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May 14, 2024

New York State Department of Environmental Conservation
Bureau E, Division of Remediation
625 Broadway
Albany, New York 12233-7012

Attention: Charles Gregory, Project Manager

Subject: **Final Extraction Well Optimization Evaluation Field Activities Report**
American Thermostat NYSDEC Site No. 420006
Work Assignment # D009809-01
MACTEC Engineering & Geology, P.C., Project # 3616206098

Dear Mr. Gregory:

This Field Activities Report (FAR) has been prepared by MACTEC Engineering & Geology, P.C. (MACTEC) as part of Work Assignment No. D009809-01 for the New York State Department of Environmental Conservation (NYSDEC) American Thermostat Site (Site No. 420006) in South Cairo, New York (NY) (the Site). This FAR summarizes activities conducted as part of an evaluation to optimize contaminant mass removal and operational efficiency of the groundwater extraction and treatment system (GWETS) with respect to active groundwater extraction well EW-9 (MACTEC, 2022).

BACKGROUND

The American Thermostat Site is located in a rural residential area in South Cairo, Town of Catskill, Greene County, NY, approximately 30 miles southwest of Albany and five miles west of the Village of Catskill (**Figure 1**). The approximately eight-acre site is bordered by Routes 23B and Route 23 on the north and south, respectively, by a residential property on the west, and by New York State-owned

property on the east. American Thermostat Company produced thermostats and used chlorinated and non-chlorinated solvents in its manufacturing process from 1954 to 1985. Waste solvents were disposed of on the property and/or discharged to the septic system. Two structures are located on the Site, the former American Thermostat Company building and the water treatment plant which was constructed for implementation of the groundwater remedy.

The Site has been remediated in accordance with the Record of Decision (ROD) for Operable Unit (OU)1 (public potable water supply) (United States Environmental Protection Agency [USEPA], 1988) and OU2 (soil, sediment, surface water, groundwater, and building contamination) (USEPA, 1990). The contaminants of concern (COCs) are volatile organic compounds (VOCs) including tetrachloroethene (PCE), trichloroethene (TCE), 1,2-dichloroethene (1,2-DCE), and vinyl chloride. Remedial goals outlined in the Site's ROD documents are instituted to ensure protection of groundwater from site contaminants in soil, restore groundwater to drinking water standards or until a point has been reached at which contaminant concentrations in the groundwater "level off," and reduce risk to human health and the environment. The treatment of groundwater was accomplished by the installation of a GWETS consisting of, at the time of installation, 14 open-hole bedrock extraction wells, 16 screened overburden extraction wells, 14 open-hole bedrock re-injection wells, and three re-injection trenches.

The Site's current Remedial Action Objective (RAO) includes operation of the GWETS to maintain hydraulic control of bedrock contamination source area through inward hydraulic gradients. Hydraulic control is achieved through level-controlled pumping of five bedrock extraction wells (EW-2, EW-6, EW-7, EW-9, and EW-16) (**Figure 2**). Bedrock extraction well EW-2 has been inoperable since September 2020 due to electrical and mechanical issues. Through combined pumping of bedrock extraction wells, the most contaminated bedrock groundwater is confined to the source area with diminishing concentrations to the west (M-8), north (IW-8 and IW-10), east (EW-3 and EW-4), and south (M-9) (**Figure 3**).

Seven overburden extraction wells (OW-2, OW-3, OW-5, OW-7, OW-13, OW-14, and OW-16) collect contaminated groundwater from residual source material inferred to remain at the Site to prevent further downward migration through the overburden into bedrock (**Figure 2**). Due to the dense nature of the overburden material, these wells are effectively sumps, and their pumps intermittently cycle on and off as water accumulates in the wells.

Prior to commencement of the extraction well optimization evaluation in February 2022, the combined groundwater throughput to the GWETS was approximately 22 gallons per minute (gpm). Well EW-9 contributes the most water to the GWETS with pumping rates historically capped at approximately 11 gpm to avoid exceeding the GWETS throughput capacity. The pumping rate at EW-9 was increased to the 11-gpm cap in 2012 to create an inward hydraulic gradient from IW-9 (MACTEC, 2013). The remaining extraction wells provided a combined 12 gpm to the GWETS:

- 4.5 gpm from EW-16,
- 3.5 gpm from EW-6, and
- <4 gpm combined from extraction wells EW-7, OW-2, OW-3, OW- 5, OW-7, OW-13, OW-14, and OW-16.

PURPOSE AND OBJECTIVES

At the request of the NYSDEC, MACTEC prepared and submitted a Field Activities Plan (FAP) to evaluate optimization of contaminant mass removal by the GWETS. This plan focused on pumping rates at bedrock extraction well EW-9 and operational efficiency of the GWETS while still meeting RAOs (MACTEC, 2021). The FAP also included an assessment of the need return well EW-2 to service. A rebound evaluation of Site COCs in this well under ambient conditions was proposed, however, scoped activities were not completed as a result of the current well conditions and is discussed in the “Deviations from the Field Activities Plan” section of this report.

Objectives of the EW-9 evaluation included:

- Phased reductions of the groundwater pumping rate at EW-9 to reduce over-pumping of off-site clean water while evaluating effects on hydraulic control of bedrock source area contamination.
- Collection of VOC samples from EW-9 following each pumping rate reduction phase to monitor Site COC concentrations in extracted groundwater and evaluate improvements to contaminant mass removal efficiency.
- Collection of water level measurements from select groundwater extraction and monitoring wells to evaluate effects of pumping rate reductions on hydraulic gradients north and west of the Site.

- Determining the optimal groundwater pumping rate at EW-9 for improved contaminant mass removal efficiency while maintaining the current RAO of hydraulic control of the most contaminated area in bedrock, which is defined as water with a PCE concentration of greater than 1,000 µg/L (MACTEC, 2013).
- With respect to the previous goal, evaluating if EW-9 can be removed from service to improve long-term maintenance cost efficiencies for mass removal at the Site. Frequent non-routine site visits are necessary to troubleshoot well equipment affected by periodic power brownouts/power surges and radio antenna communication dropouts between the well and the treatment system building.

FIELD ACTIVITIES

Work was conducted in general accordance with the FAP submitted to the NYSDEC on November 11, 2021, and approved for implementation. Additional clarifications were requested by the NYSDEC following implementation, and a revised FAP was submitted on March 25, 2022. A baseline assessment and optimization evaluation occurred from February to August 2022 during routine operation, maintenance, and monitoring (OM&M) visits performed under the Site's current Work Assignment. Activities included bedrock groundwater level monitoring, groundwater sample collection from EW-9, and phased reductions of the pumping rate at EW-9. A task and sampling summary is presented in **Table 1**.

For each phase, water level measurements were collected twice per month during routine OM&M visits at five bedrock extraction wells (EW-2, EW-6, EW-7, EW-9, and EW-16) and at eight monitoring wells (M-8, IW-8, IW-9, IW-10, EW-3, EW-4, EW-5, EW-8). Bedrock extraction well water levels are logged automatically by dedicated level transducers and displayed on a human machine interface (HMI) screen at each well's control panel. Depth to water was manually measured in the eight monitoring wells using a water level meter. Manual measurements in bedrock extraction wells are not feasible due to the amount and sensitivity of the equipment within them. Water level measurements were recorded on the forms provided in **Attachment 1** and the corresponding groundwater elevations are presented in **Table 2**.

Grab groundwater samples were collected from the EW-9 sample port, located in an aboveground enclosure approximately 315 feet north of the well, the first week of each month concurrent with

routine monthly GWETS performance sampling. Samples were analyzed for the site-specific (19 compounds) target compound list (TCL) for VOCs using USEPA Method 8260 by Pace Analytical Services, LLC in Melville, NY, and Longmeadow, Massachusetts. A Category A chemistry review of the analytical results was completed by MACTEC, and analytical results for Site COCs are presented in **Table 3**.

Baseline Assessment

On February 1, 2022, a baseline assessment for the 11-gpm pumping rate was performed that consisted of the collection of a groundwater sample for VOCs at EW-9 and water level measurements from the 13 wells listed above. The level transducer in EW-16 was not functioning at the time of the assessment, and a groundwater elevation measurement could not be collected. Due to the amount and sensitivity of the equipment within the well, depth to water could not be manually measured. The inferred bedrock groundwater potentiometric surface from the baseline assessment is included as **Figure 4**.

Optimization Evaluation

The pumping rate at EW-9 was reduced using the variable frequency drive (VFD) controller in its control panel in three phases with each phase lasting approximately two months.

Phase 1 (February 1, 2022 - April 1, 2022)

On February 1, 2022, immediately following baseline assessment activities, the pumping rate cap at EW-9 was reduced from 11 gpm to 9 gpm, marking the beginning of Phase 1. This rate was continued through April 1, 2022, a duration of 59 days. Grab samples for VOCs were collected from EW-9 on March 1 and April 1, 2022, to represent Phase 1 Site COC concentrations in water extracted from EW-9. Water level measurements were collected twice per month for approximately two months during routine OM&M visits on February 17, March 1, March 16, and April 1, 2022. Inferred bedrock groundwater potentiometric surfaces for March and April are included as **Figures 5** and **6**, respectively.

Phase 2 (April 1, 2022 - June 1, 2022)

On April 1, 2022, following collection of final water level measurements and a groundwater sample

for Phase 1, the pumping rate cap at EW-9 was reduced from 9 gpm to 7 gpm to start Phase 2 of the evaluation. This rate was continued through June 1, 2022, a duration of 61 days. Grab samples for VOCs were collected from EW-9 on May 2 and June 1, 2022, representing Phase 2 Site COC concentrations in water extracted from EW-9. Water level measurements were collected twice per month for approximately two months during routine OM&M visits on April 18, May 2, May 16, and June 1, 2022. On June 1, 2022, the level transducer in EW-16 was not functioning properly and a groundwater elevation could not be obtained for the well. Inferred bedrock groundwater potentiometric surfaces for May and June are included as **Figures 7** and **8**, respectively.

Phase 3 (June 1, 2022 - August 1, 2022)

On June 1, 2022, following collection of final water level measurements and a groundwater sample for Phase 2, the pumping rate cap at EW-9 was reduced from 7 gpm to 5 gpm to start Phase 3 of the evaluation. For the purposes of this evaluation, August 1, 2022, marks the end of Phase 3, a duration of 61 days. Grab samples for VOCs were collected from EW-9 on July 1 and August 1, 2022, representing Phase 3 Site COC concentrations in water extracted from EW-9. Water level measurements were collected twice per month for approximately two months during routine OM&M visits on June 16, July 1, July 18, and August 1, 2022. On June 16, July 18, and August 1, 2022, the level transducer in EW-16 was not functioning properly and a groundwater elevation could not be obtained for the well. Inferred bedrock groundwater potentiometric surfaces for July and August are included as **Figures 9** and **10**, respectively.

DEVIATIONS FROM THE FIELD ACTIVITIES PLAN

Extraction at EW-2 has been offline since September 2020 due to electrical and mechanical issues. Collection of bimonthly VOC samples was proposed to evaluate rebound of Site COCs under ambient conditions in the well (MACTEC, 2022). The PDB deployed for the baseline assessment could not be retrieved. The suspension tether caught on extraction equipment in the well and snapped. MACTEC personnel were unable to recover the PDB to collect a baseline sample, and further attempts were determined to be infeasible. Rebound study activities at EW-2 are anticipated to resume following removal of extraction equipment within the well by an approved contractor.

OPTIMIZATION EVALUATION FINDINGS

Water Level Response

As described above, the pumping rate at EW-9 was reduced from 11 to 5 gpm in three bimonthly phases of 2-gpm reductions between February and August 2022. Effects of rate adjustments on hydraulic gradients in the area of EW-9 were evaluated using water level measurements from three nearby monitoring wells (EW-8, IW-8, and IW-9), one cross gradient background well (EW-3), and treatment system Supervisory Control and Data Acquisition (SCADA) data for active extraction wells EW-7 and EW-9.

For the purposes of evaluating the effects of pumping rate reduction at EW-9 on hydraulic control of the bedrock source area, well IW-10 has been excluded from groundwater contour maps in this report as it is hydrogeologically inconsistent with surrounding wells. Borehole geophysics completed as part of the 2013 RSO identified shallow bedrock fractures up to 40 feet below ground surface (ft bgs) with relatively competent rock to the terminal depth of 200 ft bgs (MACTEC, 2013). Based on the shallow groundwater elevations consistently observed at this location compared to surrounding wells, this well is considered to represent a separate hydrogeologic unit rather than the deeper unit from which the GWETS is operating for hydraulic control.

Groundwater elevation measurements for select wells for the three phases of the evaluation are presented as **Figure 11**. Monitoring wells EW-3 and EW-8 are located beyond the influence of the active bedrock extraction well network and are representative of the seasonal groundwater responses in the bedrock aquifer. Water level trends between the wells indicates that seasonal variability in water levels due to recharge from precipitation or natural drainage of the aquifer during drier periods is the dominant controlling factor on groundwater elevations in these select monitoring wells. Reduction in flow rates at EW-9 was observed to raise the groundwater elevation in that well by approximately 1 foot for each 2-gpm flow rate reduction.

Bedrock groundwater potentiometric surfaces for March to August 2022 (**Figures 5 through 10**) were consistent indicating that pumping rate reductions at EW-9 did not alter groundwater flow paths at the Site.

Hydraulic Capture

The bedrock potentiometric surface maps (**Figures 4 through 10**) indicate that control of the bedrock source area is maintained with the reduced pumping rates at EW-9. Observed gradients from EW-9 (and other active extraction wells) were inward towards the center of the hydraulic control area around EW-7. Comparison of the potentiometric surface maps and the extraction well concentration data indicate that the reduced pumping rate for EW-9 does achieve the 2013 RAO of hydraulic control of the most contaminated area (PCE concentrations greater than 1,000 µg/L) of bedrock groundwater (MACTEC, 2013).

As anticipated, the reductions in pumping rate at EW-9 resulted in higher groundwater elevations at EW-9. Groundwater elevations at IW-9 were consistently lower than those at EW-9 as the pumping rate was decreased for the monitoring period (**Figure 11** and **Table 2**). Therefore, the reduced pumping rate will not be able to achieve the 2013 RAO of maintaining inward gradients from IW-9 towards EW-9. PCE concentrations at IW-9 have decreased to 168 µg/L (July 2022) (MACTEC, 2023) which is an order of magnitude lower than the 2013 concentration of 1,300 µg/L. With this reduction in concentrations, IW-9 is below the bedrock source area PCE threshold of 1,000 µg/L established for the hydraulic control RAO in 2013. Therefore, the RAO of hydraulic control of IW-9 by EW-9 is no longer necessary.

Contaminant Mass Extraction

To evaluate if lower pumping rates would increase contaminant mass removal efficiency, groundwater samples were collected and analyzed monthly for VOCs from EW-9. **Table 3** presents Site COC sample results for each phase of the evaluation. Individual Site COCs are presented in time-series in **Figure 12**.

Contaminant concentrations in EW-9 were relatively stable for the first four sampling events. Site COC concentrations increased in June 2022, particularly for cis-1,2-dichloroethene (cis-1,2-DCE) which increased by an order of magnitude. This increase is likely due to a shutdown of the GWETS resulting from a power outage from May 27 to June 1, 2022. Rapid increases in contaminant concentrations have been observed historically immediately after a prolonged (greater than 24 hours) shutdown of the GWETS. Total Site COC concentrations in subsequent sampling events decreased

from the peak concentrations observed in June 2022, but remained elevated above baseline values (**Figure 12**).

The contaminant mass removal rate in EW-9 is calculated in **Table 4** for the baseline assessment and optimization phases. Excluding June sample results, as these are not representative of standard operating conditions of the GWETS, the 5-gpm pumping rate was the most efficient at removing contaminant mass representing an approximate 60% improvement over the baseline removal rate. Albeit these efficiency gains are on an already relatively low mass removal rate.

RECOMMENDATIONS

Based on the results of the extraction well optimization evaluation, MACTEC recommends the following:

1. EW-2 should be converted from an extraction well to a monitoring well which will reduce GWETS operational costs. Although EW-2 has not been sampled due to extraction equipment remaining within the well, groundwater contour maps presented in this report indicate that the EW-7 capture zone includes EW-2. Therefore, active extraction at EW-2 is not necessary.
2. Continue operating EW-9 at a pumping rate of 5 gpm and resume routine well sampling and hydraulic monitoring in accordance with the SMP.
3. Further evaluate if EW-9 should be removed from service. Based on the relatively low mass removal rate and hydraulic control of the bedrock source area under reduced pumping, continued use of EW-9 may not be needed. Eliminating EW-9 will reduce operating costs as the well frequently requires unscheduled site visits to restore operation caused by power and antenna communication interruptions unique to this well. A rebound study would be proposed for EW-9 under non-pumping conditions prior to removal of supporting extraction infrastructure.
4. Evaluate source of and remedies for level transducer malfunctions in EW-16.
5. Evaluate the long-term monitoring sampling and hydraulic monitoring program and refine to optimize monitoring the off-site bedrock plume.

Please feel free to contact us if you have any questions.

Sincerely,

MACTEC Engineering & Geology, P.C.

Katie Amann
Site Manager

Jean Firth, P.G.
Project Manager/Program Manager

Enclosures (17):

Figure 1	Site Location
Figure 2	Groundwater Well Locations
Figure 3	Bedrock Groundwater PCE Plume, July 2022
Figure 4	Interpreted Bedrock Potentiometric Surface (Pumping) February 1, 2022
Figure 5	Interpreted Bedrock Potentiometric Surface (Pumping) March 1, 2022
Figure 6	Interpreted Bedrock Potentiometric Surface (Pumping) April 1, 2022
Figure 7	Interpreted Bedrock Potentiometric Surface (Pumping) May 2, 2022
Figure 8	Interpreted Bedrock Potentiometric Surface (Pumping) June 1, 2022
Figure 9	Interpreted Bedrock Potentiometric Surface (Pumping) July 1, 2022
Figure 10	Interpreted Bedrock Potentiometric Surface (Pumping) August 1, 2022
Figure 11	Groundwater Elevation in Select Wells
Figure 12	Site VOCs of Concern Time Series Plot (EW-9)
Table 1	Task and Sampling Summary
Table 2	Groundwater Elevation Data
Table 3	Sample Results for Site VOCs of Concern
Table 4	Site VOCs of Concern Removal Rates in EW-9
Attachment 1	Field Data Records

REFERENCES

MACTEC, 2013. RSO Implementation Field Activities Report, American Thermostat Site, Site No. 42006. Prepared for New York State Department of Environmental Conservation, Albany, New York.

MACTEC, 2021. Field Activities Plan – Extraction Well Optimization Evaluation American Thermostat. Work Assignment # D009809-01.

MACTEC, 2022. Revised Field Activities Plan – Extraction Well Optimization Evaluation American Thermostat. Work Assignment # D009809-01.

MACTEC, 2023. Final 2022 Annual Report, American Thermostat Site (NYSDEC Site No. 420006). October 2023.

USEPA, 1988. USEPA Region II – Record of Decision for the American Thermostat site, South Cairo, Greene County, New York. January 7, 1988.

USEPA, 1990. USEPA Region II – Record of Decision, Operable Unit 2, American Thermostat site, South Cairo, Greene County, New York. June 29, 1990.

FIGURES

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: https://gis.ny.gov

N

0 100 200 Feet

Prepared/Date: BRP 12/01/22
Checked/Date: KAA 12/01/22

EXTRACTION WELL OPTIMIZATION EVALUATION FIELD ACTIVITIES REPORT
AMERICAN THERMOSTAT SITE NO. 420006
SOUTH CAIRO, NEW YORK

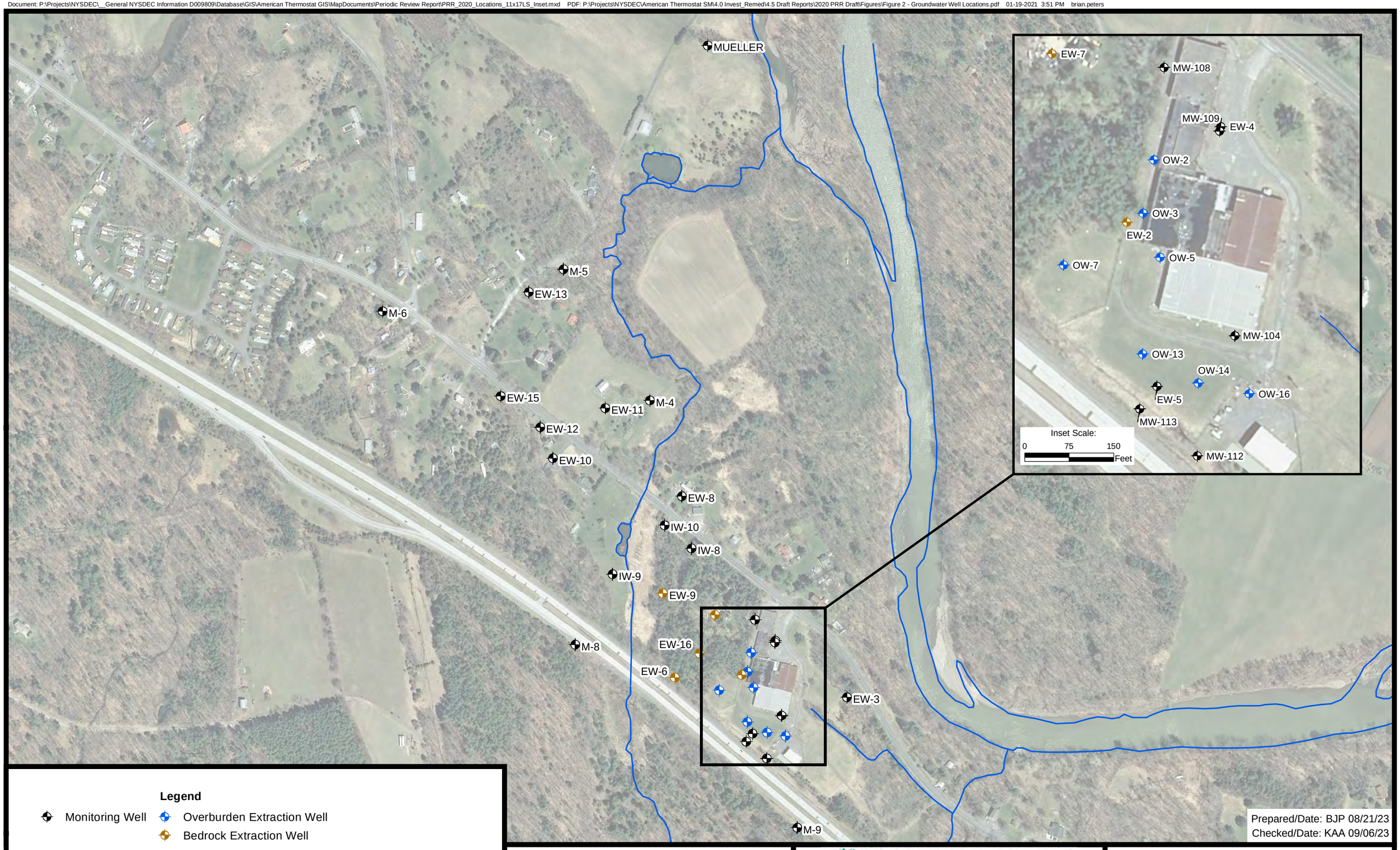
MACTEC

SITE LOCATION

Project 3616206098 Figure 1

Document: P:\Projects\NYSDEC_General NYSDEC Information D009809\Database\GIS\American Thermostat GIS\MapDocuments\AmericanThermostat_SiteLocMap.mxd

Document: P:\Projects\NYSDEC__General NYSDEC Information D009809\Database\GIS\American Thermostat GIS\MapDocuments\Periodic Review Report\PRR_2020_Locations_11x17LS_Inset.mxd PDF: P:\Projects\NYSDEC\American Thermostat SM\4.0 Invest_Remed\4.5 Draft Reports\2020 PRR Draft\Figures\Figure 2 - Groundwater Well Locations.pdf 01-19-2021 3:51 PM brian.peters



Legend

- Monitoring Well
- Overburden Extraction Well
- Bedrock Extraction Well

N

0 210 420 Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: https://gis.ny.gov

EXTRACTION WELL OPTIMIZATION EVALUATION
FIELD ACTIVITIES REPORT
AMERICAN THERMOSTAT SITE NO. 420006
SOUTH CAIRO, NEW YORK

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GROUNDWATER WELL LOCATIONS

Project 3616206098 Figure 2

Prepared/Date: BJP 08/21/23
Checked/Date: KAA 09/06/23

CE-2
10.9

CE-1
NS

M-6
ND

EW-13
24.3

M-5
ND

EW-12
5.7

EW-11
ND

M-4
ND

Tributary B

EW-8
ND

IW-10
ND

IW-8
ND

IW-9
168

EW-9
6.1

EW-7
6.5

M-8
ND

EW-16
599

EW-4
ND

EW-6
446

EW-2
NS

EW-3
ND

EW-5
182

M-9
ND

10
5
100
10
400
5
200
5

Legend

- Bedrock Monitoring Well
- Bedrock Extraction Well
- Interpreted PCE Isocontour (µg/L) (contour is dashed where inferred)

Notes:
PCE = Tetrachloroethene
ND = not detected above reporting limit
NS = not sampled
- Samples collected 7/19/22 & 7/20/22
- CE-2 sample collected 8/1/22
- EW-2 has been inoperable since Sept. 2020
- CE-1 is a backup supply well for Country Estates and is not sampled as part of LTM

N

0 150 300 Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: https://gis.ny.gov

Prepared/Date: BRP 03/14/23
Checked/Date: KT 03/14/23

EXTRACTION WELL OPTIMIZATION
EVALUATION FIELD ACTIVITIES REPORT
AMERICAN THERMOSTAT SITE NO. 420006
SOUTH CAIRO, NEW YORK

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BEDROCK GROUNDWATER PCE PLUME
JULY 2022

Project 3616206098

Figure 3

Document: P:\Projects\NYSDEC__General NYSDEC Information D009809\Database\GIS\American Thermostat GIS\MapDocuments\Annual Report\GW_PCE_2022_11x17P.mxd PDF: P:\Projects\NYSDEC__General NYSDEC Information D009809\Database\GIS\American Thermostat GIS\Figures\PCE July 2022\Figure 3 - Bedrock GW PCE Plume July 2022.pdf 03-14-2023 8:10 AM brian.peters

EW-8
134.24

IW-8
147.94

IW-9
145.19

EW-9
145.20

EW-7
65.00

EW-4
143.01

EW-16
NM

M-8
247.71

EW-6
153.18

EW-2
151.27

EW-3
143.33

EW-5
255.07

140
120
80
100
180
200
220
240
160
200
220
240

Legend

- Bedrock Monitoring Well
- Bedrock Extraction Well
- Interpreted Bedrock Groundwater Contour, feet above mean sea level (contour is dashed where inferred)
- Interpreted Groundwater Flow Direction

Notes:
NM = Not Measured
- Depth to water measurements collected 02/01/22
- Groundwater contours are modeled using Surfer
- EW-16 level transducer not functioning properly during measurement event

N

0 25 50 100 150 Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: https://gis.ny.gov

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EXTRACTION WELL OPTIMIZATION
FIELD ACTIVITIES REPORT
AMERICAN THERMOSTAT SITE NO. 420006
SOUTH CAIRO, NEW YORK

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INTERPRETED BEDROCK POTENTIOMETRIC SURFACE (PUMPING)
FEBRUARY 1, 2022

Project 3616206098

Figure 4

EW-8
143.32

IW-8
157.52

IW-9
153.77

EW-9
153.95

EW-7
94.00

EW-4
152.01

EW-16
128.74

M-8
250.94

EW-6
161.87

EW-2
163.32

EW-3
152.29

EW-5
255.71

100
120
140
160
180
200
220
240
240

Legend

- Bedrock Monitoring Well
- Bedrock Extraction Well
- Interpreted Bedrock Groundwater Contour, feet above mean sea level (contour is dashed where inferred)
- Interpreted Groundwater Flow Direction

Notes:
NM = Not Measured
- Depth to water measurements collected 03/01/22
- Groundwater contours are modeled using Surfer

N

0 25 50 100 150
Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at:https://gis.ny.gov

Prepared/Date: BJP 07/19/23
Checked/Date: KAA 09/06/23

EXTRACTION WELL OPTIMIZATION
FIELD ACTIVITIES REPORT
AMERICAN THERMOSTAT SITE NO. 420006
SOUTH CAIRO, NEW YORK

MACTEC

INTERPRETED BEDROCK POTENTIOMETRIC SURFACE (PUMPING)
MARCH 1, 2022

Project 3616206098

Figure 5

EW-8
145.53

IW-8
NM

IW-9
154.49

EW-9
155.60

EW-7
65.00

EW-4
152.98

EW-16
132.36

M-8
253.64

EW-6
162.91

EW-2
164.39

EW-3
153.28

EW-5
257.83

80
100
120
140
160
180
200
220
240

Legend

- Bedrock Monitoring Well
- Bedrock Extraction Well
- Interpreted Bedrock Groundwater Contour, feet above mean sea level
- Interpreted Groundwater Flow Direction

Notes:
NM = Not Measured
- Groundwater contours modeled using Surfer.
- Contour is dashed where inferred.
- Water level measurements collected 4/1/22.
- IW-08 flooded with surface water. Depth to water could not be measured.

N

0 25 50 100 150 Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at:https://gis.ny.gov

Prepared/Date: BJP 07/19/23
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EXTRACTION WELL OPTIMIZATION
FIELD ACTIVITIES REPORT
AMERICAN THERMOSTAT SITE NO. 420006
SOUTH CAIRO, NEW YORK

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INTERPRETED BEDROCK POTENTIOMETRIC SURFACE (PUMPING)
APRIL 1, 2022

Project 3616206098

Figure 6

EW-8
144.98

160

IW-8
163.18

IW-9
153.92

140

120

EW-9
155.69

EW-7
70.00

100

80

EW-4
153.67

EW-16
133.39

140

160

M-8
249.72

EW-6
163.45

EW-2
165.10

240

180

EW-3
154.01

200

220

240

EW-5
257.51

Legend

- Bedrock Monitoring Well
- Bedrock Extraction Well
- Interpreted Bedrock Groundwater Contour, feet above mean sea level (contour is dashed where inferred)
- Interpreted Groundwater Flow Direction

Notes:
NM = Not Measured
- Depth to water measurements collected 05/02/22
- Groundwater contours are modeled using Surfer

N

0 25 50 100 150
Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at:https://gis.ny.gov

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EXTRACTION WELL OPTIMIZATION
FIELD ACTIVITIES REPORT
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SOUTH CAIRO, NEW YORK

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INTERPRETED BEDROCK POTENTIOMETRIC SURFACE (PUMPING)
MAY 2, 2022

Project 3616206098

Figure 7

EW-8
144.98

IW-8
156.34

IW-9
153.82

EW-9
157.29

EW-7
69.00

EW-16
NM

EW-4
154.06

EW-6
162.28

EW-2
164.10

M-8
248.82

EW-3
154.17

EW-5
254.90

140
80
100
120
160
140
240
180
200
220
240

Legend

- Bedrock Monitoring Well
- Bedrock Extraction Well
- Interpreted Bedrock Groundwater Contour, feet above mean sea level (contour is dashed where inferred)
- Interpreted Groundwater Flow Direction

Notes:
NM = Not Measured
- Depth to water measurements collected 06/01/22
- Groundwater contours are modeled using Surfer
- EW-16 level transducer not functioning properly during measurement event

N

0 25 50 100 150 Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at:https://gis.ny.gov

Prepared/Date: BJP 07/19/23
Checked/Date: KAA 09/06/23

EXTRACTION WELL OPTIMIZATION
FIELD ACTIVITIES REPORT
AMERICAN THERMOSTAT SITE NO. 420006
SOUTH CAIRO, NEW YORK

MACTEC

INTERPRETED BEDROCK POTENTIOMETRIC SURFACE (PUMPING)
JUNE 1, 2022

Project 3616206098

Figure 8

EW-8
144.64

IW-8
156.97

IW-9
153.97

EW-9
156.94

EW-7
65.00

EW-4
153.62

EW-16
132.86

M-8
247.62

EW-6
163.16

EW-2
164.68

EW-3
153.95

EW-5
254.33

140
120
80
100
140
160
180
200
220
240
240

Legend

- Bedrock Monitoring Well
- Bedrock Extraction Well
- Interpreted Bedrock Groundwater Contour, feet above mean sea level (contour is dashed where inferred)
- Interpreted Groundwater Flow Direction

Notes:
NM = Not Measured
- Depth to water measurements collected 07/01/22
- Groundwater contours are modeled using Surfer

N

0 25 50 100 150 Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at:https://gis.ny.gov

Prepared/Date: BJP 07/19/23
Checked/Date: KAA 09/06/23

EXTRACTION WELL OPTIMIZATION
FIELD ACTIVITIES REPORT
AMERICAN THERMOSTAT SITE NO. 420006
SOUTH CAIRO, NEW YORK

MACTEC

INTERPRETED BEDROCK POTENTIOMETRIC SURFACE (PUMPING)
JULY 1, 2022

Project 3616206098

Figure 9

EW-8
143.43

IW-8
156.47

IW-9
152.77

EW-9
155.87

EW-7
68.00

EW-4
152.82

EW-16
NM

M-8
247.62

EW-6
163.52

EW-2
164.83

EW-3
152.91

EW-5
253.27

140
80
100
120
140
160
180
200
220
240
240

Legend

- Bedrock Monitoring Well
- Bedrock Extraction Well
- Interpreted Bedrock Groundwater Contour, feet above mean sea level (contour is dashed where inferred)
- Interpreted Groundwater Flow Direction

Notes:
NM = Not Measured
- Depth to water measurements collected 08/01/22
- Groundwater contours are modeled using Surfer

N

0 25 50 100 150 Feet

Greene County digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at:https://gis.ny.gov

Prepared/Date: BJP 07/19/23
Checked/Date: KAA 09/06/23

EXTRACTION WELL OPTIMIZATION
FIELD ACTIVITIES REPORT
AMERICAN THERMOSTAT SITE NO. 420006
SOUTH CAIRO, NEW YORK

MACTEC

INTERPRETED BEDROCK POTENTIOMETRIC SURFACE (PUMPING)
AUGUST 1, 2022

Project 3616206098

Figure 10

Figure 11: Groundwater Elevation in Select Wells

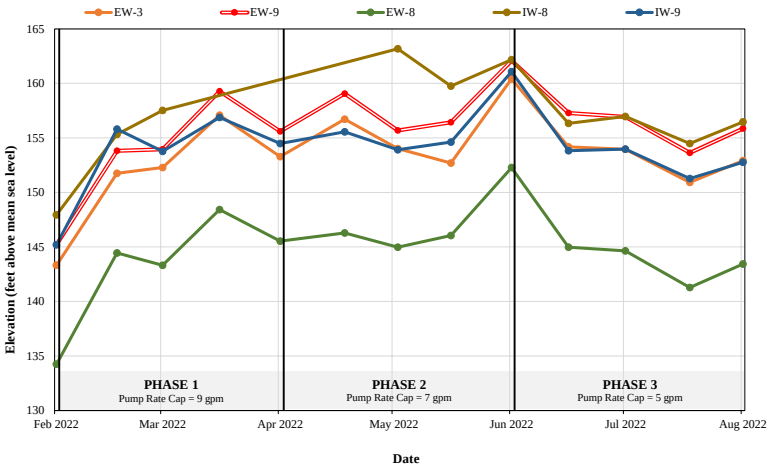
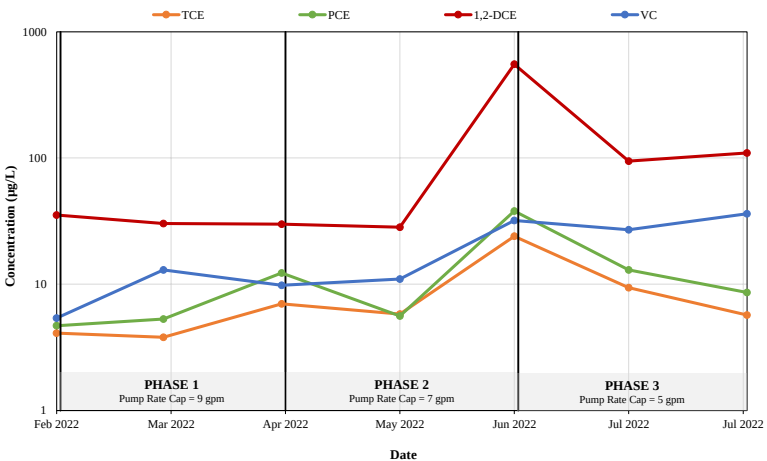


Figure 12: Site VOCs of Concern Time Series Plot (EW-9)



TABLES

Table 1: Task and Sampling Summary

Date	Phase Duration (days)	EW-9 Extraction Rate Adjustment	EW-9 Sample Collection	Water Level Measurements	Comments
Baseline Assessment					
02/01/2022	1		X	X	EW-9 pump rate cap 11 gpm.
Phase 1					
02/01/2022	59	X			EW-9 pump rate cap adjusted from 11 to 9 gpm following Baseline Assessment activities.
02/17/2022				X	
03/01/2022			X	X	
03/16/2022				X	
04/01/2022			X	X	
Phase 2					
04/01/2022	61	X			EW-9 pump rate cap adjusted from 9 to 7 gpm following Phase 1 activities.
04/18/2022				X	
05/02/2022			X	X	
05/16/2022				X	
06/01/2022			X	X	
Phase 3					
06/01/2022	61	X			EW-9 pump rate cap adjusted from 7 to 5 gpm following Phase 2 activities.
06/16/2022				X	
07/01/2022			X	X	
07/18/2022				X	
08/01/2022			X	X	

Notes:
gpm = gallons per minute

Prepared By: KRT 02/20/23
Checked By: KAA 07/10/23

Table 2: Groundwater Elevation Data

Meausrement Date	Well ID												
	EW-2 [1]	EW-3	EW-4	EW-5	EW-6	EW-7	EW-8	EW-9	EW-16	IW-8	IW-9	IW-10	M-8
02/01/2022	151.27	143.33	143.01	255.07	153.18	65.00	134.24	145.20	NM [2]	147.94	145.19	228.13	247.71
02/17/2022	162.68	151.75	151.47	255.15	161.71	86.00	144.45	153.83	128.37	155.32	155.80	229.76	250.73
03/01/2022	163.32	152.29	152.01	255.71	161.87	94.00	143.32	153.95	128.74	157.52	153.77	230.22	250.94
03/16/2022	168.53	157.08	156.83	256.61	169.21	104.00	148.43	159.28	142.65	NM [3]	156.88	230.57	252.37
04/01/2022	164.39	153.28	152.98	257.83	162.91	65.00	145.53	155.60	132.36	NM [3]	154.49	230.78	253.64
04/18/2022	166.57	156.72	156.55	257.61	164.88	132.64	146.28	159.07	134.85	NM [3]	155.55	230.24	251.00
05/02/2022	165.10	154.01	153.67	257.51	163.45	70.00	144.98	155.69	133.39	163.18	153.92	229.63	249.72
05/16/2022	163.79	152.69	152.35	256.55	162.17	63.00	146.04	156.44	130.8	159.75	154.62	228.99	248.52
06/01/2022	171.37	160.42	160.26	255.46	170.01	156.00	152.28	162.09	NM [2]	162.17	161.08	228.57	248.89
06/16/2022	164.10	154.17	154.06	254.90	162.28	69.00	144.98	157.29	NM [2]	156.34	153.82	228.32	248.82
07/01/2022	164.68	153.95	153.62	254.33	163.16	65.00	144.64	156.94	132.86	156.97	153.97	227.32	247.62
07/18/2022	161.82	150.92	150.66	253.65	160.18	69.00	141.28	153.64	NM [2]	154.48	151.27	226.66	247.97
08/01/2022	164.83	152.91	152.82	253.27	163.52	68.00	143.43	155.87	NM [2]	156.47	152.77	226.86	247.62

Notes:

[1] EW-2 has been off-line since 09/26/2020 due to electrical and mechanical issues.

[2] The water level transducer in EW-16 was not functioning properly on 02/01, 06/01, 06/16, 07/18, or 08/01/2022.

[3] Well IW-8 was found to be flooded with surface water on 03/16, 04/01, and 04/18/2022.

All measurements are reported in feet above mean sea level.

NM = not measured

Prepared By: KAA 11/15/22
Checked By: KRT 02/20/23

Table 3: Sample Results for Site Contaminants of Concern

Parameter			1,2-DCE (total)	Cis-1,2-DCE	Trans-1,2-DCE	PCE	TCE	Vinyl Chloride	Total VOCs (µg/L)
Units			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
GA			5	5	5	5	5	2	
Location	**Pumping Rate**	**Sample Date**							
EW-9	11 gpm*	02/01/2022 (1)	**35.3**	**35.3**	1 U	**4.7**	**4.1**	**5.4** J-	**49.5**
EW-9	9 gpm	03/01/2022 (2)	**30.3**	**30.3**	1 U	**5.3**	**3.8**	**13**	**52**
EW-9	9 gpm*	04/01/2022 (2)	**29.9**	**29.9**	1 U	**12.3**	**7**	**9.8**	**59**
EW-9	7 gpm	05/02/2022 (3)	**28.3**	**27.3**	**1.1**	**5.6**	**5.8**	**11**	**51**
EW-9	7 gpm*	06/01/2022 (3)	**553**	**550**	**3.2**	**38**	**24**	**32**	**647**
EW-9	5 gpm	07/01/2022 (4)	**94**	**93**	**1.4**	**13**	**9.4**	**27**	**144**
EW-9	5 gpm	08/01/2022 (4)	**110**	**108**	**1.6**	**8.6**	**5.7**	**36.2**	**160**

Notes:

(1) Baseline Assessment sample

(2) Phase 1 sample

(3) Phase 3 sample

(4) Phase 3 sample

* Pumping rate at time of sample collection. Rate adjusted following sample collection.

Bold Result = analyte detected

Gray highlight = exceedance of standard

1,2-DCE = 1,2-Dichloroethene

Cis-1,2-DCE = Cis-1,2-Dichloroethene

GA = New York State Class GA Standard

µg/L = micrograms per liter

PCE = Tetrachloroethene

TCE = Trichloroethene

Trans-1,2-DCE = Trans-1,2-Dichloroethene

VOCs = volatile organic compunds

Qualifiers:

U = not detected

J- = estimated value, biased low

Prepared By: KRT 02/20/23
Checked By: KAA 07/10/23

Table 4: Site VOCs of Concern Removal Rates in EW-9

Month	Pumping Rate (gpm)	Total VOC Concentration (µg/L)	Estimated VOC Removal (lbs/day)	Estimated VOC Removal (lbs/month)
February	11	49.5	0.007	0.2
March	9	52	0.006	0.2
April	9	59	0.006	0.2
May	7	51	0.004	0.1
June	7	647	0.054	1.6
July	5	144	0.009	0.3
August	5	160	0.010	0.3

Notes:
Samples collected 02/01, 03/01, 04/01, 05/02, 06/01, 07/01, and 08/01/2022
gpm = gallons per minute
µg/L = micrograms per liter
lbs/day = pounds per day
lbs/month = pounds per month (30-day period)
VOCs = volatile organic compounds

Prepared By: KRT 02/20/23
Checked By: KAA 07/10/23

ATTACHMENT 1

FIELD DATA RECORDS

Water Level Measurements

Name(s): Adam Norvelle, Kim Stilson Date: 2-1-2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	116.34	Not Applicable
EW-4	256.01	322	TOC	113.00	Not Applicable
EW-5	259.85	235.2	TOC	4.78	Not Applicable
EW-8	223.93	318	TOC	89.69	Not Applicable
IW-8	239.47	391.8	TOC	91.53	Not Applicable
IW-9	224.37	358.1	TOC	79.18	Not Applicable
IW-10	235.57	176.3	TOC	7.44	Not Applicable
M-8	261.57	200	TOC	13.86	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	TOC/Well Panel	Not Applicable	151.27
EW-6	242.94	325	TOC/Well Panel	Not Applicable	153.18
EW-7	251.64	227	TOC/Well Panel	Not Applicable	65
EW-9	236.21	365	TOC/Well Panel	Not Applicable	145.20
EW-16	248.16	417	TOC/Well Panel	Not Applicable	75.41

Notes:

(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

- EW-9 sampled at 1340; EW-2 PDB cable snagged and broken after pulling ~340' from well — no sample collected. AN
- EW-9 pumping rate reduced from ~10.3 gpm (56.8 Hz) to ~9.0 gpm (52.3 Hz).

Water Level Measurements

Name(s): Adam Norvelle Date: 2-17-2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl) *
Monitoring Wells					
EW-3	259.67	295	TOC	107.92	Not Applicable
EW-4	256.01	322	TOC	104.54	Not Applicable
EW-5	259.85	235.2	TOC	4.70	Not Applicable
EW-8	223.93	318	TOC	79.48	Not Applicable
IW-8	239.47	391.8	TOC	84.15	Not Applicable
IW-9	224.37	358.1	TOC	68.57	Not Applicable
IW-10	235.57	176.3	TOC	5.81	Not Applicable
M-8	261.57	200	TOC	10.84	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	TOC/Well Panel	Not Applicable	162.68
EW-6	242.94	325	TOC/Well Panel	Not Applicable	161.71
EW-7	251.64	227	TOC/Well Panel	Not Applicable	86 **
EW-9	236.21	365	TOC/Well Panel	Not Applicable	153.83
EW-16	248.16	417	TOC/Well Panel	Not Applicable	128.37

Notes:

(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

* Measurement collected from well panel
** Intermittent issues with level reading noted - will drop to ~62 ft. Attempted manual measurement but stopped at ~115 ft. due to risk of entangling water level tape in well.

Water Level Measurements

Name(s): Adam Norvelle Date: 3-1-2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl) *
Monitoring Wells					
EW-3	259.67	295	TOC	107.38	Not Applicable
EW-4	256.01	322	TOC	104.00	Not Applicable
EW-5	259.85	235.2	TOC	4.14	Not Applicable
EW-8	223.93	318	TOC	80.61	Not Applicable
IW-8	239.47	391.8	TOC	81.95	Not Applicable
IW-9	224.37	358.1	TOC	70.60	Not Applicable
IW-10	235.57	176.3	TOC	5.35	Not Applicable
M-8	261.57	200	TOC	10.63	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	TOC/Well Panel	Not Applicable	163.32
EW-6	242.94	325	TOC/Well Panel	Not Applicable	161.87
EW-7	251.64	227	TOC/Well Panel	Not Applicable	94
EW-9	236.21	365	TOC/Well Panel	Not Applicable	153.95
EW-16	248.16	417	TOC/Well Panel	Not Applicable	128.74

Notes:
(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

- EW-9 running a little fast at ~9.25 gpm upon arrival; adjusted pump speed down from 52.0Hz to 51.5Hz to bring back to ~9 gpm.
- Sample collected from EW-9 at 11:00.
* Measurement collected from well panel at active extraction wells.

Water Level Measurements

Name(s): AJN / M Date: 3/16/2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	102.59	Not Applicable
EW-4	256.01	322	TOC	99.18	Not Applicable
EW-5	259.85	235.2	TOC	3.24	Not Applicable
EW-8	223.93	318	TOC	75.50	Not Applicable
* IW-8	239.47	391.8	TOC	0.00	Not Applicable
IW-9	224.37	358.1	TOC	67.49	Not Applicable
IW-10	235.57	176.3	TOC	5.00	Not Applicable
M-8	261.57	200	TOC	9.20	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	TOC/Well Panel	Not Applicable	168.53
EW-6	242.94	325	TOC/Well Panel	Not Applicable	169.21
EW-7	251.64	227	TOC/Well Panel	Not Applicable	104.00
EW-9	236.21	365	TOC/Well Panel	Not Applicable	159.28
EW-16	248.16	417	TOC/Well Panel	Not Applicable	142.65

Notes:
(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

* IW-8 - vault + well was flooded - bailed out to below TOC.

- EW-9 pump rate holding at ~9 gpm - no adjustment required
- Measurements from active extraction wells collected from well panels

Water Level Measurements

Name(s): K. Stilson M. Ladny Date: 4/1/22

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	106.39	Not Applicable
EW-4	256.01	322	TOC	103.03	Not Applicable
EW-5	259.85	235.2	TOC	2.02	Not Applicable
EW-8	223.93	318	TOC	78.40	Not Applicable
IW-8	239.47	391.8	TOC	0.00*	Not Applicable
IW-9	224.37	358.1	TOC	69.88**	Not Applicable
IW-10	235.57	176.3	TOC	4.79	Not Applicable
M-8	261.57	200	TOC	7.93	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	TOC/Well Panel	Not Applicable	164.39
EW-6	242.94	325	TOC/Well Panel	Not Applicable	162.91
EW-7	251.64	227	TOC/Well Panel	Not Applicable	65
EW-9	236.21	365	TOC/Well Panel	Not Applicable	155.60
EW-16	248.16	417	TOC/Well Panel	Not Applicable	132.36

Notes:
(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

*IW-8 - Vault flooded, water to top of casing. Water not sucked due to PDB installed in well.

**IW-9 - well vault flooded, pumped out.

EW-9 Panel Frequency set point:
51.7 Hz -> 46.0 Hz 8.94 gmp -> 7.01 gmp

Water Level Measurements

Name(s): Adam Narvelle, Kim Stilson Date: 4-18-22

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	102.95	Not Applicable
EW-4	256.01	322	TOC	99.46	Not Applicable
EW-5	259.85	235.2	TOC	2.24	Not Applicable
EW-8	223.93	318	TOC	77.65	Not Applicable
IW-8	239.47	391.8	TOC	57.46	Not Applicable
IW-9	224.37	358.1	TOC	68.82	Not Applicable
IW-10	235.57	176.3	TOC	5.33	Not Applicable
M-8	261.57	200	TOC	10.57	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	TOC/Well Panel	Not Applicable	~~165.29~~ A.M. 166.57
EW-6	242.94	325	TOC/Well Panel	Not Applicable	164.88
EW-7	251.64	227	TOC/Well Panel	Not Applicable	* ~~70~~ 132.64
EW-9	236.21	365	TOC/Well Panel	Not Applicable	159.07
EW-16	248.16	417	TOC/Well Panel	Not Applicable	134.85

Notes:

(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

1) Locks replaced at M8 & M9.

*Returned to EW-7 after system startup following routine maintenance – significantly higher water elevation noted vs. AM reading.

Water Level Measurements

Name(s): Adam Norvelle Date: 5-2-2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	105.66	Not Applicable
EW-4	256.01	322	TOC	102.34	Not Applicable
EW-5	259.85	235.2	TOC	2.34	Not Applicable
EW-8	223.93	318	TOC	78.95	Not Applicable
IW-8	239.47	391.8	TOC	76.29	Not Applicable
IW-9	224.37	358.1	TOC	70.45	Not Applicable
IW-10	235.57	176.3	TOC	5.94	Not Applicable
M-8	261.57	200	TOC	11.55	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	~~TOC/Well Panel~~	Not Applicable	165.10
EW-6	242.94	325	~~TOC/Well Panel~~	Not Applicable	163.45
EW-7	251.64	227	~~TOC/Well Panel~~	Not Applicable	70
EW-9	236.21	365	~~TOC/Well Panel~~	Not Applicable	155.69
EW-16	248.16	417	~~TOC/Well Panel~~	Not Applicable	133.39

Notes:

(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

- EW-9 pump rate holding at ~7 gpm - no adjustment required
- Measurements from active extraction wells collected from well panels
- Sample collected from EW-9 at 1120 AM.

Water Level Measurements

Name(s): Michael Lachy Date: 5/16/2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	106.98	Not Applicable
EW-4	256.01	322	TOC	103.66	Not Applicable
EW-5	259.85	235.2	TOC	3.30	Not Applicable
EW-8	223.93	318	TOC	77.89	Not Applicable
IW-8	239.47	391.8	TOC	79.72	Not Applicable
IW-9	224.37	358.1	TOC	69.75	Not Applicable
IW-10	235.57	176.3	TOC	6.58	Not Applicable
M-8	261.57	200	TOC	13.05	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	TOC/Well Panel	Not Applicable	163.79
EW-6	242.94	325	TOC/Well Panel	Not Applicable	162.17
EW-7	251.64	227	TOC/Well Panel	Not Applicable	63
EW-9	236.21	365	TOC/Well Panel	Not Applicable	156.44
EW-16	248.16	417	TOC/Well Panel	Not Applicable	130.80

Notes:
(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

* Measurements from active extraction wells were collected at well panel

Water Level Measurements

Name(s): A. Norvelle, J. Minardi Date: 6-1-2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	99.25	Not Applicable
EW-4	256.01	322	TOC	95.75	Not Applicable
EW-5	259.85	235.2	TOC	4.39	Not Applicable
EW-8	223.93	318	TOC	71.65	Not Applicable
IW-8	239.47	391.8	TOC	77.30	Not Applicable
IW-9	224.37	358.1	TOC	63.29	Not Applicable
IW-10	235.57	176.3	TOC	7.00	Not Applicable
M-8	261.57	200	TOC	12.68	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	~~TOC~~/Well Panel	Not Applicable	171.37
EW-6	242.94	325	~~TOC~~/Well Panel	Not Applicable	170.01
EW-7	251.64	227	~~TOC~~/Well Panel	Not Applicable	156.00
* EW-9	236.21	365	~~TOC~~/Well Panel	Not Applicable	162.09
EW-16	248.16	417	~~TOC~~/Well Panel	Not Applicable	75.41

Notes:

(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

*Adjust flow rate from ~7.14 at 45.6 Hz down to ~4.99 gpm at 40.1 Hz at 14:36. System was down from 5-27 to 6-1 at 8:29 AM and EW-9 was not running briefly at ~13:00 PM.

Water Level Measurements

Name(s): M. Ludwig / J. Minard Date: 6/16/2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	105.50	Not Applicable
EW-4	256.01	322	TOC	101.95	Not Applicable
EW-5	259.85	235.2	TOC	4.95	Not Applicable
EW-8	223.93	318	TOC	78.95	Not Applicable
IW-8	239.47	391.8	TOC	83.13	Not Applicable
IW-9	224.37	358.1	TOC	70.55	Not Applicable
IW-10	235.57	176.3	TOC	7.25	Not Applicable
M-8	261.57	200	TOC	12.75	Not Applicable
Active Extraction Wells					
EW-2 [(1)]	255.29	322	TOC/Well Panel	Not Applicable	164.10
EW-6	242.94	325	TOC/Well Panel	Not Applicable	162.28
EW-7	251.64	227	TOC/Well Panel	Not Applicable	69.00
EW-9	236.21	365	TOC/Well Panel	Not Applicable	157.29
EW-16	248.16	417	TOC/Well Panel	Not Applicable	75.41

Notes:

(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

Water Level Measurements

Name(s): Adam Norvelle Date: 7-1-2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	105.72	Not Applicable
EW-4	256.01	322	TOC	102.39	Not Applicable
EW-5	259.85	235.2	TOC	5.52	Not Applicable
EW-8	223.93	318	TOC	79.29	Not Applicable
IW-8	239.47	391.8	TOC	82.50	Not Applicable
IW-9	224.37	358.1	TOC	70.40	Not Applicable
IW-10	235.57	176.3	TOC	8.25	Not Applicable
M-8	261.57	200	TOC	13.95	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	TOC/Well Panel	Not Applicable	164.68
EW-6	242.94	325	TOC/Well Panel	Not Applicable	163.16
EW-7	251.64	227	TOC/Well Panel	Not Applicable	65
EW-9	236.21	365	TOC/Well Panel	Not Applicable	156.94
EW-16	248.16	417	TOC/Well Panel	Not Applicable	~~175.44~~ 132.86

Notes:

(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

~~Adjusted~~ AN Adjusted EW-9 frequency from 40.7Hz (~4.75gpm) up to 41.3Hz (~5.00gpm)

Water Level Measurements

Name(s): A. Novelle, K. Stilson Date: 7-18-2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	108.75	Not Applicable
EW-4	256.01	322	TOC	105.35	Not Applicable
EW-5	259.85	235.2	TOC	6.20	Not Applicable
EW-8	223.93	318	TOC	82.65	Not Applicable
IW-8	239.47	391.8	TOC	84.99	Not Applicable
IW-9	224.37	358.1	TOC	73.10	Not Applicable
IW-10	235.57	176.3	TOC	8.91	Not Applicable
M-8	261.57	200	TOC	13.60	Not Applicable
Active Extraction Wells					
EW-2 [1]	255.29	322	TOC/Well Panel	Not Applicable	161.82
EW-6	242.94	325	TOC/Well Panel	Not Applicable	160.18
EW-7	251.64	227	TOC/Well Panel	Not Applicable	69
EW-9	236.21	365	TOC/Well Panel	Not Applicable	153.64
EW-16	248.16	417	TOC/Well Panel	Not Applicable	75.41

Notes:

[1] = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

-Adjusted EW-9 pump rate from 41.3Hz (~4.86gpm) up to 41.8 Hz (~5.03 gpm).

Water Level Measurements

Name(s): Adam Norvelle Date: 8-1-2022

Well ID	Measurement Point Elevation (ft msl)	Well Depth (ft)	Measurement Point Reference	Measured Depth to Water (ft btoc)	Groundwater Elevation (ft msl)
Monitoring Wells					
EW-3	259.67	295	TOC	106.76	Not Applicable
EW-4	256.01	322	TOC	103.19	Not Applicable
EW-5	259.85	235.2	TOC	6.58	Not Applicable
EW-8	223.93	318	TOC	80.50	Not Applicable
IW-8	239.47	391.8	TOC	83.00	Not Applicable
IW-9	224.37	358.1	TOC	71.60	Not Applicable
IW-10	235.57	176.3	TOC	8.71	Not Applicable
M-8	261.57	200	TOC	13.95	Not Applicable
Active Extraction Wells					
EW-2 (1)	255.29	322	~~TOC~~/Well Panel	Not Applicable	164.83
EW-6	242.94	325	~~TOC~~/Well Panel	Not Applicable	163.52
EW-7	251.64	227	~~TOC~~/Well Panel	Not Applicable	68
EW-9	236.21	365	~~TOC~~/Well Panel	Not Applicable	155.87
EW-16	248.16	417	~~TOC~~/Well Panel	Not Applicable	75.41

Notes:
(1) = EW-2 off-line since September 2020
btoc = below top of casing
ft = feet
msl = mean sea level
TOC = top of casing

Comments:

-EW-9 was not running upon arrival to site due to VFD Fault (Over-Voltage) on 7-25-22 at 0913 — reset VFD/panel at ~0845 and running normally.
-Sample collected at EW-9 at 1235.