FOURTH FIVE-YEAR REVIEW REPORT FOR AMERICAN THERMOSTAT SUPERFUND SITE TOWN OF CATSKILL GREENE COUNTY



Prepared by

U.S. Environmental Protection Agency
Region 2
New York, New York

Pat Evangelista, Acting Director
Superfund and Emergency Management Division

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List of Abbreviations & Acronyms

CIC	Community Involvement Coordinator
DCE	dichloroethylene
EPA	U.S. Environmental Protection Agency
FYR	five-year review
FFS	focused feasibility study
gpm	gallons per minute
GWETS	groundwater extraction and treatment system
LTM	long-term monitoring
LTTD	low temperature thermal desorption
MCLs	Maximum Contaminant Levels
µg/m^3	micrograms per cubic meter
µg/L	micrograms per liter
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OU	operable unit
PCE	tetrachloroethylene
RA	remedial action
RAO	Remedial Action Objective
RD	remedial design
RI/FS	remedial investigation/feasibility study
RSO	Remedial Systems Optimization
SVI	Soil vapor intrusion
TCE	trichloroethylene
VC	vinyl chloride
VOCs	volatile organic compounds

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

This is the fourth FYR for the American Thermostat site. The triggering action for this policy FYR is the signature date of the last review. The approval date of the last review was December 5, 2013. This FYR has been prepared because while the remedial action will not leave hazardous substances, pollutants or contaminants on-site above levels that allow for unlimited use and unrestricted exposure, but the remedy required five or more years to complete.

The work at the site is being conducted under two operable units (OUs). The first OU provided a clean water supply to residents near the site. The second OU covers source control and the cleanup of the contaminated soil and groundwater. Both OUs are the subject of this FYR.

The U.S. Environmental Protection Agency (EPA) conducted this FYR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act Section 121, consistent with the National Contingency Plan (40 CFR Section 300.430(f)(4)(ii)) and considering EPA policy.

The site's FYR team was led by Christos Tsiamis (Remedial Project Manager) and included Sharissa Singh (hydrogeologist), Michael Clemetson (ecological risk assessor), Abbey States (human health risk assessor), and Larissa Romanowski (EPA community involvement coordinator [CIC]).

The FYR began on April 13, 2018.

Site Background

The site is in a rural residential area in the Town of Catskill, Greene County, New York, approximately 30 miles southwest of Albany and five miles west of the Village of Catskill. 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. The site contains the former American Thermostat building and the water treatment plant constructed for the implementation of the groundwater remedy. See Appendix A, Figure 1 for a site plan.

Until a waterline was installed to protect the public from exposure to the contaminated groundwater, all homes within ½ mile of the site used private wells. At present, all residences and businesses within the immediate vicinity of the site receive water from the municipal supply of the Village of Catskill.

Appendix B, attached, summarizes the documents utilized to prepare this FYR.
Appendix C, attached, summarizes the site's topography and geology/hydrogeology. For more

details related to background, physical characteristics, geology/hydrogeology, land/resource use, and history related to the site, please refer to www.epa.gov/superfund/american-thermostat.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: American Thermostat		
EPA ID: NYD001233634		
Region: 2	**State:** NY	**City/County:** Town of Catskill/Greene County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:**		
Author name (Federal or State Project Manager): Christos Tsiamis		
Author affiliation: EPA		
Review period: 12/6/2013 - 12/5/2018		
Date of site inspection:11/6/2018		
Type of review: Policy		
Review number: 4		
Triggering action date: 12/5/2013		
Due date *(five years after triggering action date)*: 12/5/2018		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

History of Contamination

From 1954 to 1985, the American Thermostat Corporation built thermostats for small appliances at the site. In 1981, the New York State Department of Environmental Conservation (NYSDEC) discovered that American Thermostat employees were improperly disposing of chemicals at the site—workers had been pouring waste organic solvents down drains attached to an abandoned

septic system for several years and they had been dumping solvents and sludges onto the parking lot. State health personnel tested wells near the site and found them to be contaminated with tetrachloroethylene (PCE) and trichloroethylene (TCE). PCE and TCE were subsequently identified by EPA as the contaminants of concern for the site because their presence in the soil and groundwater presented unacceptable risks to human health through ingestion or dermal contact with the soils and ingestion of drinking water from contaminated wells in the area, respectively. In addition, the presence of PCE and TCE in the soil and in sediments in a small pond on an adjacent residential property were a potential source of groundwater contamination through leaching.

An ecological assessment was not performed for OU2.

Response Actions

In February 1983, New York State entered into an interim consent order with American Thermostat Corporation and Amro Realty Corporation (the property owner) in which the companies agreed to clean up the site and its surroundings; install, monitor, and maintain carbon filter systems for five affected wells; supply bottled water for consumption by the affected residents; and monitor two groups of bordering private wells to determine whether any contamination had spread beyond the original affected area. However, when the company went out of business in May 1985, it stopped providing bottled water and abandoned the maintenance of carbon filtration systems at the affected homes. The State requested that EPA take over the maintenance of the water treatment systems, sample other private wells near the site, and provide bottled water and carbon filtration systems where necessary. In addition to undertaking the work requested by the State, EPA also installed three air stripping systems at the site. A system of seven extraction and reinjection wells and a soil vacuum extraction system were installed at the site in 1989 to accelerate the treatment of the groundwater.

Following the listing of the site on the National Priorities List in June 1986, EPA undertook a focused feasibility study (FFS) to evaluate alternative water supplies for the affected and potentially affected residences at the site.

In January 1988, EPA initiated a source control remedial investigation/feasibility study (RI/FS) to determine the nature and extent of contamination emanating from the site and to evaluate remedial alternatives. The RI concluded that the groundwater in the on-property overburden and bedrock aquifers and in the off-property bedrock aquifer was contaminated with volatile organic compounds (VOCs), primarily PCE and TCE. An estimated 26,000 square feet of soil at the site were also found to be contaminated with TCE and PCE down to a maximum depth of approximately 30 feet. Contamination was also detected in portions of the building located on-site.

Remedy Selection

Based upon the results of the above-noted FFS, in January 1988, EPA signed a Record of Decision (ROD), calling for the extension of the existing Village of Catskill water district pipeline to the affected and potentially affected areas as an interim remedy.

On June 29, 1990, a ROD to control the source of the contamination was signed, selecting low temperature thermal desorption (LTTD) to treat the contaminated soil, and extraction, air stripping, carbon adsorption, and reinjection for treating the contaminated groundwater. The ROD also called for the decontamination of the building by vacuuming, dusting, and wiping of approximately 67,000 square feet of the building floor, off-site disposal/treatment of the collected hazardous dust, removal and off-site disposal/treatment of 18 drums containing liquid hazardous waste that were stored in the building, and removal and off-site disposal/treatment of sludge from four drainage pits inside the building.

The Remedial Action Objectives (RAOs) for the OU2 ROD were:

- ensure protection of groundwater from the continued release of contaminants from soils and
- restore groundwater in the affected area to levels consistent with state and federal groundwater standards.

The ROD specified that approximately 7,000 cubic yards (CY) of soil above the water table exceeding 1.0 milligram per kilogram (mg/kg) for PCE and 0.4 mg/kg for TCE[1] were to be excavated and thermally treated by LTTD. Sampling conducted during the remedial design (RD), however, revealed additional contamination both in the shallow soil (above the water table) and in the deep soil (from the water table down to bedrock). Because the saturated source material would continue to contribute to the groundwater contamination, EPA concluded that in addition to remediating the additional shallow soil, remediating the soil below the water table would be beneficial to the long-term groundwater cleanup. Based on the RD findings, it was concluded that approximately 40,000 CY of contaminated soil would need to be remediated as part of the source control remedy. These findings were documented in a July 1997 Explanation of Significant Differences (ESD).

Response Action Implementation

Alternate Water Supply

Although an alternate water supply remedy was selected in 1988, the design of the alternate water supply was not initiated until July 1990. The delay in the initiation of the RD was due to lengthy negotiations between EPA, NYSDEC, the New York State Department of Health, and the Town and the Village of Catskill aimed at resolving several complex issues regarding the new water supply system and the development of a new water district.

The plans and specifications related to the construction of the alternate water supply were completed in September 1991. The construction of the alternate water supply, which included the installation of approximately 3.5 miles of pipeline and connections to 52 residences, started in May

[1] Based on a risk assessment performed as part of the source control RI/FS, it was determined that soils containing less than 1.0 mg/kg of PCE and less than 0.4 mg/kg of TCE would present excess carcinogenic risks of no more than $1x10^{-6}$, falling within EPA's target risk range of 10^{-4} to10^{-6}.

1992 and was completed in November 1992. The Village of Catskill assumed responsibility for maintaining the alternate water supply system in accordance with an October 1991 memorandum of understanding between EPA and the Village of Catskill.

An RA Report associated with the alternate water supply was approved on December 29, 1992.

In the late 1990s, VOC contamination was detected in three residential wells along Scotch Rock Road and in two wells at the Country Estates residential development, which were located beyond the previous limits of the contaminated groundwater plume. Granular activated carbon (GAC) treatment systems were installed on these wells.

Building Decontamination

The building decontamination RD was initiated in October 1990 and completed in September 1991. The cleanup activities at the building were performed in September 1992.

An RA Report associated with the building decontamination was approved on December 31, 1992.

Soil Remediation

The soil excavation and treatment RD was initiated in October 1990 and was completed in September 1992. Soil remediation was initiated in September 1993 and had completed the treatment of 12,670 CY of contaminated soil by May 1995. Prior to mobilization to the site, EPA conducted preconstruction deep soil sampling to define the outer limits of the contamination. Based on these results and on the findings of post-excavation wall and floor sampling performed during the execution of the soil remedy, EPA defined several areas for additional excavation and treatment both on the site and on the adjacent private property and estimated the total potential additional volume of contaminated soil to be 30,000 CY. This work was initiated in December 1995; all the thermal treatment and backfilling was completed by December 1996. The quantity of soil treated during this phase of the soil remedy was 25,644 CY. The total amount of contaminated source material remediated was 38,314 CY.

An RA Report associated with the soil remedy was approved on September 19, 1997.

Groundwater Remediation

The groundwater remediation RD was initiated in October 1990; the plans and specifications related to the groundwater extraction and treatment were completed in September 1993. Initiation of the groundwater RA, though, had to be postponed until all soil RA activities at the site were completed. The construction of the groundwater remedy began in June 1997 and was completed in July 1998.

The groundwater extraction and treatment system (GWETS) includes extraction, injection, and monitoring wells installed in the overburden and bedrock aquifers, as well as residential monitoring wells. Initially, the GWETS consisted of 16 overburden extraction wells, 14 extraction

bedrock wells, 14 injection wells, and 10 monitoring wells (several wells have been converted or eliminated as a result of optimization efforts).

An RA Report associated with the groundwater remedy was approved on September 30, 1998.

Construction Completion

A Preliminary Closeout Report (PCOR) was approved on September 25, 1998.

Institutional Controls

Because the OU1 ROD called for the extension of the existing Village of Catskill water district pipeline to the affected and potentially affected areas, institutional controls to restrict the installation of wells in the groundwater plume were not deemed necessary. The OU2 ROD did not call for institutional controls for the site property because it was envisioned that the use of the property would be significantly encumbered by the groundwater extraction, treatment, and reinjection system until groundwater standards are achieved. Because the final remedy will allow for unrestricted use of the property, institutional controls following the completion of the remedy are not needed. Nevertheless, to obtain site access to the property to perform the remediation, long-term response action, and state operation and maintenance (O&M) and to prevent the property owner's interference with these activities, in 1997, Amro Realty Corporation (the property owner) and the Estate of Harry Moskowitz (the former president and owner of American Thermostat Corporation) signed a *Declaration of Covenants, Conditions, and Restrictions* which, among other things, prohibits the installation of wells and the use of the property in any manner by Amro Realty Corporation and the Estate of Harry Moskowitz unless EPA determines that such use would not adversely affect the integrity or effectiveness of the response action.

Table 1, below, summarizes the status of the institutional controls.

Table 1: **Summary of Implemented Institutional Controls**

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs needed?	ICs called for in the decision documents?	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater and land use	Yes	No	Site property	Prohibit the installation of wells and the use of the property in any manner that would adversely affect the integrity or effectiveness of the response action.	Declaration of Covenants, Conditions, and Restrictions on November 28, 1997.

Systems Operation/Operation & Maintenance

From 1998 to 2001, groundwater monitoring was conducted monthly. To optimize the GWETS, in September 2000, an injection well was converted into an extraction well and an extraction well was deepened to access a zone of higher aquifer contamination. In 2001, an injection well where high PCE concentrations were detected was converted into an extraction well, and pumping was discontinued at one overburden and two bedrock extraction wells that had reached the groundwater standards. In 2001, all the overburden extraction wells, six monitoring wells, and eight bedrock extraction wells were monitored semiannually, while the remaining bedrock extraction and monitoring wells and all nine residential wells were sampled monthly. As further optimization measures, in 2003, the pumping at five bedrock extraction wells with very low contaminant concentrations was discontinued and the sampling of eight monitoring wells with low depths and/or low concentrations was discontinued. At the end of the aforementioned optimization measures, the GWETS extracted water from nine bedrock and 14 overburden wells. Groundwater monitoring in five bedrock extraction wells, six residential wells, and one monitoring well were originally performed on a quarterly basis. The remaining four bedrock wells and 14 overburden wells were monitored on a semiannual basis. Based on the review of the April 2008 sampling results, it was decided that three additional bedrock wells would be sampled on a semiannual basis since their concentrations had stabilized at relatively low levels and two bedrock wells, which are located immediately downgradient of the source area and still had elevated concentrations of PCE, would be sampled on a quarterly basis.

From August 1998 to December 2003, the groundwater treatment plant operated at a pumping rate of approximately 70 gallons per minute (gpm). In December 2003, when the five bedrock wells with low contamination levels were taken offline to optimize the treatment system, the groundwater treatment plant began operating at a pumping rate ranging from 35 to 40 gpm.

In 2008, following 10 years of groundwater long-term response actions by EPA, the O&M associated with the GWETS was transferred to NYSDEC. NYSDEC completed a Periodic Review Report (PRR) in 2010. The PRR indicated that while concentrations of site contaminants appeared to be steady and/or slightly trending downward in the downgradient plume, in the source area, concentrations remained significantly elevated and declining at an even slower rate, indicating that concentrations may be sustained by the presence of a residual contaminant source. The PRR concluded that it appeared that the groundwater treatment had reached a point at which contaminant concentrations had more or less "leveled off." The PRR recommended that the groundwater remedial action be reevaluated for its effectiveness. Accordingly, in 2012, a Remedial Systems Optimization (RSO) field investigation was conducted. The RSO suggested modifications to the GWETS that would result in a more streamlined system to improve effectiveness and lower operating costs. Specifically, by focusing on the hydraulic containment of the source area and eliminating off-property deep bedrock extraction wells, the northwestern edge of the plume is expected to separate from the remainder of the plume and migrate toward Catskill Creek. As a result, the effectiveness of the GWETS will increase, operating costs will decrease, and groundwater will continue to be treated and its quality will gradually improve with time. From 2013 through 2017, the modifications were carried out. A new control system was installed at the extraction wells and within the main plant. As expected, there has been a shift in the plume (for more details, see the "Data Review" section, below).

Currently, the GWETS consists of five bedrock and seven overburden extraction wells and discharges treated effluent to a surface drainage swale on the eastern side of the site that eventually leads to Catskill Creek. In addition to the GWETS, the groundwater remedial action includes individual wellhead GAC treatment systems on residential wells.

Routine maintenance of the GWETS includes repairs of well pumps and process equipment at the treatment plant, and of the liquid carbon adsorption filter, pumping standing water from the well vaults and replenishing treatment chemicals.

Since December 2014, the long-term monitoring (LTM) events for the site have been conducted every 15 months. Accordingly, during the review period, sampling was conducted in December 2014, March 2016, June 2017, and September 2018. The GWETS' influent and effluent VOC samples are collected and analyzed monthly.

During the 2014-2018 period, approximately 60 million gallons of extracted groundwater were processed with an average flow rate of approximately 26 gpm, and approximately 920 pounds of total VOCs were removed (see Table 2).

The system performance sampling results (air stripper effluent) indicated that site-related VOCs were detected in the effluent air samples twice in 2018 (the air stripper was undergoing maintenance at the time).

Table 2: Groundwater Treatment Details

Year	Volume Treated (million gallons)	Average Flow Rate (gpm)	VOCs Removed (lbs.)
2014	10.3	20.9	197
2015	10.5	25	142
2016	13.2	27	196
2017	14.4	31.7	180
2018	12	23	199
Totals	**60.4**	**25.52**	**918**

Potential site impacts from climate change have been assessed. The performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site.

PRRs were submitted by NYSDEC's contractor on an annual basis through January 2018. In June 2018, NYSDEC directed its contractor to submit PRRs every three years.

III. PROGRESS SINCE THE LAST REVIEW

The protectiveness determinations from the last FYR are summarized in Table 3, below.

Table 3: **Protectiveness Determinations/Statements from 2013 Five-Year Review**

Operable Unit	Protectiveness Determination	Protectiveness Statement
01	Protective	The implemented OU1 actions protect human health by providing the affected and potentially affected residences with a public water supply or treatment systems.
02	Short-term Protective	The OU2 actions are protective of human health and the environment in the short-term. For these actions to be protective in the long-term, data needs to be collected during the 2013/2014 heating season at a residence where a mitigation measure was implemented to ensure that the mitigation measure is effective.
Sitewide	Short-term Protective	The site is protective of human health and the environment in the short-term. For the site to be protective in the long-term, ongoing chemical and hydraulic monitoring needs to be completed and data needs to be collected during the 2013/2014 heating season at a residence where a vapor intrusion mitigation measure was implemented to ensure that it is effective.

The previous FYR had recommendations and follow-up actions and suggestions. The status of the recommendations and follow-up actions and suggestions are summarized in Tables 4 and 5, respectively, below.

Table 4: Recommendations and Follow-Up Actions from 2013 Five-Year Review

Issue	Recommendations and Follow-Up Actions	Status
Follow up vapor intrusion sampling is needed at a residence where a mitigation measure was implemented to ensure that the measure is effective.	A follow up vapor intrusion survey should be conducted during the 2013/2014 heating season at the residence where a mitigation measure was implemented.	Follow up vapor intrusion samples at the home where a sump was covered were collected January 2014. The sampling results showed increases in subslab soil vapor concentrations for PCE and TCE; indoor air concentrations, however, showed a decrease from the prior year. No further monitoring will be performed by NYSDEC.
The conceptual site model needs to be updated.	Complete the ongoing chemical and hydraulic monitoring to update the conceptual site model.	The conceptual site model was revised and presented in "Final RSO Implementation Activities Report, American Thermostat Site," MACTEC Engineering and Consulting, P.C., January 2013.[2]

[2] EPA did not know that the conceptual site model had been revised at the time that the 2013 FYR report was prepared.

Table 5: Suggestions from 2013 Five-Year Review

Comment/Suggestion	Status
Extraction wells EW-2 and OW-16 show significant, unexplained increases in PCE concentrations in the most recent sample results. The subject wells should be resampled to determine the basis for the increases.	The extraction wells were sampled every year during the review period except 2015. Extraction well EW-2 showed an increasing PCE trend through 2014, a decrease in 2016 and then an increasing trend beginning in 2017. The 2017 PRR report hypothesized that the increase in PCE may be attributed to a residual source area. The 2018 Annual Report hypothesizes that the increase in PCE in the extraction wells is attributable to refocusing the extraction of groundwater with the reconfigured GWETS (and no longer extracting clean water from off-property extraction wells).
The RSO recommended pumping several overburden extraction wells to reduce the migration of contamination into the bedrock aquifer. Continue pumping extraction wells OW-2, OW-3, OW-5, OW-7, OW-9, OW-10, OW-11, OW-13, OW-14, OW-15 and OW-16 to reduce migration of contamination into the bedrock aquifer. Note: The RSO recommended continue pumping at highly contaminated overburden extraction wells OW-2, OW-3, OW-5, OW-7, OW-13, OW-14 and OW-16 to reduce migration of contamination into the bedrock aquifer. Overburden wells OW-9, OW-10, OW-11 and OW-15 were added since the PCE concentrations in these wells are high enough to warrant continuation of extraction and treatment of the groundwater.	Pumping has continued using the improved network of wells.
There are overburden extraction wells that are no longer needed. Properly abandon the unneeded overburden extraction wells.	No new wells have been decommissioned since 2014.
The existing well pumps in all the extraction wells should be replaced with variable speed pumps. Replace the existing well pumps in all extraction wells with variable speed pumps.	The new well pumping controls were programmed and adjusted in 2015, 2016 and 2017. In 2018, all pumping wells are performing optimally.
Some extraction wells may need to be decommissioned. Based on a well inventory and the results of the hydraulic testing, decommission extraction wells, as appropriate.	As of 2018, no new wells have been decommissioned.

Bedrock extraction wells EW-2, EW-5, EW-6, EW-7, EW-9 and EW-16 should continue to be pumped to hydraulically contain and treat the most contaminated area PCE of bedrock groundwater. Continue pumping the bedrock extraction wells EW-2, EW-5, EW-6, EW-7, EW-9 and EW-16.	The network of twelve pumping wells in 2018 include EW-2, EW-6, EW-7, EW-9, EW-16, OW-2, OW-3, OW-5, OW-7, OW-13, OW-14, and OW-16.
The carbon treatment systems at the three residential properties should continue to be maintained. Continue to maintain the carbon treatment systems at the residential properties.	NYSDEC continues to maintain the three residential carbon systems.
The optimum sustainable pumping rates that result in hydraulic capture of the source area, including the area around injection well IW-9 should be determined. Conduct a hydraulic evaluation of the extraction wells to determine the optimum sustainable pumping rates that result in hydraulic capture of the source area, including the area around injection well IW-9.	Pumping rates have been adjusted to eliminate cycling to the maximum extent possible and support hydraulic capture to the maximum extent possible.
Additional water level monitoring wells might be needed to evaluate/demonstrate hydraulic capture at the site. Install additional water level monitoring wells, as necessary, to evaluate/demonstrate hydraulic capture at the site.	NYSDEC will continue to use the existing wells because they appear to be adequate. Water levels are measured every six months (more frequently than groundwater samples are collected for water quality).
Selected wells should be monitored to evaluate changes in concentration resulting from the recommended changes to the extraction well array. Monitor selected wells to evaluate the changes in concentration resulting from the recommended changes to the extraction well array.	LTM continues to be conducted on a 15-month frequency.
A determination should be made as to whether the decommissioned off-site wells should be appropriately abandoned. If, after three years of monitoring the selected monitoring wells, the results do not show reason to re-activate the off-site inter-plume extraction wells, the decommissioned off-site wells should be appropriately abandoned.	These wells were taken out of service in 2014. Abandonment can be added to the contractor's next work assignment in 2019.
The need for downgradient monitoring points to monitor potential effects of discontinuing off-site bedrock extraction wells (likely plume shift) should be evaluated. Evaluate the need to install downgradient monitoring points to monitor potential effects of discontinuing off-site bedrock extraction wells.	As expected based on recommendations of the RSO, monitoring wells show a shift in the plume.

All bedrock wells not being used for extraction or monitoring should be abandoned. Properly abandon all bedrock wells not being used for extraction or monitoring.	This is to be included in the contractor's work assignment in 2019.
The long-term monitoring plan should be updated within the Site Management Plan (SMP). Update the long-term monitoring plan (LTMP) within the SMP.	NYSDEC revised the SMP to include a revised LTM plan and to document the RSO implementation. The effort was completed in summer 2018.
The remaining extraction wells should be retrofitted with electronics in above-ground structures eliminating the need for frequent inspections due to weather-related issues. Retrofit the remaining extraction wells with electronics in above-ground structures.	This has been completed for all the extraction wells.
Flow metering is needed on all extraction wells. Install flow metering on all extraction wells.	This has been implemented.
Unused and outdated treatment components should be replaced, and the treatment train should be modified to focus on needed components focusing on operator-friendly and less maintenance to reduce overall operating costs. Streamline the treatment train to remove unused components, replace old and outdated components (air stripper) and modify the treatment train to focus on needed components focusing on operator-friendly and less maintenance to reduce overall operating costs. Note: Changes to the groundwater treatment should be made in consultation with the EPA, since certain modifications may require a formal change to the groundwater treatment portion of the remedy as described in the ROD.	The operation has been modernized. Wells are accessible remotely from the office. Operator attention is scheduled for every other week.
System controls should be updated, and the auto-alarm system should be automated for remote monitoring. Upgrade system controls and automate the auto-alarm system.	Fully operational in 2018.
The number, location and depth of the unused monitoring wells should be determined and inventoried. Inventory the number, location and depth of the unused monitoring wells.	NYSDEC has a working list of wells with their location and depth.

Based on their location and depth, some monitoring wells may prove useful for long-term monitoring purposes. Monitoring wells that may prove useful for long-term monitoring purposes, based on their location and depth, should be re-developed to see if they are still viable. Viable wells should be reconditioned and incorporated into the long-term groundwater monitoring program. Monitoring wells that are no longer useful should be properly abandoned.	NYSDEC agreed. Currently, NYSDEC has no changes planned.
To reduce the time needed to extract and treat the contaminated groundwater, means to address the residual soil contamination should be evaluated. EPA should discuss with NYSDEC possible ways to address the residual soil contamination.	Currently, NYSDEC has no plan for further soil remediation.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On October 1, 2018, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 42 Superfund sites in New York and New Jersey, including the American Thermostat site. The announcement can be found at the following web address: https://www.epa.gov/aboutepa/fiscal-year-2019-five-year-reviews.

In addition to this notification, a notice of the commencement of the FYR was sent to local public officials. The notice was provided to the town and village of Catskill on August 1, 2018 with a request that the notice be posted in the municipal offices and on the town and village webpages. The purpose of the public notice was to inform the community that EPA would be conducting a FYR to ensure that the remedy implemented at the site remains protective of public health and is functioning as designed. In addition, the notice included contact information, including addresses and telephone numbers, for questions related to the FYR process or the site. No questions or comments were received from the public.

Once the FYR is completed, the results will be made available on EPA's American Thermostat Co. site webpage, www.epa.gov/superfund/american-thermostat, and at the site repositories, which are the Town of Catskill Office, 439 Main Street, Catskill, NY 12414 and the village of Catskill Office, 422 Main Street, Catskill, NY 12414.

No site interviews were conducted.

Data Review

Currently the GWETS consists of five bedrock extraction wells and seven overburden extraction wells. Groundwater samples are collected from both the extraction wells and monitoring wells on

a 15-month cycle. For this FYR period, sampling was conducted in December 2014, March 2016, June 2017, and September 2018.

The system performance sampling results (air stripper effluent) indicates that site related VOCs are being sporadically detected in the effluent air samples.

The principal compounds detected during the review period were PCE, TCE, cis-l,2-dichloroethylene (DCE) and vinyl chloride (VC). During this review period, the highest concentrations of these VOCs in the bedrock were consistently detected in extraction wells EW-7 and EW-16 and in overburden wells OW-5 and OW-14 (for the locations of the monitoring wells, see Appendix A, Figure 2) (see the highest concentrations, see Table 6, below).

Table 6: Highest VOC Concentrations in Select Monitoring Wells During Review Period micrograms per liter (µg/L)

Well No.	1,2-DCE	cis-1,2-DCE	PCE	TCE	VC
EW-7	1,300	1,300	6,900	2,200	14
EW-16	1,400	1,400	4,400	2,000	20
OW-5	1,600	1,600	5,200	310	200
OW-14	950	950	15,000	1,100	100

The bedrock plume continues to show signs of changing shape and shifting toward Catskill Creek, likely because of the discontinuance of off-site extraction wells. The leading edge of the bedrock groundwater plume, as evidenced by PCE detected at extraction well EW-13, is interpreted to be beyond the influence of the on-site extraction system and is expected to continue to migrate toward Catskill Creek.

Based upon the 2018 data, the core of the plume, previously centered around extraction well EW-16, appears to have shifted northeastward to extraction well EW-7 (see Appendix A, Figure 3). The interpreted 500 µg/L PCE boundary between injection well IW-9 and extraction well EW-9 appears to have shifted northwest, encompassing injection well IW-9. This shift is likely due to extraction well EW-9 being inactive at the time of the LTM sample collection in October 2018. Pumping at extraction well EW-9 resumed in November 2018 and a groundwater sample was collected from extraction well EW-9 during December 2018. The reconfigured extraction well arrangement appears to have resulted in pulling back the plume (*i.e.*, to the southeast) from its previous high off-site concentration location at injection well IW-9 to an on-site high concentration centered on extraction well EW-7. Time-series graphs from bedrock extraction well EW-16 and overburden extraction well OW-14 depict an increase in PCE concentrations during this FYR period. The rebound in PCE concentrations are likely attributable to refocusing the extraction of groundwater with the reconfigured GWETS, whereby the system is no longer extracting clean water from off-property extraction wells. Residual source areas cannot, however, be discounted.

Although there appears to be increasing PCE concentrations in the overburden and bedrock source areas, in sentinel wells CE-2 and M-5, PCE concentrations appear to be stable. Monitoring well M-5 was selected as a measure of the northeastward (off-site) progression of the plume that appears to be migrating more northward since the off-property extraction wells located northwest of the

site were shut down. Although PCE concentration in groundwater at monitoring well M-5 was not detected during the review period, cis-l,2-DCE was observed, demonstrating degradation of PCE. Country Estates primary supply well CE-2, which is fitted with a GAC system, is used to track in time-series the distal end (*i.e.*, northwest tip) of the residual plume as the off-site body of the plume continues to flow toward the northeast and eventual discharge in Catskill Creek. PCE concentration in CE-2 were below the New York State standard of 5 µg/L during each sampling event conducted during the review period.

A review of groundwater contours, PCE isoconcentrations maps for bedrock wells, and the "Final RSO Implementation Activities Report, American Thermostat Site," MACTEC Engineering and Consulting, P.C., January 2013, indicated that groundwater contamination on the southern and western portion (along Route 23) of the site is not fully delineated. Specifically, 2018 Annual Report figure 4, bedrock potentiometric surface map (pumping) (see Appendix A, Figure 4), indicates that some of the volume of groundwater flow within the vicinity of extraction well EW-5 and monitoring well M-9 is toward the south/southeast. The PCE concentration in October 2018 in extraction well EW-5 was 340 µg/L and was not measured in monitoring well M-9. The figure also depicts groundwater flow within the immediate vicinity of injection well IW-10 as radial due to a mounding affect. The PCE concentration in injection well IW-9 was 550 µg/L in October 2018.

To address the noted data gap, monitoring wells M-9, MW-112, and MW-113 should be sampled and gauged to confirm that the southern portion of the plume has not migrated beyond extraction well EW-5. Also, monitoring well M-8, located across Route 23, should be sampled and gauged to confirm that impacted groundwater in the vicinity of injection well IW-9 is not migrating beyond Route 23. If site-related contaminants of concern are detected in the above-noted wells, additional groundwater samples may need to be collected to confirm the boundaries of the plume.

To confirm that the remedy remains protective of ecological receptors, sampling should be conducted in Catskill Creek.

Site Inspection

A FYR site inspection was performed by Ms. States and NYSDEC Project Manager Jenelle Gaylord on November 6, 2018. Observations made during the inspection indicated that the remedy-related infrastructure was in good condition. There were no visible signs of trespassing or vandalism at the site, all the well casings were found to be properly secured and locked, and the treatment system building was found to be properly secured.

V. TECHNICAL ASSESSMENT

QUESTION A: *Is the remedy functioning as intended by the decision documents?*

Alternate Water Supply

The 1988 ROD called for the extension of the existing Village of Catskill water district pipeline to the affected and potentially affected areas. The construction of the alternate water supply

connected 52 affected and potentially affected residences to the Village of Catskill's water supply. The Village of Catskill is presently maintaining the alternate water supply system. The alternate water supply is functioning as intended by the 1988 ROD.

GAC treatment systems were installed on the three residential wells to the west of Scotch Rock Road and in two wells at the Country Estates residential development. The systems have been maintained as a precautionary measure since 2003, and the VOC levels in these wells have been either below the Maximum Contaminant Levels (MCLs) or non-detect for PCE, TCE and the daughter products.

Building Decontamination

The 1990 ROD specified that, for the former manufacturing building to be utilized in the future, hazardous dust would have to be removed from contaminated surfaces and all hazardous materials in drums and drainage pits in the building would be removed and disposed.

An inspection on September 29, 1992 verified that the building had been cleared of all debris, visible dust had been vacuumed from the floors and the drainage pits had been power washed.

Presently, the building is in disrepair and a portion of it is structurally unsound.

Source Control

The 1990 ROD, as modified by the 1997 ESD, called for the cleanup of the contaminated soil at the site to eliminate the threat to human health from possible ingestion or dermal contact with the soil. The analytical results from post-excavation soil samples collected from the excavation limits indicated that the residual levels of PCE and TCE were well below the 1.0 mg/kg and 0.4 mg/kg target levels, respectively. Therefore, the remediation of the source of contamination has reduced contamination of site soils to acceptable health-based levels in the areas that were excavated.

Based on the most recent groundwater sample results, it is likely that a significant mass of PCE within the overburden soils continues to act as a source of groundwater contamination mainly in locations underneath the former manufacturing building or near the building's southwest wall and in the fractured bedrock, and it continues to act as a source of groundwater contamination.

Sediments from a small pond on an adjacent residential property were excavated and treated. Because the exposure pathways have been addressed, the remedy is functioning as intended for ecological receptors.

Recent groundwater monitoring reports indicate that the residual groundwater plume is migrating toward Tributary B and then to Catskill Creek. To confirm that the remedy remains protective of ecological receptors, sampling should be conducted in Tributary B and Catskill Creek.

Groundwater Restoration

The 1990 ROD called for the extraction and treatment of the contaminated groundwater to contain the migration of the contaminant plume and, in time, to achieve federal and state groundwater standards.

The Applicable or Relevant and Appropriate Requirements for groundwater cleanup include the EPA's MCLs and New York State's groundwater quality standards. The action level established for PCE and TCE is 5 µg/L (the proposed MCL and New York State's groundwater quality standard at the time of ROD issuance). Based on the analytical results associated with the groundwater management system influent and effluent VOC sampling and monitoring, it has been concluded that the groundwater management system is effectively treating the VOC-contaminated water to concentrations meeting discharge requirements.

An RSO study was completed in January 2013. The RSO evaluated remedy performance relative to remedial goals, adequacy of prior site characterization efforts, identified potential changes to the remedy to enhance effectiveness, reduce costs and shorten the time to closure, verified the site conceptual model and closure strategy, identified problem areas and recommended improvements and evaluate progress in reaching closure. The report provided recommendations to improve the effectiveness of the groundwater management system, decrease operating costs and improve downgradient groundwater quality over time (see the "Technical Assessment Summary," below, for a summary of the recommendations from the RSO). Based on the findings of the RSO, NYSDEC implemented several system optimizations.

Monitoring well data indicates that concentrations in both shallow and bedrock wells downgradient from the source area continue to decline for PCE, TCE, and their daughter products. However, some on-property monitoring wells continue to exhibit high concentrations of PCE and TCE. Therefore, it is possible that the groundwater goals identified in the ROD may not be achievable in the source areas.

NYSDEC is presently conducting monitoring to evaluate the hydraulic effectiveness of the GWETS. Under this effort, water level measurements will be taken in surrounding wells under pumping and non-pumping conditions. Groundwater quality samples will also be collected to monitor current conditions and the future stability of the plume during the GWETS optimization activities. Upon completion of this effort, the conceptual site model should be updated.

In summary, based upon the results of the FYR, it has been concluded that the alternate water supply is functioning as intended by the 1988 ROD. While the GWETS is effectively extracting and treating the groundwater plume as intended by the 1990 ROD, the high pumping rate of the Country Estates wells continue to draw the contaminated plume in their direction. Decreases in the levels of VOC contamination in the groundwater are a direct result of the groundwater extraction and treatment system. The three residential wells located to the west of Scotch Rock Road are the historical limits of the contaminated groundwater plume. PCE and TCE have not been detected in these wells since January 2006; there have, however, been sporadic low-level detections of their breakdown products.

While 12 million gallons of groundwater was extracted by the GWETS during the 2018 reporting period, only 199 pounds of VOCs was recovered. During the 2017 reporting period, 14 million gallons of groundwater was extracted, and 180 pounds of VOCs was recovered. The volume of contaminated groundwater extracted, and the mass of VOCs recovered for the other reporting periods during the review period are similar. The mass of VOCs that is being recovered appears to be disproportionate to the volume of groundwater that is being extracted (the mass of VOCs that are being recovered by the GWETS is approaching asymptotic levels). Enhancements to address the residual groundwater contamination should be explored.

The south south-west portion of the bedrock plume has not been delineated recently; it should be reconfirmed that this portion of the plume is contained by the GWETS. To confirm capture of the bedrock plume in this area, monitoring wells M-9, MW-112, and MW-113 should be sampled and gauged to confirm that the southern portion of the plume has not migrated beyond extraction well EW-5. In addition, monitoring well M-8, located across Route 23, should be sampled and gauged to confirm that impacted groundwater in the vicinity of injection well IW-9 is not migrating beyond Route 23. If site-related contaminants of concern are detected in any of the above-noted wells, additional groundwater samples may need to be collected to confirm the boundaries of the plume.

Also, it is unknown whether the plume is impacting the Catskill Creek's surface water and/or sediments. Therefore, sampling should be conducted in the creek to confirm that the plume is not impacting surface water or sediments.

QUESTION B: *Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?*

The exposure assumptions and toxicity values that were used to estimate the potential cancer risks and noncancer hazards in the risk assessment supporting the 1990 ROD followed EPA guidance at the time, and the process used are still valid. While toxicity data for PCE and TCE have been updated since the ROD, the cleanup criteria used for soil excavation (1.0 mg/kg for PCE and 0.4 mg/kg for TCE) are below NYSDEC Unrestricted Use Soil Cleanup Objectives and remain protective of human health. The RAOs for the site to eliminate the threat posed to area residents by exposure to contaminated groundwater, protection of groundwater and surface water from the continued release of contaminants from soils, groundwater restoration, and building decontamination remain valid.

The Country Estates mobile home park and three off-site residential properties remain on groundwater wells and have GAC treatment systems. The three-remaining private residential POET systems are maintained and sampled by the State quarterly to ensure protectiveness. As a community water supply, Country Estates operates and maintains their own treatment system. NYSDEC samples this water supply every 15 months. All other properties are connected to a municipal water supply. The federal MCL for PCE and TCE remains at 5 µg/l, and despite high concentrations of PCE in extraction wells, discharge concentrations are below discharge criteria. Area groundwater use is not expected to change during the next five years, and a deed restriction is in place which prohibits the installation of wells within the site boundaries and other use of the property that interferes with the remedy's effectiveness. Therefore, the groundwater remedy is

protective, because routes of exposure have been interrupted or the groundwater is treated prior to use.

The property currently houses the former manufacturing building (which is currently used for storage by the property owner) and the groundwater management system building. The land use is not expected to change in the next five years. NYSDEC completed an initial soil vapor intrusion (SVI) investigation at the site in 2012 to assess the pathway's potential which was not considered in the original risk assessment. Structures located on the property and nearby residential structures were evaluated for sub-slab and indoor air VOC concentrations, where possible. The former manufacturing building contained elevated concentrations of PCE and TCE in the sub-slab, which exceeded EPA's commercial vapor intrusion screening levels (VISLs) set at a cancer risk of 10^{-4} and hazard of 1. The indoor air values for both TCE and PCE were within the EPA's acceptable risk ranges. Therefore, further monitoring or mitigation may be necessary if the building structure is modified or if there is a change in its use. Since a portion of the building is no longer structurally sound, it is unlikely that it will be occupied in the future.

PCE and TCE were detected in the sub-slab of the groundwater management system building at concentrations below the acceptable risk range, however indoor air concentrations exceeded commercial VISLs set at 10^{-4} and a hazard of 1. This suggests that the source of indoor air VOC contamination is emanating from within the building, likely the groundwater treatment system or VOC-containing products stored there, and vapor intrusion is not affecting the indoor air concentrations. Although the indoor air results exceeded the unacceptable risk range for the commercial worker, there are currently no permanent or full-time workers at the site. Indoor source control and ventilation measures are recommended if the building is planned to be occupied with increased frequency in the future.

To evaluate the potential for SVI for off-site buildings, ten residences were also sampled during the 2012 event. The testing did not show any significant indoor impacts associated with the SVI pathway in the off-site residential properties. However, the sump water at one structure located adjacent to the western site boundary showed elevated concentrations of site-related VOCs. Although indoor results did not exceed unacceptable risk VISLs, as a precautionary measure the New York State Department of Health (NYSDOH) recommended the installation of a sump cover to limit the potential for any future exposures, which was completed in 2013. Follow-up indoor air samples were collected at this residence in 2014; the results showed increases in sub-slab concentrations of PCE and TCE, but a significant decrease in indoor air concentrations. This indicates that the sump cover was effective in reducing indoor air VOCs. While the sump cover was an adequate form of mitigation in the past, it may not be able to prevent indoor air impacts now due to the condition of the slab and the fact that hydraulic capture has increased groundwater concentrations in the vicinity of this residence, thereby increasing the potential for SVI exposure. NYSDOH recommends that this residence be reevaluated to assess if additional actions are needed to mitigate exposure via SVI.

Remediating the contaminated soils on the property and contaminated sediments both on and off the property eliminated potential ecological exposure.

QUESTION C: *Has any other information come to light that could call into question the*

protectiveness of the remedy?

There is no other information or issues related to the site that would change the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Table 7, below, presents the recommendations and follow-up actions for this FYR.

Table 7: Issues and Recommendations

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
OU1				
OU(s): **OU2**	**Issue Category: Remedy Performance**			
	Issue: The south south-west portion of the bedrock plume has not been delineated recently; it should be reconfirmed that this portion of the plume is contained by the GWETS.			
	Recommendation: It is recommended that monitoring wells M-9, MW-112, and MW-113 be sampled and gauged to confirm that the southern portion of the plume has not migrated beyond extraction well EW-5. It is also recommended that monitoring well M-8, located across Route 23, be sampled and gauged to confirm that impacted groundwater in the vicinity of injection well IW-9 is not migrating beyond Route 23. If site-related contaminants of concern are detected in any of the above-noted wells, additional groundwater samples may need to be collected to confirm the boundaries of the plume.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	12/31/2020
OU(s): **OU2**	**Issue Category: Monitoring**			
	Issue: It is unknown whether the plume is impacting Catskill Creek's surface water and/or sediments.			
	Recommendation: Sampling should be conducted in Catskill Creek to confirm that the plume is not impacting surface water or sediments.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	12/31/2020
OU(s):	**Issue Category: Remedy Performance**			

OU2				
	Issue: It is unknown whether the GWETS will be able to achieve groundwater restoration goals because of potential residual source material.			
	Recommendation: A statistical analysis of the remedy using current groundwater concentrations should be used to update the conceptual site model to determine if RAOs can be met.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	12/31/2020
OU(s): **OU2**	**Issue Category: Remedy Performance**			
	Issue: While the sump cover was an adequate form of mitigation in the past, it may not be able to prevent indoor air impacts now due to the condition of the slab and the fact that hydraulic capture has increased groundwater concentrations in the vicinity of this residence, thereby increasing the potential for SVI exposure.			
	Recommendation: It is recommended that this residence be reevaluated to assess if additional actions are needed to mitigate exposure via SVI.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	Yes	State	EPA	12/31/2020

OTHER FINDINGS

In addition, the following suggestion was identified during the FYR and may improve management of operation and maintenance, but do not affect current and/or future protectiveness:

Because of high concentrations of VOCs, to facilitate their analysis, some of the samples had to be diluted in the laboratory. As a result, the method detection limits in some of the laboratory results are significantly higher than the regulatory guidance values. It is recommended that a lower dilution factor be utilized so that the detection limits will be below the MCLs.

The following should be included in the future monitoring reports to facilitate the evaluation of the data:

- Trend analysis for key monitoring wells
- Overburden plume maps
- Overburden groundwater contour maps
- Historical groundwater data tables

VII. PROTECTIVENESS STATEMENT

Table 8, below, provides protectiveness statements.

Table 8: Protectiveness Statements

Protectiveness Statement(s)	
Operable Unit:	*Protectiveness Determination:*
OU1	**Protective**
Protectiveness Statement:	
The remedy for OU1 is protective of human health and the environment.	
Operable Unit:	*Protectiveness Determination:*
OU2	**Protectiveness Deferred**
Protectiveness Statement:	
A protectiveness determination for OU2 cannot be made until additional information is obtained. Specifically, reconfirmation that the south south-west portion of the bedrock plume is contained by the GWETS is needed, a determination as to whether the groundwater contaminant plume is impacting the creek's surface water and/or sediments needs to be made, and because of increased groundwater contaminant concentrations in the vicinity of the residence with an SVI issue in the past, this residence should be reevaluated to assess if additional actions are needed to mitigate exposure via SVI. It is expected that a report addendum containing a protectiveness statement will be issued within two years of the date of this report. Additionally, the CSM should be updated to determine whether the RAOs can be achieved.	
Sitewide Protectiveness Statement	
Protectiveness Determination:	
Protectiveness Deferred	
Protectiveness Statement:	
A sitewide protectiveness determination cannot be made until additional information is obtained. Specifically, reconfirmation that the south south-west portion of the bedrock plume is contained by the GWETS is needed, a determination as to whether the groundwater contaminant plume is impacting the creek's surface water and/or sediments needs to be made, and because of increased groundwater contaminant concentrations in the vicinity of the residence with an SVI issue in the past, this residence should be reevaluated to assess if	

additional actions are needed to mitigate exposure via SVI. It is expected that a report addendum containing a protectiveness statement will be issued within two years of the date of this report. Additionally, the CSM should be updated to determine whether the RAOs can be achieved.

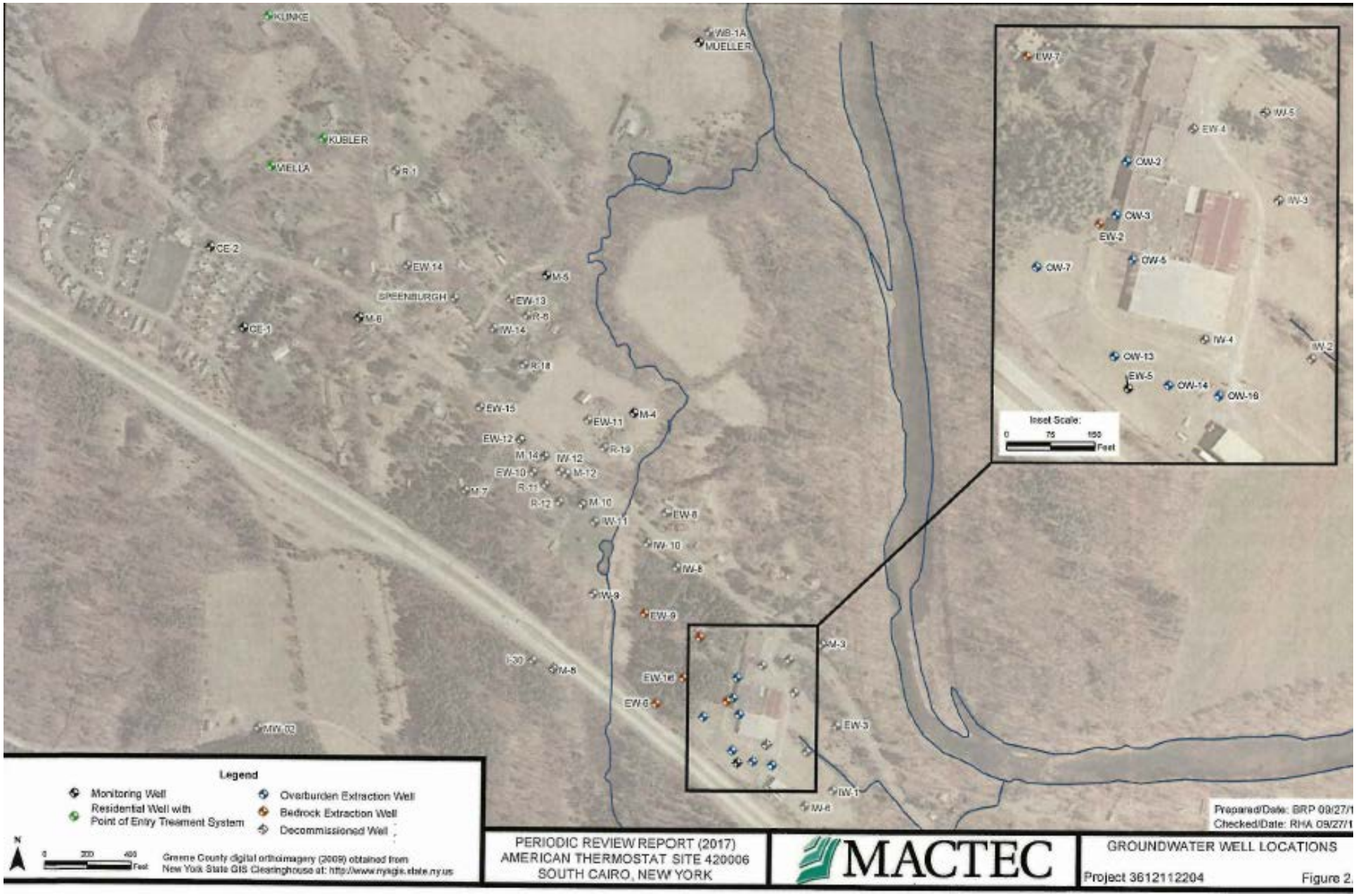
VIII. NEXT REVIEW

The next FYR report for the American Thermostat site is required five years from the completion date of this review.

APPENDIX A: FIGURES

Figure 1-- Site Plan (source: MACTEC Engineering and Consulting)




KUNKE
KUBLER
MIELLA
R-1
CE-2
CE-1
EW-14
GREENBURGH
M-6
EW-13
R-8
IW-14
M-5
R-18
EW-15
EW-12
M-14
IW-12
EW-10
M-12
R-11
M-7
R-12
M-10
EW-11
M-4
R-19
IW-11
EW-8
IW-10
IW-8
IW-9
EW-9
M-3
EW-16
EW-6
M-8
MW-02
EW-3
IW-1
IW-6
WB-1A
MUELLER
EW-7
IW-5
EW-4
OW-2
IW-3
OW-3
EW-2
OW-7
OW-6
IW-4
IW-2
OW-13
EW-5
OW-14
OW-16
Inset Scale:
0 75 150
Feet
Legend
Monitoring Well
Residential Well with Point of Entry Treatment System
Overburden Extraction Well
Bedrock Extraction Well
Decommissioned Well
N
0 200 400
Feet
Greene County digital orthoimagery (2009) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us
PERIODIC REVIEW REPORT (2017)
AMERICAN THERMOSTAT SITE 420006
SOUTH CAIRO, NEW YORK
MACTEC
GROUNDWATER WELL LOCATIONS
Project 3612112204
Figure 2.
Prepared/Date: BRP 09/27/1
Checked/Date: RHA 09/27/1

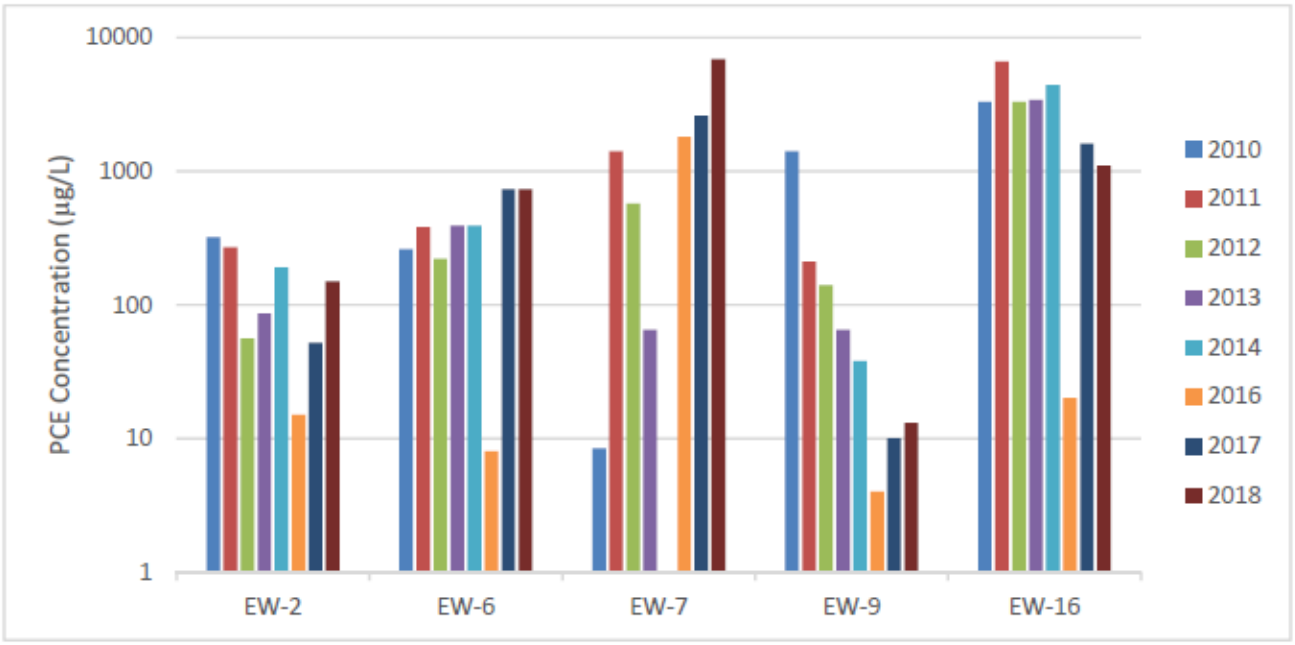
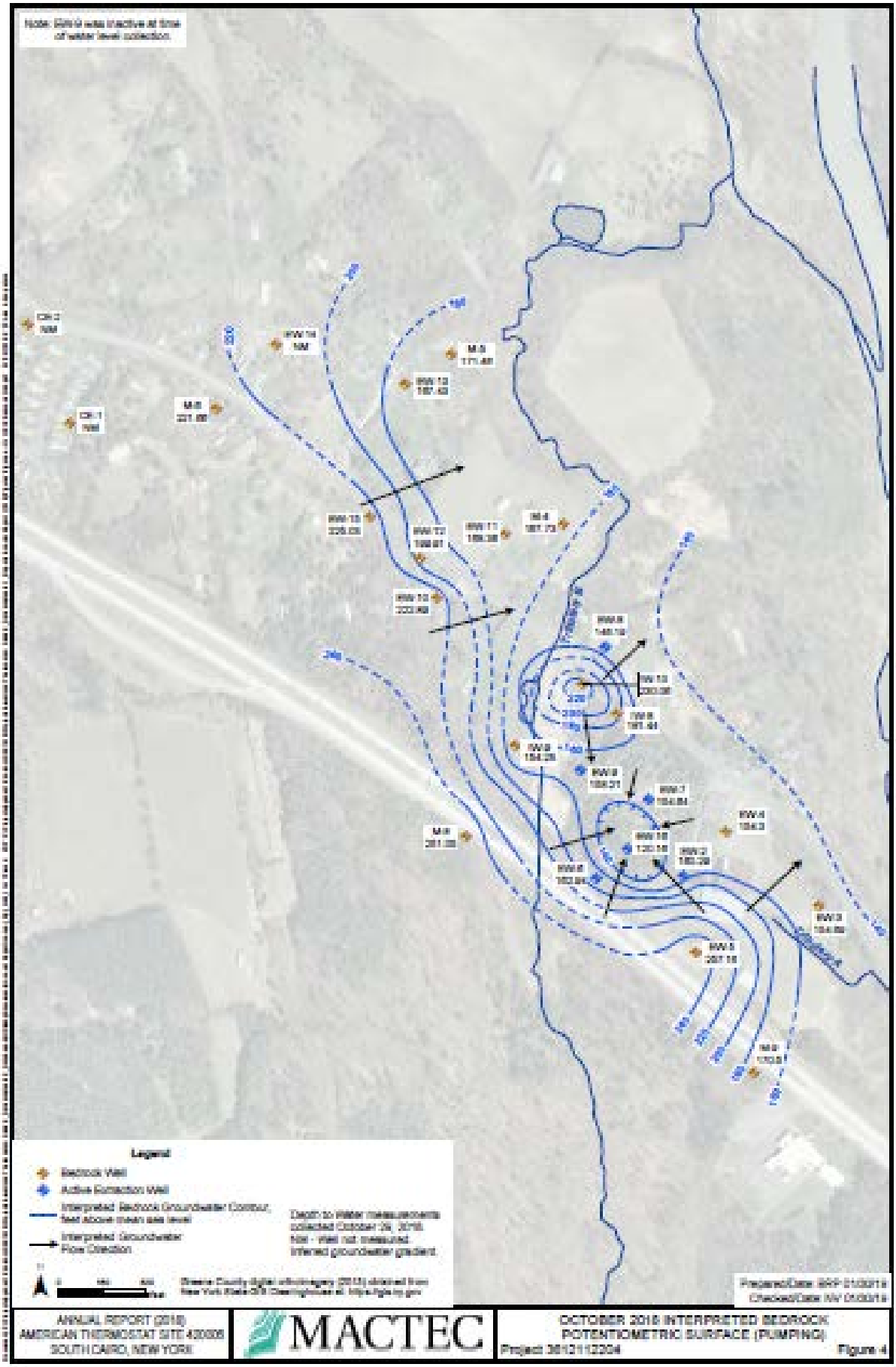


Figure 3: Histograph



ANNUAL REPORT (2018)
AMERICAN THERMOSTAT SITE 420008
SOUTH CAIRO, NEW YORK

MACTEC

OCTOBER 2016 INTERPRETED BEDROCK POTENTIOMETRIC SURFACE (PUMPING)
Project 3612112204

Figure 4

APPENDIX B: REFERENCES

Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review
Record of Decision (alternate water supply), EPA, January 1988
Record of Decision (source control), EPA, June 1990
Remedial Action Report (source control), Foster Wheeler Environmental, July 1997
Explanation of Significant Differences, EPA, July 1997
Remedial Action Report (groundwater remedy), Foster Wheeler Environmental, September 1998
Preliminary Site Close-Out Report, EPA, September 1998
First Five-Year Review Report, EPA, September 2003
Second Five-Year Review Report, EPA, August 2008
Final Remedial System Optimization Report, American Thermostat Site MACTEC Engineering and Consulting, P.C., November 2008
RSO Implementation Activities Report, American Thermostat Site, Prepared for the New York State Department of Environmental Conservation by MACTEC Engineering and Consulting, P.C., January 2013
Third Five-Year Review Report, EPA, December 2013
Periodic Review Report (2013), American Thermostat Site, Prepared for the New York State Department of Environmental Conservation by MACTEC Engineering and Consulting, P.C., March 2014
Periodic Review Report (2014), American Thermostat Site, Prepared for the New York State Department of Environmental Conservation by MACTEC Engineering and Consulting, P.C., January 2015
Periodic Review Report (2015), American Thermostat Site, Prepared for the New York State Department of Environmental Conservation by MACTEC Engineering and Consulting, P.C., February 2016
Periodic Review Report (2016), American Thermostat Site, Prepared for the New York State Department of Environmental Conservation by MACTEC Engineering and Consulting, P.C., January 2017
2017 Periodic Review Report, American Thermostat Site, Prepared for the New York State Department of Environmental Conservation by MACTEC Engineering and Consulting, P.C., January 2018
2018 Annual Report, American Thermostat Site, Prepared for the New York State Department of Environmental Conservation by MACTEC Engineering and Consulting, P.C., January 2019
EPA guidance for conducting five-year reviews and other guidance and regulations to determine if any new applicable or relevant and appropriate requirements relating to the protectiveness of the remedy have been developed since EPA issued the ROD

APPENDIX C: SITE TOPOGRAPHY, GEOLOGY, AND HYDROGEOLOGY

Site Topography

The topography within the vicinity of the site may be characterized as gently rolling foothills of the Catskill Mountains which are deeply incised by stream channels. The site is located on a slight ridge overlooking Catskill Creek Valley. Immediately west of the facility is a small valley which includes Tributary B, a tributary of Catskill Creek. East of the facility is Tributary A, which also flows into Catskill Creek, located approximately a quarter mile to the east of the site.

Site Geology/Hydrogeology

Regionally, the bedrock within Greene County consists of interbedded shales and sandstones of Devonian age, known as the Catskill Formation. The Catskill Formation is made up of four distinct bedrock groups. From oldest to youngest, these groups are Hamilton, Geneses, Sonya, and West Falls. The site lies within the Hamilton Group. Near the site, groundwater is found between 5 to 8 feet below the ground surface in the overburden. The bedrock is at an average depth of 28-30 feet below the ground surface but has been observed up to 100 feet below the ground surface on-site. The unconsolidated soils overlying the bedrock are primarily glacially-derived soils and sediments.