating throughout this reporting period for only a brief period of time. All alarm conditions and non-routine system maintenance activities completed during this reporting period are summarized below. Refer to *Attachment B* for operations and maintenance logs, as prepared by the NYSDEC Remedial Services Contractor for this reporting period.

Routine Equipment Maintenance Schedule Summary

Major System Component	Manufacturer	Model Number	Maintenance Frequency	Maintenance Summary					
				Current Reporting Period (1)			Next Reporting Period		
				July-16	Aug-16	Sept-16	Oct-16	Nov-16	Dec-16
Extraction Well Pump RW-1	Grundfos Pump Corp.	150550-2	As needed based on flow trends						
Extraction Well Pump RW-2	Grundfos Pump Corp.	1505100-5	As needed based on flow trends						
Pressure Blower	Cincinnati Fan	PB-18	Bi-Monthly						
Vapor Carbon Vessels	Cameron Great Lake	VS7.2x6.7x8.6-5000-DUAL	As needed based on analytical results						
Air Stripper Maintenance	Branch Environmental	48T-25H	As needed based contaminant concentrations						
Air Stripper Transfer Pump Maintenance	Magnatex Pumps, Inc.	MTA-A10-P-F20-2-FE	Quarterly						

: Planned Activity

Notes:

1. Routine maintenance was not performed as the system was shut down throughout the vast majority of this reporting period.

Non-Routine Treatment System Maintenance:

- On August 8, 2016, the NYSDEC Remedial Services Contractor was on-site to complete well redevelopment of extraction well RW-1. While on-site the NYSDEC Remedial Services Contractor completed one round of screen brushing, two rounds of pumping (via air lift) and surging, where approximately 465 gallons were removed from the well per air lift.
- On August 9, 2016, the NYSDEC Remedial Services Contractor was on-site to complete well redevelopment activities at extraction well RW-2. Approximately 13 feet of material was identified in the well. After several attempts approximately 6 feet of the accumulated material was removed; however, NYSDEC Remedial Services Contractor was unable to successfully complete the slated well redevelopment.
- On August 10, 2016, the NYSDEC Remedial Services Contractor re-wired the submersible pump and re-deployed the pump into extraction well RW-1, completing all redevelopment activities.
- On August 16, 2016, the NYSDEC Remedial Services Contractor scoped extraction well RW-2 utilizing a camera to assess for potential structural issues within the extraction well.
- On August 23, 2016, the NYSDEC Remedial Services Contractor was on-site with ALM Systems to complete VFD programming for Transfer Pump P-1. Following the reprogramming at Transfer Pump P-1, the system was successfully restarted with both Transfer Pumps operating. However, the pumps were cycling rather than maintaining a constant level in the sumps. According to the NYSDEC Remedial Services Contractor, Transfer Pump P-2 was not receiving a modulating signal from the PLC.

- On August 24, 2016, the NYSDEC Remedial Services Contractor was on-site to collect system influent and effluent samples. While on-site, the NYSDEC Remedial Services Contractor noted that there was a leaking 4-inch union at Transfer Pump P-1 effluent pipe.
- On August 26, 2016, the NYSDEC Remedial Services Contractor was on-site to repair the leaking 4-inch PVC union at the Transfer Pump P-1 effluent pipe. The NYSDEC Remedial Services Contractor reconnected the pump and restarted the GWE&TS system upon departure from the site.
- On August 29, 2016, the NYSDEC Remedial Services Contractor arrived on-site for a system check; however, the GWE&TS was observed to be off. According to the NYSDEC Remedial Services Contractor, the GWE&TS shut-down due to a "high-level" condition in the Tower 2. The date and time that the system shut-down was not provided on the NYSDEC Remedial Service Contractors operational logs. The NYSDEC Remedial Services Contractor attempted to pump out the AST-2 sump and restart the system but was not successful at this time.
- On August 30, 2016, the NYSDEC Remedial Services Contractor arrived on-site to troubleshoot malfunctioning issues at Transfer Pump P-2. Upon inspection of Transfer Pump P-2 the motor was found to be working sufficiently; however, the impeller shaft inside the pump end was cracked.

Facility Maintenance:

On August 26, 2016 the NYSDEC Remedial Services Contractor performed lawn mowing, weed waking and general landscaping activities.

Alarm Conditions:

On August 29, 2016, the GWE&TS was found to be shut down due to a "high liquid level" condition at Air Stripper Tower 2. The NYSDEC Remedial Services Contractor attempted to restart the system; however, due to equipment malfunctions the system could not be restarted.

Treatment System Monitoring and Sampling Results

A summary of the routine treatment system monitoring and sampling collection and associated results are provided below.

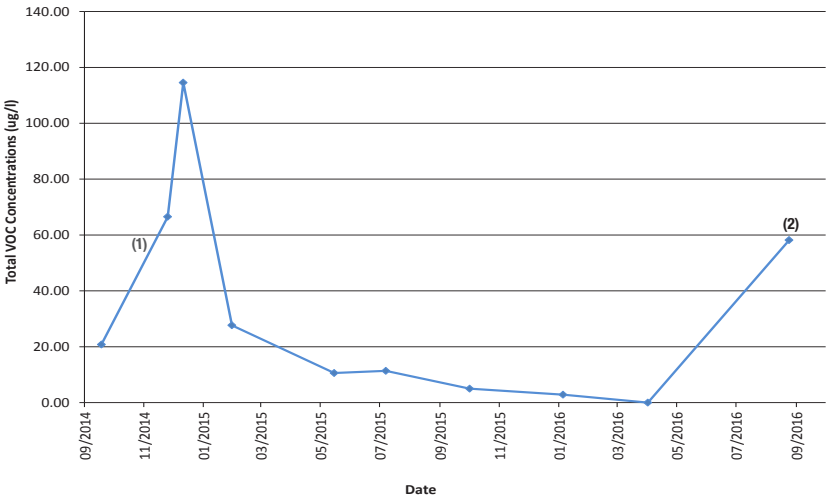
Treatment System and Groundwater Sampling Summary

Sampling Location	Monthly				Quarterly	Semi-Annual	
	Influent/Effluent VOC (EPA Method 8260)	Influent/Effluent TAL Metals (EPA Method 6010)	Effluent pH (Field Screening)	Effluent TDS (EPA Method 160.1 or SM 2540C)	Monitoring Well VOC (EPA Method 8260)	Monitoring Well VOC (EPA Method 8260)	Effluent VOC (EPA Method TO-15)
Extraction Well RW-1 Influent	8/24/2016						
Extraction Well RW-2 Influent[1]							
Air Stripper Aqueous-phase Effluent [2]	8/24/2016						
Air Stripper Vapor-phase Effluent [3] [4]							
Groundwater Monitoring Wells MW-103 through MW-107, MW-2S, MW-4D and MW-5S and RW-2					07/06/2016 07/07/2016		
Groundwater Monitoring Wells MW-101, MW-102, MW-108, MW-109 and MW-111						07/06/2016 07/07/2016	

Notes:

1. RW-2 is not currently being operated; however, RW-2 is currently being sampled on a quarterly basis as part of the quarterly groundwater sampling effort.
2. As the GWE&TS was not operating for the vast majority of the reporting period, the NYSDEC Remedial Services Contractor collected one sample from the aqueous-phase effluent for VOC analysis only, per NYSDEC direction.
3. Monthly effluent vapor samples are analyzed utilizing tedlar bags and a hand-held photoionization detector (PID). However, effluent vapor samples were not collected during this reporting period as the GWE&TS was not operating throughout the vast majority of this reporting period.
4. System vapor-phase effluent samples are to be collected on a semi-annual basis. However, as the system was not operating for the vast majority of this reporting period, a vapor-phase effluent sample was not collected. Vapor-phase effluent samples for laboratory analysis were last collected on April 3, 2014.

Extraction Well RW-1 Total VOC Concentration Trend Line



1. As previously discussed, the GWE&TS was manually shut down on April 30, 2014 and remained off until November 3, 2014, when it was restarted, as per NYSDEC direction. The GWE&TS remained off during this time due to anomalous elevated contaminant concentrations in aqueous-phase effluent samples, for inspection of a partially blocked discharge pipe and in an effort to achieve static aquifer conditions for the MIP Investigation program.
2. The GWE&TS was only operating for a brief amount of time throughout this reporting period, as such only one aqueous-phase influent sample was collected from RW-1 for VOC analysis only.

Extraction Well RW-1 - System Influent Contaminant Concentration Ranges/Averages (1)

Contaminant (2)	Current Reporting Period (3)	Previous Reporting Period (4)	Average to Date	Class GA Groundwater Standard
Tetrachlorothene (PCE)	16.0 ug/l	--	185 ug/l	5.0 ug/l
Trichlorothene (TCE)	4.9 ug/l	--	50 ug/l	5.0 ug/l
cis-1,2-Dichloroethene (cis-1,2-DCE)	34 ug/l	--	83 ug/l	5.0 ug/l
Vinyl chloride (VC)	3.0 ug/l	--	1 ug/l	2.0 ug/l
Iron	--	--	186 ug/l	300 ug/l
Manganese	--	--	1,198 ug/l	300 ug/l
Sodium	--	--	25,622 ug/l	20,000 ug/l

--: Not analyzed.

Red font denotes an exceedance of the applicable standard.

1. Only includes constituents consistently or periodically detected in exceedance of their respective Class GA Groundwater Standard.
2. Click on the blue-colored contaminants for graphs of VOC concentrations over the last 2 years for VOCs detected above the Class GA Groundwater Standards for this and/or the previous reporting periods.
3. As the GWE&TS was not operating throughout the vast majority of the reporting period, one aqueous-phase influent sample was collected from RW-1 for VOC analysis only, as per NYSDEC direction.
4. As the GWE&TS was not operating throughout the duration of the previous reporting period, aqueous-phase influent system samples were not collected.

Aqueous-Phase Air Stripper Effluent Concentration Ranges (1)			
Discharge Permit Parameters	Current Reporting Period (2)	Previous Reporting Period (3)	Site-Specific Effluent Limit
PCE	0.15	--	10.0 ug/l
TCE	ND	--	10.0 ug/l
cis-1,2-DCE	ND	--	NL
VC	ND	--	10.0 ug/l
Iron	--	--	1,000 ug/l
Manganese	--	--	NL
Sodium	--	--	NL
pH	--	--	6.5 - 8.5

ND: Constituent concentration below the analytical detection limit. NL: No limit. - - : Not analyzed.

1. Only includes constituents historically detected in exceedance of their respective Class GA Groundwater Standard in influent water.
2. As the GWE&TS was not operating throughout the vast majority of this reporting period, one aqueous-phase effluent system sample was collected on August 24, 2016; however, only VOC's were analyzed.
3. As the GWE&TS was not operating throughout the duration of the previous reporting period, aqueous-phase effluent system samples were not collected.

Quarterly Groundwater Monitoring Summary

The network of groundwater monitoring wells was sampled on July 6 and 7, 2016 to determine groundwater quality at and in the vicinity of the Site. Samples were collected from ten on-site groundwater monitoring wells (MW-101 through MW-108, MW-4D and MW-5S), three off-site groundwater monitoring wells (MW-109, MW-111, MW-2S) and off-site extraction well RW-2.

The locations of the on-site groundwater monitoring wells are depicted on *Figure 3* and the locations of off-site groundwater monitoring wells are depicted on *Figure 4*.

Groundwater Monitoring Well Condition Summary:

All of the sampled groundwater monitoring wells were found to be accessible during the groundwater monitoring/sampling events conducted on July 6 and 7, 2016. All groundwater monitoring wells were located as indicated on the site map and the concrete well pads (where applicable), protective casings, surface seals, well IDs, PVC well risers, well plugs and locks were observed to be present and in good condition. With the exception of a well lock was not present at monitoring well RW-2.

Refer to *Attachment C* for monitoring well inspection logs.

Groundwater Monitoring Results Summary:

A headspace reading was collected utilizing a PID at each groundwater monitoring well. PID readings were collected from each well immediately after the removal of the well caps and plugs. VOCs were detected at concentrations ranging from non-detect to a maximum of 13.4 ppm, which was detected in monitoring well MW-105.

Below is a table summarizing the site-specific contaminants of concern in on-site and off-site groundwater. Refer to *Attachment D* for analytical data results.

Site-Specific Contaminant of Concern Concentrations (1)

Monitoring Well (2)	PCE		TCE		cis-1,2-DCE		Vinyl Chloride		Site-Specific 2-Year Contaminant Trend Analysis
	Current Reporting Period	Previous Reporting Period	Current Reporting Period	Previous Reporting Period	Current Reporting Period	Previous Reporting Period	Current Reporting Period	Previous Reporting Period	
On-Site Monitoring Wells									
MW-101	0.81 ug/l	NS	1.0 ug/l	NS	ND	NS	ND	NS	Stable
MW-102	1.9 ug/l	NS	0.61 ug/l	NS	ND	NS	ND	NS	Stable
MW-103	8.0 ug/l	NS	0.58 ug/l	NS	ND	NS	ND	NS	Stable
MW-104	47 ug/l	NS	4.7 ug/l	NS	1.3 ug/l	NS	ND	NS	Increasing
MW-105	2.1 ug/l	NS	0.36 ug/l	NS	34 ug/l	NS	5.1 ug/l	NS	Increasing
MW-106	6.9 ug/l	NS	3.7 ug/l	NS	23 ug/l	NS	4.8 ug/l	NS	Decreasing
MW-107	1.3 ug/l	NS	0.53 ug/l	NS	0.38 ug/l	NS	ND	NS	Stable
MW-108	5.6 ug/l	NS	0.46 ug/l	NS	ND	NS	ND	NS	Stable
MW-4D	170 ug/l	NS	24 ug/l	NS	5.4 ug/l	NS	0.13 ug/l	NS	Decreasing
MW-5S	0.25 ug/l	NS	ND	NS	ND	NS	ND	NS	Stable
Off-Site Monitoring Wells									
MW-109	0.96 ug/l	NS	0.99 ug/l	NS	ND	NS	ND	NS	Stable
MW-111	ND	NS	ND	NS	ND	NS	ND	NS	Decreasing
MW-2S	8.8 ug/l	NS	4.3 ug/l	NS	25 ug/l	NS	1.9 ug/l	NS	Decreasing
RW-2 (1)	ND	NS	0.49 ug/l	NS	0.53 ug/l	NS	ND	NS	Decreasing

ND: Constituent concentration below the analytical detection limit. NS: Not sampled.

Red font denotes an exceedance of the constituents Class GA Groundwater Standard (5.0 ug/l for PCE, TCE and cis-1,2-DCE, and 2.0 ug/l for VC).

- In addition, the following VOCs were also detected in one or more wells, generally well below their respective Class GA Groundwater Standards: carbon disulfide, 1,1-dichloroethane, MTBE, 1,1,2 -trichloroethane and trans-1-2 dichloroethene.

Click on monitoring well IDs for graphs depicting contaminant concentrations over the last 2 years in wells exhibiting exceedances of the Class GA Groundwater Standards for this and the previous reporting period.

1. Extraction well RW-2 is sampled on a quarterly basis in order to better monitor off-site contaminant concentrations.

Site-specific VOC concentrations in wells sampled during this reporting period were generally slightly lower than, or consistent with, those detected during the previous reporting periods. In addition, twelve of the fourteen monitoring wells exhibited overall decreasing or stable concentrations of the site-specific contaminants of concern over the past 2-year period, and only two of the fourteen monitoring wells have exhibited generally increasing contaminant trends over the past 2-year period, including monitoring wells MW-104 and MW-105. A figure depicting total VOC concentrations in on-site and off-site wells is provided as *Figure 5*.

On-site monitoring well MW-4D continues to exhibit elevated contaminant concentrations, though contaminant concentrations in monitoring well MW-4D have generally fluctuated widely over the last two years. However, it should be noted that contaminant concentrations have generally remained consistent in this well since May 2015, well below the greatly elevated concentrations initially observed in this well upon its identification in June 2012. It should be noted that monitoring well MW-4D is screened at a depth approximately 30 feet deeper than on-site extraction well RW-1 and the on-site monitoring wells. As previously reported, a MIP Investigation completed at the Site in July 2014 indicated that elevated concentrations of site-specific contaminants, primarily PCE, have been detected in groundwater monitoring well MW-4D, with PCE concentrations fluctuating up to a high of 110,000 ug/l (detected in both June and September 2012) since the well has been routinely sampled starting in September 2012.

As discussed in previous Site Management Quarterly Reports, off-site extraction well RW-2 has exhibited widely varying concentrations of total VOCs, with total VOC concentrations ranging from non-detect to a maximum of 258.83 ug/l (detected on March 21, 2014), since the well has been sampled along with the quarterly monitoring wells in mid-2011.

Data Validation:

All sample results have been reviewed by D&B and deemed valid and usable for environmental assessment purposes. Data Validation Checklists are presented in *Attachment E*. Based on D&B's review, the data was qualified as follows:

- The percent recoveries (%Rs) were above the quality control (QC) limit for chloroethane and trichlorofluoromethane in the laboratory control sample (LCS), matrix spike (MS) sample and/or matrix spike duplicate (MSD) sample associated with the groundwater samples collected on July 6, 2016. Chloroethane and trichlorofluoromethane were not detected in the associated groundwater samples; therefore, qualification of the data was not necessary.
- The percent recovery (%R) for cis-1,2-dichloroethene was below QC limits in the MS sample. The %R was above the QC limit for naphthalene in the MS sample; however, the relative percent difference (RPD) was above the QC limit for naphthalene in the MSD sample. Therefore, cis-1,2-dichloroethene was qualified as an estimated value (J/UJ) in all groundwater samples collected on July 7, 2016.
- The %Rs for 1,1-dichloropropene, 1,3,5-trimethylbenzene, 4-chlorotoluene, ethylbenzene and tert-butylbenzene were above the QC limit in the MSD sample associated with the remedial system aqueous-phase samples collected on August 24, 2016. In-addition, the %R for dichlorodifluoromethane was below the QC limit in the MS sample. The RPD was above the QC limits for iodomethane in MS and MSD samples. Dichlorodifluoromethane was qualified as an estimated detection limit (UJ) in all remedial system aqueous phase samples collected on August 24, 2016.

Findings and Recommendations

Findings:

- GWE&TS Operation: Due to ongoing issues associated with various GWE&TS components, the system was off throughout the vast majority of this reporting period. The GWE&TS will be restarted pending troubleshooting activities associated with Transfer Pumps P-1 and P-2, addressing system wiring and controls issues and proper testing of the repaired effluent line.
- GWE&TS Maintenance: The NYSDEC Remedial Services Contractor did not complete routine maintenance during this reporting period, as the GWE&TS was not operating throughout the vast majority of this reporting period. However, as detailed above, non-routine maintenance was completed in an effort to restart the GWE&TS. Non-routine maintenance consisted of well redevelopment activites at extraction well RW-1 and attempted redevelopment of extraction well RW-2. It should be noted that redevelopment efforts at RW-2 have not been completed. In addition, trouble shooting activities were completed by the NYSDEC Remedial Services Contractor regarding Transfer Pumps P-1 and P-2.
- System Aqueous-Phase Influent and Effluent Contaminant Concentrations: As the GWE&TS was off throughout the vast majority of this reporting period, only one round of aqueous-phase influent and effluent sampling was completed on August 24, 2016. In addition, the NYSDEC Remedial Services Contractor collected a groundwater sample from extraction well RW-2 on July 7, 2016 for VOC analysis only as part of the quarterly groundwater sampling event, per NYSDEC direction. It should be noted that three site-specific contaminants, including PCE were detected within the collected influent sample above their respective Class GA Standards during this reporting period.
- System Vapor-Phase Effluent Monitoring: System vapor-phase effluent samples are to be collected on a semi-annual basis. However, as the system was not operating throughout the vast majority of this reporting period and previous reporting periods, vapor-phase effluent samples for laboratory analysis have not been collected since April 3, 2014.
- Monitoring/Extraction Well Conditions: According to information provided by the NYSDEC Remedial Services Contractor, all groundwater monitoring wells were located as indicated on the site map and the concrete well pads (where applicable), protective casings, surface seals, well IDs, PVC well risers, well plugs and locks were observed to be present and in good condition. Additionally, extraction wells (RW-1 and RW-2) were observed to be in generally good condition, however a well lock was not present at monitoring well RW-2.

- Monitoring/Extraction Well Sampling: On-site groundwater monitoring wells (MW-103, MW-104, MW-105, MW-106, MW-108 and MW-4D) and one off-site monitoring well (MW-2S) exhibited one or more of the site-specific VOC's at concentrations exceeding their respective Class GA Groundwater Standards during this reporting period. It should also be noted that PCE was detected in twelve of the fourteen groundwater monitoring wells at concentrations ranging from 0.25 u/gl to a maximum of 170 ug/l, detected in groundwater monitoring well MW-4D. However, PCE only exceeded the Class GA Standards of 5 ug/l in six of the groundwater monitoring wells.

Recommendations:

- General Treatment System:
  - It is recommended to expedite the above-referenced repair activities and bring the GWE&TS back online and ensure contaminant capture on-site.
  - Based on varying site-specific contaminant concentrations in extraction well RW-2, it is recommended that the GWE&TS be restarted with both extraction wells operating and remain operational to ensure capture of on-site and off-site shallow groundwater contamination.
  - Based on the remaining elevated contaminant concentrations in groundwater still detected at the site, it is recommended that additional subsurface investigation be completed beneath and in the immediate vicinity of the treatment system building to evaluate possible remaining areas of contamination below the treatment systems building slab.
  - D&B recommends that the NYSDEC Remedial Services Contractor record more clear and detailed descriptions of completed field activities and issues encountered, as well as alarm triggers, downtime dates and times and the steps taken to bring the GWE&TS back online on the Site Activities and System Operation Logs, as appropriate. In addition, logs received over the last several quarters have included multiple copies of logs, including some differing information. As such, D&B further recommends that the NYSDEC Remedial Services Contractor make an effort to provide one set of logs with all descriptions and dates of activities clearly indicated. These steps will help enable D&B to better understand the current status of the GWE&TS and facilitate a more efficient preparation of the Site Management Quarterly Reports. In addition, it is recommended that the NYSDEC Remedial Services Contractor adhere to the routine maintenance schedule.
- Treatment System Operational Issues:
  - System Wiring and Controls: D&B recommends that the NYSDEC Remedial Services Contractor ensure that the system electrical components are properly wired and the VFDs and PLC are properly programmed to allow for proper and automated system operation. D&B can assist with this effort if needed.
  - Transfer Pump P-2: D&B recommends that the NYSDEC Remedial Services Contractor repair or replace Transfer Pump P-2 to ensure proper system operations.
  - Effluent Piping: D&B recommends that the effluent line be tested to ensure it is capable of accepting system effluent flow.
  - Well Redevelopment: D&B recommends that the NYSDEC Remedial Services Contractor complete well redevelopment activities at extraction well RW-2 and reinstall the submersible pump.
- Monitoring/Extraction Well Sampling: Based on the widely varying VOC concentrations detected in several wells over the course of several previous monitoring events, it is recommended that the NYSDEC ensures that the Remedial Services Contractor is utilizing proper and consistent sampling techniques during each groundwater and system sampling event.
- Vapor-Phase Effluent Sampling: The NYSDEC Remedial Services Contractor should collect the semi-annual vapor-phase effluent samples as soon as the system is back up and running, as vapor-phase effluent samples have not been collected since April 3, 2014.

- Off-Site Extraction Well Contaminant Concentrations: As detailed above, off-site extraction well RW-2 has exhibited widely varying concentrations of total VOCs, with total VOC concentrations ranging from non-detect to a maximum of 258.83 ug/l (detected on March 21, 2014), since the well has been sampled along with the quarterly monitoring wells in mid-2011. It is recommended that the GWE&TS be restarted with both extraction wells operating and remain operational to ensure that site-specific contamination is adequately captured and not extending from the Site.
- Off-Site Monitoring Well Network: Due to the varying concentrations of total VOC's exhibited in RW-2 it is recommended that the shallow groundwater monitoring well network be expanded to included the installation of additional shallow monitoring wells on Lane Street, Grove Street, Willow Lane and Palm Street.

Reclassification/Delisting Evaluation

The Site was originally listed as a Class 2 Inactive Hazardous Waste Site by the NYSDEC in November 1990. Since this time, completion of the following project phases has occurred, as summarized below:

Project Phases and Completion Dates

Project Phase	Completion Date
Remedial Investigation	04/1994
Phase II Remedial Design Investigation	12/1998
Remedial Design	06/2000
Groundwater Extraction and Treatment System Construction	12/2001 (1)
UST Removal and Phase I Contaminated Soil Removal IRM	06/2010
Phase II Contaminated Soil Removal IRM	07/2011

1. Construction of the GWE&TS was completed in December 2001. The GWE&TS was placed into routine operation in December 2001 and D&B assumed O&M duties in February 2005.

Given the above, it does not appear that the Active Industrial Uniform Site can be reclassified at this time, pursuant to the requirements identified in 6 NYCRR §375-2.7, as site-related contamination has not been fully remediated and continues to pose a significant threat to public health and the environment. As such, Site delisting is not recommended at this time, as all remediation and post-remediation activities have not been satisfactorily completed. Work continues to address residual on-site contamination and system optimization to expedite overall remediation and Site closure.

Report Certification:

I have personally examined and am familiar with the information submitted in the referenced report. To the best of my knowledge and belief, and based upon my inquiry of those individuals immediately responsible for obtaining the information reported therein, I certify that the submitted information is true, accurate, and complete.

Project Director: Richard M. Walka — 5.17.17
Richard M. Walka, Senior Vice President — Date

Project Manager: James Van Horn — 5/16/2017
James Van Horn, Project Manager — Date