8976 Wellington Road
Manassas, VA 20109

January 24, 2017

Gary Priscott
New York State Department of Environmental Remediation
1679 Route 11
Kirkwood, NY 13795

Re: Periodic Review Report and IC/EC Certification Submittal
IBM Gun Club, Former Burn Pit Area
Robinson Hill Road, Union, NY 13760
NYSDEC Site # C704044

Dear Mr. Priscott:

This letter serves to transmit copies of the Periodic Review Report and required IC/EC Certifications to the New York State Departments of Conservation (NYSDEC). The remedy performance monitoring work and the preparation of this report were completed by Sanborn, Head Engineering, P.C. (SHPC) in accordance with NYSDEC-approved Site Management Plan (SMP) for this project.

If you have any questions regarding the enclosed report, please contact me at 703-257-2585.

Very truly yours,

Linda Daubert
IBM Program Manager

Enclosures: Periodic Review Report and Certification Form

cc: Kevin O'Hara (Binghamton Country Club)
Bridget Boyd (NYSDOH)
Maureen Schuck (NYSDOH)
Harry Warner (NYSDEC)

SANBORN HEAD ENGINEERING
Building Trust. Engineering Success.

20 Foundry Street
Concord, NH 03301

Linda Daubert, P.E.
IBM Corporate Environmental Affairs
8976 Wellington Road
Manassas, Virginia 20109

January 24, 2017
File No. 63526.05

Re: 2016 Periodic Review Report
IBM Gun Club – Former Burn Pit Area
Union, New York
BCP Agreement #C704044

Dear Ms. Daubert:

This letter and attachments comprise the 2016 Periodic Review Report (PRR) of the remedy status for the above-referenced site. The PRR has been prepared on behalf of IBM by Sanborn, Head Engineering P.C. (SHPC) for submittal to the New York State Department of Environmental Conservation (NYSDEC) and Department of Health (NYSDOH), collectively the Agencies, in accordance with the requirements of the Site Management Plan of April 2016 (SMP). We understand that a copy of this PRR will be provided to the Binghamton Country Club (Country Club), who took ownership of the site at the end of 2015.

This PRR includes the following:

Attachment A – Institutional and Engineering Controls Certification Form
Attachment B – Remedy Performance Testing Reports of April, June, and September 2016
Attachment C – Site-Wide Inspection Reports for May and September 2016
Attachment D – Maintenance Reports for 2016

For the PRR Certification (Attachment A), the items in boxes 1, 2, and 3 list the questions/statements that the Country Club as the site owner has certified by adding a signature in Box 6. The items in Box 2A are technical matters pertaining to past Remedial Investigation reporting that SHPC certifies as IBM's Designated Representative based on our site inspections conducted in 2016. Additionally, SHPC, as representative of the remedial party (IBM), has endorsed Box 7, certifying that the information provided in Box 4 (pertaining to ECs), and Box 5 (overall certification) is true.

For clarity, a tabular summary of the certification responsibilities of the Country Club, as site owner, and SHPC, as representative of the remedial party, IBM, is provided below:

Binghamton Country Club	SHPC for IBM
▪ Box 1 and 2, Questions 1 through 6 – Institutional Controls ▪ Box 3 – Institutional Controls	▪ Box 2, Question 7 – Engineering Controls ▪ Box 2A, Questions 8 and 9 ▪ Box 4 ▪ Box 5 – Based on Country Club Certification of Boxes 1 through 3

The remaining components of this PRR have been previously submitted to the Agencies, and include: remedy performance testing summary memoranda based on field sampling and laboratory analyses conducted in accordance with the SMP; and semi-annual site-wide inspection reports to assess the integrity of the remedy Engineering Controls (ECs) and compliance with Institutional Controls (ICs) outlined in the SMP. Routine and non-routine maintenance reports are also included.

As discussed with the NYSDEC, IBM intends to prepare a comprehensive remedy evaluation every two years as part of the PRR, with the next such evaluation to cover 2016 and 2017, and will be submitted with the next PRR in 2018.

If you have any questions or comments, please contact us. We appreciate the opportunity to provide service to you on this important project.

Very truly yours,
SANBORN, HEAD ENGINEERING, P.C.

David Shea, P.E.
President
SANBORN HEAD ENGINEERING, P.C.
20 Foundry Street
Concord, NH 03301

Erica M. Bosse, P.G.
Project Manager
SANBORN HEAD & ASSOCIATES, INC.
1 Technology Park Drive
Westford, MA 01886

Encl. Attachment A – Executed Certification Form
Attachment B – Performance Testing Memorandum Reports
Attachment C – Site Inspection Memorandum Reports
Attachment D – Maintenance Reports

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ATTACHMENT A

CERTIFICATION FORM

Attachment A

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Site Management Periodic Review Report Notice
Institutional and Engineering Controls Certification Form

Site Details **Box 1**

Site No. **C704044**

Site Name **IBM Gun Club, Burn Pit**

Site Address: Robinson Hill Road Zip Code: 13760
City/Town: Union
County: Broome
Site Acreage: 15.6

Reporting Period: January 1, 2016 thru December 31, 2016

	YES	NO
1. Is the information above correct?	☑	☐
If NO, include handwritten above or on a separate sheet.		
2. Has some or all of the site property been sold, subdivided, merged, or undergone a tax map amendment during this Reporting Period?	☐	☑
3. Has there been any change of use at the site during this Reporting Period (see 6NYCRR 375-1.11(d))?	☐	☑
4. Have any federal, state, and/or local permits (e.g., building, discharge) been issued for or at the property during this Reporting Period?	☐	☑
If you answered YES to questions 2 thru 4, include documentation or evidence that documentation has been previously submitted with this certification form.		
5. Is the site currently undergoing development?	☐	☑

Box 2

	YES	NO
6. Is the current site use consistent with the use(s) listed below? Multiple Uses Allowed.	☑	☐
7. Are all ICs/ECs in place and functioning as designed?	☑	☐

IF THE ANSWER TO EITHER QUESTION 6 OR 7 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

Not applicable

Signature of Owner, Remedial Party or Designated Representative Date

☐ ☐ ☐

Box 2A

	YES	NO
8. Has any new information revealed that assumptions made in the Qualitative Exposure Assessment regarding offsite contamination are no longer valid?	☐	☑
If you answered YES to question 8, include documentation or evidence that documentation has been previously submitted with this certification form.		
9. Are the assumptions in the Qualitative Exposure Assessment still valid? (The Qualitative Exposure Assessment must be certified every five years)	☑	☐
If you answered NO to question 9, the Periodic Review Report must include an updated Qualitative Exposure Assessment based on the new assumptions.		

SITE NO. C704044

Box 3

Description of Institutional Controls

Parcel	Owner	Institutional Control
126.18-1-20	Binghamton Country Club	Ground Water Use Restriction Soil Management Plan Landuse Restriction Monitoring Plan Site Management Plan O&M Plan

The site is covered by an Environmental Easement which calls for the adherence to a Site Management Plan (SMP). The property is restricted from use as a farm and/or a livestock breeding facility via local ordinance/zoning. Residential use is allowed throughout the property, except for within the capped area, where restricted residential use is allowed. Groundwater use restrictions apply throughout the site, and a requirement to assess and abate impacts, if any, for soil vapor contamination applies throughout the site as well. Off-site property within the contaminated plume area is also controlled institutionally via agreement between IBM and the owners of the Binghamton Country Club. This agreement restricts groundwater use in a manner consistent with the above, and similarly requires assessment and abatement, as needed, for soil vapor contamination.

Box 4

Description of Engineering Controls

Parcel	Engineering Control
126.18-1-20	Groundwater Treatment System Cover System Fencing/Access Control

The site contains a capped area that is covered via Environmental Easement and is managed through the SMP. Groundwater is being treated in-situ via an enhanced biological degradation system.

Box 5

Periodic Review Report (PRR) Certification Statements

1. I certify by checking "YES" below that:

   a) the Periodic Review report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

   b) to the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and the information presented is accurate and compete.

YES	NO
☑	☐

2. If this site has an IC/EC Plan (or equivalent as required in the Decision Document), for each Institutional or Engineering control listed in Boxes 3 and/or 4, I certify by checking "YES" below that all of the following statements are true:

   (a) the Institutional Control and/or Engineering Control(s) employed at this site is unchanged since the date that the Control was put in-place, or was last approved by the Department;

   (b) nothing has occurred that would impair the ability of such Control, to protect public health and the environment;

   (c) access to the site will continue to be provided to the Department, to evaluate the remedy, including access to evaluate the continued maintenance of this Control;

   (d) nothing has occurred that would constitute a violation or failure to comply with the Site Management Plan for this Control; and

   (e) if a financial assurance mechanism is required by the oversight document for the site, the mechanism remains valid and sufficient for its intended purpose established in the document.

YES	NO
☑	☐

IF THE ANSWER TO QUESTION 2 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

Not applicable

Signature of Owner, Remedial Party or Designated Representative — Date

☐ ☐ ☐

IC CERTIFICATIONS
SITE NO. C704044

Box 6

SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE

I certify that all information and statements in Boxes 1,2, and 3 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I James Pecko (print name) at 1505 Buffalo St, Endicott, NY 13760 (print business address)

am certifying as Representative of Binghamton Country Club as the Owner (Owner or Remedial Party)

for the Site named in the Site Details Section of this form.

Signature of Owner, Remedial Party, or Designated Representative Rendering Certification

Date 1/13/17

IC/EC CERTIFICATIONS

Box 7

Professional Engineer Signature

I certify that all information in Boxes 4 and 5 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I David Shea, P.E. (print name) at Sanborn Head Engineering P.C. 20 Foundry Street, Concord NH.03301 (print business address),

am certifying as a Professional Engineer for the IBM Corporation as the Remedial Party (Owner or Remedial Party)

David Shea — 1/9/2017

Signature of Professional Engineer, for the Owner or Remedial Party, Rendering Certification

Stamp (Required for PE)

Date

ATTACHMENT B

PERFORMANCE TESTING MEMORANDUM REPORTS

APRIL 2016 PERFORMANCE TESTING

SANBORN HEAD ENGINEERING

SUMMARY OF APRIL 2016 WATER QUALITY MONITORING

IBM Gun Club – Former Burn Pit Area
Union, New York

INTRODUCTION AND SUMMARY

This memorandum is intended to summarize the program of remedy performance monitoring conducted in April 2016. It documents and summarizes the sampling event and provides tabular and figure summaries of the field and laboratory data. The field work was conducted the week of April 11, 2016 in general accordance with the scope and procedures discussed in Appendix J of the approved Site Management Plan (SMP)[1].

This memorandum will be included as a component of the next Periodic Review Report, due in March 2018, and has been prepared consistent with the Monitoring Reporting Requirements discussed in Section 3.6 of the SMP. The Sanborn Head field staff included: Sam Warner, Chris Norton and Neal Orosz.

The field and laboratory data indicate continued remedy performance consistent with project performance goals established in the SMP. The data indicate sufficient concentrations of electron donor constituents and the presence of geochemical conditions conducive to reductive dehalogenation such that additional injection is not necessary at this time. The data continue to support a substantial reduction in downgradient volatile organic compound (VOC) mass flux of approximately 90% and nearly 99% for total chlorinated ethenes and TCE, respectively. The data support the validity of the qualitative exposure assessment.

SCOPE OF WORK

The scope of work included:

- Limited groundwater elevation survey;
- Water quality sampling associated with the performance monitoring program;
- Water quality parameter field screening and field geochemical testing.

Groundwater Elevation Survey

On April 11, 2016, prior to starting the water quality sampling program, the depths to water in select monitoring wells and injection boreholes were gauged in accordance with procedures detailed in Appendix G of the SMP. Water levels were also measured and recorded for monitoring points at the time sampling was conducted. Based on the depth to

[1] Sanborn, Head & Associates, Inc., March 2016, Site Management Plan – April 2016 Revision, Brownfield Cleanup Program, IBM Gun Club – Former Burn Pit area, Union, New York, NYSDEC Site #C704044, BCA Index #B7-0661004-05.

water data and survey information, groundwater elevations were calculated for each location. Depth to water measurements and groundwater elevations are summarized on Table 2.

Water Quality Sampling

The scope of sampling as originally planned is included as Table 1. The scope was modified as follows as a result of field conditions:

- Water from BP-6A was deemed too turbid for geochemical field testing , and samples were collected for laboratory analysis;
- Insufficient water was present in monitoring well BP-13A to sample using low-flow techniques. A grab sample was collected instead using the dedicated bladder pump;
- BP-15A had insufficient volume to perform sampling. No samples were collected;
- Purge water collected during previous sampling and contained on site in one of several poly tanks was discharged onto the ground after results from prior sampling indicated that water quality was acceptable.

Exhibit 1 summarizes the sampling methods used during the monitoring event. The quality assurance/quality control (QA/QC) samples collected for VOC analysis are summarized in Exhibit 2. Samples (including QA/QC samples) submitted for fixed laboratory analysis or field screening are tabulated in Exhibit 3. Laboratory and field analytical data are summarized in Table 3A for groundwater and Table 3B for surface water. A summary of groundwater quality data and inference is presented in Figure 1. An interactive plan view figure included as Figure 2 can be used to view the geochemical data used in inferring the geochemical conditions shown on Figure 1. Field sampling records and analytical laboratory reports are kept on file and are available by request.

Exhibit 1 Summary of Sampling Methods

Sample Method	Number of Locations Sampled
Modified Low-Flow	13
Bladder Pump Grab	1
Submerged Container (surface water)	4
Passive Diffusion Bag	5

Exhibit 2 Summary of QA/QC Samples for VOC analysis

Total Sample Locations	23
Duplicate Samples	3
Matrix Spikes	1
Matrix Spike Duplicates	1
Field Blanks	3
Equipment Blanks	0
Trip Blanks	3

Exhibit 3 Summary of Analytical Type

Sample Type - Fixed Laboratory	Laboratory	Number of Samples
VOCs	Lancaster	34
Total Organic Carbon	Lancaster	21
Volatile Fatty Acids	Microseeps	21
Light Gases (Ethane, Ethene, and Methane)	Microseeps	21
Geochemical Analyses	Microseeps	1
Sample Type - Field Screening	**Laboratory**	**Number of Samples**
Field Geochemistry	Sanborn Head	13

Equipment Calibration

Exhibit 4 summarizes the field instruments utilized during field sampling. The instruments were calibrated each morning and a calibration check was performed at the end of each day.

Exhibit 4 Summary of Field Instrumentation

INSTRUMENT	FIELD PARAMETER
YSI Water Quality Parameter Probe	Temperature, pH, Specific Conductance, Dissolved Oxygen, and Oxidation-reduction Potential
HACH 2100Q Turbidimeter	Turbidity
HACH DR2800 Spectrophotometer	Total and Ferrous Iron, Nitrate, Sulfate, and Sulfide

Attachments:
Table 1 Scope of Performance Monitoring
Table 2 Summary of Water Level Data
Table 3A Summary of April 2016 Performance Monitoring - Groundwater
Table 3B Summary of April 2016 Performance Monitoring – Surface Water
Figure 1 Summary of April 2016 Groundwater Quality Conditions
Figure 2 Summary of Geochemical Conditions

C:\Users\dcarr\Desktop\201604 Trip Report\DBC Markup Apr 2016 WQ Routine Monitoring Memo.docx

Table 1
Summary of Routine and Performance Monitoring Program
IBM Gun Club - Former Burn Pit Area
Union, New York

Monitoring Type	Monitoring Location	Monitoring Location Type	Sample Method				Analytical Laboratory				Field Screening	
			Low Flow	PDBs	Nitrogen Purge	Surface Water	VOCs	Light Gasses	TOC	VFAs	Water Quality Parameter	Field Geochemistry
Routine Monitoring (Annually in June)	BP-7A	Monitoring Well		x			x				x	
	BP-8A	Monitoring Well		x			x				x	
	BP-10A	Monitoring Well		x			x				x	
	BP-11A	Monitoring Well		x			x				x	
	BP-12A	Monitoring Well		x			x				x	
	BP-14A	Monitoring Well		x			x				x	
	BP-16A	Monitoring Well		x			x				x	
	BP-17A	Monitoring Well		x			x				x	
	BP-18A	Monitoring Well		x			x				x	
	BP-19A	Monitoring Well		x			x				x	
	BP-20A	Monitoring Well		x			x				x	
	BP-21A	Monitoring Well		x			x				x	
	BP-22A	Monitoring Well		x			x				x	
	BP-23A	Monitoring Well		x			x				x	
	BP-24A	Monitoring Well		x			x				x	
	BP-25A	Monitoring Well		x			x				x	
	BP-26A	Monitoring Well		x			x				x	
	BP-27A	Monitoring Well		x			x				x	
	BP-30A	Monitoring Well		x			x				x	
	BP-32A	Monitoring Well		x			x				x	
	GC-2A	Monitoring Well		x			x				x	
	GC-1, P-1	Multi-Depth			x		x				x	
	GC-1, P-8	Multi-Depth			x		x				x	
	BP-12D, P1	Multi-Depth			x		x				x	
	BP-12D, P7	Multi-Depth			x		x				x	
	BP-13D, P1	Multi-Depth			x		x				x	
	BP-13D, P5	Multi-Depth			x		x				x	
	BP-15D, P1	Multi-Depth			x		x				x	
	BP-15D, P5	Multi-Depth			x		x				x	
Performance Monitoring (3x/year in April, June, and Sept/October)	IB-7	Injection Borehole		x			x	x	x	x		
	A-13	Injection Borehole		x			x	x	x	x		
	B-4	Injection Borehole		x			x	x	x	x		
	B-7	Injection Borehole		x			x	x	x	x		
	B-9	Injection Borehole		x			x	x	x	x		
	BP-1A	Monitoring Well	x				x	x	x	x	x	x
	BP-2A	Monitoring Well	x				x	x	x	x	x	x
	BP-4A	Monitoring Well	x				x	x	x	x	x	x
	BP-5A	Monitoring Well	x				x	x	x	x	x	x
	BP-6A	Monitoring Well	x				x	x	x	x	x	x
	BP-9A	Monitoring Well	x				x	x	x	x	x	x
	BP-13A	Monitoring Well	x				x	x	x	x	x	x
	BP-31A	Monitoring Well	x				x	x	x	x	x	x
	BP-34A	Monitoring Well	x				x	x	x	x	x	x
	BP-35A	Monitoring Well	x				x	x	x	x	x	x
	BP-36A	Monitoring Well	x				x	x	x	x	x	x
	BP-37A	Monitoring Well	x				x	x	x	x	x	x
	BP-38A	Monitoring Well	x				x	x	x	x	x	x
	BP-39A	Monitoring Well	x				x	x	x	x	x	x
	111	Seep/spring				x	x				x	
	112	Seep/spring				x	x				x	
	113	Seep/spring				x	x				x	
	118	Seep/spring				x	x				x	
	SW-Z	Seep/spring				x	x				x	
		Total	**14**	**26**	**8**	**5**	**53**	**19**	**19**	**19**	**48**	**14**

Notes:
1. This table is intended to summarize the programs of routine and performance monitoring for remedy operations at the IBM Gun Club - Former Burn Pit Area starting in 2016. Additional monitoring points may be sampled based on field observations. "SW-Z" serves as a placeholder for sampling any on-site seep or spring that can be reasonably sampled. The table summarizes sample method, analytical laboratory analysis, and field screening.

2. Sample method:
"Low Flow" indicates samples will be collected by bladder pump using low flow techniques.
"PDBs" indicates that the well has sufficient water column to sample with passive diffusion bags - if conditions are observed to be different than anticipated, sampling will proceed using low flow techniques.
"Nitrogen purge" indicates that sample will be collected by purging the multi-level port with nitrogen (multi-level systems only).
"Surface water" samples will be collected using a clean glass vial.

3. Analytical laboratory samples:
"VOCs" indicates volatile organic compounds.
"Light gasses" includes methane, ethene and ethane.
"TOC" indicates total organic carbon.
"VFAs" indicates volatile fatty acids.

4. " Water quality parameters" indicates screening during well purging and water quality sampling by multi-parameter probes, e.g. by YSI® 556 multi-Probe meter or similar and HACH® turbidity meter or similar (low flow, multi-level system, bailer, and surface water sampling) or by water quality parameter sounding (PDB sampling). The water quality parameters may include temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, pH, and turbidity. In addition surface water samples will include water clarity descriptors (transparency, translucence, or opaqueness, and color).

5. "Field Geochemistry" will be performed during performance monitoring by using reagent kits and a spectrophotometer (HACH® DR 800, DR 2800, or similar). The field geochemistry includes analysis for sulfate, sulfide, ferrous iron, total iron, and oxygen. In some cases elevated turbidity (>10 NTU) or color may interfere with the spectrophotometric analysis. In such cases field geochemistry samples will be supplemented with samples submitted to an analytical laboratory as outlined in Table J.5.

Table 2
Summary of Water Level Data
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Well Location	Reference Elevation (ft amsl)	Depth to Water (ft bgs)	Equivalent Potentiometric Elevation (ft amsl)
A-1	1391.11	6.65	1384.46
A-2	1390.68	2.62	1388.06
A-3	1392.74	3.97	1388.77
A-4	1397.56	13.27	1384.29
A-5	1397.4	17.22	1380.18
A-6	1397.86	10.93	1386.93
A-7	1397.28	13.51	1383.77
A-8	1396.81	12.61	1384.2
A-9	1396.47	11.55	1384.92
A-10	1396.06	6.48	1389.58
A-11	1395.73	9.45	1386.28
A-12	1395.59	6.8	1388.79
A-13	1394.25	6.5	1387.75
A-14	1394.61	5.85	1388.76
A-15	1393.47	5.44	1388.03
A-16	1398.14	5.74	1392.4
A-17	1395.48	4.15	1391.33
B-1	1385.26	6.08	1379.18
B-2	1384.71	6.97	1377.74
B-3	1385.48	5.36	1380.12
B-4	1385.03	4.48	1380.55
B-5	1383.99	7.76	1376.23
B-6	1384.48	4.46	1380.02
B-7	1385.33	8.81	1376.52
B-8	1384.9	9.08	1375.82
B-9	1385.21	12.16	1373.05
B-10	1384.69	4.98	1379.71
B-11	1384.4	8.1	1376.3
B-12	1383.87	6.59	1377.28
B-13	1384.5	3.54	1380.96
BP-1A	1395.67	12	1383.67
BP-2A	1396.89	10.42	1386.47
BP-4A	1391.96	12.31	1379.65
BP-5A	1391.09	12.88	1378.21
BP-6A	1393.95	19.21	1374.74
BP-7A	1388.89	9	1379.89
BP-8A	1384.53	6.79	1377.74
BP-9A	1379.17	9.97	1369.2
BP-10A	1381.74	10.81	1370.93
BP-11A	1384.8	11.83	1372.97

Table 2
Summary of Water Level Data
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Well Location	Reference Elevation (ft amsl)	Depth to Water (ft bgs)	Equivalent Potentiometric Elevation (ft amsl)
BP-13A	1398.89	10.15	1388.74
BP-15A	1388.32	15.12	1373.2
BP-16A	1389.69	9.89	1379.8
BP-18A	1386.54	13.24	1373.3
BP-31A	1369.63	9.75	1359.88
BP-32A	1389.58	7.79	1381.79
BP-34A	1392.55	11.67	1380.88
BP-35A	1391.75	13.92	1377.83
BP-36A	1383.68	11.41	1372.27
BP-37A	1389.92	9.19	1380.73
BP-38A	1375.1	8.91	1366.19
BP-39A	1370.17	5.78	1364.39
IB-1	1392.2	5.8	1386.4
IB-2	1393.47	4.25	1389.22
IB-3	1393.07	12.86	1380.21
IB-4	1393.78	5.29	1388.49
IB-5	1393.88	11.44	1382.44
IB-6	1393.05	7.15	1385.9
IB-7	1393.23	10.54	1382.69
IB-8	1393.43	13.17	1380.26
IB-9	1393.62	7.32	1386.3

Notes:

1. This table summarizes depth to water measurements and calculated water table elevations recorded during the April 2015 performance monitoring round on August 11, 2016. Measurements were collected relative to the marked reference point at each location using a QED MP30 water level meter.

2. Abbreviations
ft amsl = feet above mean sea level
ft bgs - feet below ground surface

TABLE 3A
SUMMARY OF APRIL 2016 PERFORMANCE MONITORING - GROUNDWATER
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Analyte Name	Unit	BP-1A BP1A Low Flow S 4/12/2016	BP-2A BP2A Low Flow S 4/12/2016	BP-4A BP4A Low Flow S 4/13/2016	BP-4A DUP2 Low Flow FD 4/13/2016	BP-5A BP5A Low Flow S 4/12/2016	BP-6A BP6A Low Flow S 4/13/2016	BP-9A BP9A Low Flow S 4/12/2016	BP-13A BP13A Low Flow S 4/12/2016	BP-31A BP31A Low Flow S 4/12/2016	BP-31A DUP1 Low Flow FD 4/12/2016	BP-34A BP34A Low Flow S 4/13/2016	BP-35A BP35A Low Flow S 4/13/2016	BP-36A BP36A Peristaltic Pump S 4/13/2016	BP-37A BP37A Low Flow S 4/13/2016	BP-38A BP38A Low Flow S 4/12/2016	BP-39A BP39A Low Flow S 4/12/2016	A-13 A13 Passive Diffusion Bag S 4/11/2016	B-4 B4 Passive Diffusion Bag S 4/11/2016	B-7 B7 Passive Diffusion Bag S 4/11/2016
VOLATILE ORGANIC COMPOUNDS (VOCs)																				
Trichloroethene (TCE)	µg/l	**140**	**130**	**210**	**190**	**30**	**4,800**	**280**	**31**	**71**	**70**	**30,000**	**3,900**	**180**	**11**	**270**	**50**	<100	**26**	**55**
Dichloroethene (cis-1,2-)	µg/l	**130**	**3,800**	**26**	**26**	**41**	**8,500**	**2,100**	**1.1**	**23**	**22**	**28,000**	**5,400**	**10,000**	**0.9**	**43**	**23**	**9,400**	**100**	**230**
Dichloroethene (trans-1,2-)	µg/l	**1.9**	**8.0 J**	**0.7 J**	**1.0**	**0.9**	**30**	**8.5 J**	<0.5	**0.1 J**	**0.1 J**	<250	**7.1 J**	**31 J**	<0.5	**0.3 J**	**0.1 J**	<100	<5	<25
Dichloroethene (1,1-)	µg/l	**0.8**	**6.0 J**	<2.5	**0.5**	<0.5	**22 J**	**7.0 J**	<0.5	**0.1 J**	**0.1 J**	**81 J**	**6.4 J**	**15 J**	<0.5	**0.4 J**	<0.5	<100	<5	<25
Tetrachloroethene (PCE)	µg/l	<0.5	<25	<2.5	**0.1 J**	<0.5	<25	<25	<0.5	**3.6**	**3.4**	<250	<25	<50	<0.5	**0.2 J**	<0.5	<100	<5	<25
Vinyl chloride	µg/l	**31**	**1,200**	**8.0**	**10**	**4.9**	**190**	**190**	<0.5	**4.0**	**4.0**	**210 J**	<25	**170**	<0.5	**0.3 J**	<0.5	**2,500**	**27**	**88**
LIGHT GASSES																				
Ethane	µg/l	**2.4**	**0.43**	**8.9**	**9.8**	**0.041 J**	**0.81**	**1.4**	**0.18**	**0.0065 J**	**0.014 J**	**3.9**	**0.20**	**4.7**	**0.15**	**0.011 J**	**0.024 J**	**18**	**5.8**	**40**
Ethene	µg/l	**9.0**	**320**	**18**	**20**	**0.070 J**	**46**	**120**	**0.054 J**	**0.62**	**0.57**	**110**	**0.042 J**	**76**	**0.087 J**	**0.017 J**	**0.030 J**	**3,900**	**64**	**510**
Methane	µg/l	**90**	**2,000**	**870**	**980**	**1.3**	**24**	**3,400**	**60**	**0.19 J**	**0.35 J**	**1,800**	**1.6**	**420**	**220**	**0.22 J**	**0.14 J**	**3,900**	**9,100**	**15,000**
MOLAR CONCENTRATION																				
Trichloroethene (TCE)	µmol/l	1.1	0.99	1.6	1.4	0.23	37	2.1	0.24	0.54	0.53	228	30	1.4	0.08	2.1	0.38	ND	0.20	0.42
Dichloroethene (cis-1,2-)	µmol/l	1.3	39	0.27	0.27	0.42	88	22	0.01	0.24	0.23	289	56	103	0.01	0.44	0.24	97	1.0	2.4
Dichloroethene (trans-1,2-)	µmol/l	0.02	0.08	0.01	0.01	0.01	0.31	0.09	ND	0.001	0.001	ND	0.07	0.32	ND	0.003	0.001	ND	ND	ND
Dichloroethene (1,1-)	µmol/l	0.01	0.06	ND	0.01	ND	0.23	0.07	ND	0.001	0.001	0.84	0.07	0.15	ND	0.004	ND	ND	ND	ND
Tetrachloroethene (PCE)	µmol/l	ND	ND	ND	0.001	ND	ND	ND	ND	0.02	0.02	ND	ND	ND	ND	0.001	ND	ND	ND	ND
Vinyl chloride	µmol/l	0.50	19	0.13	0.16	0.08	3.0	3.0	ND	0.06	0.06	3.4	ND	2.7	ND	0.005	ND	40	0.43	1.4
Ethane	µmol/l	0.08	0.01	0.30	0.33	0.001	0.03	0.05	0.01	0.0002	0.0005	0.13	0.007	0.16	0.005	0.0004	0.0008	0.60	0.19	1.3
Ethene	µmol/l	0.32	11	0.64	0.71	0.002	1.6	4.3	0.002	0.02	0.02	3.9	0.001	2.7	0.003	0.0006	0.001	139	2.3	18
Total	µmol/l	3.3	71	2.9	2.9	0.74	129	31	0.26	0.89	0.87	525	86	111	0.10	2.5	0.62	277	4.1	24
MOLAR PERCENTAGE																				
TCE	%	32	1	54	49	31	28	7	92	61	61	43	35	1	83	82	61	ND	5	2
DCEs	%	41	55	9	10	58	68	70	4	27	26	55	65	94	9	18	38	35	25	10
VC	%	15	27	4	5	11	2	10	ND	7	7	1	ND	2	ND	0	ND	14	10	6
Ethane+Ethene	%	12	16	32	35	1	1	14	3	3	2	1	0	3	8	0	0	50	60	82
VOLATILE FATTY ACIDS																				
Acetic Acid	mg/l	**0.06 J**	**0.023 J**	**0.014 J**	**0.017 J**	**0.014 J**	**0.62 J**	**0.11**	**0.016 J**	**0.015 J**	**0.0092 J**	**0.018 J**	**0.016 J**	**42**	**0.013 J**	**0.018 J**	**0.015 J**	**150**	**380**	**540**
Butyric Acid	mg/l	**0.022 J**	**0.027 J**	**0.0051 J**	<0.1	<0.1	<10	**0.017 J**	<0.1	<0.1	<0.1	<0.1	<0.1	**3.1**	<0.1	<0.1	<0.1	**13**	**46**	**270**
Hexanoic Acid	mg/l	<0.4	<0.2	<0.2	<0.2	<0.2	<20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**2.5**	<0.2	<0.2	<0.2	**4.0**	**22**	**80**
i-Hexanoic Acid	mg/l	<0.4	<0.2	<0.2	<0.2	<0.2	<20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**0.14 J**	**0.8 J**	**5.2**
i-Pentanoic Acid	mg/l	<0.2	<0.1	<0.1	<0.1	<0.1	<10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.27**	<0.1	<0.1	<0.1	**1.4**	**4.4**	**8.8 J**
Lactic Acid	mg/l	**0.37 J**	<0.2	**0.03 J**	**0.028 J**	<0.2	**0.33 J**	<0.2	**0.048 J**	**0.029 J**	<0.2	<0.2	<0.2	**0.12 J**	**0.014 J**	**0.046 J**	**0.026 J**	**0.13 J**	<2.0	**0.47 J**
Pentanoic Acid	mg/l	**0.44**	**0.043 J**	**0.011 J**	**0.01 J**	**0.026 J**	<10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.62**	<0.1	<0.1	<0.1	**15**	**43**	**260**
Propionic Acid	mg/l	<0.2	<0.1	<0.1	<0.1	<0.1	<10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**1.9**	<0.1	<0.1	<0.1	**75**	**250**	**480**
Pyruvic Acid	mg/l	<0.2	<0.1	<0.1	<0.1	**0.031 J**	**36**	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	**0.78**	<0.1	<0.1	<0.1	**21**	**9.7**	**48**
OTHER LABORATORY DATA																				
Total Organic Carbon	mg/l	**12.4**	**4.8**	**2.8**	**2.8**	**22.9**	**474**	**1.8**	**1.3**	**0.92 J**	**0.88 J**	**4.6**	**2.1**	**48.7**	**1.8**	**1.6**	**1.7**	**186**	**580**	**3,180**
WATER QUALITY PROBE DATA																				
Temperature	°C	**7.3**	**7.4**	**6.3**	--	**7.5**	**8.6**	**6.3**	**6.9**	**6.9**	--	**6.6**	**5.8**	**8.6**	**7.8**	**7.7**	**6.5**	--	--	--
Specific Conductance	uS/cm	**2,040**	**1,060**	**470**	--	**1,930**	**13,300**	**390**	**89**	**240**	--	**1,100**	**680**	**470**	**560**	**180**	**120**	--	--	--
pH	s.u.	**7.2**	**6.9**	**7.6**	--	**6.9**	**7.1**	**7.9**	**6.4**	**6.8**	--	**7.3**	**7.5**	**7.3**	**7.2**	**6.5**	**6.3**	--	--	--
Oxidation/Reduction Potential	mV	**194**	**-60**	**37**	--	**200**	**173**	**131**	**52**	**158**	--	**149**	**146**	**-117**	**208**	**128**	**178**	--	--	--
Dissolved Oxygen	mg/l	**1.7**	**0.59**	**0.97**	--	**5.7**	**6.8**	**3.2**	**4.1**	**5.3**	--	**1.5**	**8.6**	**1.4**	**2.0**	**6.4**	**5.7**	--	--	--
Turbidity	NTU	**3.7**	**3.5**	**0.34**	--	**7.9**	**6.9**	**3.4**	**6.1**	**2.2**	--	**2.6**	**5.1**	**12**	**9.4**	**1.7**	**1.0**	--	--	--
FIELD CHEMISTRY																				
Iron	mg/l	**0.11**	**5.46 OR**	**0.03**	--	**0.02**	**3.6**	**0.02**	**0.03**	**0.01**	--	**0.04**	**0.06**	**3.39 OR**	**0.07**	**0.10**	**0.04**	--	--	--
Iron - Ferrous	mg/l	**0.04**	**4.12 OR**	**0.01**	--	**0.0**	**7.4**	**0.02**	**0.01**	**0.0**	--	**0.03**	**0.03**	**3.61 OR**	**0.07**	**0.08**	**0.02**	--	--	--
Nitrate	mg/l	**0.60**	**0.50**	**0.40**	--	**1.1**	<0.5	**0.40**	**1.3**	**0.40**	--	**0.70**	**0.40**	**0.80**	**0.70**	**0.40**	**0.30**	--	--	--
Sulfate	mg/l	**148 OR**	**50**	**23**	--	**3.5**	**3,200**	**20**	**7.0**	**14**	--	**77 OR**	**1.0**	**4.0**	**4.0**	**6.0**	**8.0**	--	--	--
Sulfide	µg/l	**18**	**299**	**78**	--	**45**	<2,000	**307**	**250**	**7.0**	--	**34**	**80**	**281**	**17**	**153**	**45**	--	--	--

TABLE 3A
SUMMARY OF APRIL 2016 PERFORMANCE MONITORING - GROUNDWATER
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Analyte Name	Unit	B-9 B9 Passive Diffusion Bag S 4/11/2016	IB-7 IB7 Passive Diffusion Bag S 4/11/2016
VOLATILE ORGANIC COMPOUNDS (VOCs)			
Trichloroethene (TCE)	µg/l	**59**	<5
Dichloroethene (cis-1,2-)	µg/l	**510**	**1.6 J**
Dichloroethene (trans-1,2-)	µg/l	<25	<5
Dichloroethene (1,1-)	µg/l	<25	<5
Tetrachloroethene (PCE)	µg/l	<25	<5
Vinyl chloride	µg/l	**29**	<5
LIGHT GASSES			
Ethane	µg/l	**19**	**30**
Ethene	µg/l	**89**	**0.28**
Methane	µg/l	**5,400**	**23,000**
MOLAR CONCENTRATION			
Trichloroethene (TCE)	µmol/l	0.45	ND
Dichloroethene (cis-1,2-)	µmol/l	5.3	0.02
Dichloroethene (trans-1,2-)	µmol/l	ND	ND
Dichloroethene (1,1-)	µmol/l	ND	ND
Tetrachloroethene (PCE)	µmol/l	ND	ND
Vinyl chloride	µmol/l	0.46	ND
Ethane	µmol/l	0.63	1.0
Ethene	µmol/l	3.2	0.01
Total	µmol/l	10	1.0
MOLAR PERCENTAGE			
TCE	%	4	ND
DCEs	%	53	2
VC	%	5	ND
Ethane+Ethene	%	38	98
VOLATILE FATTY ACIDS			
Acetic Acid	mg/l	**190**	**1.1**
Butyric Acid	mg/l	**140**	**0.025 J**
Hexanoic Acid	mg/l	**16**	<0.4
i-Hexanoic Acid	mg/l	**7.3**	<0.4
i-Pentanoic Acid	mg/l	<10	<0.2
Lactic Acid	mg/l	**0.62 J**	<0.4
Pentanoic Acid	mg/l	**87**	<0.2
Propionic Acid	mg/l	**970**	**0.036 J**
Pyruvic Acid	mg/l	**5.1 J**	<0.2
OTHER LABORATORY DATA			
Total Organic Carbon	mg/l	**4,260**	**59.5**
WATER QUALITY PROBE DATA			
Temperature	°C	--	--
Specific Conductance	uS/cm	--	--
pH	s.u.	--	--
Oxidation/Reduction Potential	mV	--	--
Dissolved Oxygen	mg/l	--	--
Turbidity	NTU	--	--
FIELD CHEMISTRY			
Iron	mg/l	--	--
Iron - Ferrous	mg/l	--	--
Nitrate	mg/l	--	--
Sulfate	mg/l	--	--
Sulfide	µg/l	--	--

Notes:
1. The table summarizes samples collected during the week of April 11, 2016 as part of performance testing at the IBM Gun Club former Burn Pit Area. Samples were analyzed both in the field and at fixed analytical laboratories as indicated on the table.

2. Analytical laboratory analysis was performed by Eurofins Lancaster Laboratories of Lancaster, Pennsylvania (Lancaster) and/or Microseeps, Inc. of Pittsburgh, Pennsylvania (Microseeps). Results of compounds are recorded in units indicated on the table. Detections of compounds are emboldened.

3. Definitions:
"--" indicates the compounds were not analyzed for that particular sample.
"U" indicates the result was below the analytical detection limit.
"J" indicates that the laboratory data was below the lowest quantifiable limit and therefore estimated.
"*" indicates that the sample exhibited high turbidity and could not be analyzed in the field. Recorded results are from analysis at Lancaster and/or Microseeps.
"UR" indicates results were under the calibration range and no result was obtained.
"OR" indicates results were over the calibration range and should be considered estimated.
"ND" indicates that results were not detected above the analytical reporting limit or the calibration range of the field screening device.

4. Refer to the report text for further discussion. The sample plan can be referenced in the Site Management Plan .

TABLE 3B
SUMMARY OF APRIL 2016 PERFORMANCE MONITORING - SURFACE WATER
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Analyte Name	Unit	111	112	113	113	118
		111	112	113	DUP3	118
		Surface Water	Surface Water	Surface Water	Surface Water	Surface Water
		S	S	S	FD	S
		4/13/2016	4/13/2016	4/13/2016	4/13/2016	4/13/2016
VOLATILE ORGANIC COMPOUNDS (VOCs)						
Dichloroethene (1,1-)	ug/l	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethene (cis-1,2-)	ug/l	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethene (trans-1,2-)	ug/l	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene (PCE)	ug/l	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloroethene (TCE)	ug/l	**0.2 J**	**1.0**	**1.3**	**1.3**	**0.4 J**
Vinyl chloride	ug/l	<0.5	<0.5	<0.5	<0.5	<0.5
WATER QUALITY PROBE DATA						
Oxidation/Reduction Potential	mv	67	48	87	-	114
Specific Conductance	us/cm	83	70	128	-	508
Temperature	˚c	9.6	7.4	7.6	-	7.3
pH	su	7.3	7.5	7.0	-	7.2

Notes:
1. The table summarizes samples collected during the week of April 11, 2016 as part of performance testing at the IBM Gun Club former Burn Pit Area.

2. Analytical laboratory analysis was performed by Eurofins Lancaster Laboratories of Lancaster, Pennsylvania (Lancaster). Results of compounds are recorded in units indicated on the table. Detections of compounds are emboldened.

3. Definitions:
"--" indicates the compounds were not analyzed for that particular sample.
"<" indicates the result was below the analytical detection limit.
"J" indicates that the laboratory data was below the lowest quantifiable limit and therefore estimated.

4. Refer to the report text for further discussion. The sample plan can be referenced in the Site Management Plan.

Figure 1

Summary of April 2016 Groundwater Quality Conditions

IBM Gun Club - Former Burn Pit Area

Union, New York

Drawn By:	C. LaVack
Designed By:	E. Bosse
Reviewed By:	D. Carr
Project No:	3526.05
Date:	June 2016

Figure Narrative

The figure is intended to depict groundwater quality data and inference recorded during the week of April 11, 2016.

The groundwater data for site key VOCs including PCE, TCE, cDCE, and vinyl chloride from water table monitoring wells are presented as pie diagrams. The wedges of each pie diagram represent concentrations of the four compounds expressed in micromoles per liter (umol/L). The relative diameter of each pie diagram varies based on the sum of the four VOCs at each location.

The inferred geochemical (REDOX) conditions are based on observations of oxidation-reduction potential (ORP), methane, sulfide, ferrous and total iron, and nitrate. Methanogenic conditions are characterized by methane concentrations = 20 µg/L, sulfate reducing by sulfide = 50 µg/L, iron reducing by Fe(II)/Fe(tot) = 0.7 mg/L, and nitrate reduction by nitrate < 1 mg/L. ORP is generally expected to be less than 200 for iron reduction, less than 100 for sulfate reduction, and less than 0 for methanogenic conditions.

Legend

BP-34A / 30,000 — Well Name and April 2016 TCE Concentrations in Groundwater (µg/L).

Inferred Groundwater Contour 4/11/2016

Methanogenic, Methane >= 20 µg/L

Sulfate Reducing, Sulfide >= 50 µg/L

Parent VOC (Trichloroethene)

Primary Daughter Product (*cis*-1,2DCE)

Secondary Daughter Product (Vinyl Chloride)

Terminal Breakdown Products (Ethane, Ethene)

Total Chlorinated Ethanes & Ethenes in Groundwater (µmol/L)

< 0.1 | >0.1 to 1 | >1 to 10 | >10 to 100 | >100

40 20 0 40 80 Feet

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Clear Labels

TOC

Total VFA

pH

FeII

Methane

Sulfide

ORP

DO

Ene+Ane

Figure 2

April 2016 Summary of Geochemical Conditions

IBM Gun Club - Former Burn Pit Area

Union, New York

Drawn By:	S. Warner
Designed By:	E. Bosse
Reviewed By:	D. Carr
Project No:	3526.05
Date:	May, 2016

Figure Narrative

This figure is intended to assess multiple lines of evidence to assess what proportion of the primary and secondary source rock are under sulfate reducing and methanogenic conditions.

Posted data is from the April 2016 sampling round.

Legend

DO mg/L	>5	2-5	<=2
ORP mV	>100	0-100	<=0
Sulfide µg/L	<10	10-50	>=50
Methane µg/L	<0.5	0.5-20	>=20
FeII mg/L	<1		>=1
pH SU	6.3-7.5		<6.3 or >7.5
Total VFA mg/L	<1		>=1
TOC mg/L	<4		>=4
Ethane + Ethene µg/L	<10	10-50	>=50

60 30 0 60 120

Feet

SANBORN HEAD

JUNE 2016 PERFORMANCE TESTING

SANBORN HEAD ENGINEERING

SUMMARY OF JUNE 2016 WATER QUALITY MONITORING

IBM Gun Club – Former Burn Pit Area
Union, New York

INTRODUCTION AND SUMMARY

This memorandum is intended to summarize the program of remedy performance monitoring conducted in June 2016. It documents and summarizes the sampling event and provides tabular and figure summaries of the field and laboratory data. The field work was conducted the week of June 20, 2016 in general accordance with the scope and procedures discussed in Appendix J of the approved Site Management Plan (SMP)[1].

This memorandum will be included as a component of the next Periodic Review Report, due in March 2018, and has been prepared consistent with the Monitoring Reporting Requirements discussed in Section 3.6 of the SMP. The Sanborn Head field staff included: Chris Norton, Neal Orosz, Paula Pryor, and Matthew Stein.

The field and laboratory data indicate continued remedy performance consistent with project performance goals established in the SMP. There is some evidence that the area of subsurface where methanogenic and sulfate-reducing conditions may exist is smaller than that observed in the April sampling. The proportion of TCE on a molar basis measured in June was larger than in April 2016 in water from locations BP-1A, BP-5A, BP-6A, and BP-31A, suggesting some rebound at these locations. However, geochemical conditions remain conducive to reductive dehalogenation over much of the primary source rock. The terminal breakdown product ethene is now the predominant species in water from four of the five injection boreholes sampled regularly (A-13, B-4, B-7, and IB-7), with A-13 exhibiting ethene at about 4,300 micrograms per liter (µg/l), or over half of the mass on a molar basis. The data support compete destruction of chlorinated ethene mass and continued reductions in TCE mass discharge off site to the south which, based on the data from June 2016, may be 99% lower than what was recorded in June 2014 before the remedy was fully operational, and slightly better than the 97% reported in the recent PRR in March 2016.

The data depicted for key VOCs on Figure 2 for the majority of monitoring locations further downgradient to the south on the Binghamton Country Club property indicate water quality generally consistent with or improved when compared with the last sampling conducted in September 2015.

Sampling results from the multilevel monitoring installations, which screen productive fracture zones between the primary source rock and residential water supplies, do not indicate any adverse change in water quality.

[1] Sanborn, Head & Associates, Inc., March 2016, Site Management Plan – April 2016 Revision, Brownfield Cleanup Program, IBM Gun Club – Former Burn Pit area, Union, New York, NYSDEC Site #C704044, BCA Index #B7-0661004-05.

Groundwater temperatures at all locations are observed to be in the range conducive to processes contributing to reductive dehalogenation (9 to 35˚Celsius); some locations are several degrees higher than that observed in the first two years of operation which also may reflect recent hotter and/or drier weather patterns. Total organic carbon concentrations in injection boreholes continue to decline, which is consistent with consumption of electron donor, but still exceeds 100 milligrams per liter (mg/l) at all locations, a threshold below which we have observed evidence of diminishing remediation performance.

Accordingly, it is Sanborn Head's opinion that additional introduction of electron donor amendment is not warranted at this time. We would prefer to limit amendment injections until we observe clear evidence of diminishing returns with the goal of injections every two years or less. Field conditions and water quality data will continue to be monitored and reassessed to determine the need for additional injections. Our next performance monitoring event is to be conducted in September 2016.

JUNE 2016 MONITORING SCOPE OF WORK

The scope of work included:

- Limited groundwater elevation survey;
- Annual well inspection including depth-to-bottom measurements;
- Water quality sampling associated with the performance monitoring program as outlined in the SMP;
- Calibration of dedicated water quality probes installed in five monitoring wells; and
- Water quality parameter field screening and field geochemical testing.

During this visit representative photographs were recorded showing the condition of the tree and grass vegetation at the time the sampling was conducted.

Groundwater Elevation Survey

On June 20, 2016, prior to starting the water quality sampling program, the depths to water in select monitoring wells and injection boreholes were gauged in accordance with procedures detailed in Appendix G of the SMP. Water levels were also measured and recorded for monitoring points at the time sampling was conducted. Based on the depth to water data and survey information, groundwater elevations were calculated for each location. Depth to water measurements and groundwater elevations are summarized on Table 2.

Condition of Tree and Grass Cover

The tree and grass cover appeared greener and more vigorous following fertilizer application completed in May 2016 as shown in the following pictures.

Photo 1 Soil Cap Over Primary Source Rock Area Looking Northeast from the Gravel Access Road towards Monitoring Well BP-1A.

Photo 2 – Looking Southwest across the seep fill area with Deed Restriction Cap Monument in the Distance (Yellow Standpipe)

A routine maintenance mowing is to be conducted in August 2016.

Water Quality Sampling

The scope of sampling as originally planned is included as Table 1. The scope was modified as follows as a result of field conditions:

- Monitoring points BP-10A, BP-17A, BP-26A, and GC-2A were to be sampled via Passive Diffusion Bag (PDB), however, no PDBs were deployed prior to the June 2016 event and the wells were sampled via modified low-flow techniques;
- Flute Port BP-15D, P1 was found to be dry. We inadvertently sampled Flute ports 14D P1, and P4 after purging these points to record water levels;
- Water from BP-6A and BP-37A were deemed too turbid for geochemical field testing , and samples were collected for laboratory analysis;
- Surface water points 112 and 118 were dry during June 2016 and no samples were collected. No additional seeps or springs were observed; and

- BP-16A had insufficient volume to perform sampling. No samples were collected.

Exhibit 1 summarizes the sampling methods used during the monitoring event. The quality assurance/quality control (QA/QC) samples collected for VOC analysis are summarized in Exhibit 2. Samples (including QA/QC samples) submitted for fixed laboratory analysis or field screening are tabulated in Exhibit 3. Laboratory and field analytical data are summarized in Table 3.

A summary of groundwater quality data and inference is presented in Figure 1. A figure depicting the entire monitoring area south into the golf course and summarizing key site VOCs including carbon tetrachloride in included as Figure 2. An interactive layered plan view figure included as Figure 3 can be used to view the geochemical data used in inferring the geochemical conditions shown on Figure 1. Field sampling records and analytical laboratory reports are kept on file and are available by request.

Exhibit 1 Summary of Sampling Methods

Sample Method	Number of Locations Sampled
Modified Low-Flow	18
Submerged Container (surface water)	2
Passive Diffusion Bag	21
fLUTE® Purge	9
Sampling Event Purge Water	1

Exhibit 2 Summary of QA/QC Samples for VOC analysis

Total Primary Samples	51
Duplicate Samples	5
Matrix Spikes	3
Matrix Spike Duplicates	3
Field Blanks	4
Equipment Blanks	1
Trip Blanks	4

Exhibit 3 Summary of Analytical Type including QA/QC

Sample Type - Fixed Laboratory	Laboratory	Number of Samples
VOCs	Lancaster	71
Total Organic Carbon	Lancaster	21
Volatile Fatty Acids	Microseeps	21
Light Gases (Ethane, Ethene, and Methane)	Microseeps	21
Geochemical Analyses	Microseeps	2
Sample Type - Field Screening	**Laboratory**	**Number of Samples**
Field Geochemistry	Sanborn Head	12

Equipment Calibration

Exhibit 4 summarizes the field instruments utilized during field sampling. The instruments were calibrated each morning and a calibration check was performed at the end of each day.

Exhibit 4 Summary of Field Instrumentation

INSTRUMENT	FIELD PARAMETER
YSI Water Quality Parameter Probe	Temperature, pH, Specific Conductance, Dissolved Oxygen, and Oxidation-reduction Potential
HACH 2100Q Turbidimeter	Turbidity
HACH DR2800 Spectrophotometer	Total and Ferrous Iron, Nitrate, Sulfate, and Sulfide

Attachments:

Table 1 Scope of Performance Monitoring
Table 2 Summary of Water Level Data
Table 3 Summary of June 2016 Performance Monitoring
Figure 1 Summary of June 2016 Groundwater Quality Conditions
Figure 2 Summary of Key Site VOCs – June 2016
Figure 3 Summary of Geochemical Conditions

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Table 1
Summary of Routine and Performance Monitoring Program
IBM Gun Club - Former Burn Pit Area
Union, New York

Monitoring Type	Monitoring Location	Monitoring Location Type	Sample Method				Analytical Laboratory				Field Screening	
			Low Flow	PDBs	Nitrogen Purge	Surface Water	VOCs	Light Gasses	TOC	VFAs	Water Quality Parameter	Field Geochemistry
Routine Monitoring (Annually in June)	BP-7A	Monitoring Well		x			x				x	
	BP-8A	Monitoring Well		x			x				x	
	BP-10A	Monitoring Well		x			x				x	
	BP-11A	Monitoring Well		x			x				x	
	BP-12A	Monitoring Well		x			x				x	
	BP-14A	Monitoring Well		x			x				x	
	BP-16A	Monitoring Well		x			x				x	
	BP-17A	Monitoring Well		x			x				x	
	BP-18A	Monitoring Well		x			x				x	
	BP-19A	Monitoring Well		x			x				x	
	BP-20A	Monitoring Well		x			x				x	
	BP-21A	Monitoring Well		x			x				x	
	BP-22A	Monitoring Well		x			x				x	
	BP-23A	Monitoring Well		x			x				x	
	BP-24A	Monitoring Well		x			x				x	
	BP-25A	Monitoring Well		x			x				x	
	BP-26A	Monitoring Well		x			x				x	
	BP-27A	Monitoring Well		x			x				x	
	BP-30A	Monitoring Well		x			x				x	
	BP-32A	Monitoring Well		x			x				x	
	GC-2A	Monitoring Well		x			x				x	
	GC-1, P-1	Multi-Depth			x		x				x	
	GC-1, P-8	Multi-Depth			x		x				x	
	BP-12D, P1	Multi-Depth			x		x				x	
	BP-12D, P7	Multi-Depth			x		x				x	
	BP-13D, P1	Multi-Depth			x		x				x	
	BP-13D, P5	Multi-Depth			x		x				x	
	BP-15D, P1	Multi-Depth			x		x				x	
	BP-15D, P5	Multi-Depth			x		x				x	
Performance Monitoring (3x/year in April, June, and Sept/October)	IB-7	Injection Borehole		x			x	x	x	x		
	A-13	Injection Borehole		x			x	x	x	x		
	B-4	Injection Borehole		x			x	x	x	x		
	B-7	Injection Borehole		x			x	x	x	x		
	B-9	Injection Borehole		x			x	x	x	x		
	BP-1A	Monitoring Well	x				x	x	x	x	x	x
	BP-2A	Monitoring Well	x				x	x	x	x	x	x
	BP-4A	Monitoring Well	x				x	x	x	x	x	x
	BP-5A	Monitoring Well	x				x	x	x	x	x	x
	BP-6A	Monitoring Well	x				x	x	x	x	x	x
	BP-9A	Monitoring Well	x				x	x	x	x	x	x
	BP-13A	Monitoring Well	x				x	x	x	x	x	x
	BP-31A	Monitoring Well	x				x	x	x	x	x	x
	BP-34A	Monitoring Well	x				x	x	x	x	x	x
	BP-35A	Monitoring Well	x				x	x	x	x	x	x
	BP-36A	Monitoring Well	x				x	x	x	x	x	x
	BP-37A	Monitoring Well	x				x	x	x	x	x	x
	BP-38A	Monitoring Well	x				x	x	x	x	x	x
	BP-39A	Monitoring Well	x				x	x	x	x	x	x
	111	Seep/spring				x	x				x	
	112	Seep/spring				x	x				x	
	113	Seep/spring				x	x				x	
	118	Seep/spring				x	x				x	
	SW-Z	Seep/spring				x	x				x	
		Total	**14**	**26**	**8**	**5**	**53**	**19**	**19**	**19**	**48**	**14**

Notes:
1. This table is intended to summarize the programs of routine and performance monitoring for remedy operations at the IBM Gun Club - Former Burn Pit Area starting in 2016. Additional monitoring points may be sampled based on field observations. "SW-Z" serves as a placeholder for sampling any on-site seep or spring that can be reasonably sampled. The table summarizes sample method, analytical laboratory analysis, and field screening.

2. Sample method:
"Low Flow" indicates samples will be collected by bladder pump using low flow techniques.
"PDBs" indicates that the well has sufficient water column to sample with passive diffusion bags - if conditions are observed to be different than anticipated, sampling will proceed using low flow techniques.
"Nitrogen purge" indicates that sample will be collected by purging the multi-level port with nitrogen (multi-level systems only).
"Surface water" samples will be collected using a clean glass vial.

3. Analytical laboratory samples:
"VOCs" indicates volatile organic compounds.
"Light gasses" includes methane, ethene and ethane.
"TOC" indicates total organic carbon.
"VFAs" indicates volatile fatty acids.

4. " Water quality parameters" indicates screening during well purging and water quality sampling by multi-parameter probes, e.g. by YSI® 556 multi-Probe meter or similar and HACH® turbidity meter or similar (low flow, multi-level system, bailer, and surface water sampling) or by water quality parameter sounding (PDB sampling). The water quality parameters may include temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, pH, and turbidity. In addition surface water samples will include water clarity descriptors (transparency, translucence, or opaqueness, and color).

5. "Field Geochemistry" will be performed during performance monitoring by using reagent kits and a spectrophotometer (HACH® DR 800, DR 2800, or similar). The field geochemistry includes analysis for sulfate, sulfide, ferrous iron, total iron, and oxygen. In some cases elevated turbidity (>10 NTU) or color may interfere with the spectrophotometric analysis. In such cases field geochemistry samples will be supplemented with samples submitted to an analytical laboratory as outlined in the Site Management Plan.

Table 2
Summary of Water Level Data
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Well Location	Reference Elevation (ft amsl)	Depth to Water (ft bgs)	Equivalent Potentiometric Elevation (ft amsl)
A-1	1391.11	6.12	1384.99
A-2	1390.68	6.56	1384.12
A-3	1392.74	9.88	1382.86
A-4	1397.56	6.95	1390.61
A-5	1397.4	6.89	1390.51
A-6	1397.86	6.33	1391.53
A-7	1397.28	6.46	1390.82
A-8	1396.81	6.22	1390.59
A-9	1396.47	4.66	1391.81
A-10	1396.06	3.04	1393.02
A-11	1395.73	4.28	1391.45
A-12	1395.59	13.01	1382.58
A-13	1394.25	17.37	1376.88
A-14	1394.61	10.88	1383.73
A-15	1393.47	13.09	1380.38
A-16	1398.14	12.61	1385.53
A-17	1395.48	11.64	1383.84
B-1	1385.26	7.96	1377.30
B-2	1384.71	8.20	1376.51
B-3	1385.48	5.74	1379.74
B-4	1385.03	5.85	1379.18
B-5	1383.99	8.15	1375.84
B-6	1384.48	7.45	1377.03
B-7	1385.33	8.86	1376.47
B-8	1384.9	9.17	1375.73
B-9	1385.21	12.05	1373.16
B-10	1384.69	5.36	1379.33
B-11	1384.4	7.73	1376.67
B-12	1383.87	7.14	1376.73
B-13	1384.5	6.48	1378.02
BP-1A	1395.67	15.23	1380.44
BP-2	1396.98	29.73	1367.25
BP-2A	1396.89	11.85	1385.04
BP-3	1394.81	37.47	1357.34
BP-4	1392.81	25.88	1366.93
BP-4A	1391.96	13.36	1378.60
BP-5A	1391.09	15.12	1375.97
BP-6	1394.32	27.09	1367.23
BP-6A	1393.95	18.49	1375.46
BP-7A	1388.89	16.57	1372.32

Table 2
Summary of Water Level Data
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Well Location	Reference Elevation (ft amsl)	Depth to Water (ft bgs)	Equivalent Potentiometric Elevation (ft amsl)
BP-8A	1384.53	16.60	1367.93
BP-9A	1379.17	13.20	1365.97
BP-10A	1381.74	14.05	1367.69
BP-11A	1384.8	14.55	1370.25
BP-12A	1386.64	16.71	1369.93
BP-13A	1398.89	14.54	1384.35
BP-16A	1389.69	>15.88	<1373.81
BP-17A	1376.3	13.24	1363.06
BP-18A	1386.54	16.81	1369.73
BP-19A	1309.4	21.32	1288.08
BP-20A	1274.6	9.04	1265.56
BP-21	1244.12	20.81	1223.31
BP-21A	1244.29	7.92	1236.37
BP-22A	1242.9	6.78	1236.12
BP-23A	1333.39	15.44	1317.95
BP-24A	1338.73	16.06	1322.67
BP-25A	1301.92	7.24	1294.68
BP-26A	1336.96	16.00	1320.96
BP-27A	1299.96	4.10	1295.86
BP-30A	1336.2	13.86	1322.34
BP-31A	1369.63	13.41	1356.22
BP-32A	1389.58	17.64	1371.94
BP-33A	1369.48	20.65	1348.83
BP-34A	1392.55	13.19	1379.36
BP-35A	1391.75	15.25	1376.50
BP-36A	1383.68	13.54	1370.14
BP-37A	1389.92	10.78	1379.14
BP-38A	1375.1	13.68	1361.42
BP-39A	1370.17	11.81	1358.36
BP-40A	1358.71	17.40	1341.31
BP-12D Port 1	1385.37	2.57	1382.80
BP-12D Port 7	1385.37	68.22	1317.15
BP-13D Port 1	1397.04	89.51	1307.53
BP-13D Port 5	1397.04	89.87	1307.17
BP-14D Port 1	1378.07	142.50	1235.57
BP-14D Port 5	1378.07	71.54	1306.53
BP-15D Port 5	1386.35	76.63	1309.72
GC-1 Port 1	1383.71	13.79	1369.92
GC-1 Port 8	1383.71	64.24	1319.47
GC-2A	1383.32	17.65	1365.67

Table 2
Summary of Water Level Data
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Well Location	Reference Elevation (ft amsl)	Depth to Water (ft bgs)	Equivalent Potentiometric Elevation (ft amsl)
IB-1	1392.2	6.95	1385.25
IB-2	1393.47	8.31	1385.16
IB-3	1393.07	12.31	1380.76
IB-4	1393.78	8.62	1385.16
IB-5	1393.88	11.21	1382.67
IB-6	1393.05	7.86	1385.19
IB-7	1393.23	8.04	1385.19
IB-8	1393.43	12.83	1380.60
IB-9	1393.62	8.43	1385.19
RP-9-380	1240.73	6.40	1234.33
RP-13-885	1266.48	5.53	1260.95

Notes:

1. This table summarizes depth to water measurements and calculated water table elevations recorded during the June 2016 performance monitoring round on June 21, 2016. Measurements were collected relative to the marked reference point at each location using a QED MP30 water level meter.

2. Abbreviations
ft amsl = feet above mean sea level
ft bgs = feet below ground surface

TABLE 3
SUMMARY OF JUNE 2016 PERFORMANCE MONITORING
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Analyte Name	Unit	BP-1A BP-1A Low Flow S 6/21/2016	BP-2A BP-2A Low Flow S 6/21/2016	BP-4A BP-4A Low Flow S 6/21/2016	BP-5A BP-5A Low Flow S 6/22/2016	BP-6A BP-6A Low Flow S 6/22/2016	BP-7A BP-7A Low Flow S 6/24/2016	BP-8A BP-8A Low Flow S 6/24/2016	BP-9A BP-9A Low Flow S 6/21/2016	BP-10A BP-10A Low Flow S 6/23/2016	BP-11A BP-11A Low Flow S 6/23/2016	BP-12A BP-12A PDB S 6/23/2016	BP-13A BP-13A Low Flow S 6/21/2016	BP-17A BP-17A Low Flow S 6/23/2016	BP-18A BP-18A PDB S 6/23/2016	BP-18A DUP-5 PDB FD 6/23/2016	BP-19A BP-19A PDB S 6/22/2016	BP-20A BP-20A PDB S 6/22/2016	BP-21A BP-21A PDB S 6/22/2016
VOLATILE ORGANIC COMPOUNDS (VOCs)																				
Trichloroethene (TCE)	µg/l	**170**	**98**	**200**	**22**	**15,000**	<0.5	**16**	**210**	**2.3**	**2.6**	**2.4**	**95**	**1.0**	**10**	**11**	<0.5	**10**	<0.5
Dichloroethene (cis-1,2-)	µg/l	**130**	**4200**	**47**	**21**	**6,100**	<0.5	**1.3**	**1,400**	**0.30 J**	<0.5	**0.20 J**	**3.7**	<0.5	**0.30 J**	**0.40 J**	<0.5	**0.20 J**	<0.5
Dichloroethene (trans-1,2-)	µg/l	**1.5**	**17 J**	**1.5 J**	**0.50**	<100	<0.5	<0.5	**10 J**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichloroethene (1,1-)	µg/l	**0.70**	**7.9 J**	**0.50 J**	<0.5	<100	<0.5	<0.5	**5.1 J**	<0.5	<0.5	<0.5	**0.20 J**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene (PCE)	µg/l	<0.5	<25	**1.3 J**	<0.5	<100	<0.5	<0.5	<25	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**0.20 J**	<0.5
Vinyl chloride	µg/l	**4.3**	**980**	**13**	**0.20 J**	<100	<0.5	<0.5	**85**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
LIGHT GASSES																				
Ethane	µg/l	**0.10**	**0.42**	**16**	**0.013 J**	**0.47**	--	**--**	**0.99**	--	--	**--**	**0.13**	--	--	--	**--**	--	--
Ethene	µg/l	**0.12**	**430**	**34**	**0.026 J**	**2.2**	--	**--**	**52**	--	--	**--**	**0.33**	--	--	--	**--**	--	--
Methane	µg/l	**1.5**	**1,700**	**1,800**	**0.18 J**	**6.2**	--	**--**	**1,700**	--	--	**--**	**16**	--	--	--	**--**	--	--
MOLAR CONCENTRATION																				
Trichloroethene (TCE)	µmol/l	1.3	0.75	1.5	0.17	114	ND	0.12	1.6	0.02	0.02	0.02	0.72	0.01	0.08	0.08	ND	0.08	ND
Dichloroethene (cis-1,2-)	µmol/l	1.3	43	0.48	0.22	63	ND	0.01	14	0.003	ND	0.002	0.04	ND	0.003	0.004	ND	0.002	ND
Dichloroethene (trans-1,2-)	µmol/l	0.02	0.18	0.02	0.01	ND	ND	ND	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichloroethene (1,1-)	µmol/l	0.01	0.08	0.01	ND	ND	ND	ND	0.05	ND	ND	ND	0.002	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	µmol/l	ND	ND	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.001	ND
Vinyl chloride	µmol/l	0.07	16	0.21	0.003	ND	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethane	µmol/l	0.003	0.01	0.53	0.0004	0.02	--	--	0.03	--	--	--	0.004	--	--	--	--	--	--
Ethene	µmol/l	0.004	15	1.2	0.001	0.08	--	--	1.9	--	--	--	0.01	--	--	--	--	--	--
Total	µmol/l	2.7	75	4.0	0.39	177	ND	0.14	19	0.02	0.02	0.02	0.78	0.01	0.08	0.09	ND	0.08	ND
MOLAR PERCENTAGE																				
TCE	%	47	1	38	43	64	ND	90	8	85	100	90	93	100	96	95	ND	96	ND
DCEs	%	50	58	13	56	36	ND	10	75	15	ND	10	5	ND	4	5	ND	3	ND
VC	%	3	21	5	1	ND	ND	ND	7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethane+Ethene	%	0.28	20	44	0.35	0.05	--	--	10	--	--	--	2	--	--	--	--	--	--
VOLATILE FATTY ACIDS																				
Acetic Acid	mg/l	**0.22 J**	**0.035 J**	**0.021 J**	**0.021 J**	**0.11 J**	**--**	**--**	**0.023 J**	**--**	**--**	**--**	**0.036 J**	**--**	**--**	**--**	**--**	**--**	**--**
Butyric Acid	mg/l	<1.0	**0.037 J**	**0.0094 J**	<0.1	<1.0	--	**--**	**0.013 J**	--	--	--	<0.1	**--**	--	--	--	**--**	**--**
Hexanoic Acid	mg/l	<2.0	<0.2	<0.2	<0.2	<2.0	--	--	<0.2	--	--	--	<0.2	**--**	--	--	--	**--**	**--**
i-Hexanoic Acid	mg/l	<2.0	<0.2	<0.2	<0.2	<2.0	--	--	<0.2	--	--	--	<0.2	--	--	--	--	**--**	**--**
i-Pentanoic Acid	mg/l	<1.0	<0.1	<0.1	<0.1	<1.0	--	--	<0.1	--	--	--	<0.1	**--**	--	--	--	**--**	**--**
Lactic Acid	mg/l	<2.0	**0.017 J**	**0.049 J**	<0.2	**0.078 J**	**--**	--	**0.015 J**	**--**	--	--	**0.0080 J**	**--**	**--**	**--**	**--**	**--**	--
Pentanoic Acid	mg/l	**0.40 J**	**0.031 J**	<0.1	<0.1	<1.0	--	--	<0.1	--	--	--	**0.030 J**	**--**	--	--	--	**--**	**--**
Propionic Acid	mg/l	<1.0	<0.1	<0.1	<0.1	<1.0	--	--	<0.1	--	--	--	**0.0090 J**	**--**	--	--	--	**--**	**--**
Pyruvic Acid	mg/l	<1.0	<0.1	<0.1	**0.017 J**	<1.0	**--**	--	<0.1	--	--	--	<0.1	**--**	--	--	--	**--**	**--**
OTHER LABORATORY DATA																				
Total Organic Carbon	mg/l	**15.4**	**4.2**	**3.9**	**18.6**	**252**	**--**	**--**	**1.5**	**--**	**--**	**--**	<1.0	**--**	**--**	**--**	**--**	**--**	**--**
WATER QUALITY PROBE DATA																				
Temperature	°C	**16.4**	**14.9**	**16.3**	**14.4**	**15.1**	**--**	**--**	**11.1**	**14.9**	**15.7**	**10.4**	**14.4**	**14.2**	**10.7**	**--**	**9.6**	**9.4**	**9.3**
Specific Conductance	uS/cm	**2,400**	**710**	**560**	**1,400**	**9,300**	**--**	**--**	**340**	**130**	**150**	**380**	**150**	**270**	**150**	**--**	**71**	**180**	**530**
pH	s.u.	**7.2**	**6.5**	**7.4**	**6.9**	**6.8**	**--**	**--**	**7.5**	**6.4**	**5.2**	**6.9**	**6.6**	**6.4**	**6.7**	**--**	**6.4**	**6.2**	**7.5**
Oxidation/Reduction Potential	mV	**210**	**13**	**120**	**80**	**17**	**--**	**--**	**99**	**68**	**210**	**98**	**150**	**110**	**96**	**--**	**75**	**81**	**74**
Dissolved Oxygen	mg/l	**6.6**	**0.28**	**0.16**	**3.7**	**0.41**	**--**	**--**	**0.56**	**6.9**	**8.5**	**1.7**	**6.8**	**7.0**	**1.8**	**--**	**9.6**	**2.2**	**0.60**
Turbidity	NTU	**1.2**	**2.4**	**0.98**	**3.3**	**3.5**	**--**	**--**	**0.82**	**0.92**	**128**	**--**	**0.43**	**2.3**	**--**	**--**	**--**	**--**	**--**
FIELD CHEMISTRY																				
Iron	mg/l	**0.03**	**6.5 OR**	**0.03**	**0.10**	**1.0**	**--**	**--**	**0.11**	**--**	**--**	**--**	**0.01**	**--**	**--**	**--**	**--**	**--**	**--**
Iron - Ferrous	mg/l	**0.02**	**4.8 OR**	**0.01**	**0.04**	**0.82**	**--**	**--**	**0.09**	**--**	**--**	**--**	**0.02**	**--**	**--**	**--**	**--**	**--**	**--**
Nitrate	mg/l	**1.3**	**0.90**	**0.80**	**2.5**	<0.5	**--**	**--**	**1.0**	**--**	**--**	**--**	**0.60**	**--**	**--**	**--**	**--**	**--**	**--**
Sulfate	mg/l	**166 OR**	**54**	**42**	**3.5**	**2,400**	**--**	**--**	**20**	**--**	**--**	**--**	**23**	**--**	**--**	**--**	**--**	**--**	**--**
Sulfide	µg/l	**2**	**25**	**4**	**5**	<10	--	**--**	**19**	**--**	--	**--**	**4**	**--**	**--**	**--**	**--**	--	**--**

TABLE 3
SUMMARY OF JUNE 2016 PERFORMANCE MONITORING
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Analyte Name	Unit	BP-22A	BP-23A	BP-24A	BP-24A	BP-25A	BP-26A	BP-27A	BP-30A	BP-31A	BP-31A	BP-32A	BP-34A	BP-35A	BP-35A	BP-36A	BP-36A	BP-37A	BP-38A	BP-39A
		BP-22A	BP-23A	BP-24A	DUP-4	BP-25A	BP-26A	BP-27A	BP-30A	BP-31A	DUP-1	BP-32A	BP-34A	BP-35A	DUP-2	BP-36A	DUP-3	BP-37A	BP-38A	BP-39A
		PDB	PDB	PDB	PDB	PDB	Low Flow	PDB	PDB	Low Flow	Low Flow	PDB	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow	Low Flow
		S	S	S	FD	S	S	S	S	S	FD	S	S	S	FD	S	FD	S	S	S
		6/22/2016	6/20/2016	6/22/2016	6/22/2016	6/22/2016	6/22/2016	6/22/2016	6/20/2016	6/21/2016	6/21/2016	6/23/2016	6/21/2016	6/21/2016	6/21/2016	6/22/2016	6/22/2016	6/22/2016	6/21/2016	6/21/2016
VOLATILE ORGANIC COMPOUNDS (VOCs)																				
Trichloroethene (TCE)	µg/l	<0.5	**2.5**	**1.6**	**1.7**	**0.80**	**0.70**	**3.3**	**42**	**12**	**11**	**0.60**	**33,000**	**3,600**	**4,000**	**180**	**170**	**10**	**120**	**53**
Dichloroethene (cis-1,2-)	µg/l	<0.5	**0.2 J**	**0.50**	**0.60**	<0.5	<0.5	**1.1**	**17**	**1.4**	**1.3**	<0.5	**36,000**	**5,000**	**5,700**	**9,100**	**9,100**	**1.1**	**23**	**55**
Dichloroethene (trans-1,2-)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**52 J**	**13 J**	<50	**14 J**	**12 J**	<0.5	**0.10 J**	**0.3 J**
Dichloroethene (1,1-)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**51 J**	**6.2 J**	<50	**19 J**	**19 J**	<0.5	**0.20 J**	**0.1 J**
Tetrachloroethene (PCE)	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**2.2**	**0.80**	**0.80**	<0.5	**50 J**	<25	**32 J**	<50	**82**	<0.5	**0.10 J**	<0.5
Vinyl chloride	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	**100 J**	<25	<50	**390**	**400**	<0.5	<0.5	<0.5
LIGHT GASSES																				
Ethane	µg/l	--	--	--	--	--	--	--	--	**0.0070 J**	**0.0097 J**	--	**3.3**	**0.15**	**0.20**	**6.5**	--	**0.089 J**	**0.014 J**	**0.013 J**
Ethene	µg/l	--	--	--	--	--	--	--	--	**0.045 J**	**0.0053 J**	--	**39**	**0.026 J**	**0.030 J**	**130**	--	**0.084 J**	**0.011 J**	**0.013 J**
Methane	µg/l	--	--	--	--	--	--	--	--	**0.16 J**	**0.31 J**	--	**1,100**	**0.77**	**1.1**	**960**	--	**340**	**0.24 J**	**0.14 J**
MOLAR CONCENTRATION																				
Trichloroethene (TCE)	µmol/l	ND	0.02	0.01	0.01	0.01	0.01	0.03	0.32	0.09	0.08	0.005	251	27	30	1.4	1.3	0.08	0.91	0.40
Dichloroethene (cis-1,2-)	µmol/l	ND	0.002	0.01	0.01	ND	ND	0.01	0.18	0.01	0.01	ND	371	52	59	94	94	0.01	0.24	0.57
Dichloroethene (trans-1,2-)	µmol/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.54	0.13	ND	0.14	0.12	ND	0.001	0.003
Dichloroethene (1,1-)	µmol/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.53	0.06	ND	0.20	0.20	ND	0.002	0.001
Tetrachloroethene (PCE)	µmol/l	ND	ND	ND	ND	ND	ND	ND	0.01	0.005	0.005	ND	0.30	ND	0.19	ND	0.49	ND	0.001	ND
Vinyl chloride	µmol/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.6	ND	ND	6.2	6.4	ND	ND	ND
Ethane	µmol/l	--	--	--	--	--	--	--	--	0.0002	0.0003	--	0.11	0.005	0.01	0.22	--	0.003	0.0005	0.0004
Ethene	µmol/l	--	--	--	--	--	--	--	--	0.002	0.0002	--	1.4	0.001	0.001	4.6	--	0.003	0.0004	0.0005
Total	µmol/l	ND	0.02	0.02	0.019	0.01	0.01	0.04	0.51	0.11	0.10	0.005	627	79	89	107	102	0.09	1.2	0.98
MOLAR PERCENTAGE																				
TCE	%	ND	90	70	68	100	100	69	63	81	82	100	40	35	34	1	1	81	79	41
DCEs	%	ND	10	30	32	ND	ND	31	35	13	13	ND	59	65	66	88	92	12	21	59
VC	%	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.3	ND	ND	6	6	ND	ND	ND
Ethane+Ethene	%	--	--	--	--	--	--	--	--	2	0.5	--	0.2	0.01	0.01	5	--	6	0.1	0.1
VOLATILE FATTY ACIDS																				
Acetic Acid	mg/l	--	--	--	--	--	--	--	--	**0.015 J**	**0.022 J**	--	**0.034 J**	**0.027 J**	**0.02 J**	**32**	--	**0.015 J**	**0.012 J**	**0.020 J**
Butyric Acid	mg/l	--	--	--	--	--	--	--	--	<0.1	<0.1	--	**0.015 J**	<0.1	<0.1	**4.1**	--	<0.1	<0.1	<0.1
Hexanoic Acid	mg/l	--	--	--	--	--	--	--	--	<0.2	<0.2	--	<0.2	<0.2	<0.2	**3.1**	--	<0.2	<0.2	<0.2
i-Hexanoic Acid	mg/l	--	--	--	--	--	--	--	--	<0.2	<0.2	--	<0.2	<0.2	<0.2	<0.2	--	<0.2	<0.2	<0.2
i-Pentanoic Acid	mg/l	--	--	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1	<0.1	**0.11**	--	<0.1	<0.1	<0.1
Lactic Acid	mg/l	--	--	--	--	--	--	--	--	**0.0063 J**	**0.013 J**	--	**0.0069 J**	**0.016 J**	**0.017 J**	<2.0	--	**0.0098 J**	<0.2	**0.016 J**
Pentanoic Acid	mg/l	--	--	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1	<0.1	**0.30**	--	<0.1	<0.1	<0.1
Propionic Acid	mg/l	--	--	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1	<0.1	**1.4**	--	<0.1	<0.1	<0.1
Pyruvic Acid	mg/l	--	--	--	--	--	--	--	--	<0.1	<0.1	--	<0.1	<0.1	<0.1	**0.054 J**	--	<0.1	<0.1	<0.1
OTHER LABORATORY DATA																				
Total Organic Carbon	mg/l	--	--	--	--	--	--	--	--	<1.0	<1.0	--	**4.6**	**1.5**	**1.5**	**34.1**	--	**1.8**	**0.73 J**	**1.3**
WATER QUALITY PROBE DATA																				
Temperature	°C	**9.3**	**9.4**	**9.9**	**9.9**	**9.9**	**15.0**	**10.0**	**11.5**	**12.2**	--	--	**14.6**	**13.6**	**13.6**	**12.0**	**12.0**	**16.0**	**13.1**	**12.3**
Specific Conductance	uS/cm	**750**	**210**	**160**	**160**	**280**	**280**	**410**	**130**	**330**	--	--	**910**	**810**	**810**	**550**	**550**	**670**	**210**	**130**
pH	s.u.	**7.7**	--	**6.7**	**6.7**	**7.3**	**5.4**	**6.4**	--	**7.6**	--	--	**7.1**	**7.6**	**7.6**	**7.1**	**7.1**	**7.1**	**6.6**	**6.2**
Oxidation/Reduction Potential	mV	**79**	**250**	**91**	**91**	**73**	**170**	**104**	**99**	**57**	--	--	**110**	**91**	**91**	**-150**	**-150**	**94**	**150**	**160**
Dissolved Oxygen	mg/l	**0.73**	**0.27**	**3.2**	**3.2**	**1.3**	**8.9**	**1.3**	**6.6**	**1.8**	--	--	**0.71**	**5.5**	**5.5**	**0.22**	**0.22**	**1.8**	**3.8**	**3.1**
Turbidity	NTU	--	--	--	--	--	**3.2**	--	--	**0.27**	--	--	**2.9**	**2.2**	**2.2**	**3.6**	**3.6**	**34**	**2.3**	**0.37**
FIELD CHEMISTRY																				
Iron	mg/l	--	--	--	--	--	--	--	--	**0.03**	--	--	**0.04**	**0.01**	**0.01**	**5.4 OR**	**5.4 OR**	**0.27**	**0.06**	**0.03**
Iron - Ferrous	mg/l	--	--	--	--	--	--	--	--	**0.12**	--	--	**0.04**	**0.02**	**0.02**	**5.1 OR**	**5.1 OR**	<0.5	**0.04**	**0.01**
Nitrate	mg/l	--	--	--	--	--	--	--	--	**0.90**	--	--	**1.1**	**0.80**	**0.80**	**0.90**	**0.90**	<0.5	**0.70**	**0.70**
Sulfate	mg/l	--	--	--	--	--	--	--	--	**28**	--	--	**82 OR**	**11**	**11**	**2.0**	**2.0**	**7.4**	**13**	**9.0**
Sulfide	µg/l	--	--	--	--	--	--	--	--	**10**	--	--	**8**	**11**	**11**	**96**	**96**	<1	**14**	**10**

TABLE 3
SUMMARY OF JUNE 2016 PERFORMANCE MONITORING
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Analyte Name	Unit	GC-2A GC-2A Low Flow S 6/23/2016	A-13 A-13 PDB S 6/20/2016	B-4 B-4 PDB S 6/20/2016	B-7 B-7 PDB S 6/20/2016	B-9 B-9 PDB S 6/20/2016	IB-7 IB-7 PDB S 6/20/2016	GC-1 Port 1 GC-1,P1 FLUTe S 6/23/2016	GC-1 Port 8 GC1,P8 FLUTe S 6/23/2016	BP-12D Port 1 BP-12D,P1 FLUTe S 6/23/2016	BP-12D Port 7 BP-12D,P7 FLUTe S 6/23/2016	BP-13D Port 1 BP-13D,P1 FLUTe S 6/23/2016	BP-13D Port 5 BP-13D,P5 FLUTe S 6/23/2016	BP-14D Port 1 BP-14D,P1 FLUTe S 6/23/2016	BP-14D Port 5 BP-14D,P5 FLUTe S 6/23/2016	BP-15D Port 5 BP-15D,P5 FLUTe S 6/23/2016
VOLATILE ORGANIC COMPOUNDS (VOCs)																
Trichloroethene (TCE)	µg/l	**5.9**	**45 J**	**4.7 J**	**55**	**78**	<5.0	**8.5**	**0.20 J**	<0.5	<0.5	**54**	**0.30 J**	<0.5	<0.5	<0.5
Dichloroethene (cis-1,2-)	µg/l	**0.9**	**8,800**	**140**	**240**	**1,900**	**1.2 J**	**23**	**22**	<0.5	<0.5	**21**	**1.5**	<0.5	<0.5	<0.5
Dichloroethene (trans-1,2-)	µg/l	<0.5	**24 J**	**1.0 J**	<25	<25	<5.0	<0.5	**0.20 J**	<0.5	<0.5	**0.20 J**	<0.5	<0.5	<0.5	<0.5
Dichloroethene (1,1-)	µg/l	<0.5	<100	<5.0	<25	<25	<5.0	<0.5	<0.5	<0.5	<0.5	**0.40 J**	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene (PCE)	µg/l	<0.5	<100	<5.0	**14 J**	**19 J**	<5.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vinyl chloride	µg/l	<0.5	**2,700**	**19**	**71**	**90**	<5.0	**3.1**	**5.6**	<0.5	<0.5	**1.0**	**0.20 J**	<0.5	<0.5	<0.5
LIGHT GASSES																
Ethane	µg/l	--	**27**	**8.3**	**20**	**20**	**19**	--	--	--	--	--	--	--	--	--
Ethene	µg/l	--	**4,300**	**56**	**260**	**130**	**0.041 J**	--	--	--	--	--	--	--	--	--
Methane	µg/l	--	**5,700**	**12,000**	**7,400**	**6,300**	**22,000**	--	--	--	--	--	--	--	--	--
MOLAR CONCENTRATION																
Trichloroethene (TCE)	µmol/l	0.04	0.34	0.04	0.42	0.59	ND	0.06	0.002	ND	ND	0.41	0.002	ND	ND	ND
Dichloroethene (cis-1,2-)	µmol/l	0.01	91	1.4	2.5	20	0.01	0.24	0.23	ND	ND	0.22	0.02	ND	ND	ND
Dichloroethene (trans-1,2-)	µmol/l	ND	0.25	0.01	ND	ND	ND	ND	0.002	ND	ND	0.002	ND	ND	ND	ND
Dichloroethene (1,1-)	µmol/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.004	ND	ND	ND	ND
Tetrachloroethene (PCE)	µmol/l	ND	ND	ND	0.08	0.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µmol/l	ND	43	0.30	1.1	1.4	ND	0.05	0.09	ND	ND	0.02	0.003	ND	ND	ND
Ethane	µmol/l	--	0.90	0.28	0.67	0.67	0.63	--	--	--	--	--	--	--	--	--
Ethene	µmol/l	--	153	2.0	9.3	4.6	0.001	--	--	--	--	--	--	--	--	--
Total	µmol/l	0.05	289	4.1	14	27	0.65	0.35	0.32	ND	ND	0.65	0.02	ND	ND	ND
MOLAR PERCENTAGE																
TCE	%	83	0.12	1	3	2	ND	18	0.5	ND	ND	63	11	ND	ND	ND
DCEs	%	17	32	36	18	72	2	67	72	ND	ND	34	74	ND	ND	ND
VC	%	ND	15	7	8	5	ND	14	28	ND	ND	2	15	ND	ND	ND
Ethane+Ethene	%	--	53	56	71	20	98	--	--	--	--	--	--	--	--	--
VOLATILE FATTY ACIDS																
Acetic Acid	mg/l	--	**160**	**420**	**580**	**160**	**0.27 J**	--	--	--	--	--	--	--	--	--
Butyric Acid	mg/l	--	**13**	**45**	**340**	**100**	<1.0	--	--	--	--	--	--	--	--	--
Hexanoic Acid	mg/l	--	**4.0**	**19**	**130**	**21**	<2.0	--	--	--	--	--	--	--	--	--
i-Hexanoic Acid	mg/l	--	**0.12 J**	**0.37**	**5.4**	**4.9**	<2.0	--	--	--	--	--	--	--	--	--
i-Pentanoic Acid	mg/l	--	**1.0**	<1.0	**11**	**0.80 J**	<1.0	--	--	--	--	--	--	--	--	--
Lactic Acid	mg/l	--	<2.0	<20	**0.9 J**	**0.45 J**	<2.0	--	--	--	--	--	--	--	--	--
Pentanoic Acid	mg/l	--	**9.5**	**39**	**330**	**72**	<1.0	--	--	--	--	--	--	--	--	--
Propionic Acid	mg/l	--	**51**	**130**	**490**	**670**	<1.0	--	--	--	--	--	--	--	--	--
Pyruvic Acid	mg/l	--	**17**	**44**	**1.3 J**	**1.1**	<1.0	--	--	--	--	--	--	--	--	--
OTHER LABORATORY DATA																
Total Organic Carbon	mg/l	--	**137**	**435**	**3440**	**1750**	**57.5**	--	--	--	--	--	--	--	--	--
WATER QUALITY PROBE DATA																
Temperature	°C	**12.2**	--	--	--	--	--	**11.0**	**11.7**	**11.2**	**11.5**	**11.4**	**11.2**	**12.3**	**11.0**	**10.7**
Specific Conductance	uS/cm	**120**	--	--	--	--	--	**400**	**430**	**440**	**1,200**	**580**	**560**	**320**	**600**	**720**
pH	s.u.	**5.5**	--	--	--	--	--	**6.9**	**7.2**	**7.1**	**7.3**	**7.4**	**7.3**	**7.2**	**7.2**	**7.3**
Oxidation/Reduction Potential	mV	**110**	--	--	--	--	--	**-44**	**-120**	**23**	**-84**	**160**	**-140**	**83**	**-110**	**-86**
Dissolved Oxygen	mg/l	**7.0**	--	--	--	--	--	**2.3**	**3.1**	**1.1**	**1.8**	**12**	**1.5**	**8.6**	**1.1**	**1.0**
Turbidity	NTU	**2.0**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FIELD CHEMISTRY																
Iron	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron - Ferrous	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nitrate	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfate	mg/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sulfide	µg/l	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

TABLE 3
SUMMARY OF JUNE 2016 PERFORMANCE MONITORING
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Analyte Name	Unit	111 111 Surface Water S 6/20/2016	113 113 Surface Water S 6/20/2016	POLY3 TOTE 1 Purge Water S 6/24/2016
VOLATILE ORGANIC COMPOUNDS (VOCs)				
Trichloroethene (TCE)	µg/l	<0.5	**2.2**	**100**
Dichloroethene (cis-1,2-)	µg/l	<0.5	<0.5	**240**
Dichloroethene (trans-1,2-)	µg/l	<0.5	<0.5	<10
Dichloroethene (1,1-)	µg/l	<0.5	<0.5	<10
Tetrachloroethene (PCE)	µg/l	<0.5	<0.5	<10
Vinyl chloride	µg/l	<0.5	<0.5	<10
LIGHT GASSES				
Ethane	µg/l	--	--	--
Ethene	µg/l	--	--	--
Methane	µg/l	--	--	--
MOLAR CONCENTRATION				
Trichloroethene (TCE)	µmol/l	ND	0.02	--
Dichloroethene (cis-1,2-)	µmol/l	ND	ND	--
Dichloroethene (trans-1,2-)	µmol/l	ND	ND	--
Dichloroethene (1,1-)	µmol/l	ND	ND	--
Tetrachloroethene (PCE)	µmol/l	ND	ND	--
Vinyl chloride	µmol/l	ND	ND	--
Ethane	µmol/l	--	--	--
Ethene	µmol/l	--	--	--
Total	µmol/l	ND	0.02	--
MOLAR PERCENTAGE				
TCE	%	ND	100	--
DCEs	%	ND	ND	--
VC	%	ND	ND	--
Ethane+Ethene	%	--	--	--
VOLATILE FATTY ACIDS				
Acetic Acid	mg/l	--	--	--
Butyric Acid	mg/l	--	--	--
Hexanoic Acid	mg/l	--	--	--
i-Hexanoic Acid	mg/l	--	--	--
i-Pentanoic Acid	mg/l	--	--	--
Lactic Acid	mg/l	--	--	--
Pentanoic Acid	mg/l	--	--	--
Propionic Acid	mg/l	--	--	--
Pyruvic Acid	mg/l	--	--	--
OTHER LABORATORY DATA				
Total Organic Carbon	mg/l	--	--	--
WATER QUALITY PROBE DATA				
Temperature	°C	**20.3**	**12.9**	--
Specific Conductance	uS/cm	**120**	**230**	--
pH	s.u.	**5.8**	**--**	--
Oxidation/Reduction Potential	mV	**-61**	**-240**	--
Dissolved Oxygen	mg/l	**5.7**	**5.7**	--
Turbidity	NTU	--	--	--
FIELD CHEMISTRY				
Iron	mg/l	--	--	--
Iron - Ferrous	mg/l	--	--	--
Nitrate	mg/l	--	--	--
Sulfate	mg/l	--	--	--
Sulfide	µg/l	--	--	--

Notes:
1. The table summarizes samples collected during the week of June 20, 2016 as part of performance testing at the IBM Gun Club former Burn Pit Area. Samples were analyzed both in the field and at fixed analytical laboratories as indicated on the table.

2. Analytical laboratory analysis was performed by Eurofins Lancaster Laboratories of Lancaster, Pennsylvania (Lancaster) and/or Microseeps, Inc. of Pittsburgh, Pennsylvania (Microseeps). Results of compounds are recorded in units indicated on the table. Detections of compounds are emboldened.

3. Definitions:
"S" indicates primary sample
"FD" indicates field duplicate
"PDB" indicates the sample was collected via a passive diffusion bag
"--" indicates the compounds were not analyzed for that particular sample.
"U" indicates the result was below the analytical detection limit.
"J" indicates that the laboratory data was below the lowest quantifiable limit and therefore estimated.
"*" indicates that the sample exhibited high turbidity and could not be analyzed in the field. Recorded results are from analysis at Lancaster and/or Microseeps.
"UR" indicates results were under the calibration range and no result was obtained.
"OR" indicates results were over the calibration range and should be considered estimated.
"ND" indicates that results were not detected above the analytical reporting limit or the calibration range of the field screening device.

4. Refer to the report text for further discussion. The sample plan can be referenced in the Site Management Plan .

Figure 1

Summary of June 2016 Groundwater Quality Conditions

2016 Annual Routine Monitoring

IBM Gun Club - Former Burn Pit Area

Union, New York

Drawn By:	C. LaVack
Designed By:	E. Bosse
Reviewed By:	D. Carr
Project No:	3526.05
Date:	August 2016

Figure Narrative

The figure is intended to depict groundwater quality data and inference recorded during the week of June 21, 2016.

The groundwater data for site key VOCs including PCE, TCE, cDCE, vinyl chloride from water table monitoring wells are presented as pie diagrams. The wedges of each pie diagram represent concentrations of the four compounds expressed in micromoles per liter (umol/L). The relative diameter of each pie diagram varies based on the sum of the four VOCs at each location.

The inferred geochemical (REDOX) conditions are based on observations of oxidation-reduction potential (ORP), methane, sulfide, ferrous and total iron, and nitrate. Methanogenic conditions are characterized by methane concentrations = 20 µg/L, sulfate reducing by sulfide = 50 µg/L, iron reducing by Fe(II)/Fe(tot) = 0.7 mg/L, and nitrate reduction by nitrate < 1 mg/L. ORP is generally expected to be less than 200 for iron reduction, less than 100 for sulfate reduction, and less than 0 for methanogenic conditions.

Refer to the report text for further discussion.

Legend

BP-34A 33,000 — Well Name and June 2016 TCE Concentrations in Groundwater (µg/L).

Inferred Groundwater Contour 6/23/2016

Methanogenic, Methane >= 20 µg/L

Sulfate Reducing, Sulfide >= 50 µg/L

Parent VOC (Trichloroethene)

Primary Daughter Product (*cis*-1,2DCE)

Secondary Daughter Product (Vinyl Chloride)

Terminal Breakdown Products (Ethane, Ethene)

Total Chlorinated Ethanes & Ethenes in Groundwater (µmol/L)

< 0.1

>0.1 to 1

>1 to 10

>10 to 100

>100

40 20 0 40 80

Feet

SANBORN HEAD

Last Edited By: clavack

Figure 2

Groundwater Quality Conditions for Key Site VOCs - June 2016

2016 Annual Routine Monitoring

IBM Gun Club - Former Burn Pit Area

Union, New York

Drawn By:	C. LaVack
Designed By:	E. Bosse
Reviewed By:	D. Carr
Project No:	3526.05
Date:	August 2016

Figure Narrative

This figure depicts groundwater data for key site VOCs from monitoring of water table wells in June 2016.

The data for TCE, selected breakdown products, and carbon tetrachloride are presented as pie diagrams. The wedges of each pie diagram represent concentrations expressed in micrograms per liter (ug/L). The relative diameter of each pie diagram varies based on the sum of the VOCs at each location.

Refer to report text for further discussion.

Legend

- Injection Boring
- Dry Well/Surface Water Location

BP-34A
33,000 — Well Name and June 2016 TCE Concentrations in Groundwater (µg/L).

- Trichloroethene (TCE)
- *cis*-1,2 Dichloroethene (*cis*-1,2 DCE)
- Vinyl Chloride (VC)
- Carbon Tetrachloride (CCl4)

Total Chlorinated Ethenes and Carbon Tetrachloride in Groundwater (µg/L)

- <10
- Not detected above lab reporting limits
- >10 to 100
- >100 to 1,000
- >1,000 to 10,000
- >10,000

25 12.5 0 25 50
Feet

SANBORN HEAD ENGINEERING

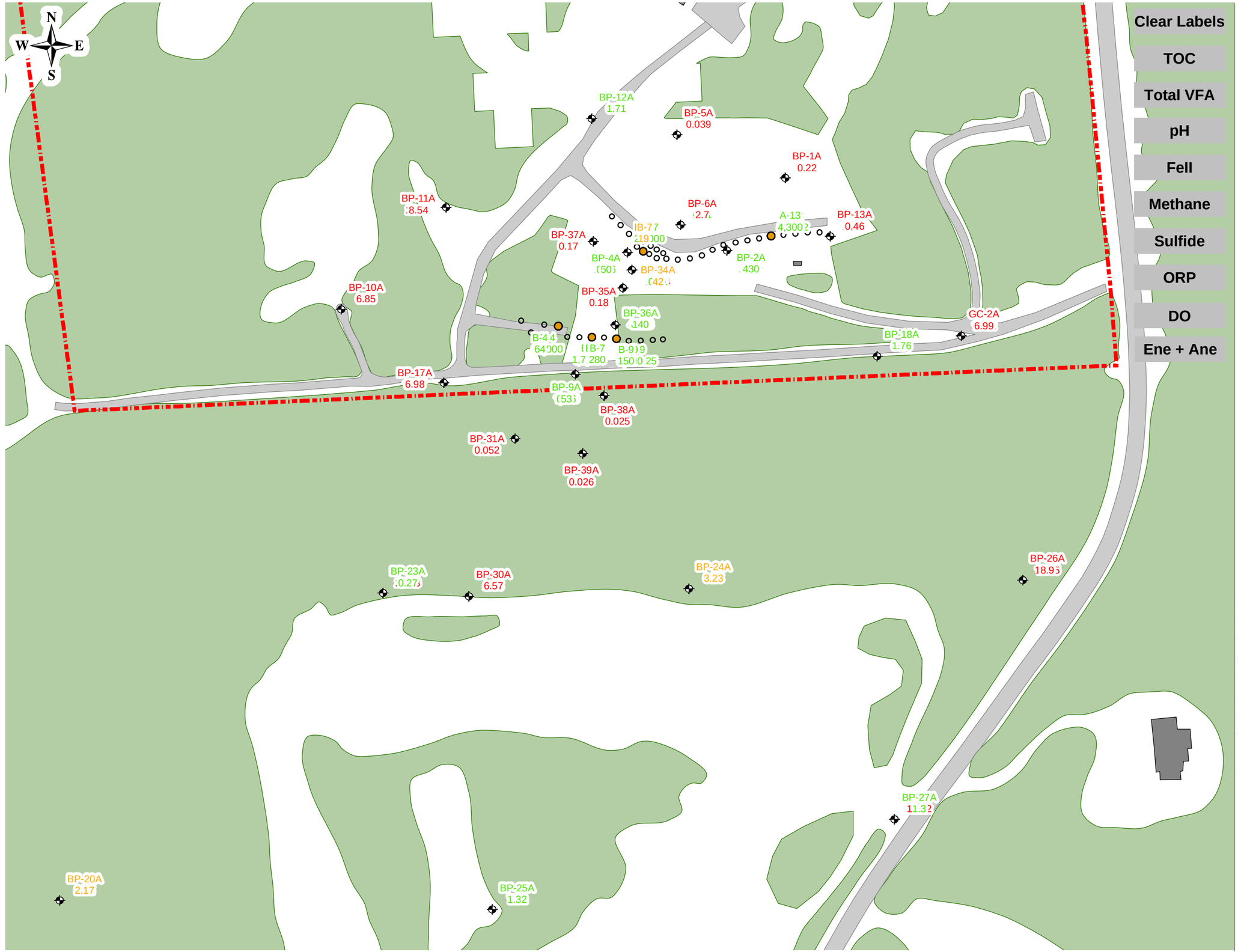

Figure 3

June 2016 Assessment of Reducing Conditions

Working

IBM Gun Club - Former Burn Pit Area

Union, New York

Drawn By:	C. LaVack
Designed By:	E. Bosse
Reviewed By:	D. Carr
Project No:	3526.05
Date:	August, 2016

Figure Narrative

This figure is intended to assess multiple lines of evidence to assess what proportion of the primary and secondary source rock are under sulfate reducing and methanogenic conditions. Green labels indicate conditions conducive to reductive dehalogenation. Orange labels indicate reductive dehalogenation may be possible, but conditions are less conducive. Red labels indicate more oxidizing conditions where reductive dehalogenation is less likely.

Posted data is from the June 2016 sampling round.

Legend

DO mg/L	>5	2-5	<=2
ORP mV	>100	0-100	<=0
Sulfide µg/L	<10	10-50	>=50
Methane µg/L	<0.5	0.5-20	>=20
FeII mg/L	<1		>=1
pH SU	6.3-7.5		<6.3 or >7.5
Total VFA mg/L	<1		>=1
TOC mg/L	<4		>=4
Ethane + Ethene µg/L	<10	10-50	>=50

60 30 0 60 120

Feet

SANBORN HEAD

SEPTEMBER 2016 PERFORMANCE TESTING

SANBORN HEAD ENGINEERING

SUMMARY OF SEPTEMBER 2016 WATER QUALITY MONITORING

IBM Gun Club – Former Burn Pit Area
Union, New York

INTRODUCTION AND SUMMARY

This memorandum is intended to summarize the program of remedy performance monitoring conducted in September 2016. It documents and summarizes the sampling event and provides tabular and figure summaries of the field and laboratory data. The field work was conducted during the week of September 19, 2016 in general accordance with the scope and procedures discussed in Appendix J of the amended Site Management Plan (SMP)[1].

This memorandum will be included as a component of the next Periodic Review Report, due in March 2018, and has been prepared consistent with the Monitoring Reporting Requirements discussed in Section 3.6 of the SMP. The Sanborn Head field staff included Chris Norton and Matthew Stein.

The field and laboratory data indicate continued remedy performance consistent with project performance goals established in the SMP. The area of subsurface where methanogenic and sulfate-reducing conditions may exist is similar to that observed in the June sampling. In general, the proportion of TCE on a molar basis was marginally lower compared to June in water from the majority of monitoring wells within the injection displacement zone and just downgradient to the north and south, while similar to marginally higher in water from locations further downgradient such as BP-5A, BP-34A, and BP-38A.

Geochemical conditions remain conducive to reductive dehalogenation over much of the primary source rock. The terminal breakdown products ethene and ethane are the predominant species in water from four of the five injection boreholes sampled regularly (A-13, B-4, B-7, and IB-7). The five injection boreholes continue to exhibit order of magnitude or greater decreases in TCE concentrations compared to historical high concentrations at these locations. The data support gradual destruction of chlorinated ethene mass to its terminal breakdown products, and continued reduced TCE mass discharge off site to the south by nearly 99% compared to pre-remediation conditions. The data suggest some rebound in the presence of biochemical breakdown products in the samples from the B-series injection wells.

Groundwater temperatures at all locations are observed to be in the range conducive to processes contributing to reductive dehalogenation. The average temperature in boreholes recorded during September sampling was about 2 °C higher compared to June sampling. In

[1] Site Management Plan – April 2016 Revision, Brownfield Cleanup Program, IBM Gun Club – Former Burn Pit area, Union, New York, NYSDEC Site #C704044, BCA Index #B7-0661004-05, prepared on behalf of IBM by Sanborn, Head & Associates, Inc., April 25, 2016.

general, monitoring wells exhibited temperatures in the top 10% of observations over the last several years.

Total organic carbon (TOC) concentrations in injection boreholes continue to decline consistent with consumption of electron donor. Concentrations exceed 100 milligrams per liter (mg/l), in water from 4 of 5 sampled injection boreholes. One hundred milligrams per liter is a threshold below which we have observed evidence of diminishing remediation performance.

Accordingly, it is our opinion that additional introduction of electron donor amendment is not warranted at this time. We would prefer to limit amendment injections until we observe clear evidence of diminishing returns with the goal of injections at most every two years. Our last injection was conducted over a year ago in August 2015. While there is some evidence that conditions conducive to reductive dehalogenation may be lessening, especially in down gradient locations, overall geochemical conditions indicate reductive dehalogenation continues to occur over much of the primary source rock. We recommend that IBM plan for the next injection in 2017.

The next performance monitoring event is to be conducted in April 2017.

SCOPE OF WORK

The scope of work included:

- Limited groundwater elevation survey;
- Water quality sampling associated with the performance monitoring program;
- Calibration of dedicated water quality probes installed in five monitoring wells; and
- Water quality parameter field screening and field geochemical testing.

Groundwater Elevation Survey

On September 19, 2016, prior to starting the water quality sampling program, the depths to water in select monitoring wells and injection boreholes were gauged in accordance with procedures detailed in Appendix G of the SMP. Water levels were also measured and recorded for monitoring points at the time sampling was conducted. Based on the depth to water data and survey information, groundwater elevations were calculated for each location. Depth to water measurements and groundwater elevations are summarized on Table 2.

Water Quality Sampling

The scope of sampling as originally planned is included as Table 1. The scope was modified as follows as a result of field conditions:

- Water from BP-6A and BP-37A was deemed too turbid for geochemical field testing, and samples were collected for laboratory analysis;
- The sample collected from BP-13A was not submitted for VFA analysis, and field screening was not conducted due to lack of sufficient water volume; and
- Surface water points 111, 112, 113 and 118 were dry during September 2016 and could not be sampled.

Exhibit 1 below summarizes the sampling methods used during the monitoring event. The quality assurance/quality control (QA/QC) samples collected for VOC analysis are summarized in Exhibit 2. Samples (including QA/QC samples) submitted for fixed laboratory analysis or field screening are tabulated in Exhibit 3. Laboratory and field analytical data are summarized in Table 3.

Exhibit 1 Summary of Sampling Methods

Sample Method	Number of Locations Sampled
Modified Low-Flow	14
Bladder Pump Grab	0
Purge Water (Tote) Grab Sample	1
Submerged Container (surface water)	0
Passive Diffusion Bag	5
fLUTE® Purge	0

Exhibit 2 Summary of QA/QC Samples for VOC analysis

Total Sample Locations	20
Duplicate Samples	3
Matrix Spikes	1
Matrix Spike Duplicates	1
Field Blanks	3
Equipment Blanks	1
Trip Blanks	2

Exhibit 3 Summary of Analytical Type

Sample Type - Fixed Laboratory	Laboratory	Number of Samples
VOCs	Lancaster	31
Total Organic Carbon	Lancaster	22
Volatile Fatty Acids	Microseeps	21
Light Gases (Ethane, Ethene, and Methane)	Microseeps	22
Geochemical Analyses	Microseeps	2
Sample Type - Field Screening	**Laboratory**	**Number of Samples**
Field Geochemistry	Sanborn Head	11

A summary of groundwater quality data and inference is presented in Figure 1. An interactive plan view figure included as Figure 2 can be used to view the geochemical data

used in inferring the geochemical conditions shown on Figure 1. Field sampling records and analytical laboratory reports are kept on file and are available by request.

Equipment Calibration

Exhibit 4 below summarizes the field instruments utilized during field sampling. The instruments were calibrated each morning and a calibration check was performed at the end of each day.

Exhibit 4 Summary of Field Instrumentation

INSTRUMENT	FIELD PARAMETER
YSI Water Quality Parameter Probe	Temperature, pH, Specific Conductance, Dissolved Oxygen, and Oxidation-reduction Potential
HACH 2100P Turbidimeter	Turbidity
HACH DR2800 Spectrophotometer	Total and Ferrous Iron, Nitrate, Sulfate, and Sulfide

Attachments:

Table 1 Scope of Performance Monitoring
Table 2 Summary of Water Level Data
Table 3 Summary of September 2016 Performance Monitoring
Figure 1 Summary of September 2016 Groundwater Quality Conditions
Figure 2 Summary of Geochemical Conditions

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Table 1
Summary of Routine and Performance Monitoring Program
IBM Gun Club - Former Burn Pit Area
Union, New York

Monitoring Type	Monitoring Location	Monitoring Location Type	Sample Method				Analytical Laboratory				Field Screening	
			Low Flow	PDBs	Nitrogen Purge	Surface Water	VOCs	Light Gasses	TOC	VFAs	Water Quality Parameter	Field Geochemistry
Routine Monitoring (Annually in June)	BP-7A	Monitoring Well		x			x				x	
	BP-8A	Monitoring Well		x			x				x	
	BP-10A	Monitoring Well		x			x				x	
	BP-11A	Monitoring Well		x			x				x	
	BP-12A	Monitoring Well		x			x				x	
	BP-14A	Monitoring Well		x			x				x	
	BP-16A	Monitoring Well		x			x				x	
	BP-17A	Monitoring Well		x			x				x	
	BP-18A	Monitoring Well		x			x				x	
	BP-19A	Monitoring Well		x			x				x	
	BP-20A	Monitoring Well		x			x				x	
	BP-21A	Monitoring Well		x			x				x	
	BP-22A	Monitoring Well		x			x				x	
	BP-23A	Monitoring Well		x			x				x	
	BP-24A	Monitoring Well		x			x				x	
	BP-25A	Monitoring Well		x			x				x	
	BP-26A	Monitoring Well		x			x				x	
	BP-27A	Monitoring Well		x			x				x	
	BP-30A	Monitoring Well		x			x				x	
	BP-32A	Monitoring Well		x			x				x	
	GC-2A	Monitoring Well		x			x				x	
	GC-1, P-1	Multi-Depth			x		x				x	
	GC-1, P-8	Multi-Depth			x		x				x	
	BP-12D, P1	Multi-Depth			x		x				x	
	BP-12D, P7	Multi-Depth			x		x				x	
	BP-13D, P1	Multi-Depth			x		x				x	
	BP-13D, P5	Multi-Depth			x		x				x	
	BP-15D, P1	Multi-Depth			x		x				x	
	BP-15D, P5	Multi-Depth			x		x				x	
Performance Monitoring (3x/year in April, June, and Sept/October)	IB-7	Injection Borehole		x			x	x	x	x		
	A-13	Injection Borehole		x			x	x	x	x		
	B-4	Injection Borehole		x			x	x	x	x		
	B-7	Injection Borehole		x			x	x	x	x		
	B-9	Injection Borehole		x			x	x	x	x		
	BP-1A	Monitoring Well	x				x	x	x	x	x	x
	BP-2A	Monitoring Well	x				x	x	x	x	x	x
	BP-4A	Monitoring Well	x				x	x	x	x	x	x
	BP-5A	Monitoring Well	x				x	x	x	x	x	x
	BP-6A	Monitoring Well	x				x	x	x	x	x	x
	BP-9A	Monitoring Well	x				x	x	x	x	x	x
	BP-13A	Monitoring Well	x				x	x	x	x	x	x
	BP-31A	Monitoring Well	x				x	x	x	x	x	x
	BP-34A	Monitoring Well	x				x	x	x	x	x	x
	BP-35A	Monitoring Well	x				x	x	x	x	x	x
	BP-36A	Monitoring Well	x				x	x	x	x	x	x
	BP-37A	Monitoring Well	x				x	x	x	x	x	x
	BP-38A	Monitoring Well	x				x	x	x	x	x	x
	BP-39A	Monitoring Well	x				x	x	x	x	x	x
	111	Seep/spring				x	x				x	
	112	Seep/spring				x	x				x	
	113	Seep/spring				x	x				x	
	118	Seep/spring				x	x				x	
	SW-Z	Seep/spring				x	x				x	
		Total	**14**	**26**	**8**	**5**	**53**	**19**	**19**	**19**	**48**	**14**

Notes:
1. This table is intended to summarize the programs of routine and performance monitoring for remedy operations at the IBM Gun Club - Former Burn Pit Area starting in 2016. Additional monitoring points may be sampled based on field observations. "SW-Z" serves as a placeholder for sampling any on-site seep or spring that can be reasonably sampled. The table summarizes sample method, analytical laboratory analysis, and field screening.

2. Sample method:
"Low Flow" indicates samples will be collected by bladder pump using low flow techniques.
"PDBs" indicates that the well has sufficient water column to sample with passive diffusion bags - if conditions are observed to be different than anticipated, sampling will proceed using low flow techniques.
"Nitrogen purge" indicates that sample will be collected by purging the multi-level port with nitrogen (multi-level systems only).
"Surface water" samples will be collected using a clean glass vial.

3. Analytical laboratory samples:
"VOCs" indicates volatile organic compounds.
"Light gasses" includes methane, ethene and ethane.
"TOC" indicates total organic carbon.
"VFAs" indicates volatile fatty acids.

4. " Water quality parameters" indicates screening during well purging and water quality sampling by multi-parameter probes, e.g. by YSI® 556 multi-Probe meter or similar and HACH® turbidity meter or similar (low flow, multi-level system, bailer, and surface water sampling) or by water quality parameter sounding (PDB sampling). The water quality parameters may include temperature, specific conductance, oxidation-reduction potential, dissolved oxygen, pH, and turbidity. In addition surface water samples will include water clarity descriptors (transparency, translucence, or opaqueness, and color).

5. "Field Geochemistry" will be performed during performance monitoring by using reagent kits and a spectrophotometer (HACH® DR 800, DR 2800, or similar). The field geochemistry includes analysis for sulfate, sulfide, ferrous iron, total iron, and oxygen. In some cases elevated turbidity (>10 NTU) or color may interfere with the spectrophotometric analysis. In such cases field geochemistry samples will be supplemented with samples submitted to an analytical laboratory as outlined in the Site Management Plan.

Table 2
Summary of Water Level Data
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Well Location	Reference Elevation (ft amsl)	Depth to Water (ft bgs)	Equivalent Potentiometric Elevation (ft amsl)
A-13	1394.25	17.30	1376.95
B-4	1385.03	7.76	1377.27
B-7	1385.33	9.70	1375.63
B-9	1385.21	13.46	1371.75
BP-1A	1396.03	17.65	1378.38
BP-2A	1397.15	11.91	1385.24
BP-4A	1392.28	15.00	1377.28
BP-5A	1391.23	17.72	1373.51
BP-6A	1394.10	18.02	1376.08
BP-9A	1379.54	13.51	1366.03
BP-10A	1381.74	14.83	1366.91
BP-11A	1384.80	15.02	1369.78
BP-13A	1399.17	18.37	1380.80
BP-17A	1376.72	13.47	1363.25
BP-31A	1370.63	13.98	1356.65
BP-34A	1392.73	16.45	1376.28
BP-35A	1392.01	17.92	1374.09
BP-36A	1383.88	14.85	1369.03
BP-37A	1390.31	12.90	1377.41
BP-38A	1375.84	14.58	1361.26
BP-39A	1370.47	14.75	1355.72
GC-2A	1384.66	21.20	1363.46
IB-7	1393.23	8.93	1384.30

Notes:

1. This table summarizes depth to water measurements and calculated water table elevations recorded during the September 2016 performance monitoring round on September 20-22, 2016. Measurements were collected relative to the marked reference point at each location using a QED MP30 water level meter.

2. Abbreviations
ft amsl = feet above mean sea level
ft bgs = feet below ground surface

TABLE 3
SUMMARY OF SEPTEMBER 2016 PERFORMANCE MONITORING
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Analyte Name	Unit	BP-1A BP-1A Low Flow S 9/21/2016	BP-2A BP-2A Low Flow S 9/21/2016	BP-4A BP-4A Low Flow S 9/21/2016	BP-4A DUP-3 Low Flow FD 9/21/2016	BP-5A BP-5A Low Flow S 9/21/2016	BP-6A BP-6A Low Flow S 9/21/2016	BP-9A BP-9A Low Flow S 9/20/2016	BP-13A BP-13A Low Flow S 9/21/2016	BP-31A BP-31A Low Flow S 9/20/2016	BP-34A BP-34A Low Flow S 9/21/2016	BP-35A BP-35A Low Flow S 9/20/2016	BP-36A BP-36A Low Flow S 9/20/2016	BP-36A DUP-2 Low Flow FD 9/20/2016
VOLATILE ORGANIC COMPOUNDS (VOCs)														
Trichloroethene (TCE)	µg/l	**65**	**24 J**	**290**	**300**	**32**	**4,600**	**270**	**54**	**11**	**23,000**	**3,900**	**170**	**210**
Dichloroethene (cis-1,2-)	µg/l	**100**	**5,300**	**87**	**78**	**22**	**18,000**	**2,400**	**2.0**	**1.3**	**16,000**	**5,100**	**7,100**	**7,500**
Dichloroethene (trans-1,2-)	µg/l	**1.0**	**9.8 J**	**3.7**	**2.1 J**	**0.50**	**29 J**	**11 J**	<0.5	<0.5	<250	**38**	**15 J**	**19 J**
Dichloroethene (1,1-)	µg/l	**0.40 J**	**7.3 J**	**0.80 J**	**0.90 J**	<0.5	**45 J**	**7.1 J**	<0.5	<0.5	<250	**5.2 J**	**10 J**	**14 J**
Tetrachloroethene (PCE)	µg/l	<0.5	<25	<2.5	<2.5	<0.5	<100	<25	<0.5	**0.60**	<250	<25	<50	<50
Vinyl chloride	µg/l	**0.20 J**	**1,800**	**34**	**29**	**0.30 J**	**64 J**	**190**	<0.5	<0.5	<250	<25	**870**	**900**
LIGHT GASSES														
Ethane	µg/l	**0.025 J**	**1.1**	**12**	**13**	**0.017 J**	**0.47**	**2.0**	**0.0066 J**	**0.0035 J**	**3.0**	**0.80**	**4.1**	**3.6**
Ethene	µg/l	**0.031 J**	**370**	**62**	**71**	**0.074 J**	**10**	**77**	**0.0026 J**	**0.014 J**	**2.2**	**0.044 J**	**140**	**140**
Methane	µg/l	**0.16 J**	**1,300**	**1,400**	**1,600**	**0.92**	**7.7**	**2,000**	**0.46 J**	**0.48 J**	**1,000**	**1.4**	**1,900**	**1,900**
MOLAR CONCENTRATION														
Trichloroethene (TCE)	µmol/l	0.49	0.18	2.2	2.3	0.24	35	2.1	0.41	0.08	180	30	1.3	1.6
Dichloroethene (cis-1,2-)	µmol/l	1.0	55	0.90	0.80	0.23	190	25	0.02	0.01	170	53	73	77
Dichloroethene (trans-1,2-)	µmol/l	0.01	0.10	0.04	0.02	0.01	0.30	0.11	ND	ND	ND	0.39	0.15	0.20
Dichloroethene (1,1-)	µmol/l	0.004	0.08	0.01	0.01	ND	0.46	0.07	ND	ND	ND	0.05	0.10	0.14
Tetrachloroethene (PCE)	µmol/l	ND	ND	ND	ND	ND	ND	ND	ND	0.004	ND	ND	ND	ND
Vinyl chloride	µmol/l	0.003	29	0.54	0.46	0.005	1.0	3.0	ND	ND	ND	ND	14	14
Ethane	µmol/l	0.001	0.04	0.40	0.43	0.001	0.02	0.07	0.0002	0.0001	0.10	0.03	0.14	0.12
Ethene	µmol/l	0.001	13	2.2	2.5	0.003	0.36	2.7	0.0001	0.0005	0.08	0.002	5.0	5.0
Total	µmol/l	1.5	97	6.3	6.5	0.49	227	33	0.43	0.10	350	83	94	98
MOLAR PERCENTAGE														
TCE	%	32	0.19	35	35	50	15	6.4	95	83	51	36	1.4	1.6
DCEs	%	68	57	15	13	48	84	76	4.8	13	49	64	78	79
VC	%	0.21	30	8.6	7.1	1.0	ND	9.1	ND	ND	ND	ND	15	14
Ethane+Ethene	%	0.13	14	41	45	0.66	0.16	8.6	0.07	0.61	0.05	0.03	5.5	--
VOLATILE FATTY ACIDS														
Acetic Acid	mg/l	**0.052 J**	**0.030 J**	**0.023 J**	**0.044 J**	**0.022 J**	**3.1 J**	**0.049 J**	--	**0.030 J**	**0.055 J**	**0.024 J**	**44**	**54**
Butyric Acid	mg/l	**0.029 J**	**0.011 J**	<0.1	**0.0094 J**	**0.014 J**	<10	<0.1	--	**0.011 J**	**0.015 J**	**0.0077 J**	**6.0**	**6.9**
Hexanoic Acid	mg/l	<0.2	<0.2	**0.011 J**	<0.2	**1.6**	<20	<0.2	--	<0.2	**0.0098 J**	<0.2	**3.3**	**3.3**
i-Hexanoic Acid	mg/l	<0.2	<0.2	<0.2	<0.2	**0.068 J**	<20	<0.2	--	<0.2	<0.2	<0.2	<0.2	<0.2
i-Pentanoic Acid	mg/l	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<0.1	--	<0.1	<0.1	<0.1	**0.045 J**	**0.07 J**
Lactic Acid	mg/l	**0.041 J**	**0.016 J**	**0.033 J**	**0.029 J**	**0.060 J**	**1.2 J**	**0.052 J**	--	**0.036 J**	**0.017 J**	**0.033 J**	<0.2	<0.2
Pentanoic Acid	mg/l	<0.1	**0.028 J**	**0.086 J**	**0.094 J**	**0.056 J**	**3.4 J**	**0.023 J**	--	<0.1	**0.050 J**	**0.036 J**	**0.51**	**0.46**
Propionic Acid	mg/l	**0.0048 J**	**0.0048 J**	<0.1	<0.1	<0.1	<10	<0.1	--	**0.0047 J**	**0.0028 J**	**0.0022 J**	**2.5**	**2.4**
Pyruvic Acid	mg/l	**0.0075 J**	<0.1	<0.1	**0.0086 J**	**0.027 J**	**18**	<0.1	--	<0.1	**0.022 J**	<0.1	**0.14**	**0.12**
OTHER LABORATORY DATA														
Total Organic Carbon	mg/l	**17**	**4.0**	**6.9**	**6.9**	**29**	**360**	**2.6**	<1.0	<1.0	**4.5**	**1.6**	**38**	**36**
WATER QUALITY PROBE DATA														
Temperature	°C	**21.5**	**17.0**	**15.3**	--	**17.7**	**14.4**	**13.9**	--	**14.2**	**15.2**	**17.2**	**16.8**	--
Specific Conductance	uS/cm	**2,900**	**950**	**730**	--	**2,300**	**16,000**	**390**	--	**280**	**1,300**	**680**	**480**	--
pH	s.u.	**7.8**	**6.6**	**7.4**	--	**6.8**	**7.0**	**7.3**	--	**7.7**	**7.2**	**7.5**	**7.3**	--
Oxidation/Reduction Potential	mV	**180**	**-22**	**-23**	--	**82**	**-200**	**110**	--	**120**	**21**	**81**	**-120**	--
Dissolved Oxygen	mg/l	**6.8**	**1.7**	**1.0**	--	**1.1**	**0.63**	**1.1**	--	**3.2**	**0.36**	**3.9**	**0.38**	--
Turbidity	NTU	**2.3**	**1.2**	**0.53**	--	**1.2**	**5.1**	**1.5**	--	**0.99**	**2.4**	**20**	**9.9**	--
FIELD CHEMISTRY														
Iron	mg/l	**0.01**	**6.1 OR**	**0.02**	--	ND	**4,300**	**0.06**	--	**0.09**	**0.04**	**1.0**	**OR**	--
Iron - Ferrous	mg/l	**0.01**	**5.2 OR**	**0.02**	--	**0.04**	**3.8**	**0.04**	--	ND	**0.03**	**0.70**	**OR**	--
Nitrate	mg/l	**1.8**	**0.30**	**0.30**	--	**0.80**	**1.0**	**3.8**	--	**0.20**	**0.40**	**1.9**	**0.60**	--
Sulfate	mg/l	**153 OR**	**23**	**49**	--	**3.5**	**3,000**	**23**	--	**27**	**85 OR**	**34**	**11**	--
Sulfide	µg/l	**46**	**72**	**13**	--	**55**	<2	**150**	--	**8.0**	**17**	**120**	**140**	--

TABLE 3
SUMMARY OF SEPTEMBER 2016 PERFORMANCE MONITORING
Summary Trip Report
IBM Gun Club - Former Burn Pit Area
Union, New York

Analyte Name	Unit	BP-37A BP-37A Low Flow S 9/21/2016	BP-38A BP-38A Low Flow S 9/20/2016	BP-38A DUP-1 Low Flow FD 9/20/2016	BP-39A BP-39A Low Flow S 9/20/2016	A-13 A-13 PDB S 9/22/2016	B-4 B-4 PDB S 9/22/2016	B-7 B-7 PDB S 9/22/2016	B-9 B-9 PDB S 9/22/2016	IB-7 IB-7 PDB S 9/22/2016	POLY3 TOTE 1 Purge Water S 9/22/2016
VOLATILE ORGANIC COMPOUNDS (VOCs)											
Trichloroethene (TCE)	µg/l	**14**	**130**	**110**	**21**	<100	**5.3**	**64**	**100**	<5.0	<10
Dichloroethene (cis-1,2-)	µg/l	**0.70**	**16**	**15**	**25**	**8,700**	**100**	**310**	**2,400**	**2.4 J**	<10
Dichloroethene (trans-1,2-)	µg/l	<0.5	<0.5	<1.0	**0.10 J**	**22 J**	<5.0	<25	<25	<5.0	<10
Dichloroethene (1,1-)	µg/l	<0.5	**0.10 J**	<1.0	<0.5	<100	<5.0	<25	<25	<5.0	<10
Tetrachloroethene (PCE)	µg/l	<0.5	<0.5	<1.0	<0.5	<100	<5.0	<25	<25	<5.0	<10
Vinyl chloride	µg/l	<0.5	<0.5	<1.0	**0.10 J**	**2,900**	**4.8 J**	**67**	**100**	<5.0	<10
LIGHT GASSES											
Ethane	µg/l	**0.0033 J**	**0.019 J**	**0.018 J**	**0.022 J**	**49**	**15**	**44**	**21**	**32**	--
Ethene	µg/l	**0.018 J**	**0.010 J**	**0.014 J**	**0.023 J**	**4,200**	**44**	**490**	**170**	**0.064 J**	--
Methane	µg/l	**0.43 J**	**0.72**	**2.0**	**0.58**	**5,600**	**27,000**	**17,000**	**10,000**	**26,000**	--
MOLAR CONCENTRATION											
Trichloroethene (TCE)	µmol/l	0.11	0.99	0.84	0.16	ND	0.04	0.49	0.76	ND	ND
Dichloroethene (cis-1,2-)	µmol/l	0.01	0.17	0.15	0.26	90	1.0	3.2	25	0.02	ND
Dichloroethene (trans-1,2-)	µmol/l	ND	ND	ND	0.001	0.23	ND	ND	ND	ND	ND
Dichloroethene (1,1-)	µmol/l	ND	0.001	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (PCE)	µmol/l	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	µmol/l	ND	ND	ND	0.002	46	0.08	1.1	1.6	ND	ND
Ethane	µmol/l	0.0001	0.001	0.001	0.001	1.6	0.50	1.5	0.70	1.1	--
Ethene	µmol/l	0.001	0.0004	0.000	0.001	150	1.6	17	6.1	0.002	--
Total	µmol/l	0.12	1.2	1.0	0.42	288	3.2	24	34	1.1	--
MOLAR PERCENTAGE											
TCE	%	93	86	85	38	ND	1.3	2.1	2.2	ND	--
DCEs	%	6.1	14	15	62	31	32	14	73	2.3	--
VC	%	ND	ND	ND	ND	16	2.4	4.5	4.7	ND	--
Ethane+Ethene	%	0.64	0.09	0.11	0.37	53	64	80	20	98	--
VOLATILE FATTY ACIDS											
Acetic Acid	mg/l	**0.035 J**	**0.042 J**	**0.029 J**	**0.04 J**	**190**	**600**	**520**	**160**	**0.096 J**	--
Butyric Acid	mg/l	**0.012 J**	<0.1	<0.1	**0.0098 J**	**17**	**76**	**320**	**77**	**0.029 J**	--
Hexanoic Acid	mg/l	<0.2	<0.2	<0.2	<0.2	**5.1**	**45**	**120**	**26**	<0.2	--
i-Hexanoic Acid	mg/l	<0.2	<0.2	<0.2	<0.2	**0.21**	**0.14 J**	**3.2**	**3.1**	<0.2	--
i-Pentanoic Acid	mg/l	<0.1	<0.1	<0.1	<0.1	**1.3**	**6.7**	**14**	**1.5**	<0.1	--
Lactic Acid	mg/l	**0.13 J**	**0.015 J**	**0.0075 J**	**0.013 J**	**0.59**	<2.0	<20	**0.089 J**	<0.2	--
Pentanoic Acid	mg/l	**0.024 J**	**0.021 J**	**0.026 J**	**0.032 J**	**7.5**	**42**	**320**	**63**	<0.1	--
Propionic Acid	mg/l	**0.0029 J**	<0.1	<0.1	<0.1	**40**	**120**	**440**	**540**	<0.1	--
Pyruvic Acid	mg/l	**0.0040 J**	<0.1	<0.1	<0.1	**22**	**64**	**86**	**13**	<0.1	--
OTHER LABORATORY DATA											
Total Organic Carbon	mg/l	**1.8**	<1.0	**0.95 J**	**1.7**	**170**	**550**	**2,300**	**1,000**	**58**	--
WATER QUALITY PROBE DATA											
Temperature	°C	**14.7**	**13.1**	--	**15.2**	--	--	--	--	--	--
Specific Conductance	uS/cm	**750**	**300**	--	**140**	--	--	--	--	--	--
pH	s.u.	**7.3**	**7.2**	--	**6.0**	--	--	--	--	--	--
Oxidation/Reduction Potential	mV	**140**	**110**	--	**130**	--	--	--	--	--	--
Dissolved Oxygen	mg/l	**6.6**	**1.9**	--	**5.4**	--	--	--	--	--	--
Turbidity	NTU	**39**	**1.7**	--	**3.2**	--	--	--	--	--	--
FIELD CHEMISTRY											
Iron	mg/l	**200**	ND	--	**0.14**	--	--	--	--	--	--
Iron - Ferrous	mg/l	<0.5	ND	--	**0.11**	--	--	--	--	--	--
Nitrate	mg/l	<0.5	**0.30**	--	**1.7**	--	--	--	--	--	--
Sulfate	mg/l	**32**	**34**	--	**45**	--	--	--	--	--	--
Sulfide	µg/l	<1	**290**	--	**82**	--	--	--	--	--	--

Notes:
1. The table summarizes samples collected during the week of September 19, 2016 as part of performance testing at the IBM Gun Club former Burn Pit Area. Samples were analyzed both in the field and at fixed analytical laboratories as indicated on the table.

2. Analytical laboratory analysis was performed by Eurofins Lancaster Laboratories of Lancaster, Pennsylvania (Lancaster) and/or Microseeps, Inc. of Pittsburgh, Pennsylvania (Microseeps). Results of compounds are recorded in units indicated on the table. Detections of compounds are emboldened.

3. Definitions:
"S" indicates primary sample
"FD" indicates field duplicate
"PDB" indicates the sample was collected via a passive diffusion bag
"--" indicates the compounds were not analyzed for that particular sample.
"U" indicates the result was below the analytical detection limit.
"J" indicates that the laboratory data was below the lowest quantifiable limit and therefore estimated.
"*" indicates that the sample exhibited high turbidity and could not be analyzed in the field. Recorded results are from analysis at Lancaster and/or Microseeps.
"UR" indicates results were under the calibration range and no result was obtained.
"OR" indicates results were over the calibration range and should be considered estimated.
"ND" indicates that results were not detected above the analytical reporting limit or the calibration range of the field screening device.

Last Edited By: clavack
Path: P:\3500s\3526.02\Graphics Files\GIS\Figures\Sept2016 GWQ_extended.mxd
Path: P:\3500s\3526.02\Graphics Files\All\Source Files\201609 Performance Monitoring\Sept2016 GWQ_extended.ai

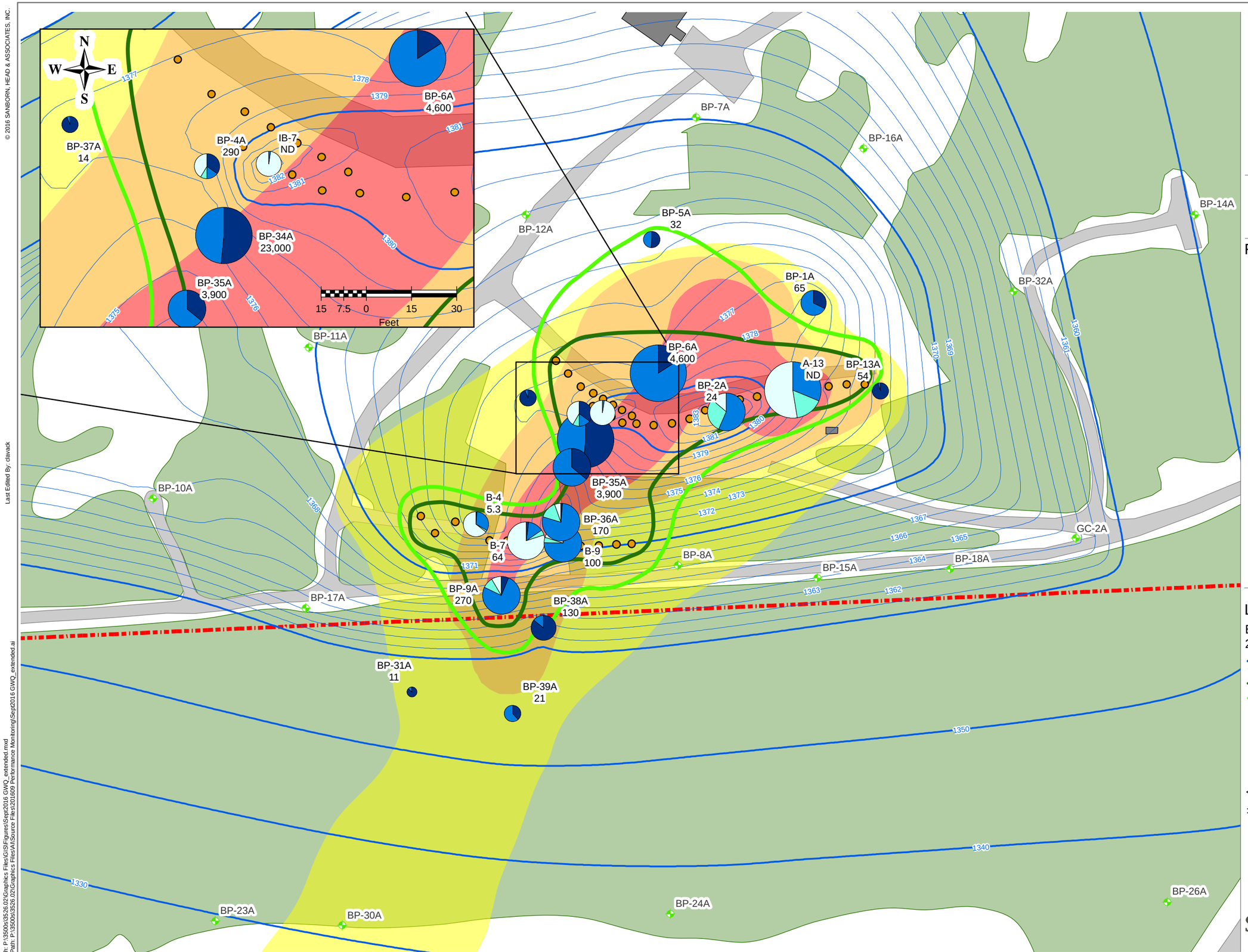


Figure 1

Summary of September 2016 Groundwater Quality Conditions

September 2016 Performance Testing Memo Report

IBM Gun Club - Former Burn Pit Area

Union, New York

Drawn By:	C. LaVack
Designed By:	E. Bosse
Reviewed By:	D. Carr
Project No:	3526.05
Date:	November 2016

Figure Narrative

The figure is intended to depict groundwater quality data and inference recorded during the week of September 19, 2016.

The groundwater data for site key VOCs including PCE, TCE, cDCE, and vinyl chloride from water table monitoring wells are presented as pie diagrams. The wedges of each pie diagram represent concentrations of the four compounds expressed in micromoles per liter (umol/L). The relative diameter of each pie diagram varies based on the sum of the four VOCs at each location.

The inferred geochemical (REDOX) conditions are based on observations of oxidation-reduction potential (ORP), methane, sulfide, ferrous and total iron, and nitrate. Methanogenic conditions are characterized by methane concentrations = 20 µg/L, sulfate reducing by sulfide = 50 µg/L, iron reducing by Fe(II)/Fe(tot) = 0.7 mg/L, and nitrate reduction by nitrate < 1 mg/L. ORP is generally expected to be less than 200 for iron reduction, less than 100 for sulfate reduction, and less than 0 for methanogenic conditions.

Refer to the report text for further discussion.

Legend

BP-34A
23,000
Well Name and September 2016 TCE Concentrations in Groundwater (µg/L).

Inferred Groundwater Contour 9/19/2016

Methanogenic, Methane >= 20 µg/L

Sulfate Reducing, Sulfide >= 50 µg/L

Parent VOC (Trichloroethene)

Primary Daughter Product (*cis*-1,2DCE)

Secondary Daughter Product (Vinyl Chloride)

Terminal Breakdown Products (Ethane, Ethene)

Total Chlorinated Ethanes & Ethenes in Groundwater (µmol/L)

< 0.1

>0.1 to 1

>1 to 10

>10 to 100

>100

40 20 0 40 80

Feet

SANBORN HEAD

Figure 2

September 2016 Assessment of Reducing Conditions

IBM Gun Club - Former Burn Pit Area

Union, New York

Drawn By:	C. LaVack
Designed By:	E. Bosse
Reviewed By:	D. Carr
Project No:	3526.05
Date:	October, 2016

Figure Narrative

This figure is intended to assess multiple lines of evidence to assess what proportion of the primary and secondary source rock are under sulfate reducing and methanogenic conditions. Green labels indicate conditions conducive to reductive dehalogenation. Orange labels indicate reductive dehalogenation may be possible, but conditions are less conducive. Red labels indicate more oxidizing conditions where reductive dehalogenation is less likely.

Posted data is from the September 2016 sampling round.

Legend

DO mg/L	>5	2-5	<=2
ORP mV	>100	0-100	<=0
Sulfide µg/L	<10	10-50	>=50
Methane µg/L	<0.5	0.5-20	>=20
FeII mg/L	<1		>=1
pH SU	6.3-7.5		<6.3 or >7.5
Total VFA mg/L	<1		>=1
TOC mg/L	<4		>=4
Ethane + Ethene µg/L	<10	10-50	>=50

60 30 0 60 120

Feet

SANBORN HEAD

ATTACHMENT C

SITE INSPECTION MEMORANDUM REPORTS

MAY 2016 SITE WIDE INSPECTION

SANBORN HEAD ENGINEERING

SANBORN HEAD ENGINEERING
Building Trust. Engineering Success.

Ms. Linda Daubert
International Business Machines Corporation
Corporate Environmental Affairs
8976 Wellington Road
Manassas, VA 20109

June 20, 2016
File No. 3526.05

Re: Site-Wide Inspection – May 2016
IBM Gun Club – Former Burn Pit Area
Union, New York
NYSDEC Site # C704044, BCA Index #B7-0661004

Dear Ms. Daubert:

This letter is intended to transmit the findings of a Site-Wide Inspection completed of the IBM Gun Club, Burn Pit Area (Site). As you are aware, under the project Site Management Plan (SMP) Site-Wide inspections are to be conducted semi-annually in the spring and fall in 2016 and annually thereafter.

This letter serves to transmit the inspection record and communicate our findings. It is formatted with the assumption that IBM could submit this to the New York State Departments of Environmental Conservation and Health as a follow up to the Spring 2016 inspection and will be included with the Periodic Review Report required under the SMP, the next of which is due March 2018.

BACKGROUND AND SCOPE

The Site-Wide inspection was conducted in accordance with Monitoring Plan included as Section 3.0 of the SMP using the Site Wide Inspection Checklist included as Appendix K.1 of that document. The inspection included visual review of the condition of the soil cap covering contaminated soils and soil fill placed within the area of historical seeps. The site visit was conducted on May 10, 2016 and included:

- A review of Site and conditions on lands downgradient of the Site related to compliance with the Institutional Controls (ICs) outlined in SMP Section 2.3 and the Environmental Easement;
- A visual review of the cover system associated with the deed restricted area as outlined in SMP Section 3.2 and seep fill area to observe for settlement, erosion, or other conditions that could be considered detrimental to the effectiveness of these components of the remedy which is considered an Engineering Control (EC);
- A review of the conditions of tree plantings and grass cover that constitute the phytoremediation component of the EC remedy as described under SMP Section 4.2.1.

We conducted a systematic review of all rows of tree plantings to assess the conditions of the plantings and estimate the proportion of apparent mortality rates against the standards outlined in the SMP.

In addition, we reviewed general Site conditions related to site fencing and security and against the list of notifications required under the SMP. The findings and observations from this visit are noted in the inspection checklist included as Attachment A. An annotated inspection figure is included as Attachment B and inspection photos are included in Attachment C.

SUMMARY OF FINDINGS

In general, as outlined in the attached checklist, the inspection found the condition of the Site to be consistent with the design intent of the ECs and use of the Site and surrounding area consistent with the ICs and the human exposure assessment on which the remedy is based. The capped area remains intact with no evidence of settlement, cracking, animal burrows, or other breaches, and is vegetated with grass and tree cover.

Tree Mortality

The condition of the tree plantings was found to be good after their second winter. In fact, poles and cuttings thought to be dead at the tree inspection in May 2015 appeared to have sprouted new growth this spring. The grass cover is somewhat thin in areas within the cap area and fill extension, but the condition of the grass is improved over the last inspection and no large-scale bare spots were observed. A systematic review of all tree planting rows indicated approximately 14 to 33% mortality about 23 months after planting, or an overall 23% mortality. Eight-inch cuttings planted with a few inches of plant material above the soil surface average on the order of 2 feet in height up to about 4 feet. Trees planted as poles have grown to over 10 feet in areas, doubling or tripling in height since planting.

As noted in the inspection form, mortality greater than 25% was observed in Areas 1, 2, and 4 at 26%, 30%, and 33%, respectively. Areas 1 and 2 have a southern exposure with little shade and the inferred mortality was generally similar to that observed in the May 2015 inspection. Mortality in Area 4 was below 25% in 2015; increased mortality in this area may be due to encroachment of woody brush and competition for moisture in area of relatively thin soil cover. Under the SMP, IBM had proposed to replant as needed to bring the tree cover up to 75% of the initial planting density, allowing for 25% mortality. Only approximately 3 and 9 cuttings would be required to replant Areas 1 and 2, respectively, to reach 25% mortality and approximately 12 poles would be required for Area 4.

The larger clusters of mortality were observed in Areas 1 and 4 outside of the primary source rock where groundwater concentrations are modest and phytoremediation will be less effective. We had discussed the possible replanting of poplar poles to address mortality after the 2015 spring inspection. However, we do not think that replanting of trees (poles or cuttings) is warranted given 1) the apparent progress of tree growth, 2) the overall mortality below 25%, which is unchanged or slightly improved from the last year, and 3) that replanting will involve tracking of mechanized equipment across the cap area, which may actually cause more soil compaction and damage.

Tree survival, growth, and mortality will continue to be assessed on an annual basis. We note that the tree mortality is influenced by many factors including but not limited to weather and infiltration rates, exposure to heat and sun, and variable soil thickness, and that a mortality rate less than 25% may not be achievable in areas that exhibit shallow bedrock or where gas generation (methane and carbon dioxide) in the subsurface may be occurring (downgradient of the pilot test injection boreholes).

Logging & Other Activity

We note that since the last inspection, the Binghamton Country Club has logged a portion of their property southwest of the Burn Pit parcel, hauling the logs to Robinson Hill Road along a temporary logging haul road south of the Burn Pit parcel. The haul road ran roughly southwest to northeast across the slope between the Burn Pit parcel and the golf course and resulted in removal of some tree cover along the 12 to 14 foot wide route. It also appears that selective cutting of some larger trees was completed along this slope. All of the removed trees were outside the Burn Pit parcel. Photo-documentation of the logging activities can be found in Attachment D.

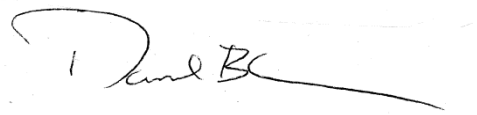
The presence of track ruts along the haul road has altered surface runoff somewhat and, although there is some evidence of erosion and sedimentation, we believe that this disturbance does not change the conditions of exposure for the Gun Club in that the soil disturbance is outside of the Gun Club parcel, and we did not observe new seep or spring activity. Water accumulated in several ruts was sampled during the normal sampling period in April 2016 and was determined to be rainwater. We do not believe that this changed condition is likely to adversely change VOC fate and transport in groundwater at depth. Country Club representatives indicated during the inspection that no additional logging is planned this season. Further logging by Binghamton Country Club is anticipated in winter 2016-2017. We will continue to monitor the condition of the haul road during sampling and inspection events Of course groundwater monitoring is on-going.

During our reconnaissance of the logging area, we noted increased evidence of use of an area northwest of monitoring well BP-10A as a bonfire and gathering spot, which contained wood pallets and scrap wood from the Country Club, chairs, tables, and a substantial accumulation of other refuse. Although this area is well outside of the Burn Pit Parcel and, while this use does not in our opinion change the conditions of the exposure assessment, it is evidence of trespassing in the area that we bring to the attention of the Binghamton Country Club.

CLOSING

If you have any questions, please contact us. We appreciate the opportunity to provide service to IBM on this important project.

Very truly yours,
SANBORN, HEAD ENGINEERING, P.C.



Daniel B. Carr, P.E., P.G.
Sr. Project Director
20 Foundry Street
Concord, New Hampshire

EMB/DBC:emb

Encl. Attachment A – Site Wide Inspection Checklist
Attachment B – Annotated Site Inspection Map
Attachment C – Inspection Photographs
Attachment D – Logging Photographs

cc: D. Shea

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ATTACHMENT A
Site Wide Inspection Checklist - May 2016
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

Part 1: General Information

Site Name: IBM Gun Club, Former Burn Pit Area Date of Inspection: May 10, 2016

Summary of Remedy:

-Capping the primary VOC source area and residual surficial soils with an engineered low permeability clean soil fill;

-Placement and compaction of engineered soil fill within a topographic depression south of the Burn Pit Area;

-Phytoremediation - establishing and maintaining grass and tree cover to limit infiltration recharge and enhance direct uptake of VOC-containing shallow groundwater; and

-Enhanced biochemical degradation - engineered introduction of amendments shown to enhance biochemical destruction of VOCs.

Part 2: Inspection Specifics

Inspector: D.B. Carr/ E.M. Bosse Title: Sr. Project Director/ Project Manager

Inspector Contact Information: Sanborn Head Engineering, P.C./Sanborn, Head & Associates, Inc.

Type of Inspection:

Site-wide inspection	☑
Soil cover system monitoring	☑
Routine well inventory and review	☐
Routine phytoremediation monitoring	☑
Non-routine storm event or other emergency	☐
Non-routine EC failure/ performance modifications	☐
Other	☐

Remarks

Weather/ Temperature: Mostly sunny, 50-60 degrees

Part 3: On-site Documents & Records Verification

	Readily Available	Up-to-date	Location/ remarks
Daily access/security logs	☑	☑	Red binder in site trailer
Site Management Plan	☑	☑	Filing cabinet
Health & Safety Plan	☑	☑	Appendix of Site Management Plan
Current underground injection control permit	☐	☐	N/A
Monitoring records	☑	☑	
Routine maintenance reports	☐	☐	In PRR, to bring next time at site
Non-routine maintenance reports	☐	☐	In PRR, to bring next time at site
Site-wide inspection reports	☑	☑	Through September 2015 inspection, will add this report next time at the site

Part 4: Review of Institutional Controls (SMP Section 2.3)

	True	False	Not Applicable
The property is only used for restricted residential, commercial, and industrial uses within the Track 4 Cleanup area;	☑	☐	☐
The property is only used for residential, restricted residential, commercial, and industrial uses throughoutt the remainder of the site;	☑	☐	☐
The property is not used for a higher level use, such as unrestricted use without additional remediation and amendment of the Easement with approval by NYSDEC;	☑	☐	☐
Activities on the property that will disturb remaining contaminated material conducted in accordance with the SMP;	☑	☐	☐
The use of groundwater within and adjacent to the currently established plume or updated plume based on groundwater monitoring is prohibited as a source of potable or process water, without necessary water quality treatment	☑	☐	☐
Any buildings developed within the Track 4 Cleanup area evaluated for vapor intrusion, and any potential impacts that are identified are monitored or mitigated	☑	☐	☐
No vegetable gardens or farming within the Track 4 Cleanup area	☑	☐	☐

Narrative/ Other Notes:

The site remains undeveloped with no buildings and is not used for agriculture

The current site owner, the Binghamton Country Club has logged a portion of the slope south of the Burn Pit parcel, including creation of logging roads parallel to and outside of the Site perimeter fence. We observed silty runoff from the edges of the logging road mid-way down the slope north of the golf course. Logs were evidently staged inside the southern access road gate , at Robinson Hill Road and surface runoff from this staging area will tend to flow onto Robinson Hill Road

Part 5: Review of Engineering Controls

5a: Soil Cover System Monitoring - Deed Restricted Area (SMP Section 3.2)

Monuments and Signage

- ☐ Damaged/missing signage
- ☐ Damaged monuments
- ☐ Location(s) shown on map
- ☐ Photo-documented

Remarks: Signage is as constructed

Settlement (Low spots)

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Settlement not evident

Approx. ft^2 _____
Depth _____
Remarks None observed

Cracks

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Cracking not evident

Length _____
Width _____
Depth _____

Remarks None observed

Erosion

- ☑ Location(s) shown on map
- ☑ Photo-documented
- ☐ Erosion not evident

Approx. ft^2 _____
Depth _____
Remarks Minor erosion rills at top of cap slope in an area of thinner grass - Areas 2 and 3

Holes

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Holes not evident

Approx. ft^2 _____
Depth _____
Remarks None observed

Vegetative Cover

- ☑ Photo-documented
- ☑ Grass properly established
- ☐ No signs of stress

Remarks Grass was observed to be thin in areas, but improved over the last inspection.

ATTACHMENT A
Site Wide Inspection Checklist - May 2016
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

Wet Areas/Water Damage **None apparent**

- ☐ Wet areas — Approx. ft^2 _____ ☐ Shown on site map
- ☐ Ponding — Approx. ft^2 _____ ☐ Photo-documented
- ☐ Seeps — Approx. ft^2 _____ ☑ Wet areas not evident
- ☐ Soft subgrade — Approx. ft^2 _____ Remarks None observed

No evidence of water damage

Slope Instability **None apparent**

- ☐ Location(s) shown on map — Approx. ft^2 _____
- ☐ Photo-documented — Remarks None observed
- ☑ Slope instability not evident

Narrative/ other notes: Overall, the grass and tree coverage showed improvements from the September 2015 inspection, which was conducted after a period of below average precipitation.

5b: Soil Fill - Seep Area

Settlement (Low spots)

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Settlement not evident

Approx. ft^2 _____
Depth _____
Remarks _____

Cracks

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Cracking not evident

Length _____
Width _____
Depth _____

Remarks None observed

Erosion

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Erosion not evident

Approx. ft^2 _____
Depth _____
Remarks None observed

Holes

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Holes not evident

Approx. ft^2 _____
Depth _____
Remarks None observed

Vegetative Cover

- ☑ Photo-documented
- ☑ Grass properly established
- ☑ No signs of stress

Remarks _____

Wet Areas/Water Damage

- ☑ Wet areas — Approx. ft^2 20-25
- ☐ Ponding — Approx. ft^2 _____
- ☑ Seeps — Approx. ft^2 20-25
- ☑ Soft subgrade — Approx. ft^2 20-25

- ☑ Shown on site map
- ☑ Photo-documented
- ☐ Wet areas not evident

Remarks The wet area is off of the soil fill area to the east.

Slope Instability

- ☐ Location shown on map
- ☐ Photo-documented
- ☑ Slope instability not evident

Approx. ft^2 _____

Remarks None observed

Narrative / other notes:

5c: Phytoremediation\Tree Condition (SMP Section 4.2.1)

Area #1 ☑ Photo Mark Map ☑	Poles	Representative height	4.5-10'		
				% Mortality	33%
	Cuttings	Representative height	2-4.5'		
Area #2 ☑ Photo Mark Map ☑	Poles	Representative height	4-10'		
				% Mortality	28%
	Cuttings	Representative height	3-4'		
Area #3 ☑ Photo Mark Map ☑	Poles	Representative height	4-10'		
				% Mortality	22%
	Cuttings	Representative height	2-3'		
Area #4 ☑ Photo Mark Map ☑	Poles	Representative height	4-7'		
				% Mortality	33%
	Cuttings	Representative height	2.5-4'		
Area #5 ☑ Photo Mark Map ☑	Poles	Representative height	4-10'		
				% Mortality	22%
	Cuttings	Representative height	3-4'		

ATTACHMENT A
Site Wide Inspection Checklist - May 2016
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

Area #6 ☑ Photo Mark Map ☑	Poles	Representative height	6-12'		
				% Mortality	17%
	Cuttings	Representative height	2-4'		
Area #7 ☑ Photo Mark Map ☑	Poles	Representative height	4-12'		
				% Mortality	18%
	Cuttings	Representative height	N/A		
Area #8 ☑ Photo Mark Map ☑	Poles	Representative height	4-12'		
				% Mortality	14%
	Cuttings	Representative height	N/A		
Area #9 ☐ Photo Mark Map ☑	Poles	Representative height	5-15'		
				% Mortality	20%
	Cuttings	Representative height	N/A		

Narrative / other notes:

Poplar tree mortality by area ranged from 33% to 14% with a median of about 23%. Estimated tree mortalities exceeded the 25% threshold specified in the SMP in Area 1 (26%), Area 2 (30%), and Area 4 (33%). In Areas 1 and 2, the mortality may be explained sun exposure depth to rock/planting depth, and possible gas generation downgradient of pilot test injection boreholes. Poplar poles in Area 4 were observed to be crowded by newer woody bushes and is generally more shaded which may contribute to mortality.

Part 6: Review of Monitoring and Injection Well Network Inspection

Conditions consistent with Monitoring and Injection Well Inspection Checklist ☑

List deviations, if any Last comprehensive well inspection was completed in September 2015

Seep Area Monitoring

Seep area dry ☐ New seeps/ springs/ wet areas observed? ☐

Remarks Several seeps were sampled during routine monitoring in April 2016.

Narrative / other notes:

Part 7 - Review of Access/General Site Conditions

Condition of fencing Intact as constructed.

Remarks

Condition of monuments and signage Intact as constructed

Remarks

Obvious signs of vandalism/trespassing? None inside the perimeter fence

Remarks

Condition of access roads and lanes Good, intact as constructed

Remarks

Investigation derived waste

Frac Tank/ Water Tank

- ☐ N/A
- ☑ Good condition
- ☐ Needs maintenance

Remarks About 50 gallons of sampling purge water in Tote #1
IDW samples will be collected following June sampling event

Approximate volume generated since last inspection 50

	Yes	No
Documentation of IDW analytical results readily available	☐	☑

Location/ Remarks IDW samples were not collected in April 2016.

Narrative / other notes:

Part #8 Notifications

	Not Applicable	Yes	No
A. 60-day advance notice of any proposed changes in site use	☑	☐	☐
B. 7-day advance notice of proposed ground-intrusive activities	☑	☐	☐
C. 48-hour notice of any damage or defect to the engineering controls	☑	☐	☐
D. Verbal notice by noon the following day of any emergency (fire, flood, etc.) that reduces the effectiveness of engineering controls	☑	☐	☐
E. Follow-up status report on emergency actions within 45 days	☑	☐	☐
F. 60-day advance notice of any change in site ownership	☐	☑	☐
G. New owner's contact information confirmed in writing within 15 days of ownership change	☐	☑	☐

Part #9 Action Items

	Action Item	Proposed time frame
Routine maintenance	Replace internal batteries in dedicated water quality probes	June 2016 sampling round
Non-routine maintenance	Repair BP-15A PVC riser	Next time drill rig is on site
Other		

NOTES:

1. THIS FIGURE IS INTENDED TO ACCOMPANY THE SITE-WIDE INSPECTION CHECKLIST AND WILL BE USED TO MARK CONDITIONS OF NOTE RECORDED ON THE INSPECTION CHECKLIST FORM. THE SITE WIDE INSPECTION IS REQUIRED AS AN ELEMENT OF THE REMEDIAL PROGRAM AT THE IBM GUN CLUB, BURN PIT UNDER THE NEW YORK STATE BROWNFIELD CLEANUP PROGRAM ADMINISTERED BY NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION. THE SITE IS IN THE PROCESS OF BEING REMEDIATED IN ACCORDANCE WITH BROWNFIELD CLEANUP AGREEMENT #C7044, WHICH WAS EXECUTED ON AUGUST 26, 2005 AND LAST AMENDED ON APRIL 26, 2012.
2. REFER TO THE SITE MANAGEMENT PLAN AND FINAL ENGINEERING REPORT FOR ADDITIONAL NOTES AND LEGEND INFORMATION.

Site-Wide Inspection May 10, 2016

Conducted by Dan Carr P.E.

See the completed inspection form and cover letter for additional details.

LEGEND

- 1350 — EXISTING 10-FOOT CONTOUR
- EXISTING 2-FOOT CONTOUR
- 1380 — AS-BUILT 10-FOOT CONTOUR
- AS-BUILT 2-FOOT CONTOUR
- EXISTING CHAIN-LINK FENCE
- AS-BUILT CHAIN-LINK FENCE
- EXISTING TREE LINE
- EXISTING UTILITY LINE
- EXISTING EDGE OF PAVED ROAD
- EXISTING EDGE OF GRAVEL PATH
- AS-BUILT EDGE OF GRAVEL PATH
- SURVEYED EXTENT OF MARKER LAYER
- BP-6 — EXISTING MONITORING WELL LOCATION AND DESIGNATION
- IB-4 — EXISTING INJECTION WELL LOCATION AND DESIGNATION
- A-1 — AS-BUILT INJECTION WELL LOCATION AND DESIGNATION
- DEED RESTRICTION BOUNDARY
- MONUMENT TO DOCUMENT DEED RESTRICTED AREA
- MONUMENT TO DOCUMENT DEED RESTRICTED AREA WITH SIGNAGE INSTALLED
- SURVEYED TREE PLANTING LIMITS
- ③ — PHYTOREMEDIATION AREA BOUNDARY AND DESIGNATION
- PRIMARY SOURCE ROCK
- SECONDARY SOURCE ROCK
- LOCATION OF DEAD POPLAR CUTTING (INSIDE CAP AREA) AND POPLAR POLE (OUTSIDE CAP AREA)

Bonfire Area

Approximate location of logging haul road (continues southward)

SANBORN HEAD ENGINEERING

GRAPHICAL SCALE
60' 30' 0 60' 120'

NO.	DATE	DESCRIPTION	BY

DRAWN BY: M. HILDENBRAND / E. WRIGHT
DESIGNED BY: J. SANBORN
REVIEWED BY: D. CARR
PROJECT MGR: E. BOSSE
PIC: D. SHEA
DATE: MAY 2016

SITE WIDE INSPECTION MEMO
IBM GUN CLUB - FORMER BURN PIT AREA
UNION, NEW YORK

PROJECT NUMBER: 3526.05

SITE INSPECTION PLAN

ATTACHMENT B

ATTACHMENT C
INSPECTION PHOTOGRAPHS

Photo 1: Tree and Grass Cover – Phytoremediation Area 1 looking southeast

Photo 2: Tree and grass cover looking west across Phytoremediation Area 2. Monitoring well BP-6A in foreground, Well BP-5A instrumentation installation is visible back right.

Photo 3: Looking north across Phytoremediation Area 3 towards BP-1A and instrumentation enclosure.

Photo 4: Looking east at poplar poles planted along the margin of Phytoremediaion Area 4.

Photo 5: Looking east across Phytoremediation Area 5.

Photo 6: Phytoremediation Area 6 looking north to BP-37A instrumentation.

Photo 7: Phytoremediation Area 7 – Seep Fill Area looking west.

Photo 8: Phytoremediation Area 8 looking south from gravel access lane.

Photo 9: Phytoremediation Area 9 looking northeast

Photo 10: Flowing seep present on the eastern edge of seep fill area, looking at injection borehole B-10.

Photo 11: Area of thin grass, minor erosion rills on the north side of Phytoremediation Area 3.

Photo 12: Standing at BP-10, looking northeast to bonfire area.

Photo 13: Close up of bonfire/gathering area.

ATTACHMENT D
LOGGING PHOTOGRAPHS

Photo 1: Log staging area at southern access road gate, looking east to Robinson Hill Road

Photo 2: Southern access road gate, looking west from Robinson Hill Road

Photo 3: Logging haul road parallel to and just outside BP site fence (to the right), looking west.

Photo 4: Standing at BP-40A, looking north to low point of logging road. Site fence just visible at the top of the hill

Photo 5: Standing on logging road, looking south to BP-40A and the golf course.

Photo 6: General condition of logging road/ debris disposal. Located on logging road, approximately due south of BP-10A, looking east

Photo 7: East of photo above, looking east

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SEPTEMBER 2016 SITE WIDE INSPECTION

SANBORN HEAD ENGINEERING

SANBORN HEAD ENGINEERING
Building Trust. Engineering Success.

Linda Daubert
International Business Machines Corporation
Corporate Environmental Affairs
8976 Wellington Road
Manassas, VA 20109

October 5, 2016
File No. 3526.05

Re: Site-Wide Inspection – September 2016
IBM Gun Club – Former Burn Pit Area
Union, New York
NYSDEC Site # C704044, BCA Index #B7-0661004

Dear Ms. Daubert:

This letter is intended to transmit the findings of a Site-Wide Inspection completed for the IBM Gun Club, Burn Pit Area (Site). As you are aware, under the project Site Management Plan (SMP), Site-Wide inspections were conducted semi-annually through May 2016, and are to be conducted annually thereafter.

This letter serves to transmit the inspection record and communicate our findings. This inspection report will be included with the next Periodic Review Report required under the SMP, due March 2018. IBM may also wish to submit this report to NYSDEC along with the Owner's Annual Certification associated with property use that is due to the Agencies before the end of the year (2016).

BACKGROUND AND SCOPE

The Site-Wide inspection was conducted in accordance with Monitoring Plan included as Section 3.0 of the SMP using the Site Wide Inspection Checklist included as Appendix K.1 of that document. The inspection included visual review of the condition of the soil cap covering contaminated soils and soil fill placed within the area of historical seeps. The site visit was conducted on September 21, 2016 and included:

- A review of the Site, and conditions on lands downgradient of the Site, related to compliance with the Institutional Controls (ICs) outlined in SMP Section 2.3 and the Environmental Easement;
- A visual review of the cover system associated with the deed restricted area as outlined in SMP Section 3.2, and seep fill area, to observe for settlement, erosion, or other conditions that could be considered detrimental to the effectiveness of these components of the remedy which is considered an Engineering Control (EC);
- A review of the conditions of tree plantings and grass cover that constitute the phytoremediation component of the EC remedy as described under SMP Section 4.2.1.

During this visit we conducted a general reconnaissance and completed photo documentation of the tree and grass cover. A more extensive assessment of tree mortality was completed in May 2016 and will be repeated at the next annual inspection in the fall of 2017.

In addition, we reviewed general Site conditions related to site fencing and security, and against the list of notifications required under the SMP. The findings and observations from this visit are noted in the inspection checklist included as Attachment A. An annotated inspection figure is included as Attachment B and photos are included in Attachment C.

SUMMARY OF FINDINGS

In general, as outlined in the attached checklist, the inspection found the condition of the Site to be consistent with the design intent of the ECs, and the use of the Site and surrounding area is consistent with the ICs and the human exposure assessment on which the remedy is based.

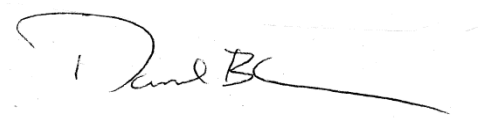
- The capped area remains intact with no evidence of settlement, cracking, animal burrows, or other breaches;
- The capped area is vegetated with grass and tree cover; the vegetative cover exhibited visual evidence of stress believed associated with dry weather conditions, but the grass and trees are well established. NYSDEC has posted a drought watch for Broome County, which is indicated to be under moderate drought conditions[1];
- Despite the dry weather, poplar poles appear to have grown 3 to 5 feet since May 2016 to an average height of 10 to 15 feet, while cuttings have grown 1 to 2 feet to an average of 4 to 5 feet;
- The grass in the area of tree planting was cut in August with no damage to the capped area;
- Approximately two sections of fence in the proximity of BP-16A were damaged by a large fallen tree limb. The barbed wire extension arm brackets and wire were also damaged, along an approximately 100-ft section of the fence; refer to Photos 15 through 17. We are currently coordinating its repair.
- There is still evidence that the bonfire gathering spot in the vicinity of monitoring well BP-10A is being utilized, but there was less debris present than during the May 2016 inspection. Apparent ATV tracks are visible outside the northwest portion of the fence heading toward the bonfire area, see Photos 11 and 12. An aerial photo of the area suggests vehicles are entering the greater Gun Club property from Robinson Hill Road at the northeast corner of the parcel. Although this area is outside of the Burn Pit Parcel, it is evidence of trespassing in the area that we will bring to the attention of the Binghamton Country Club.

[1] http://www.plantmaps.com/interactive-national-drought-conditions-map.php

CLOSING

If you have any questions, please contact us. We appreciate the opportunity to provide service to IBM on this important project.

Very truly yours,
SANBORN, HEAD ENGINEERING, P.C.



Daniel B. Carr, P.E., P.G.
Sr. Project Director
20 Foundry Street
Concord, New Hampshire

EMB/DBC:emb

Encl. Attachment A - Site Wide Inspection Checklist
Attachment B - Annotated Site Inspection Map
Attachment C - Photographs

cc: D. Shea

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Attachment A
Site Wide Inspection Checklist - September 2016
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

Part 1: General Information

Site Name: IBM Gun Club, Former Burn Pit Area Date of Inspection: September 21, 2016

Summary of Remedy:

-Capping the primary VOC source area and residual surficial soils with an engineered low permeability clean soil fill;

-Placement and compaction of engineered soil fill within a topographic depression south of the Burn Pit Area;

-Phytoremediation - establishing and maintaining grass and tree cover to limit infiltration recharge and enhance direct uptake of VOC-containing shallow groundwater; and

-Enhanced biochemical degradation - engineered introduction of amendments shown to enhance biochemical destruction of VOCs.

Part 2: Inspection Specifics

Inspector: Erica Bosse Title: Project Manager

Inspector Contact Information: Sanborn Head Engineering, P.C./Sanborn, Head & Associates, Inc.

Type of Inspection:

Site-wide inspection	☑
Soil cover system monitoring	☐
Routine well inventory and review	☑
Routine phytoremediation monitoring	☐
Non-routine storm event or other emergency	☐
Non-routine EC failure/ performance modifications	☐

Remarks As noted below we did not complete a detailed mortality survey of the trees. In accordance with our May 2016 site inspection and 2015 Periodic Review Report, mortality will be reassessed in Fall of 2017.

Weather/ Temperature: Sunny, upper 70s

Part 3: On-site Documents & Records Verification

	Readily Available	Up-to-date	Location/ remarks
Daily access/security logs	☑	☑	Red binder in site trailer
Site Management Plan	☑	☑	Filing cabinet
Health & Safety Plan	☑	☑	Appendix of Site Management Plan
Current underground injection control permit	☐	☐	N/A
Monitoring records	☑	☑	Sept 2016 sampling in progress
Routine maintenance reports	☑	☑	Filing cabinet, in PRR appendix
Non-routine maintenance reports	☑	☑	Filing cabinet, in PRR appendix
Site-wide inspection reports	☑	☑	Through May 2016, will add this report next time at the site

Part 4: Review of Institutional Controls (SMP Section 2.3)

	True	False	Not Applicable

Attachment A
Site Wide Inspection Checklist - September 2016
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

The property is only used for restricted residential, commercial, and industrial uses within the Track 4 Cleanup area;	☑	☐	☐
The property is only used for residential, restricted residential, commercial, and industrial uses throughoutt the remainder of the site;	☑	☐	☐
The property is not used for a higher level use, such as unrestricted use without additional remediation and amendment of the Easement with approval by NYSDEC;	☑	☐	☐
Activities on the property that will disturb remaining contaminated material conducted in accordance with the SMP;	☑	☐	☐
The use of groundwater within and adjacent to the currently established plume or updated plume based on groundwater monitoring is prohibited as a source of potable or process water, without necessary water quality treatment	☑	☐	☐
Any buildings developed within the Track 4 Cleanup area evaluated for vapor intrusion, and any potential impacts that are identified are monitored or mitigated	☑	☐	☐
No vegetable gardens or farming within the Track 4 Cleanup area	☑	☐	☐

Narrative/ Other Notes:

The site remains undeveloped with no buildings and is not used for agriculture

The current site owner, the Binghamton Country Club logged a portion of the slope south of the Burn Pit parcel in early 2016, including creation of logging roads parallel to and outside of the Site perimeter fence.

The logging roads have developed grass cover since the last inspection, no silty runoff was observed.

Part 5: Review of Engineering Controls

5a: Soil Cover System Monitoring - Deed Restricted Area (SMP Section 3.2)

Monuments and Signage

- ☐ Damaged/missing signage
- ☐ Damaged monuments
- ☐ Location(s) shown on map
- ☑ Photo-documented

Remarks: Signage is as constructed, bollards could use a coat of paint.

Settlement (Low spots)

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Settlement not evident

Approx. ft^2 _____
Depth _____
Remarks None observed

Cracks

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Cracking not evident

Length _____
Width _____
Depth _____
Remarks None observed

Erosion

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Erosion not evident

Approx. ft^2 _____
Depth _____
Remarks Minor rills at the NE edge of cap slope observed in May 2016 have filled in with grass.

Holes

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Holes not evident

Approx. ft^2 _____
Depth _____
Remarks None observed

Vegetative Cover

- ☑ Photo-documented
- ☑ Grass properly established
- ☐ No signs of stress

Remarks Grass was observed to be stressed due to recent dry weather in August and September but no major bare areas were observed.

Attachment A
Site Wide Inspection Checklist - September 2016
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

Wet Areas/Water Damage **None apparent**

- ☐ Wet areas — Approx. ft^2 _____ ☐ Shown on site map
- ☐ Ponding — Approx. ft^2 _____ ☐ Photo-documented
- ☐ Seeps — Approx. ft^2 _____ ☑ Wet areas not evident
- ☐ Soft subgrade — Approx. ft^2 _____ Remarks No evidence of water damage

The base of the cap slope in the NE portion of the cap is vegetated with phreatophyte plants but is presently dry.

Slope Instability **None apparent**

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Slope instability not evident

Approx. ft^2 _____

Remarks None observed

Narrative/ other notes: The grass and tree cover are showing minor signs of drought stress. The grass was observed to be starting to brown in areas, and the poplar trees are exhibiting some yellowing/ leaf loss. A review of rainfall records for Binghamton NY (National Climatic Data Center) indicate that August rainfall was 1.9 inches above average and September precipitation was 2.4 inches below average.

5b: Soil Fill - Seep Area

Settlement (Low spots)

- ☐ Location(s) shown on map
- ☑ Photo-documented
- ☑ Settlement not evident

Approx. ft^2 _____
Depth _____
Remarks None observed

Cracks

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Cracking not evident

Length _____
Width _____
Depth _____

Remarks None observed

Erosion

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Erosion not evident

Approx. ft^2 _____
Depth _____
Remarks None observed

Holes

- ☐ Location(s) shown on map
- ☐ Photo-documented
- ☑ Holes not evident

Approx. ft^2 _____
Depth _____
Remarks None observed

Vegetative Cover

- ☑ Photo-documented
- ☑ Grass properly established
- ☐ No signs of stress

Remarks Less signs of stress in the seep area compared to the cap area, the former of which is generally more shaded and historically wet.

Wet Areas/Water Damage **None apparent**

- ☐ Wet areas — Approx. ft^2 _____
- ☐ Ponding — Approx. ft^2 _____
- ☐ Seeps — Approx. ft^2 _____
- ☐ Soft subgrade — Approx. ft^2 _____

- ☐ Shown on site map
- ☐ Photo-documented
- ☑ Wet areas not evident

Remarks No observed seep activity. The borders of the soil fill (e, w & s) are vegetated with phreatophyte plants but are presently dry.

Slope Instability

- ☐ Location shown on map
- ☐ Photo-documented
- ☑ Slope instability not evident

Approx. ft^2 _____

Remarks None observed

Narrative / other notes:

NOTE: The tree condition survey information below reflects what was recorded in May 2016. This inspection did not include a detailed mortality survey. The next survey is scheduled for fall 2017.

On average, both poles and cuttings were observed to have grown 2-4 ft since the May 2016 inspection.

5c: Phytoremediation\Tree Condition (SMP Section 4.2.1)

Area #1 ☑ Photo Mark Map ☑	Poles	Representative height 4.5-10' Representative canopy width	% Mortality	33%
	Cuttings	Representative height 2-4.5' Representative canopy width		
Area #2 ☑ Photo Mark Map ☑	Poles	Representative height 4-10' Representative canopy width	% Mortality	28%
	Cuttings	Representative height 3-4' Representative canopy width		
Area #3 ☑ Photo Mark Map ☑	Poles	Representative height 4-10' Representative canopy width	% Mortality	22%
	Cuttings	Representative height 2-3' Representative canopy width		
Area #4 ☑ Photo Mark Map ☑	Poles	Representative height 4-7' Representative canopy width	% Mortality	33%
	Cuttings	Representative height 2.5-4' Representative canopy width		
Area #5 ☑ Photo Mark Map ☑	Poles	Representative height 4-10' Representative canopy width	% Mortality	22%
	Cuttings	Representative height 3-4' Representative canopy width		

Attachment A
Site Wide Inspection Checklist - September 2016
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

Area #6 ☑ Photo Mark Map ☑	Poles	Representative height 6-12' Representative canopy width	% Mortality	17%
	Cuttings	Representative height 2-4' Representative canopy width		
Area #7 ☑ Photo Mark Map ☑	Poles	Representative height 4-12' Representative canopy width	% Mortality	18%
	Cuttings	Representative height N/A Representative canopy width		
Area #8 ☑ Photo Mark Map ☑	Poles	Representative height 4-12' Representative canopy width	% Mortality	14%
	Cuttings	Representative height N/A Representative canopy width		
Area #9 ☐ Photo Mark Map ☑	Poles	Representative height 5-15' Representative canopy width	% Mortality	20%
	Cuttings	Representative height N/A Representative canopy width		

Narrative / other notes: FROM May 2016 survey:

Poplar tree mortality by area ranged from 33% to 14% with a median of about 23%. Estimated tree mortalities exceeded the 25% threshold specified in the SMP in Area 1 (26%), Area 2 (30%), and Area 4 (33%). In Areas 1 and 2, the mortality may be explained sun exposure depth to rock/planting depth, and possible gas generation downgradient of pilot test injection boreholes. Poplar poles in Area 4 were observed to be crowded by newer woody bushes and is generally more shaded which may contribute to mortality.

Part 6: Review of Monitoring and Injection Well Network Inspection

Conditions consistent with Monitoring and Injection Well Inspection Checklist ☑

List deviations, if any The comprehensive well inspection was completed in June 2016, conditions

were observed to be similar. A barrier bollard at GC-2A was apparently struck by a vehicle and is partially tipped over. No damage to the well was observed.

Seep Area Monitoring

Seep area dry ☑ New seeps/ springs/ wet areas observed? ☐

Remarks No seeps evident on-site during this dry-weather visit. Good, tree growth and survival in the seep fill area.

Narrative / other notes:

Attachment A
Site Wide Inspection Checklist - September 2016
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

Part 7 - Review of Access/General Site Conditions

Condition of fencing damaged in the vicinity or BP-16A

Remarks One small tree is resting on the fence in the NW corner of the larger parcel, no fence damage was observed. A large downed limb has damaged approximately 2 fence panels NE of BP-16A.

Condition of monuments and signage Intact as constructed

Remarks

Obvious signs of vandalism/trespassing? None inside the perimeter fence

Remarks

Condition of access roads and lanes Intact as constructed. Some woody brush is starting to encroach on the southern access road.

Remarks

Investigation derived waste

Frac Tank/ Water Tank

- ☐ N/A
- ☑ Good condition
- ☐ Needs maintenance

Remarks About 100 gallons of sampling purge water in Tote #1.

Approximate volume generated since last inspection 50

	Yes	No
Documentation of IDW analytical results readily available	☐	☑

Location/ Remarks June 2016 sampling of un-bubbled purge water indicated levels of cDCE above threshold for on-site discharge. Tote was being bubbled during September sampling and samples collected. Results are pending and will be added to the filing cabinet during the next visit to the site.

Narrative / other notes:

Attachment A
Site Wide Inspection Checklist - September 2016
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

Part #8 Notifications

We are not aware of any planned change in use by the Binghamton Country	Not Applicable	Yes	No
A. 60-day advance notice of any proposed changes in site use	☑	☐	☐
B. 7-day advance notice of proposed ground-intrusive activities	☑	☐	☐
C. 48-hour notice of any damage or defect to the engineering controls	☑	☐	☐
D. Verbal notice by noon the following day of any emergency (fire, flood, etc.) that reduces the effectiveness of engineering controls	☑	☐	☐
E. Follow-up status report on emergency actions within 45 days	☑	☐	☐
F. 60-day advance notice of any change in site ownership	☑	☐	☐
G. New owner's contact information confirmed in writing within 15 days of ownership change	☑	☐	☐

Part #9 Action Items

	Action Item	Proposed time frame
Routine maintenance		
Non-routine maintenance	Repair BP-15A PVC riser	Next time drill rig is on site
	Removed downed limbs and repair permimeter fence	As soon as practicable
Other		

NOTES:

1. THIS FIGURE IS INTENDED TO ACCOMPANY THE SITE-WIDE INSPECTION CHECKLIST AND WILL BE USED TO MARK CONDITIONS OF NOTE RECORDED ON THE INSPECTION CHECKLIST FORM. THE SITE WIDE INSPECTION IS REQUIRED AS AN ELEMENT OF THE REMEDIAL PROGRAM AT THE IBM GUN CLUB, BURN PIT UNDER THE NEW YORK STATE BROWNFIELD CLEANUP PROGRAM ADMINISTERED BY NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION. THE SITE IS IN THE PROCESS OF BEING REMEDIATED IN ACCORDANCE WITH BROWNFIELD CLEANUP AGREEMENT #C7044, WHICH WAS EXECUTED ON AUGUST 26, 2005 AND LAST AMENDED ON APRIL 26, 2012.
2. REFER TO THE SITE MANAGEMENT PLAN AND FINAL ENGINEERING REPORT FOR ADDITIONAL NOTES AND LEGEND INFORMATION.

Site-Wide Inspection September 21, 2016

Conducted by Erica Bosse, P.G.

See the completed inspection form and cover letter for additional details.

Approximate location of downed tree on fence (no fence damage)

Approximate length of damaged barbed wire

Approximate location of downed tree limb and damaged fence

Bonfire Area

Approximate location of logging haul road (continues southward)

LEGEND

- EXISTING 10-FOOT CONTOUR
- EXISTING 2-FOOT CONTOUR
- AS-BUILT 10-FOOT CONTOUR
- AS-BUILT 2-FOOT CONTOUR
- EXISTING CHAIN-LINK FENCE
- AS-BUILT CHAIN-LINK FENCE
- EXISTING TREE LINE
- EXISTING UTILITY LINE
- EXISTING EDGE OF PAVED ROAD
- EXISTING EDGE OF GRAVEL PATH
- AS-BUILT EDGE OF GRAVEL PATH
- SURVEYED EXTENT OF MARKER LAYER
- BP-6 EXISTING MONITORING WELL LOCATION AND DESIGNATION
- IB-4 EXISTING INJECTION WELL LOCATION AND DESIGNATION
- A-1 AS-BUILT INJECTION WELL LOCATION AND DESIGNATION
- DEED RESTRICTION BOUNDARY
- MONUMENT TO DOCUMENT DEED RESTRICTED AREA
- MONUMENT TO DOCUMENT DEED RESTRICTED AREA WITH SIGNAGE INSTALLED
- SURVEYED TREE PLANTING LIMITS
- ③ PHYTOREMEDIATION AREA BOUNDARY AND DESIGNATION
- PRIMARY SOURCE ROCK
- SECONDARY SOURCE ROCK
- LOCATION OF DEAD POPLAR CUTTING (INSIDE CAP AREA) AND POPLAR POLE (OUTSIDE CAP AREA)

Based on May 2016 Inspection

SANBORN HEAD ENGINEERING

GRAPHICAL SCALE
60' 30' 0 60' 120'

NO.	DATE	DESCRIPTION	BY

DRAWN BY: E. WRIGHT
DESIGNED BY: E. BOSSE
REVIEWED BY: D. CARR
PROJECT MGR: E. BOSSE
PIC: D. SHEA
DATE: OCTOBER 2016

SITE WIDE INSPECTION MEMO
IBM GUN CLUB - FORMER BURN PIT AREA
UNION, NEW YORK

PROJECT NUMBER: 3526.05

SITE INSPECTION PLAN

FIGURE NUMBER: 1

ATTACHMENT C
INSPECTION PHOTOGRAPHS

Photo 1: Tree and grass cover looking east across Phytoremediation Areas 1 and 2. Well BP-5A instrumentation is visible in the center.

Photo 2: Tree and grass cover looking south across the cap from Phytoremediation Area 2 to Area 5.

Photo 3: Close up of grass cover in Phytoremediation Area 2, looking southeast.

Photo 4: Looking northwest from Phytoremediation Area 4 towards Areas 2 and 3. BP-1A and instrumentation enclosure are faintly visible in the back right corner.

Photo 5: Looking west across Phytoremediation Area 4 towards the A-line of injection boreholes.

Photo 6: Looking west from Phytoremediation Area 6 towards Area 8 in an area of poplar poles averaging 10 feet or more in height.

Photo 7: Phytoremediation Area 6 looking northeast to BP-37A instrumentation.

Photo 8: Phytoremediation Area 7 – Seep Fill Area looking north.

Photo 9: Phytoremediation Area 7 – Seep Fill Area looking south.

Photo 10: Phytoremediation Area 9 looking northwest.

Photo 11: ATV/vehicle track outside the perimeter fence in the northwest portion of the perimeter fence heading towards the bonfire area.

Photo 12: Looking northwest at the bonfire area outside the perimeter fence.

Photo 13: Damaged bollard at GC-2A

Photo 14: Small tree resting on fence in the northwest corner of the perimeter fence.

Photo 15: Damaged barbed wire arm brackets and downed wire in the vicinity of the fallen tree limb near BP-16A

Photo 16: Large downed limb and damaged fence just northeast of BP-16A.

Photo 17: Large downed limb and damaged fence just northeast of BP-16A.

Photo 18: Current condition of logging road outside perimeter fence approximately due south from BP-10A, looking east.

Photo 19: East of photo above, looking east.

ATTACHMENT D

MAINTENANCE REPORTS

Routine Maintenance Report Form
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

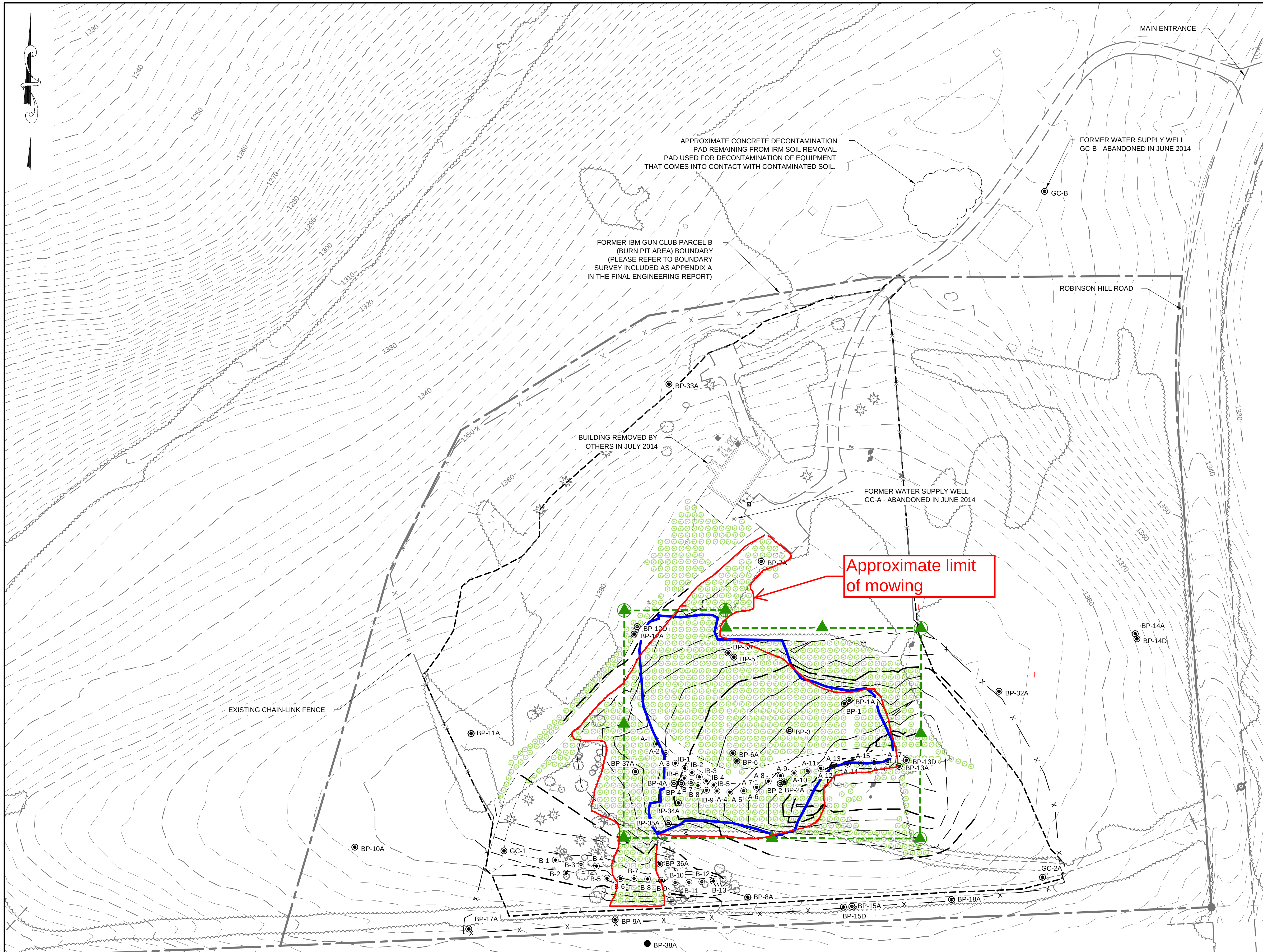
Field Representative:	Erica Bosse (Sanborn Head)	Position: Project Manager
Company:	Glenn Carson (Groundwater Sciences)	
System Type (circle one)	Monitoring Well Injection Well Soil Fill in Seep Area	Soil Cap (Phytoremediation)

Maintenance activities:

Sanborn Head coordinated with Groundwater Sciences personnel to mow the grass within the area of tree planting. We provided a marked up field sketch of the areas to mow, but were not present at the time of mowing. In a visit to the site several weeks after mowing, it was observed that mowing was completed with no damage to the capped area.

Modifications to the system: None

Field Representative Date Erica Bosse 8/3/2016	Attachments: ☐ None ☐ Photographs ☒ Field Sketch ☐ Invoices/ Receipts ☐ Other	SANBORN HEAD
Reviewed By Date David Shea 8/3/2016		



NOTES:

1. WITH THE EXCEPTION OF THE FEATURES IDENTIFIED UNDER NOTE 3, THE BASE MAP WAS DEVELOPED FROM THE FOLLOWING SURVEY DATA MERGED BY SANBORN, HEAD & ASSOCIATES, INC. (SANBORN HEAD):

   A. WITHIN THE LIMITS SHOWN ON THE PLAN VIEW FIGURE AS DENOTED IN THE LEGEND THE TOPOGRAPHY AND SITE FEATURES REFLECT FIELD GROUND SURVEY DOCUMENTED ON A PLAN ENTITLED "TOPOGRAPHIC SURVEY OF FORMER IBM GUN CLUB", PREPARED BY BUTLER LAND SURVEYING, LLC (BUTLER) OF LITTLE MEADOWS, PENNSYLVANIA AND PROVIDED TO SANBORN HEAD IN DIGITAL FORMAT. TOPOGRAPHY REPRESENTS SITE CONDITIONS ON MARCH 28, 2012. ORIGINAL SCALE: 1" = 50'. THE MARCH 2012 SURVEY WAS CONDUCTED TO OBTAIN REFINED TOPOGRAPHIC DATA FOR THE AREA THAT WILL BE AFFECTED BY SOIL EXCAVATION AND CAPPING AND TO ESTABLISH PROJECT BENCHMARKS.

   B. OUTSIDE THE AREA OF MARCH 2012 FIELD SURVEY THE TOPOGRAPHY AND SITE FEATURES ARE FROM A PHOTOGRAMMETRIC SURVEY PLAN PREPARED BY BUTLER AND PROVIDED TO SANBORN HEAD IN DIGITAL FORMAT. THE PHOTOGRAMMETRIC MANUSCRIPT DATED AUGUST 11, 2008 WAS BASED ON AERIAL PHOTOGRAPHY FLOWN IN AUGUST, 2007.

   C. AS-BUILT CONTOURS WERE DEVELOPED BY KEYSTONE ASSOCIATES OF BINGHAMTON, NEW YORK AND WERE BASED ON FIELD SURVEYS CONDUCTED BY KEYSTONE ON OCTOBER 29 AND 30 AND NOVEMBER 7, 2013, AND JUNE 24, 2014.

2. THE VERTICAL DATUM IS BASED ON THE NAVD OF 1988 AND THE HORIZONTAL DATUM IS BASED ON THE NEW YORK STATE PLANE COORDINATE SYSTEM, CENTRAL ZONE. THE APPROXIMATE GLOBAL COORDINATES FOR THE SITE ARE: LONGITUDE - W76° 0' 20", LATITUDE - N42° 7' 57.6".

3. THE EXTENT OF THE MARKER LAYER WAS SURVEYED BY KEYSTONE ASSOCIATES OF BINGHAMTON, NY ON SEPTEMBER 18, 2013. THE REMAINING AS-BUILT FEATURES WERE SURVEYED BY KEYSTONE ON OCTOBER 29 AND 30, 2013 AND NOVEMBER 7, 2013.

LEGEND

- EXISTING 10-FOOT CONTOUR
- EXISTING 2-FOOT CONTOUR
- AS-BUILT 10-FOOT CONTOUR
- AS-BUILT 2-FOOT CONTOUR
- EXISTING CHAIN-LINK FENCE
- AS-BUILT CHAIN-LINK FENCE
- EXISTING TREE LINE
- EXISTING UTILITY LINE
- APPROXIMATE LIMIT OF MARCH 2012 FIELD SURVEY (SEE NOTE 1A)
- EXISTING EDGE OF PAVED ROAD
- EXISTING EDGE OF GRAVEL PATH
- AS-BUILT EDGE OF GRAVEL PATH
- SURVEYED EXTENT OF MARKER LAYER
- BP-6 EXISTING MONITORING WELL LOCATION AND DESIGNATION
- IB-4 EXISTING INJECTION WELL LOCATION AND DESIGNATION
- A-1 AS-BUILT INJECTION WELL LOCATION AND DESIGNATION
- DEED RESTRICTION BOUNDARY
- MONUMENT TO DOCUMENT DEED RESTRICTED AREA
- MONUMENT TO DOCUMENT DEED RESTRICTED AREA WITH SIGNAGE INSTALLED
- SURVEYED TREE PLANTING LIMITS

SANBORN | HEAD ENGINEERING

GRAPHICAL SCALE

60' 30' 0 60' 120'

NO.	DATE	DESCRIPTION	BY

DRAWN BY: M. HILDENBRAND
DESIGNED BY: J. SANBORN
REVIEWED BY: D. CARR
PROJECT MGR: E. BRADSTREET
PIC: D. SHEA
DATE: OCTOBER 2014

FINAL ENGINEERING REPORT
IBM GUN CLUB - FORMER BURN PIT AREA
UNION, NEW YORK

PROJECT NUMBER: 63526.00

LOCATION PLAN

FIGURE NUMBER: 4

Non-Routine Maintenance Report Form
IBM Gun Club - Former Burn Pit Area
BCP Site No. C704044

Field Representative:	Erica Bosse	Position: Project Manager
Company:	Sanborn Head	
System Type (circle one)	Monitoring Well Injection Well Soil Fill in Seep Area	Soil Cap Phytoremediation (Other: Perimeter Fence)
Nature of problem or incident:	A large downed tree limb and damaged perimeter fence was discovered upon arrival for the September performance testing round. Approximately two fencing panels and 100' of extension arm brackets and barbed wire were damaged by the falling limb	

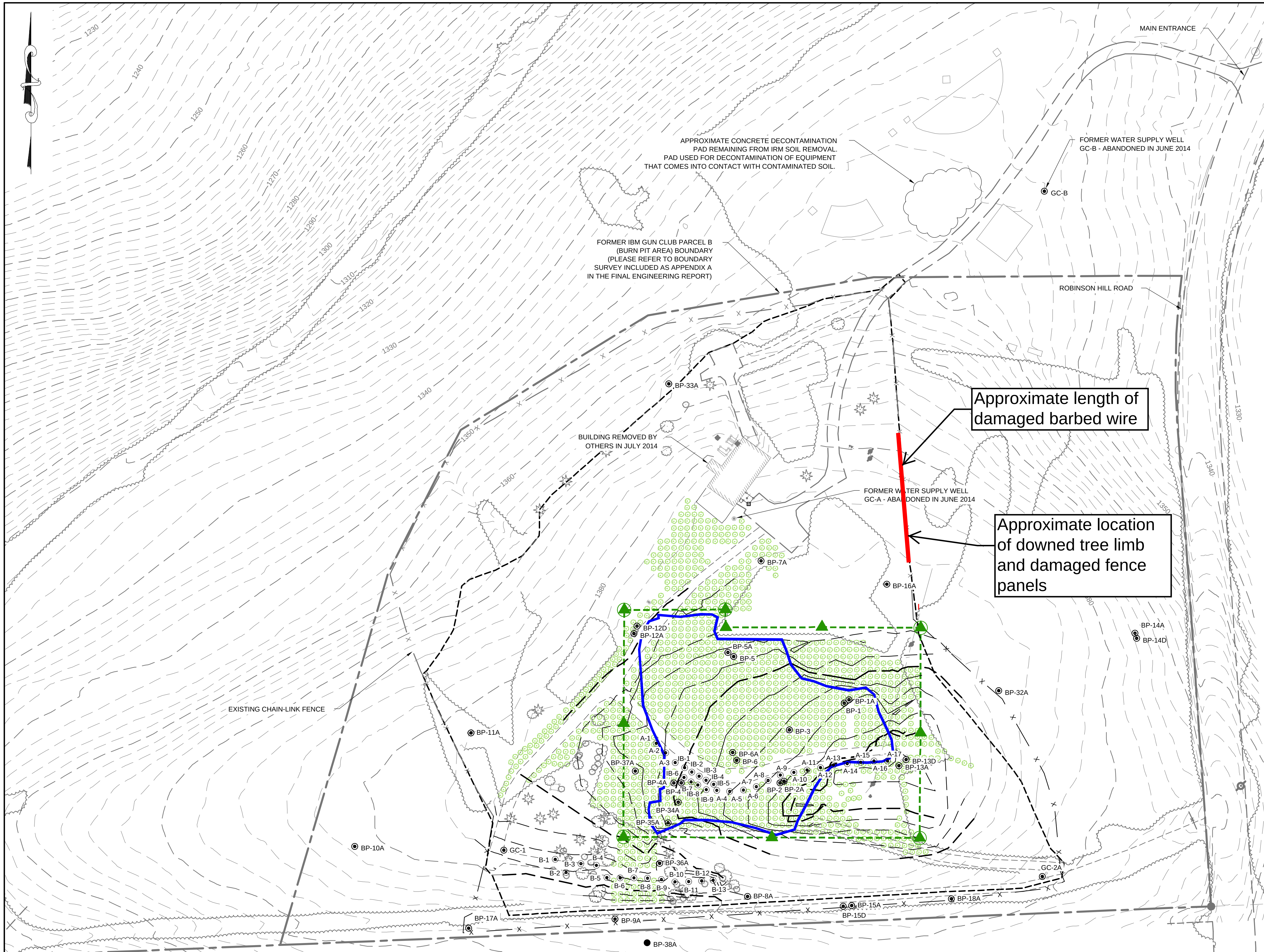
Maintenance activities:

Sanborn Head coordinated with Groundwater Sciences personnel to remove the downed tree limb in advance of fence repair and contracted with a local fencing company, Budget Fence of America, of Binghamton, New York to repair the fence. The fence was repaired by Budget Fence with observation from Groundwater Sciences on November 18, 2016. A marked up field sketch and before and after photos are attached.

Modifications to the system:

The fence was repaired with no modifications to the systems.

Field Representative Date Erica Bosse 11/21/2016	Attachments: ☐ None ☒ Photographs ☒ Field Sketch ☐ Invoices/ Receipts ☐ Other	SANBORN HEAD
Reviewed By Date David Shea 11/21/2016		



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LEGEND

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- EXISTING 2-FOOT CONTOUR
- AS-BUILT 10-FOOT CONTOUR
- AS-BUILT 2-FOOT CONTOUR
- EXISTING CHAIN-LINK FENCE
- AS-BUILT CHAIN-LINK FENCE
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- SURVEYED TREE PLANTING LIMITS

SANBORN | HEAD ENGINEERING

GRAPHICAL SCALE
60' 30' 0 60' 120'

NO.	DATE	DESCRIPTION	BY

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DESIGNED BY: J. SANBORN
REVIEWED BY: D. CARR
PROJECT MGR: E. BRADSTREET
PIC: D. SHEA
DATE: OCTOBER 2014

FINAL ENGINEERING REPORT
IBM GUN CLUB - FORMER BURN PIT AREA
UNION, NEW YORK

LOCATION PLAN

PROJECT NUMBER: 63526.00

FIGURE NUMBER: 4

ATTACHMENT D
PHOTOGRAPHS

Photo 1: Downed tree limb and fence damage, discovered upon arrival for sampling during the week of September 19, 2016

Photo 2: Close up of fence showing damaged fence panels and barbed wire.

Photo 3: Repaired fence, taken east (outside) of the perimeter fence, looking generally north.

Photo 4: Repaired fence, taken east (outside) of the perimeter fence, looking generally west towards field trailers.