

**SIXTH FIVE-YEAR REVIEW REPORT FOR
MARATHON BATTERY COMPANY SUPERFUND SITE
PUTNAM COUNTY, NEW YORK**



Prepared by

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

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April 25, 2023

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

AS/SVE	Air Sparge and Soil Vapor Extraction
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
CIC	Community Involvement Coordinator
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
FYR	Five-Year Review
GCL	Geosynthetic Clay Liner
ICs	Institutional Controls
MCL	Maximum Contaminant Level
µg/L	Micrograms per Liter
Mg/kg	Milligram per Kilogram
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OU	Operable Unit
PCE	Tetrachlorethylene
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
RPM	Remedial Project Manager
TCLP	Toxicity Characteristics Leaching Procedure
TCE	Trichloroethylene
UAO	Unilateral Administrative Order
USACE	United States Army Corps of Engineers
UU/UE	Unrestricted Use/Unlimited Exposure
UCL	Upper Confidence Level
VI	Vapor Intrusion
VOC	Volatile Organic Compound

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 sixth FYR for the Marathon Battery Company Superfund site. The triggering action for this statutory review is the completion date of the previous FYR. The signature date of the last review was September 17, 2018. The FYR has been prepared due to the fact that hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

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

The site consists of three operable units (OUs). All three OUs will be addressed in this FYR. OU1 includes Constitution Marsh and East Foundry Cove Marsh and is also known as “Area I.” OU2 consists of East Foundry Cove, West Foundry Cove, and the Hudson River in the vicinity of the Cold Spring pier and is referred to as “Area III.” OU3 contains the former Marathon Battery Company plant grounds and the surrounding residential neighborhood and is known as “Area II.”

The Marathon Battery Company Superfund site FYR was led by Pamela Tames, P.E., the EPA Remedial Project Manager. Participants included Michael Scorca, EPA hydrogeologist; Charles Nace, EPA biologist; Dr. Lora Smith, EPA risk assessor; Shereen Kandil, EPA community involvement coordinator (CIC); Michael Squire, New York State Department of Environmental Conservation (NYSDEC) project manager; and Lisa Rosman, National Oceanic and Atmospheric Administration. The performing potentially responsible party (PRP) was notified of the initiation of the FYR. The review began on August 17, 2022.

Site Background

The site, located in the Village of Cold Spring, Putnam County, New York, includes the grounds of a 12-acre former nickel-cadmium battery manufacturing facility, the Hudson River in the vicinity of the Cold Spring pier and a series of river backwater areas known as East Foundry Cove, East Foundry Cove Marsh, Constitution Marsh, and West Foundry Cove (see Appendix A, Figure 1). Before the site was remediated, a battery plant and an underground asphalt- and clay-lined vault containing spoils from dredging activities in East Foundry Cove were located on the facility’s grounds. Twenty-nine houses, located on Constitution Drive, are in the vicinity of the site.

The former battery plant grounds parcel is zoned “light industrial” and is currently awaiting redevelopment. Because this portion of the site is surrounded on three sides by residential properties and the access roads leading to it are very narrow, it is unlikely that its future use will

mirror its historic industrial use. Potential redevelopment scenarios include mixed-use, single and/or multi-family homes, senior housing and a municipal parking lot.

Scenic Hudson, a not-for-profit conservation organization, bought East Foundry Cove and East Foundry Cove Marsh, in addition to the adjacent 95-acre West Point Foundry Historic site. The area is open to the public for walking, hiking, bird watching, canoeing, and kayaking. Hunting and camping are not allowed. The marsh and cove areas are managed by the Audubon Society, which also manages the adjacent Constitution Marsh.

Nickel-cadmium batteries were manufactured at the plant from 1952-1979. The plant’s wastewater treatment system originally consisted of a lift station and piping for transfer of all process wastewater into the Cold Spring sewer system for discharge directly into the Hudson River at the Cold Spring pier. In addition, a bypass valve was installed so that when the lift station was shut down or overloaded, a direct gravity discharge could be made into the Kemble Avenue storm sewer for discharge into Foundry Cove. Samples of sediments, vegetation, various species of fish, muskrat, turtle eggs and green heron taken for studies conducted from 1976 to 1980 revealed high concentrations of cadmium.

Appendix B, attached, summarize the documents utilized to prepare this FYR. Appendix C, attached, includes an assessment of climate change at the site. For more detail related to background, physical characteristics, geology/hydrogeology, land/resource use, and history related to the site, please refer to <https://www.epa.gov/superfund/marathon-battery>.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Marathon Battery Company		
EPA ID: NYD01095957		
Region: 2	State: NY	City/County: Cold Spring/ Putnam County
SITE STATUS		
NPL Status: Deleted		
Multiple OUs? Yes	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Pamela Tames		
Author affiliation: EPA		
Review period: 9/18/2018 – 4/20/2023		

Date of site inspection: 10/20/2022
Type of review: Statutory
Review number: 6
Triggering action date: 9/17/2018
Due date (five years after triggering action date): 9/17/2023

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The results of a remedial investigation (RI) for OU1, completed in 1985, indicated widespread heavy metal contamination of the sediments in Foundry Cove. The highest level of contamination occurred in East Foundry Cove Marsh in close proximity to the Kemble Avenue outfall. This area, characterized by a layer of greenish-white sediment spanning an approximately 50 by 100-foot area, showed concentrations as high as 171,000, 156,000, and 6,700 milligrams/kilogram (mg/kg) for cadmium, nickel, and cobalt, respectively. Cadmium levels as high as 2,200 mg/kg were found in the Hudson River in the vicinity of the Cold Spring pier.

Human health risks were driven by the high cadmium concentrations in East Foundry Cove Marsh; unacceptable risks were associated with ingestion of surface water and sediment during recreational activities. In addition, human health risks were present from the ingestion of fish and blue crabs in the vicinity of the site. The ecological risk assessment found that cadmium contamination was evident in all trophic levels and was being bioaccumulated through the food chain.

A RI/feasibility study (FS) for the plant area, existing buildings, adjacent residential homes and underlying groundwater was completed in 1988. Samples from the former battery facility indicated contamination as high as 120,000 mg/kg cadmium and 130,000 mg/kg nickel in the rafters, and up to 600 mg/kg cadmium on the surrounding grounds. Cadmium concentrations up to 67 mg/kg were found in soils in the adjacent residential yards. The risk assessment concluded that an unacceptable risk was associated with the ingestion of cadmium contaminated soils and building dust. The Agency for Toxic Substances and Disease Registry (ATSDR) conducted an evaluation of the health risks associated with the ingestion of garden vegetables grown in cadmium contaminated soils and determined that concentrations of 20 mg/kg cadmium or above in the soils posed an unacceptable risk for current and future residential use. A pre-design investigation sampled the soil of residential properties adjacent to and near the site. As a result, one residential property was found to have soil levels of cadmium above 20 mg/kg and required soil remediation in addition to the former battery facility grounds.

Volatile organic compounds (VOCs) and inorganics were detected in the groundwater underlying the plant grounds. Although the groundwater is not used as a potable water source, the Village of Cold Spring had expressed an interest in using this aquifer to supplement its fire hydrant water

supply, which is connected to the municipal water supply. Therefore, if the aquifer is to be used as a water source, the potential exists that residents may be exposed to the VOCs and inorganic contaminants present in the groundwater.

Response Actions

In 1972, the U.S. Department of Justice signed a Consent Agreement requiring the owners/operators of the battery facility to remove as much cadmium from the outfall area and channel leading into East Foundry Cove as was economically, technically and ecologically feasible. Dredging was performed from 1972 to 1973. The dredge spoils were entombed in the above-described vault. The dredging that was performed by the owners/operators was not totally successful. Post-dredging monitoring continued to detect elevated cadmium concentrations in the cove's sediments, flora, and fauna. Tidal action slowly flushed some of the remaining cadmium deposits from the cove into the Hudson River and into Constitution Marsh, a National Audubon Society sanctuary.

Based upon these findings, in 1981, the site was included on the National Priorities List (NPL).

Remedy Selection

On September 30, 1986, a Record of Decision (ROD) was signed for Area I (OU1). The ROD established the following remedial action objectives (RAOs):

- Prevention of all biota from contacting East Foundry Cove Marsh and Constitutional Marsh contaminated sediments that would threaten them.
- Prevention of resuspension and redistribution of the contaminated sediments that would threaten the area flora and fauna.
- Minimization of the disturbance to Constitution Marsh, because this wetland is a delicate ecological habitat.

The selected remedy included:

- Dredging of the cadmium-contaminated sediments within East Foundry Cove Marsh exceeding 100 mg/kg;¹
- Placement of a clay cap and soil cover on the excavated marsh areas;
- Restoration of the marsh;
- Chemical fixation and off-site disposal of the excavated sediments; and
- Long-term monitoring of Constitution Marsh.²

¹ In conjunction with the clay cap and soil cover, the 100 mg/kg action level, which was based upon an analysis of available information and discussions with state and federal fish and wildlife experts, was found to be protective of human health and the environment.

² Although cadmium-contaminated sediment hot spots were identified in Constitution Marsh, remediation of these sediments would have had a significant adverse impact on the marsh's sensitive ecosystem. In addition, the cadmium-contaminated sediments would eventually be covered with clean sediments

A ROD for the former battery facility (Area II and OU3) was signed on September 30, 1988, which established the following RAOs:

- Reduce cadmium in soils and building dust to protect human health and the environment.
- Reduce VOCs in the groundwater to protect human health and the environment.

The selected remedy included:

- Decontamination of the inside surfaces and contents of the former battery facility to remove the heavy metal-contaminated dust;
- Excavation of the cadmium-contaminated soil to a level of 20 mg/kg³ on the battery plant grounds and the residential yards impacted by the site;
- Excavation of the on-site dredge spoils vault;
- Fixation of the excavated soil, dust and vault sediments;
- Off-site disposal of the cadmium-contaminated soils, sediments, and dust at a facility to be arranged for by NYSDEC;
- Excavation of the VOC-contaminated soil hotspots followed by enhanced volatilization and replacement of the clean residuals on-site;
- Backfilling of the excavated areas with clean fill;
- Institutional controls (ICs) to restrict development of the aquifer for potable or municipal use, until state or federal applicable or relevant and appropriate requirements are reached;
- Long-term monitoring of the groundwater underlying the site; and
- Evaluation and performance of minor repairs, if needed, to the inoperable sprinkler and heating systems inside the former battery facility.

In 1993, an Explanation of Significant Differences (ESD) modified three of the components of the remedy for OU3 (Area II). First, the majority of the residential yard soils were not fixated prior to off-site disposal because the results of tests performed on each roll-off of excavated yard soils showed that the majority of yard soils passed Toxicity Characteristics Leaching Procedure (TCLP) testing without treatment. Second, the plant grounds' soils would not undergo enhanced volatilization as called for in the ROD because the results of soil gas testing showed that the levels of volatile organics present in the VOC-contaminated soils were below action levels. Lastly, the sprinkler and heating systems would not be repaired because the removal of the decontaminated books previously stored within the facility eliminated the threat of fire.

following the remediation of the cadmium-contaminated sediments in East Foundry Cove Marsh. Therefore, long-term monitoring was selected for Constitution Marsh.

³ The 20 mg/kg action level was based upon a risk assessment performed by ATSDR. The risk assessment assumed that the risk pathway for humans was via ingestion of vegetables grown in cadmium contaminated soils (chronic exposure). NYSDEC, as an enhancement to the EPA selected remedy, used a 10 mg/kg action level developed by the New York State Department of Health (NYSDOH) to evaluate the health risks associated with the ingestion of garden vegetables grown in cadmium contaminated soils and remediated several residential properties adjacent to the former battery facility grounds.

A second ESD in 1994 documented the incorporation of the demolition of the facility into the remedy for OU3 (Area II). Following the decontamination of the building, it had deteriorated and a portion of the roof experienced structural failure. Due to the threat of potential exposure of the public to contaminated dust from the building's foundation and the VOCs present in the soil underlying the foundation, the building would be demolished, and the contaminated soil remediated.

A third ESD in 1995 documented a modification to the remedy in which cadmium-contaminated soils remaining within a 20- by 60-foot area at twenty-four feet below ground surface (bgs) would not be removed. Two feet of limestone would be added to stabilize it and an IC added to the deed to prevent excavations deeper than 15 feet in that area.

A ROD for East Foundry Cove, West Foundry Cove, and the Hudson River in the vicinity of the Cold Spring pier portion of the site (Area III and OU2) was signed on September 26, 1989. The ROD established the following RAOs:

- Reduce cadmium in sediments to protect aquatic organisms and protect human health;
- Reduce the transport of suspended sediments from East to West Foundry Coves and the pier area.

The selected remedy called for:

- Dredging the contaminated sediments from East Foundry Cove to a depth of one foot, chemical fixation and off-site disposal of those sediments, and restoration of the original contours, as necessary;⁴
- Continued monitoring for the West Foundry Cove;⁵ and
- Sampling and analysis adjacent to and under the Cold Spring pier with dredging of any contaminated sediments determined to be a threat to the environment, followed by chemical fixation, off-site disposal, and restoration of the original contours, as necessary.

Status of Implementation

From 1987 to 1992, through an interagency agreement with the U.S. Army Corps of Engineers (USACE), Malcolm Pirnie, Inc. performed the Areas I, II (the dredge spoils vault and the plant grounds), and III designs.

Because the proposed treatment area, location for the haul road, East Foundry Cove Marsh, and East Foundry Cove were located within the West Point Foundry National Historic District, a

⁴ Because most of the contamination was located in the top four inches of the sediment, removal of one foot of sediment would achieve the 95% removal rate and the cleanup goal of about 10 mg/kg which was sought in the 1989 ROD.

⁵ Although West Foundry Cove sediments are contaminated with cadmium, because they would eventually be covered with clean sediments following the remediation of the cadmium-contaminated sediments in the other portions of the site, long-term monitoring was selected for West Foundry Cove.

cultural resources survey was conducted. The cultural resources survey indicated that five archaeologically sensitive areas would be impacted as a result of construction activities. Accordingly, a Data Recovery Plan was developed to recover, remove, stabilize, conserve, and curate artifacts from these areas and thereby document these archeological resources. Through these efforts, over 145,000 prehistoric and Civil War era artifacts were analyzed, documented, and recovered. The artifacts were temporarily transferred to the Orange County Historical Society for display and research. Some of the artifacts are now located at the Putnam County Historical Society and the remainder are in storage in the Village of Cold Spring.

In 1989, EPA issued a Unilateral Administrative Order (UAO) to the PRPs, Marathon Battery Company, Gould Inc., and Merchandise Dynamics (the property owner), requiring them to decontaminate the interior of the 114,000-square foot former battery plant (which at the time was an abandoned book repository) and its contents, recycle the decontaminated books and properly dispose of contaminated materials. Following a pilot-scale study conducted by ENSR Consulting and Engineering (Marathon Battery Company and Gould Inc.'s contractor⁶) to evaluate decontamination techniques, the facility, as well as 4,170 pallets containing approximately 2.5 million books, were decontaminated. Based on the results of the sampling of 76 rolloffs that were filled with debris from the building and HEPA vacuum filters from the decontamination work, 12 were determined to contain hazardous debris and were disposed of at Chemical Waste Management's hazardous landfill in Model City, New York. The remaining rolloffs were sent to Waste Management's Modern Landfill in York, Pennsylvania. While the book and building decontamination work was completed in 1991, due to the limited production rate of available book recycling companies, the recycling of the books continued until 1993.

From 1992 to 1993, the residential properties adjacent to the former facility were remediated, resulting in the excavation, stabilization, and off-site disposal of approximately 1,600 cubic yards of contaminated soil. This work was performed by NYSDEC, as an enhancement to the EPA selected remedy, using a 10 mg/kg cadmium concentration based upon an New York State Department of Health (NYSDOH)-performed evaluation of the health risks associated with the ingestion of garden vegetables grown in cadmium contaminated soils.

After the completion of the comprehensive remedial design for Areas I, II (the dredge spoils vault and the plant grounds), and III, bids for the implementation of the remedial action were solicited by the USACE. EPA and the PRPs, however, negotiated a settlement the week prior to the bid opening and the bidding process was halted. Pursuant to the Consent Decree, Gould Inc. agreed to perform the remedial action and Marathon Battery Company and the U.S. Army agreed to a cash settlement.

Gould Inc., as the settling work defendant, took over the solicitation of the contract and chose Severson Environmental Services as its contractor. The USACE performed oversight of the work. Full-scale dredging of East Foundry Cove Marsh and East Foundry Cove and the excavation of the plant grounds began in 1993. The treated sediments and soils were stockpiled on the treatment area for curing and post-treatment testing prior to off-site disposal. All treated materials were subjected to the TCLP testing. Dredging in the Hudson River in the vicinity of the Cold Spring pier and East Foundry Cove were completed in 1994. All dredged areas underwent post-

⁶ The bankrupt Merchandise Dynamics did not comply with the UAO.

remediation sampling. The dredged areas in the Hudson River and East Foundry Cove were surveyed to determine whether the proper dredging depth was achieved. In East Foundry Cove Marsh, post-dredging cadmium levels in the sediments did not exceed the 100 mg/kg action level, averaging 11.75 mg/kg. In the Hudson River and East Foundry Cove, an average of 10 mg/kg cadmium remained, which was consistent with the ROD requirement that at least one foot of sediment and 95% of the contamination be removed. In all, 189,265 tons of treated soils and sediments were transported off-site (via 1,979 railcars) to City Management Landfill in Michigan. Chemical Waste Management's hazardous waste landfill in Model City, New York received 906 tons of hazardous materials.

The collection of ice and snow on the former battery facility's roof in 1994 resulted in the collapse of a 10,000 square foot section of the roof, thereby exposing a portion of the concrete foundation to the outside elements. This particular portion of the foundation contained numerous trenches that were used for waste disposal during the manufacture of nickel-cadmium batteries. Sample analyses revealed that elevated levels of cadmium and nickel remained encased in the rubble-filled and cemented-over trenches. Due to the concern that continued exposure to the elements and freeze/thaw cycles may cause the concrete floor and/or trenches' cement caps to heave and crack, possibly resulting in a release of contaminated dust, the PRPs agreed to demolish the building and remove the foundation and process trenches. Demolition of the former battery facility was performed from 1994 to 1995.

Following the demolition of the former battery facility, it was discovered that a cadmium nitrate tank located on a pedestal (hereinafter referred to "pedestal area") immediately adjacent to the plant had leaked onto the underlying soil prior to the closing of the plant in 1979. In an attempt to remove this cadmium-contaminated soil, a 20 by 60-foot area was excavated to a depth of approximately 22 feet (approximately two feet above the groundwater table). While post-excavation sampling of this area showed that some cadmium contamination remained in the saturated soils at levels above the 20 mg/kg action level and that cadmium was present in the groundwater, it was determined that excavating an additional four feet of contaminated soil to a depth of 26 feet (two feet below the water table), placing two feet of limestone at the bottom of the excavation (to raise pH levels and keep the cadmium insoluble), and backfilling the excavation with clean fill would be protective of public health and the environment.⁷

At the completion of the marsh remediation and restoration activities in 1995, the marsh was planted with cattails, bull rush, arrow arum, and upland shrubs in specified areas. Growth of these plants was interrupted by significant ice scour and an invasion of geese, which destroyed approximately 40% of the newly planted marsh areas. A geese control plan was devised and denuded areas were replanted during molting season, when the geese would not be able to fly in.

The site was deleted from the NPL on October 18, 1996.

Institutional Controls

⁷ The noted modification to the remedy was documented in a 1995 ESD.

The 1988 ROD called for ICs to prevent the installation of on-site groundwater wells without the approval of EPA, and the 1995 ESD calls for ICs to prevent excavation deeper than 15 feet within the “pedestal area.” Although not called for in the ROD, EPA also determined that there should be an IC to limit disturbances to the marsh and not expose or puncture the protective clay cap covering it. Preventing the installation of on-site groundwater wells and excavation deeper than 15 feet within the “pedestal area” were incorporated via a deed restriction when the former battery facility grounds changed ownership. An agreement to limit disturbances to the marsh and not expose or puncture the protective clay cap covering was formalized via a Prospective Purchaser Agreement between EPA and Scenic Hudson.

In addition, in the late 1980s, NYSDOH began issuing fish advisories to prevent the consumption of fish and blue claw crabs from East Foundry Cove, West Foundry Cove, and the Hudson River in the vicinity of the Cold Spring Pier (Area III). Although the main objective of these advisories are to prevent human consumption of fish and blue claw crabs contaminated with PCBs, previous studies have shown that the fish and crabs were also contaminated with cadmium in this area.

Table 1, below, summarizes the status of the ICs.

Table 1: Summary of Planned and/or Implemented ICs

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/Soil	Yes	Yes	Area II (former battery facility grounds)	Bar the construction of on-site groundwater wells without the approval of EPA and excavation deeper than 15 feet within the “pedestal area.”	Deed restriction dated November 14, 2003
Vapor	Yes	No	Area II (former battery facility grounds)	Require vapor intrusion (VI) mitigation as part of new building construction	Formal agreement with developer/owner April 2026
Sediment	Yes	No	East Foundry Cove Marsh	Limit disturbances to the marsh and not to expose or puncture the protective clay cap covering it	Prospective Purchaser Agreement between EPA and Scenic Hudson dated October 10, 1996.

Fish	Yes	No	Surface water (Areas I and III)	Prevent the consumption of fish and blue claw crabs from East Foundry Cove, West Foundry Cove, and the Hudson River in the vicinity of the Cold Spring Pier (Area III).	NYSDOH fish advisories in effect since late 1980s
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Systems Operations/Operation & Maintenance

Annual site inspections are conducted to examine the restored marsh for invasive vegetative species, determine the percentage of vegetative cover on the cap in East Foundry Cove Marsh, identify irregular settlement, bubbles, erosion or other disturbances which might affect the integrity of the cap and vegetative cover, check the integrity of the fencing surrounding the plant grounds, and check the integrity of the monitoring wells. Maintenance is performed, as necessary. The plantings are being monitored on a regular basis by the warden of the adjacent National Audubon sanctuary, Constitution Marsh.

In accordance with the site monitoring plan, monitoring originally included the collection of groundwater, surface water, sediment, and wildlife tissue samples and the performance of marsh vegetation inventories annually. Laboratory analyses included metals for sediments, VOCs and metals for groundwater, metals for surface water, and metals for wildlife analyses. Since the second FYR period, there had not been a change in the wetland surface water and soil sample results. Additionally, the levels of contaminants present in the surface water and East Foundry Cove Marsh soil concentrations do not pose a significant threat to the environment. Therefore, sampling and analysis of surface water, wildlife tissue samples and East Foundry Cove Marsh soils are no longer performed.

Thirteen monitoring wells on the plant grounds were used for the long-term monitoring of the groundwater for VOCs and cadmium until 2003, when 11 of the wells were decommissioned because of the absence of contamination in those particular wells. In 2005, an additional groundwater monitoring well and five temporary wells were installed to better delineate the groundwater plume.

A natural attenuation enhancement (NAE) pilot program began in 2012 with a two-day air sparge (AS) and soil vapor extraction (SVE) pilot-test (Phase I). Phases II and III consisted of a three-month AS/SVE program in 2012 (Phase II), followed by a 6-month groundwater monitoring rebound study (Phase III). Phase IV consisted of an 11-month expanded AS/SVE program from 2013 to 2014, followed by a groundwater monitoring rebound study from 2014 to 2017 (Phases V and VI). Phase VII and VIII consisted of a 12-month ozone injection program from 2017 to 2018 (Phase VII), followed by approximately three years of post-ozone groundwater and soil gas monitoring (Phase VIII rebound and extended monitoring).

A vegetation survey performed in 2013 indicated that the transect locations located within large, planted areas had become more established and had a denser vegetative cover. The stations in relatively open areas or areas adjacent to the marsh channels continued to show little or no change in vegetative cover. A review of photographs from several annual site visits showed that bare areas persisted and more of the marsh was underwater at low tide. Given the sensitivity of marsh plants to changes in water elevation, it was requested that the PRPs investigate settlement within the marsh. In 2016, an analysis of the rate of settlement was performed in addition to a physical inspection of the geosynthetic clay liner (GCL) seams near the area of greatest settlement. Test trenches indicated that the seams at all exposed locations were still intact and in good condition.

In spring 2013, more than four hundred quart-sized wetland plants of various species were planted throughout the marsh. The plant locations were determined based on water depths and the location of the same or similar species currently thriving in the marsh. Perimeter fencing was installed along with small metallic flags to deter geese predation. In fall 2013, a vegetation survey was performed, and the results compared to previous surveys performed in 2010 and 2012. The 2013 results indicated that the percentage of total cover at the transect locations increased by more than 10% from 2012. Subsequent site visits do not indicate that these plantings have thrived, as the size of the unvegetated mud flats has increased. Areas within the marsh experiencing subsidence are no longer at an elevation which would support elevation-sensitive submerged aquatic vegetation.

A review of the marsh to identify ways to improve vegetation coverage and reduce settlement and erosion was performed in 2019. It was determined that the dredging during the remedial action caused the dredged areas, specifically East Foundry Cove and East Foundry Pond, to act as sediment traps, thereby reducing sedimentation in the Marsh. Subsidence in the interior of the marsh was compounded by limited sediment delivery since remediation and caused vegetation to die off due to increased water depth. Areas of remedial sediment removal in the cove and pond have shown substantial sediment accumulation over the past 25+ years. As the system reaches equilibrium in the cove and pond, sediment accumulation in the marsh is expected to increase.

During the 2015 annual site visit, a previously identified “bubble” (caused by localized spring activity in the underlying marsh soils exposing a portion of the GCL) adjacent to the channel in the southern half of the marsh was found to be increasing in size. Samples of sediment were collected beneath the GCL and it was determined that the GCL could safely be removed from this area to allow the underlying water to escape. A 30- by 10-foot section of the GCL was removed in spring 2016.

Another “bubble” was found during a 2018 site visit. It was subsequently removed in fall 2018 to allow the underlying water to escape.

Potential site impacts from climate change have been assessed and the performance of the remedy may be impacted by sea level rise (see Appendix C). Marsh plants are sensitive to the amount of time they spend submerged during the tidal cycle. Because the water in the marsh will continue to deepen as the sea level slowly rises, a review of the marsh should be performed to identify ways to evaluate how best to keep the marsh stable and healthy.

III. PROGRESS SINCE THE LAST REVIEW

The protectiveness determinations from the last FYR are summarized in Table 2, below.

Table 2: Protectiveness Determinations/Statements from the 2018 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The implemented actions at OU1 protect human health and the environment.
2	Protective	The implemented actions at OU2 protect human health and the environment
3	Short-term Protective	The implemented actions at OU3 protect human health and the environment in the short term. In order to be protective in the long term, methods of addressing the groundwater contamination should continue to be assessed and implemented, as appropriate.
Sitewide	Short-term Protective	The implemented actions at the site protect human health and the environment in the short term. For the remedy to be protective in the long term, methods of addressing the groundwater should continue to be assessed and implemented, as appropriate.

Table 3, below, summarizes the status of the recommendations from the 2018 FYR

Table 3: Status of Recommendations from the 2018 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
3	The levels of VOCs in the groundwater remain above Maximum Contaminant Levels (MCLs).	Methods of addressing the residual source and groundwater contamination should continue to be assessed and implemented.	Completed	As part of the NAE pilot study, quarterly groundwater sampling was conducted for two years and a completion report was submitted.	4/5/2022

The primary purpose of the NAE pilot study was to reduce the VOC contaminant levels in the plume, to increase the rate of natural attenuation and to generate data to determine the possibility of shortening the time to achieve MCLs. The completion report noted that the monitoring wells within the treatment zone achieved trichloroethylene (TCE) concentration reductions of 25% to 70% with the exception of IW-6 which did not show a significant reduction. Monitoring wells downgradient of the treatment area achieved TCE concentration reductions of approximately 40% to 50%. The data suggests that the MCLs will be met in the downgradient wells in 10 to 20 years. Continued monitoring of the plume, but no further treatment, was recommended.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On August 15, 2022, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands, including the Marathon Battery Company Superfund site. The announcement can be found at the following web address: <https://www.epa.gov/superfund/R2-fiveyearreviews>.

In addition to this notification, the CIC for the site, Shereen Kandil, posted a public notice on the EPA site webpage <https://www.epa.gov/superfund/marathon-battery> and provided the notice to the county by email on February 14, 2023 with a request that the notice be posted in municipal offices and on the village/town webpages. This notice indicated that a FYR would be conducted at the Marathon Battery Company Superfund site to ensure that the cleanup at the site continues to be protective of human health and the environment. Once the FYR is completed, the results will be made available at the following repositories: EPA Region 2 Records Center, 290 Broadway, 18th Floor, New York, New York 10007 and the Cold Spring Village Hall, 87 Main Street, Cold Spring, NY. In addition, the final report will be posted on the following website: <https://www.epa.gov/superfund/marathon-battery>. Efforts will be made to reach out to local public officials to inform them of the results.

Data Review

Following the 2012-2018 natural attenuation enhancement pilot program, groundwater sampling was conducted quarterly beginning in December 2019 and ending in September 2021. It has included wells from the long-term monitoring network and system-performance wells. The most recent comprehensive groundwater sampling round was conducted in September 2021 and included 19 wells. Groundwater sampling of three wells was also conducted in October 2022.

The results and concentration trends from several selected wells are discussed below. Concentrations of TCE at on-property monitoring wells MB-3 and MW-7S(A)⁸ generally have exhibited declining trends since the 1990s but remain above the New York State standard of 5 micrograms per liter ($\mu\text{g/L}$). Both monitoring wells are located nearby, but outside the natural attenuation enhancement treatment area. Monitoring well MW-7S(A) is about 50 feet to the west of the treatment area and is screened from 29 to 39 feet bgs. The TCE concentration was 100 $\mu\text{g/L}$ in 1998 and decreased to 58 in 2011. During the natural attenuation enhancement study, TCE concentrations have been somewhat variable, ranging from 52 to 43 $\mu\text{g/L}$. Monitoring well MB-3 is about 40 feet to the east of the treatment area and is screened at 30 to 40 feet bgs. The TCE concentration decreased to 18 $\mu\text{g/L}$ in October 2022.

⁸ The original monitoring well MW-7S was replaced by monitoring well MW-7S(A) in 1987.

Monitoring wells IW-6, IW-8, and ASMP-1 are all located within the natural attenuation enhancement treatment area. Monitoring well IW-6 (screened 25 to 35 feet bgs) showed a sharp reduction in TCE from 110 to 42 µg/L during the first part of the ozone treatment phase but rebounded to 87 µg/L in October 2022.

Monitoring well IW-8 (screened 25 to 35 feet bgs) had a TCE concentration of 180 µg/L in 2009. Its TCE concentration decreased significantly during the operation of the AS/SVE and ozone treatment systems, decreasing to 36 µg/L in 2021. Monitoring well ASMP-1 (screened 22 to 32 feet bgs) had a TCE concentration of 160 µg/L during the early phase of the enhancement systems. Concentrations dropped significantly to 7 µg/L during Phase IV of the AS/SVE pilot, but TCE concentrations rebounded to 46 µg/L in 2021. Off-property monitoring well OSMW-3 (screened 48 to 58 feet bgs), which was installed along Constitution Drive in 2009, continues to show levels of TCE above the New York State standard, ranging between 7.7 to 17 µg/L (see Figure 2). The other two off-property monitoring wells, OSMW-1 (screened 47 to 57 feet bgs) and OSMW-2 (screened 49 to 59 feet bgs), which are downgradient from OSMW-3, have had VOC concentrations below 1 µg/L, which is less than EPA's 5 µg/L MCL.

At several on-property wells located outside the treatment zone, but near the source area (monitoring wells VP-3, VP-7, and VP-9), a direct correlation has been observed between groundwater levels and TCE concentrations. When water levels rise, concentrations increase and when water levels decline, concentrations decrease. This indicates that small amounts of VOCs are present near the water table (possibly sorbed to soils) and are more easily mobilized during periods of higher groundwater.

An inverse correlation was observed at off-property downgradient monitoring well OSMW-3, with higher concentrations during periods of low groundwater levels and lower concentrations during higher groundwater levels, which suggests more water in the aquifer system dilutes a fixed concentration of TCE, thus resulting in lower concentrations.

During this FYR period, concentrations of tetrachloroethylene (PCE) in groundwater were also reviewed for the monitoring wells in the network. Nine monitoring wells have PCE concentrations that have remained less than EPA's 5 µg/L MCL since monitoring commenced. The maximum PCE concentration observed was 34 µg/L at monitoring well IW-8 in 2009, but PCE has subsequently declined at that monitoring well to between 3.2 µg/L to 7.8 µg/L during the review period, depending on the seasonal water level in the aquifer. Five other monitoring wells within the VOC plume remained above 5 µg/L during the review period. The maximum groundwater PCE concentration in 2021 was 15 µg/L at location monitoring well VP-3.

Overall, the VOC (TCE and PCE) concentrations in the groundwater plume on the property generally have decreased over time, but remain above the MCL in several wells, as shown in Figures 3a-f. The maximum observed TCE concentrations in the groundwater samples during and following the six-year natural attenuation enhancement pilot have decreased from 160 µg/L in 2012 to 86 µg/L in 2021 (monitoring well IW-6).

The sediment in East Foundry Cove is sampled at five locations every year. Due to the tidal nature of the cove, the sample results for cadmium usually show some variation. During the review

period, cadmium levels ranged from non-detect to 66.7 mg/kg, but all sample locations ranged from non-detect to 8.5 mg/kg during the most recent sample year (2021). Some fluctuation in the cadmium levels is expected due to daily tidal action plus storm events.

Site Inspection

An inspection of the site was conducted on October 20, 2022. In attendance were Ms. Tames, Mr. Squire, David Decker of the National Audubon Society (Constitution Marsh), and Pia Ruisi-Besares of Scenic Hudson. The purpose of the inspection was to assess the protectiveness of the remedy.

The marsh was inspected during low tide. An inspection of the bubble area showed two additional spots (1 ft²) where the bentomat was fully exposed, however, the areas exposed are small and are expected to resolve themselves through natural deposition. The remaining two bubbles (described above and identified prior to the 2022 inspection) were compact and the vent seems to be functional. There is also a large area containing phragmites, an invasive species, which although invasive, does a good job of retaining sediment. Much of the marsh was underwater even though it was low tide. No erosion was noted during the walk through. The former plant grounds remained fenced and the monitoring wells were locked and in good condition.

V. TECHNICAL ASSESSMENT

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

The three RODs for the site addressed unacceptable risks through the excavation of contaminated soils on the former plant grounds and adjacent properties, dredging of the contaminated sediments in East Foundry Cove Marsh, East Foundry Cove, and the Hudson River in the vicinity of the Cold Spring pier, placement of a clay cap and soil cover on the excavated marsh areas in East Foundry Cove Marsh, and natural attenuation of the contaminated groundwater. In addition, the application of ICs to prevent perforation of the cap, human consumption of contaminated blue claw crabs, and the potable use of on-site groundwater also contributes to the reduction of unacceptable risks.

While the remedies to address the contaminated soils and sediments are functioning as intended by the decision documents, the contamination levels in the groundwater have not declined as quickly as expected and have remained relatively stable to slowly declining since the remediation was completed. Pilot studies were conducted to enhance the degradation of the VOCs in the groundwater. Monitoring should continue to best inform strategies to facilitate the continued degradation of the contamination in the groundwater.

An inspection of the marsh is performed annually to ascertain that the cap is secure and bubbles and/or exposed cap areas are remediated/ fixed promptly. Concerns about bare areas and the risk of future erosion which could expose additional cap areas should be investigated.

Although not directly related to the effectiveness of the remedy, there is concern regarding erosion of shoreline areas within the marshes due to sea level rise. The rising water levels, combined with

wave action, are harming vegetation by eroding sediment from the root area, causing plants to die and increasing the amount of unvegetated areas. Monitoring and mitigation efforts are being evaluated to increase vegetated areas and to determine if anything can be done regarding the increase in water levels. Indirectly, over years, the loss of vegetation and sediment could impact the capped areas. This should be evaluated during the next FYR period.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The exposed populations evaluated in the three RODs for the site remain appropriate currently and for the next five years. These include recreational users and consumers of fish and blue crab, trespassers, and nearby residents. Exposure pathways also remain valid and include direct contact and incidental ingestion of contaminated sediments during recreational use of surface water, ingestion of cadmium-contaminated sediments in the surface water during water sports, ingestion of fish and/or blue crab from the site surface water bodies, ingestion of site soils or adjacent residential soils, ingestion of groundwater, or inhalation of organics during domestic groundwater use.

The OU1 and OU2 RODs were signed prior to the implementation of the Risk Assessment Guidance for Superfund used currently by EPA. However, the process that was used remains valid.

With the exception of cadmium-contaminated soils just below the water table within the “pedestal area,” all the soils on the former battery facility grounds and residential yards have been remediated to the site-specific, risk-based cleanup goal of 20 mg/kg. As a result of the placement of two feet of limestone at the bottom of the 26-foot-deep excavation (to raise pH levels and keep the cadmium insoluble), the backfilling of the excavation with clean fill, and the placement of ICs to restrict excavation within the “pedestal area” on the former battery plant grounds, there is no route of exposure to these contaminated soils.

Since the last FYR, EPA has decreased its residential Regional Screening Level (RSL) for cadmium exposure to 7.1 mg/kg. An evaluation of post-excavation data collected on the plant grounds determined that the residual soil cadmium exposure point concentration is 7.4 mg/kg (95% upper confidence level [UCL]), which is slightly above the current residential soil RSL. The New York State Part 375 Soil Cleanup Objective (SCO) for unrestricted residential soil also decreased to 2.5 mg/kg, which is based rural background for cadmium because the health-based value is lower. The unrestricted SCO is designed to be protective of intensive uses including single-family homes and farming. The restricted residential SCO is 4.3 mg/kg and is based on a 1×10^{-6} cancer risk. Restricted residential is appropriate for properties with multi-family housing and where gardening is prohibited. The site is currently zoned industrial. The current exposure point concentration (EPC) of 7.4 mg/kg is just slightly above the restricted residential SCO and would be within the cancer risk range established by EPA of 1×10^{-6} to 1×10^{-4} . The industrial SCO is 60 mg/kg. Therefore, the soil remedy on the battery facility grounds is protective of current use and would be protective of the mixed-use development (combined commercial/residential) that the town is envisioning. As discussed in more detail below, the residential soil cleanup would also be considered protective even with the change in screening levels.

Off-property residential property data was also reevaluated for this FYR in light of the lower RSL. Residential properties were remediated (six inches of surface soil removed in the entire front and/or backyard) if a single sample in the top 6 inches of the front and/or back yard exceeded 10 mg/kg. In addition, vegetable gardens in yards undergoing remediation had one foot of soil removed instead of 6 inches. This cleanup goal was developed by NYSDOH based on the ingestion of garden vegetables grown in soils. For this FYR, samples collected prior to the cleanup efforts were used to estimate an off-property residual cadmium EPC of 3.5 mg/kg (95% UCL). This EPC is likely higher than the true EPC remaining since this calculation only assumed remediation of an individual sample above 10 mg/kg, not the entire front and/or back yard as mentioned above. Residual soil cadmium at the residential properties is below the EPA RSL and also likely at or below the rural background concentration.

Inhalation of cadmium-contaminated dust (soils) was identified as the pathway of greatest risk to nearby residents and trespassers as part of the OU3 ROD. To achieve a risk level of 10^{-6} or lower, cadmium in soils would need to be less than 56 mg/kg, which is less conservative than the selected cleanup goal for the site. This pathway was interrupted with the implementation of the remedy.

In the absence of standards or criteria for cadmium, nickel, and cobalt in sediments, to evaluate remedial alternatives for East Foundry Cove Marsh and Constitution Marsh (Area I), it was necessary to establish a risk-based cadmium cleanup level for the site. Nickel and cobalt were determined to be less toxic to humans than cadmium and were dredged with the comingled cadmium contamination. A sediment cadmium remediation goal of 100 mg/kg was selected to be protective of both human health and ecological receptors. The average post-excavation cadmium concentration in East Foundry Cove was approximately 25 mg/kg, well below the cleanup goal. Further, the remaining contaminated sediment was capped so the direct contact pathway has been interrupted. As such, the sediment exposure pathway remains protective.

While a no action remedy was selected for Constitution Marsh to minimize its disturbance, it was anticipated that the cadmium-contaminated sediments would eventually be covered with clean sediments following the remediation of East Foundry Cove Marsh sediments. In fact, sediment cadmium concentrations in Constitution Marsh are following a general decreasing trend. The average post-excavation cadmium concentration in East Foundry Cove was approximately 12 mg/kg, which is well below the cleanup goal. Current concentrations of cadmium in Area III sediments are below current EPA residential RSLs for soil. While they tend to fluctuate due to tidal conditions, they were all less than 8.5 mg/kg in 2021. Sediment monitoring will continue.

As was noted previously, surface water is no longer sampled because cadmium concentrations are below drinking water standards.

The RAOs remain valid. The RAO for soil is to protect human health and the environment from the potential effects of exposure to eroded suspended soils. The remedy reduced soil concentrations to below the cleanup goal. While the property is currently zoned for light industrial use, EPA has been informed that this designation will likely change to mixed use, including residential. Any construction that is performed will disturb the current surface soils; however, as stated above, the concentrations remaining in soil would not likely pose an unacceptable risk under

current or anticipated future use. It is understood that either surface soil sampling or confirmation of the placement of clean fill prior to occupancy of any residential structure will be required. This will ensure additional protectiveness. The “pedestal area,” which contains contaminated soil at a depth of 26 feet, is protected by the IC.

The dredging of contaminated sediment from East Foundry Cove Marsh, East Foundry Cove, and the Hudson River in the vicinity of Cold Spring pier has resulted in achievement of cleanup goals and, thus, the RAO to prevent resuspension and redistribution of the contaminated sediments that would threaten the area flora and fauna. Constitution Marsh and West Foundry Cove were left to recover naturally. Data indicate that sediment is currently approaching background levels and, therefore, achieving the RAO to minimize the disturbance to Constitution Marsh.

As a result of the aforementioned remedial actions in these water bodies (e.g., dredging/natural recovery of sediment), the RAO to prevent all biota from contacting East Foundry Cove Marsh and Constitution Marsh contaminated sediments that would threaten them was achieved. Additionally, a state fishing advisory remains in effect for blue crabs in this area of the Hudson River due to cadmium and PCBs in the crabs.

The remedial goal for groundwater was to restore it to drinking water standards. This RAO remains valid. While the remedial goal for TCE and PCE in the groundwater has not been met, because residents receive public water and an IC is in place to prohibit the installation of groundwater wells on the plant grounds, the remedy remains protective of human health in the short term.

Based on a recommendation from the third FYR, in 2009, a VI investigation was performed at the adjacent residences on Constitution Drive. Sub-slab VOC concentrations were all below EPA’s action levels, indicating that there was no VI issue at the site. One home had low levels of VOCs in indoor air and the PRPs installed a VI mitigation system at this residence as a proactive measure. Another residence had recently installed a radon mitigation system similar to the VOC mitigation system due to the presence of radon above levels of concern. In 2012, both homes had their sub-slab and indoor air retested to confirm that their mitigation systems were operating properly. With functioning sub-slab depressurization systems, EPA requires no further follow-up sampling. The VI pathway is incomplete. Groundwater on the plant grounds currently exceeds VI screening levels, however. Therefore, if the plant grounds are redeveloped, efforts to ensure the VI pathway remains incomplete must be taken by ensuring that new construction is built with vapor barriers and/or VI mitigation systems.

Ecological

Ecological risk evaluations were completed during the RI/FSs conducted for Areas I and III, which contain valuable ecological habitat, including, but not limited to the East Foundry Cove March, Constitution March, East Foundry Cove, West Foundry Cove and portions of the Hudson River. These evaluations found elevated concentrations of cadmium, nickel and cobalt in sediment, plant tissue, and biota. The exposure parameters and toxicity values used in the ecological assessments are still valid.

Several remedial actions addressed the contamination in the marsh sediment and open water sediments near the shoreline of the Hudson River. These remedial actions removed contaminated

sediment and/or capped the remaining contaminated sediment that was above the cleanup goal for cadmium. Cleanup goals were not established for nickel or cobalt due to cadmium having a larger footprint, and the remedial footprint addressing cadmium also addressed exposure to nickel and cobalt. The cleanup goal that was derived for cadmium in the sediment remains valid and the remedial actions have interrupted any potential exposure pathways for ecological receptors.

The ecological-related RAOs (prevention of biota contacting East Foundry Cove Marsh and Constitutional Marsh contaminated sediments that would threaten them and prevention of resuspension and redistribution of the contaminated sediments that would threaten the area flora and fauna) remain valid and the remedies are functioning as intended in the ecologically relevant areas.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

No.

VI. ISSUES/RECOMMENDATIONS

Table 4, below, notes that there is one recommendation or follow-up action for this FYR.

Table 4: Issues and Recommendations

Issues/Recommendations				
OU(s) without Issues/Recommendations Identified in the Five-Year Review:				
<i>OU1 and OU2</i>				
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): OU3	Issue Category: Institutional Controls			
	Issue: Groundwater concentrations exceed VI screening levels			
	Recommendation: Require VI mitigation for new development through an agreement with the property owner.			
Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	Other	EPA	4/30/2026

OTHER FINDINGS

The following are recommendations that were identified during the FYR and may improve performance of the remedy, but do not affect current and/or future protectiveness:

- Select groundwater monitoring wells should be sampled annually to determine if the contaminant levels are declining as expected to ensure that the MCLs will be met in the downgradient wells in 10 to 20 years, as expected.
- It appears that the dredged areas in the cove have reached equilibrium and that the marsh will once again become a depositional area and, hopefully, become more vegetated. The marsh should be monitored annually to determine if that is occurring. If the extent of the vegetation in the marsh is diminishing, analyses should be performed to determine if there are ways to increase the amount of vegetation.
- Although not directly related to the effectiveness of the remedy, there is concern regarding erosion of shoreline areas within the marshes due to sea level rise. The rising water levels, combined with wave action, are harming vegetation by eroding sediment from the root area, causing plants to die and increasing the amount of unvegetated areas. Monitoring and mitigation efforts are being evaluated to increase vegetated areas and to determine if anything can be done regarding the increase in water levels. Indirectly, over years, the loss of vegetation and sediment could impact the capped areas. This issue should be evaluated during the next FYR period.

VII. PROTECTIVENESS STATEMENT

Table 5, below, presents the OU and sitewide protectiveness statements.

Table 5: Protectiveness Statements

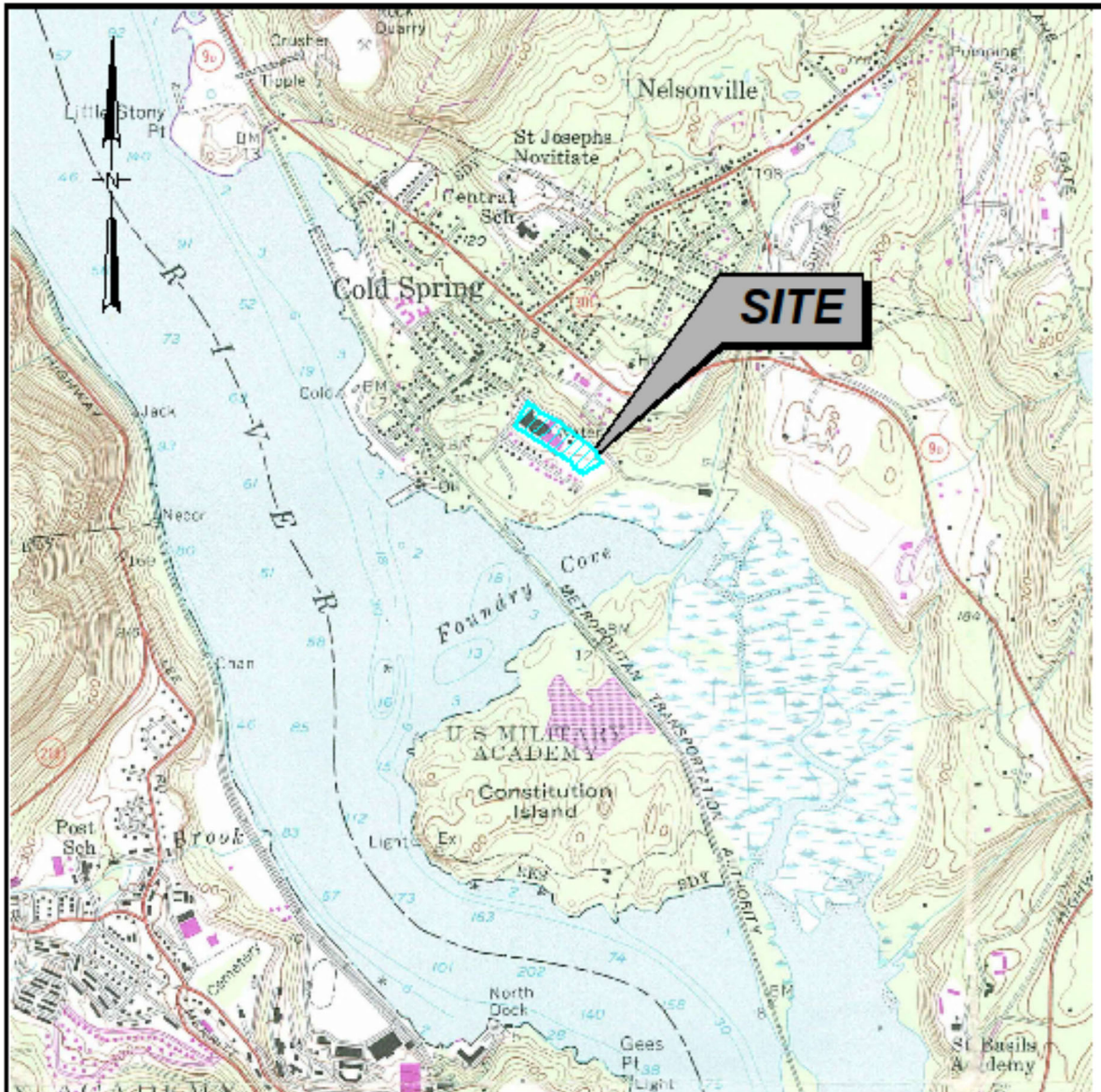
Protectiveness Statement(s)	
<i>Operable Unit:</i> 1	<i>Protectiveness Determination:</i> Protective
<i>Protectiveness Statement:</i> The implemented actions at OU1 protect human health and the environment.	
Protectiveness Statement(s)	
<i>Operable Unit:</i> 2	<i>Protectiveness Determination:</i> Protective
<i>Protectiveness Statement:</i> The implemented actions at OU2 protect human health and the environment.	
Protectiveness Statement(s)	
<i>Operable Unit:</i> 3	<i>Protectiveness Determination:</i> Short-term Protective
<i>Protectiveness Statement:</i> The implemented actions at OU3 protect human health and the environment in the short term. To be protective in the long term, VI mitigation for new development through an agreement with the property owner is needed.	
Sitewide Protectiveness Statement	
<i>Protectiveness Determination:</i> Short-term Protective	

Protectiveness Statement: The implemented actions at the site protect human health and the environment in the short term. To be protective in the long term, VI mitigation for new development through an agreement with the property owner is needed.

VIII. NEXT REVIEW

The next FYR report for the Marathon Battery Company Superfund site is required five years from the completion date of this review.

APPENDIX A—FIGURES



SOURCE: U.S.G.S. 7.5' TOPOGRAPHIC MAP OF WEST POINT, NY DATED 1957, REVISED 1981



1000 ANDREW DRIVE SUITE A
WEST CHESTER, PENNSYLVANIA 19380
Tel: 610.840.8100 Fax: 610.840.8108 Web: montrose-env.com

SITE LOCATION MAP

MARATHON REMEDIATION SITE
Cold Spring, New York

PROJECT ENGINEER: B.L.P.	SCALE: 1" = 8000'
CHECKED BY: M.J.P.	PROJECT NUMBER: NY05-819
DRAWN BY: C.E.P.	DATE: _____
	FIGURE: 1-1

It is a violation of the New York Education Article 143 - Engineering and Land Surveying, Section 7206 (2) law for any person, unless he is acting under the direction of a licensed professional engineer or land surveyor, to alter in any way, or on item bearing the seal of an engineer or land surveyor is altered, the altering engineer or land surveyor shall affix to the item his seal and the notation "altered by" followed by his signature and the date of such alteration, and a specific description of the alteration.

Figure 1—Site Location

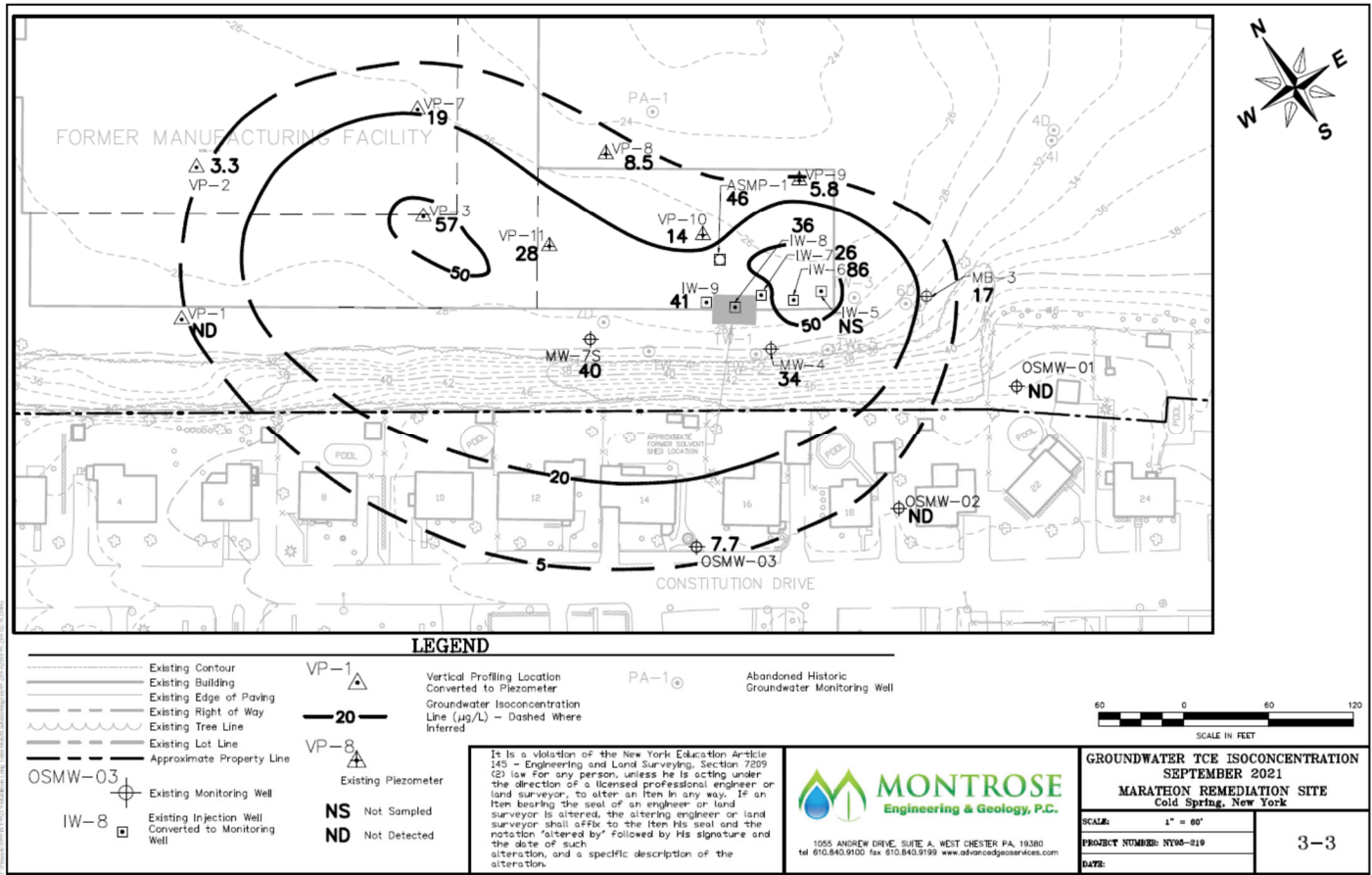


Figure 2—Groundwater TCE Concentrations, September 2021

FIGURE 5-15
 VOC CONCENTRATION TRENDS IN OSMW-3 - OFFSITE WELL
 Marathon Remediation Site
 Cold Spring, New York

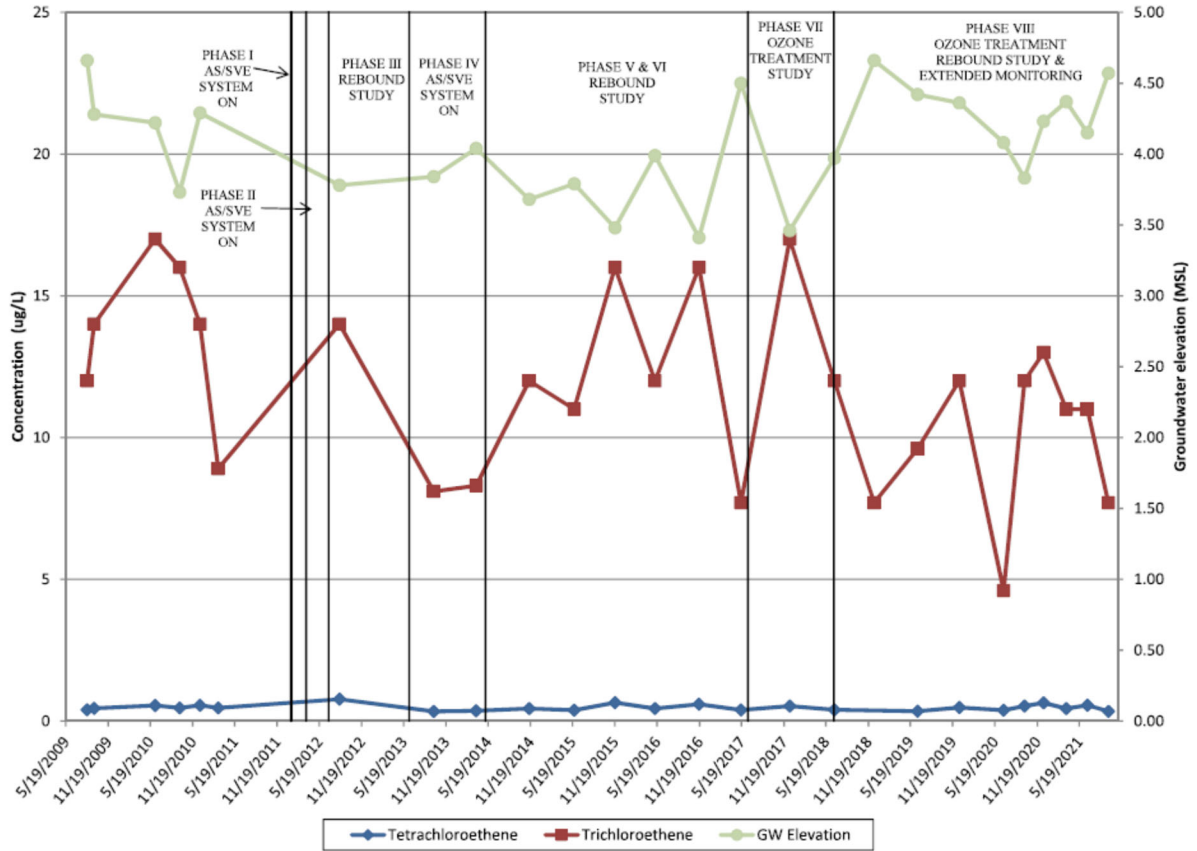


Figure 3a—VOC Concentration Trends in Monitoring Well OSMW-3

FIGURE 5-12
 VOC CONCENTRATION TRENDS IN MB-3 - OUTSIDE TREATMENT AREA
 Marathon Remediation Site
 Cold Spring, New York

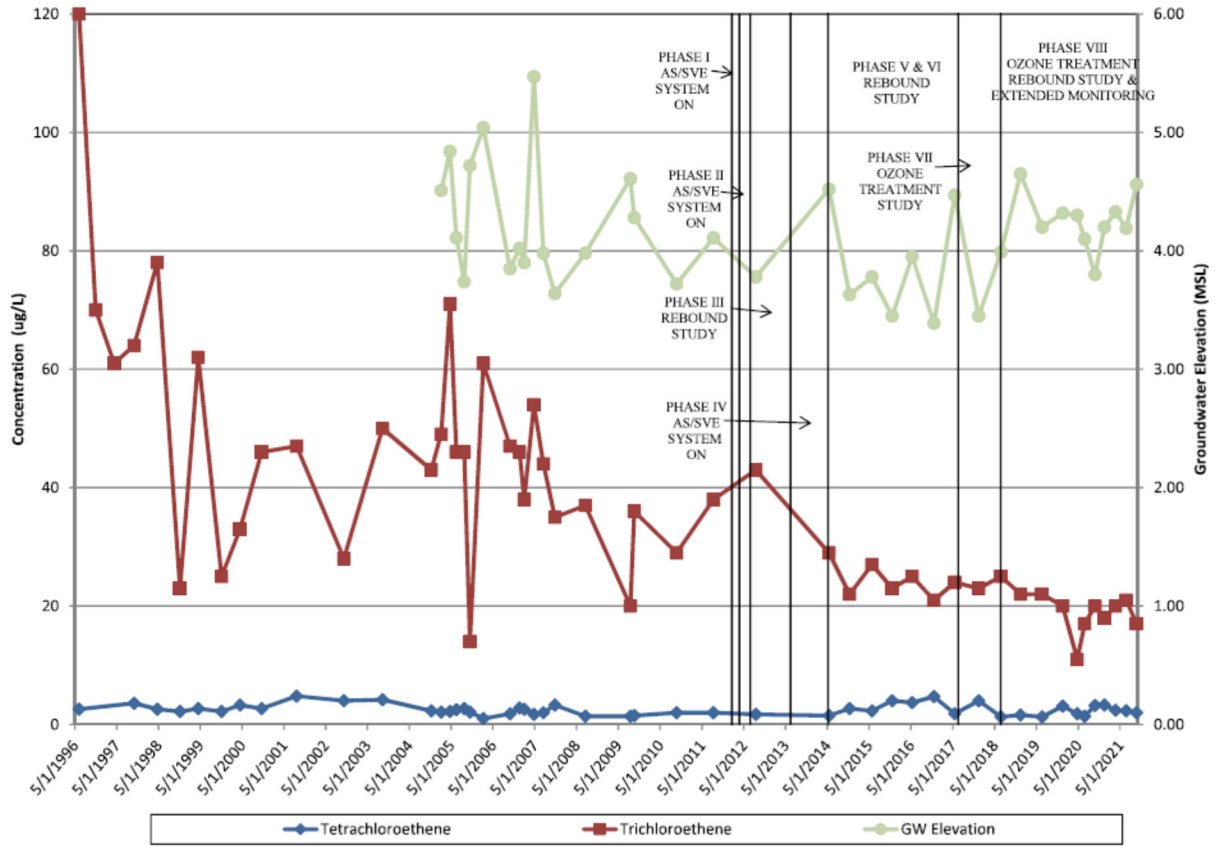


Figure 3b—VOC Concentration Trends in Monitoring Well MB-3

FIGURE 5-1
 VOC CONCENTRATION TRENDS IN ASMP-1 - INSIDE TREATMENT AREA
 Marathon Remediation Site
 Cold Spring, New York

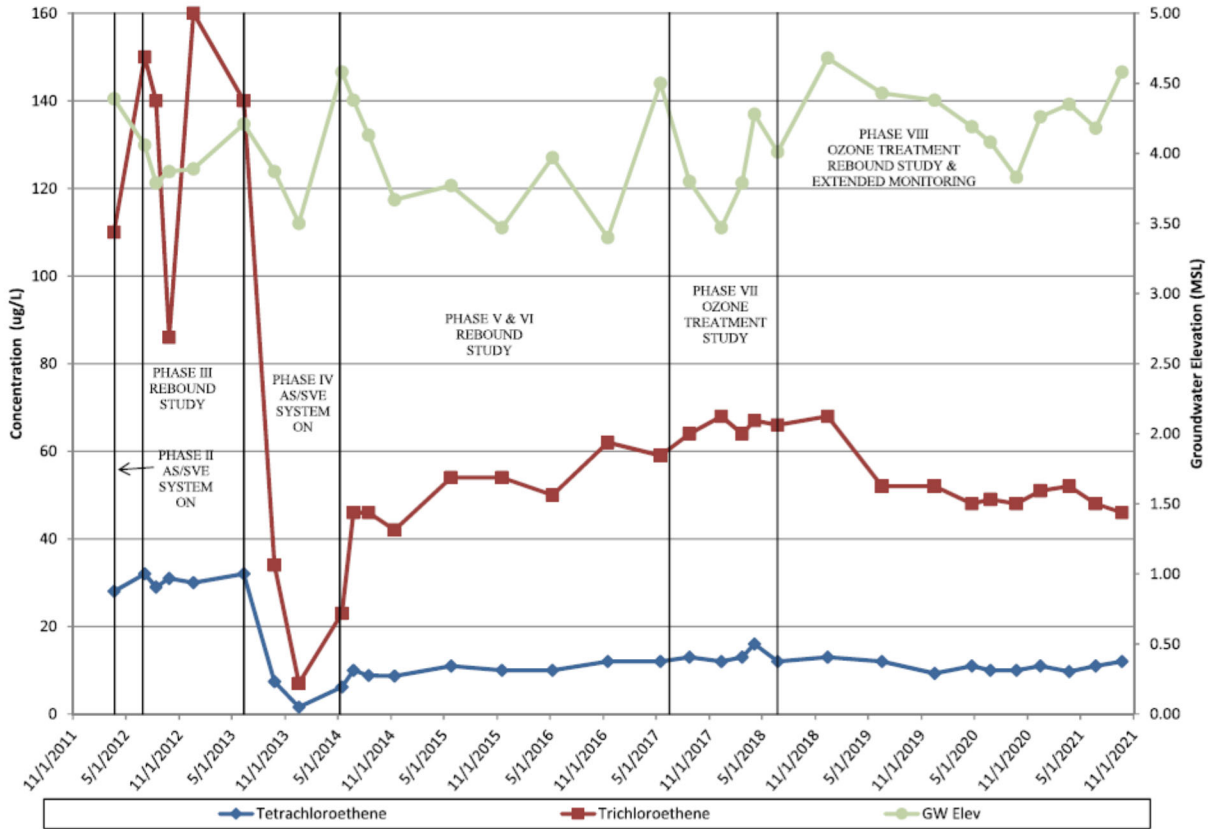


Figure 3c—VOC Concentration Trends in Monitoring Well ASMP-1

FIGURE 5-4
 VOC CONCENTRATION TRENDS IN IW-8 - INSIDE TREATMENT AREA
 Marathon Remediation Site
 Cold Spring, New York

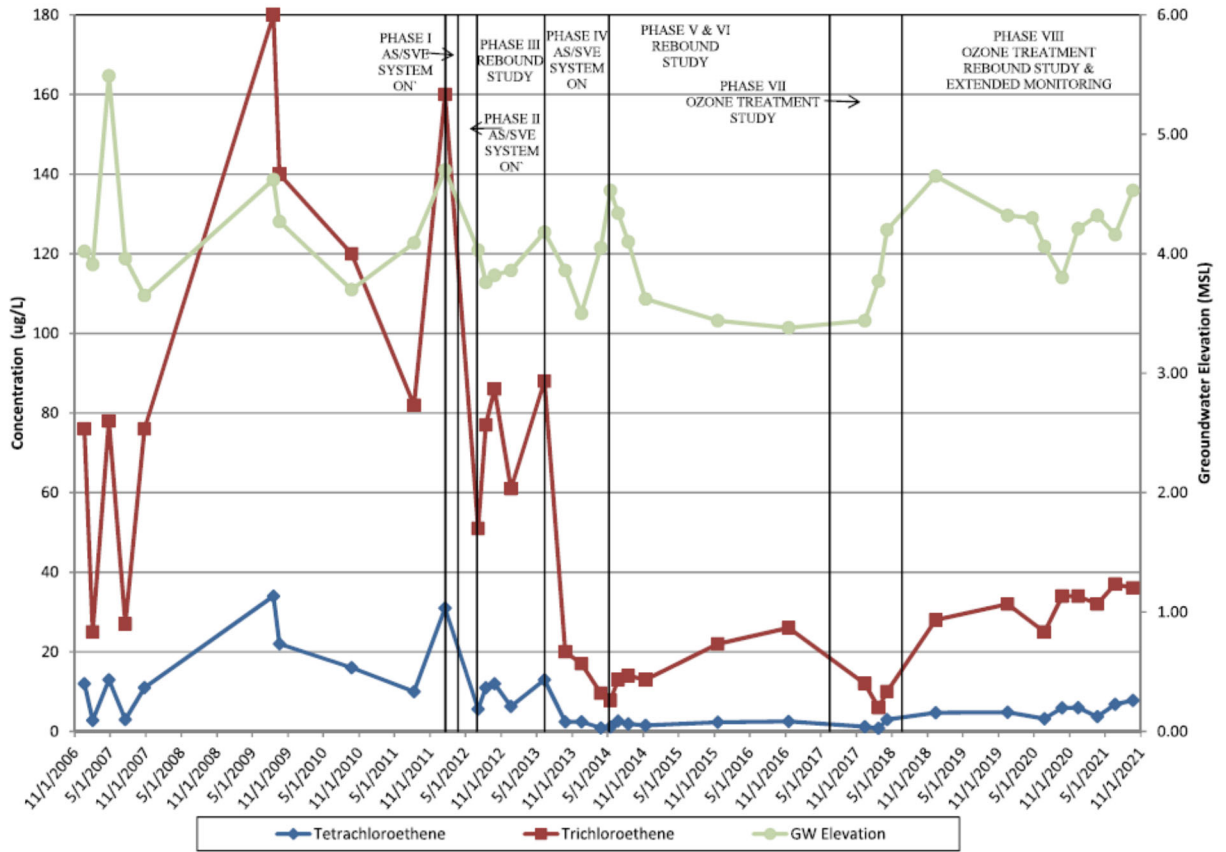


Figure 3d—VOC Concentration Trends in Monitoring Well IW-8

FIGURE 5-2
 VOC CONCENTRATION TRENDS IN IW-6 - INSIDE TREATMENT AREA
 Marathon Remediation Site
 Cold Spring, New York

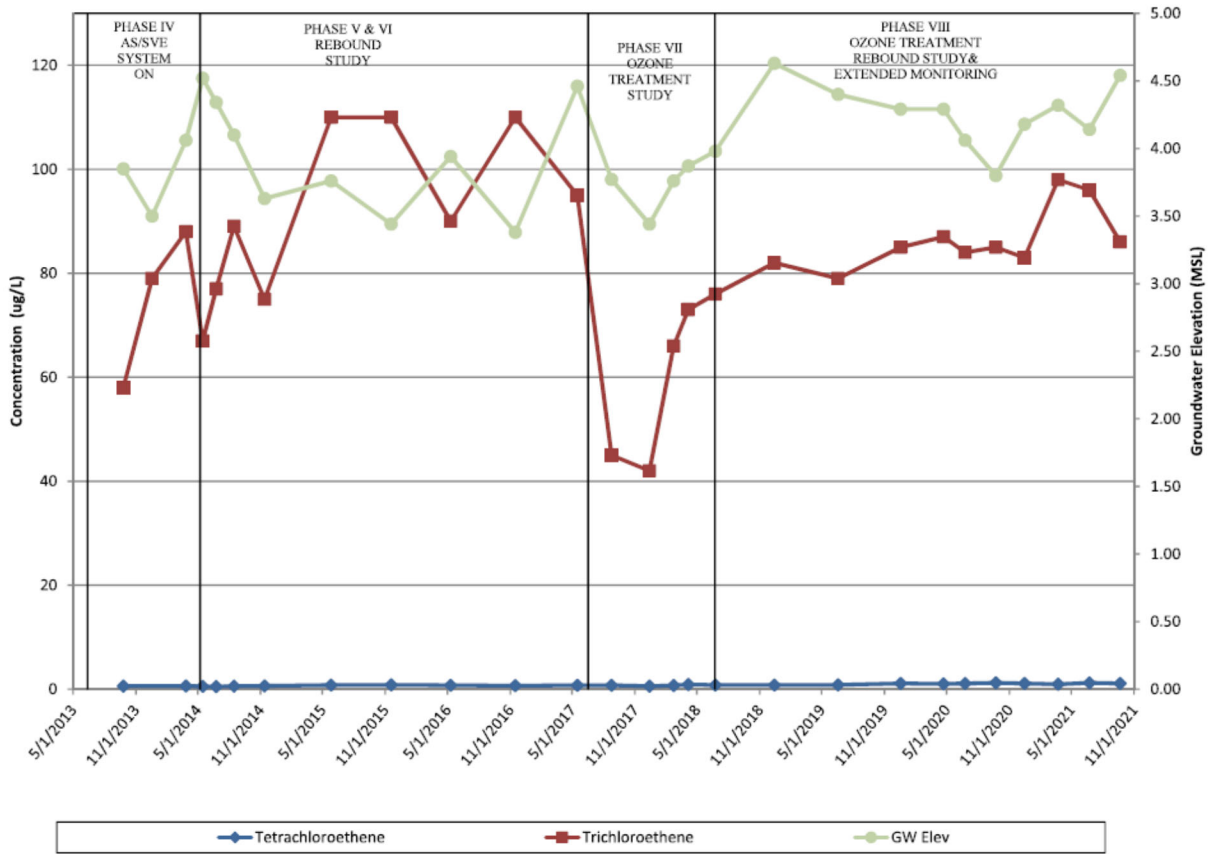


Figure 3e—VOC Concentration Trends in Monitoring Well IW-6

FIGURE 5-13
 VOC CONCENTRATION TRENDS IN MW-7S - OUTSIDE TREATMENT AREA
 Marathon Remediation Site
 Cold Spring, New York

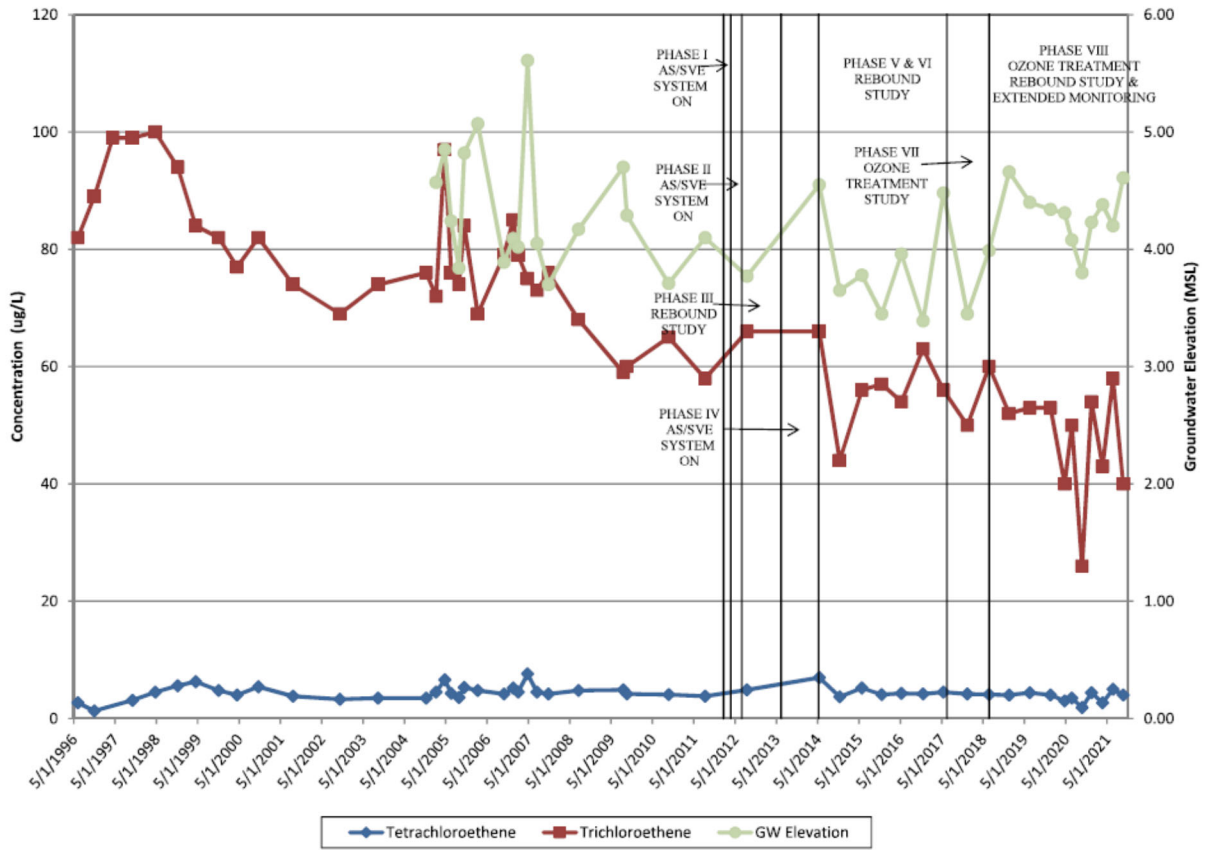


Figure 3f—VOC Concentration Trends in Monitoring Well MW-7S

APPENDIX B – REFERENCES

Documents, Data, and Information Reviewed In Completing The Five-Year Review	
Document Title, Author	Date
Record of Decision, EPA	1986
Record of Decision, EPA	1988
Record of Decision, EPA	1989
RD/RA Report, Malcolm Pirnie, Inc.	1992
ESDs, EPA	1993, 1994, and 1995
Long Term Monitoring Plan, Advanced GeoServices Corp.	1995
First Five-Year Review Report	1998
Second Five-Year Review Report	2003
Third Five-Year Review Report	2008
Third Five-Year Review Report Addendum	2011
Groundwater Natural Attenuation Enhancement Pilot-Test Completion Report, Advanced GeoServices Engineering P.C.	2013
Fourth Five-Year Review Report	2013
2013 Vegetation Survey East Foundry Cove Marsh, Advanced GeoServices Engineering P.C.	2014
Groundwater Natural Attenuation Enhancement Phase IV & V Completion Report, Advanced GeoServices Engineering P.C.	2015
Memorandum – Marathon Battery Groundwater Remediation Ozone Sparging April 2017 Progress Update Groundwater Treatment Report, Advanced GeoServices Engineering P.C.	2018
Fifth Five-Year Review Report	2018
Long Term Monitoring Sampling Event Report Year 24	2019
Phase VIII Groundwater Natural Attenuation Enhancement Completion Report	2019
Long Term Monitoring Sampling Event Report Year 25	2020
Long Term Monitoring Sampling Event Report Year 26	2021
PFAS Dioxane Sample Results	2021
Phase VIII Groundwater Natural Attenuation Enhancement Extended Monitoring Report	2022
Table of Preliminary groundwater sampling results	2022
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 RODs	

Chronology of Site Events	
Event	Date(s)
High levels of cadmium contamination were discovered in Foundry Cove sediments by New York University, EPA, and the New York State Department of Environmental Conservation.	Early 1970s
U.S. Department of Justice required owners/operators to remove cadmium from the outfall area and channel leading into the Cove and place in an on-Site vault	1972
Dredging of Foundry Cove conducted	1972-1973
Marathon Battery Company site included on the Interim National Priorities List	1981
NYSDEC undertakes RI/FS	1983
EPA's contractor, Ebasco Services, Inc., conducts a Supplemental RI/FS	1986-1989
ROD issued selecting remedy for Area I (OU1)	1986
ROD issued selecting remedy for Area II (OU3)	1988
Unilateral Administrative Order required owners to decontaminate the former battery plant and its contents	1989
ROD issued selecting remedy for Area III (OU2)	1989
Consent Decree entered by the Southern District of New York with the PRPs to undertake the construction of the selected remedy for the Site	1993
Site remedy implemented by Severson Environmental Services, Inc.	1993-1995
ESD Issued	1993
ESD Issued	1994
ESD Issued	1995
Final Close-Out Report approved	1995
Marathon Battery Company Site deleted from the NPL	1996
First Five-Year Review	1998
Second Five-Year Review	2003
Third Five-Year Review	2008
Third Five-Year Review addendum	2011
Fourth Five-Year Review	2013
Fifth Five-Year Review	2018

APPENDIX C: CLIMATE CHANGE ASSESSMENT

According to the *Region 2 Guidance for Incorporating Climate Change Considerations in Five Year Reviews*, three climate change tools were utilized to assess the Marathon Battery Company Superfund Site. Screenshots from each of the tools assessed are included here.

The first tool utilized was The Climate Explorer. As can be seen from Figure C-1, there is a projected increase of days per year with maximum temperatures greater than 100°F in Putnam County. As can be seen on Figure C-2, there is a slight increase in potential drought conditions. A summary of the Top Climate Concerns from the tool can be seen in Figure C-3.

The second tool utilized is called the Risk Factor (for Flood Risk). According to this assessment tool, as can be seen from Figures C-4a and C-4b, there are 76 properties in Cold Spring that have greater than a 26% chance of being severely affected by flooding over the next 30 years.

The final tool utilized is called NOAA Sea Level Rise Viewer. Because the site is located in the Hudson River in the vicinity of the Cold Spring pier and includes the immediately adjacent East Foundry Cove, West Foundry Cove, Constitution Marsh, and East Foundry Cove Marsh, flooding may be experienced in these portions of the site as time passes. This is of concern because the water in the restored marsh will continue to deepen as the sea level slowly rises and marsh plants are sensitive to the amount of time they spend submerged during the tidal cycle. Because the former battery plant property and adjacent residential properties are located in close proximity to the Hudson River, East Foundry Cove, and West Foundry Cove, flooding may be experienced in these areas as time passes. However, given the lack of source material remaining on the former battery plant property and adjacent residential properties, flooding is not expected to impact these portions of the site in the future. Figure C-5 illustrates the NOAA Sea Level Rise Viewer for Cold Spring.

Potential site impacts from climate change have been assessed and the performance of the remedy may be impacted by sea level rise. Because the water in the marsh will continue to deepen as the sea level slowly rises, a review of the marsh should be performed to identify ways to evaluate how best to keep the marsh stable and healthy.

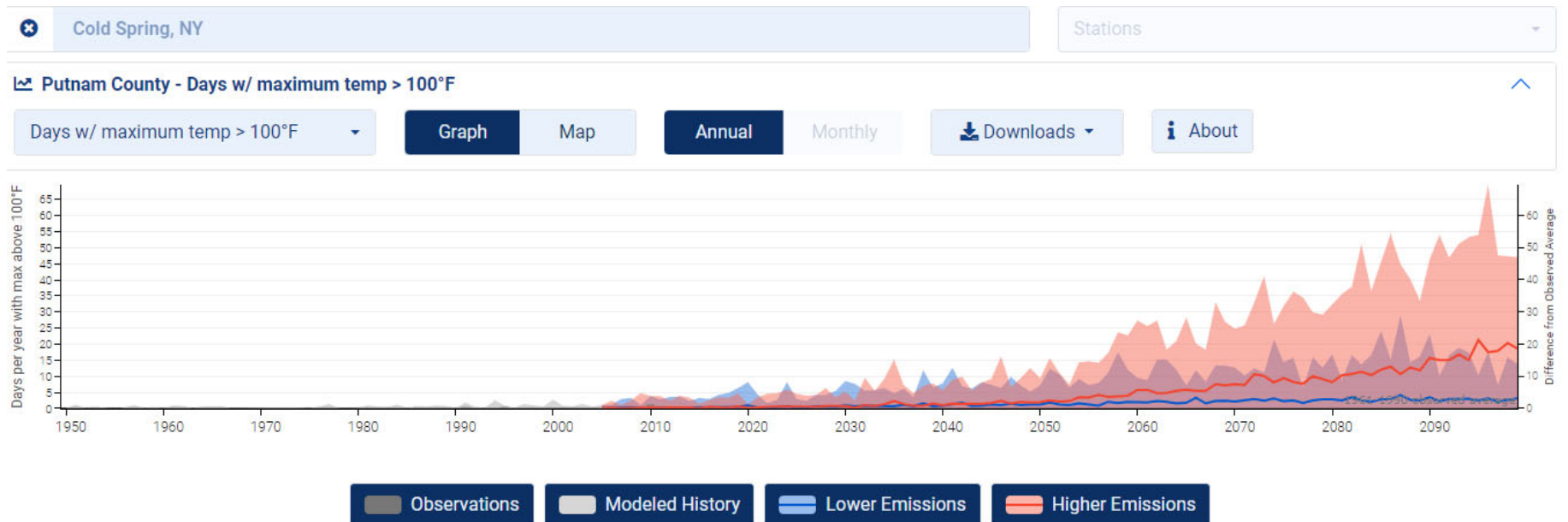


Figure C-1: Putnam County Days per Year With Maximum Temperatures Greater Than 100°F

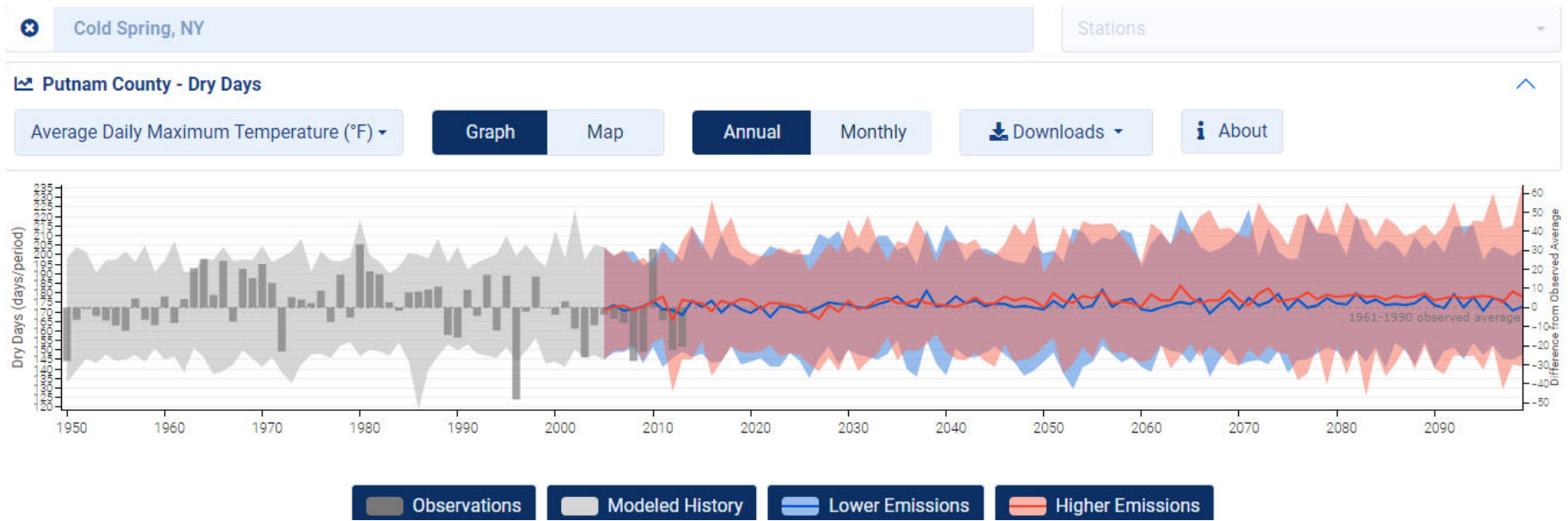


Figure C-2: Putnam County Drought Conditions



Top climate concerns

Top regional hazards for Cold Spring, NY, according to the 2018 National Climate Assessment. These statements compare projections for the middle third of this century (2035-2064) with average conditions observed from 1961-1990.



Show full range of projections

[Methodology](#)



Changed seasonal patterns may affect rural ecosystems, environments, and economies.



Annual counts of **intense rainstorms** – those that drop two or more inches in one day – are projected to increase by 0%. *Historically, Cold Spring averaged 1 intense rainstorms per year.*



Extreme temperatures on the hottest days of the year are projected to increase by 6°F. *Historically, extreme temperatures in Cold Spring averaged 91°F.*



At Risk Neighborhoods

Putnam County has 4 census tracts where vulnerabilities to climate change exceed the county median.

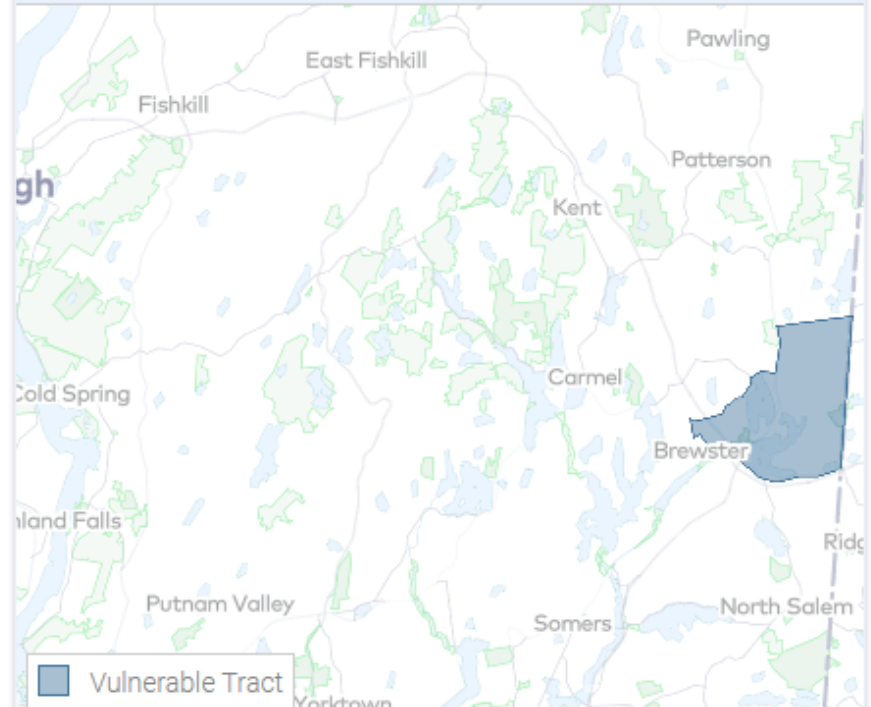


Figure C-3: Summary of Top Climate Concerns for Putnam County, NY

Does Cold Spring have risk?

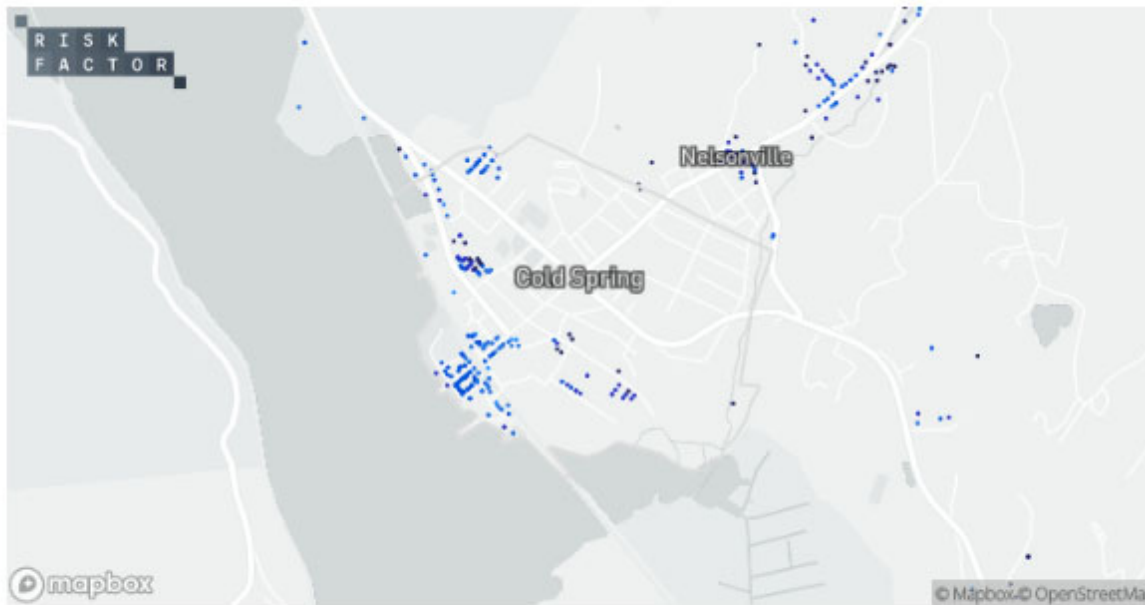
Minor



There are **76** properties in Cold Spring that have greater than a **26%** chance of being severely affected by flooding over the next 30 years. This represents **18%** of all properties in Cold Spring.

In addition to damage on properties, flooding can also cut off access to utilities, emergency services, transportation, and may impact the overall economic well-being of an area. Overall, **Cold Spring** has a **minor risk of flooding** over the next 30 years, which means flooding is likely to impact day-to-day life within the community. This is based on the level of risk the properties face rather than the proportion of properties with risk.

Figure C-4a: Flood Factor



Cold Spring Flood Risk ⓘ

Residential **Moderate Risk**

105 out of 668 homes ⓘ

Road **Moderate Risk**

3 out of 14 miles of roads ⓘ

Commercial **Minor Risk**

25 out of 79 commercial properties ⓘ

Critical Infrastructure **Minor Risk**

1 out of 3 infrastructure facilities ⓘ

Social Facilities **Minimal Risk**

0 out of 6 social facilities ⓘ

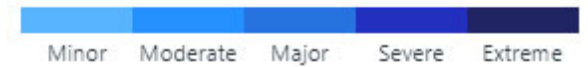


Figure C-4b: *Risk Factor for Cold Spring Flood Risk*

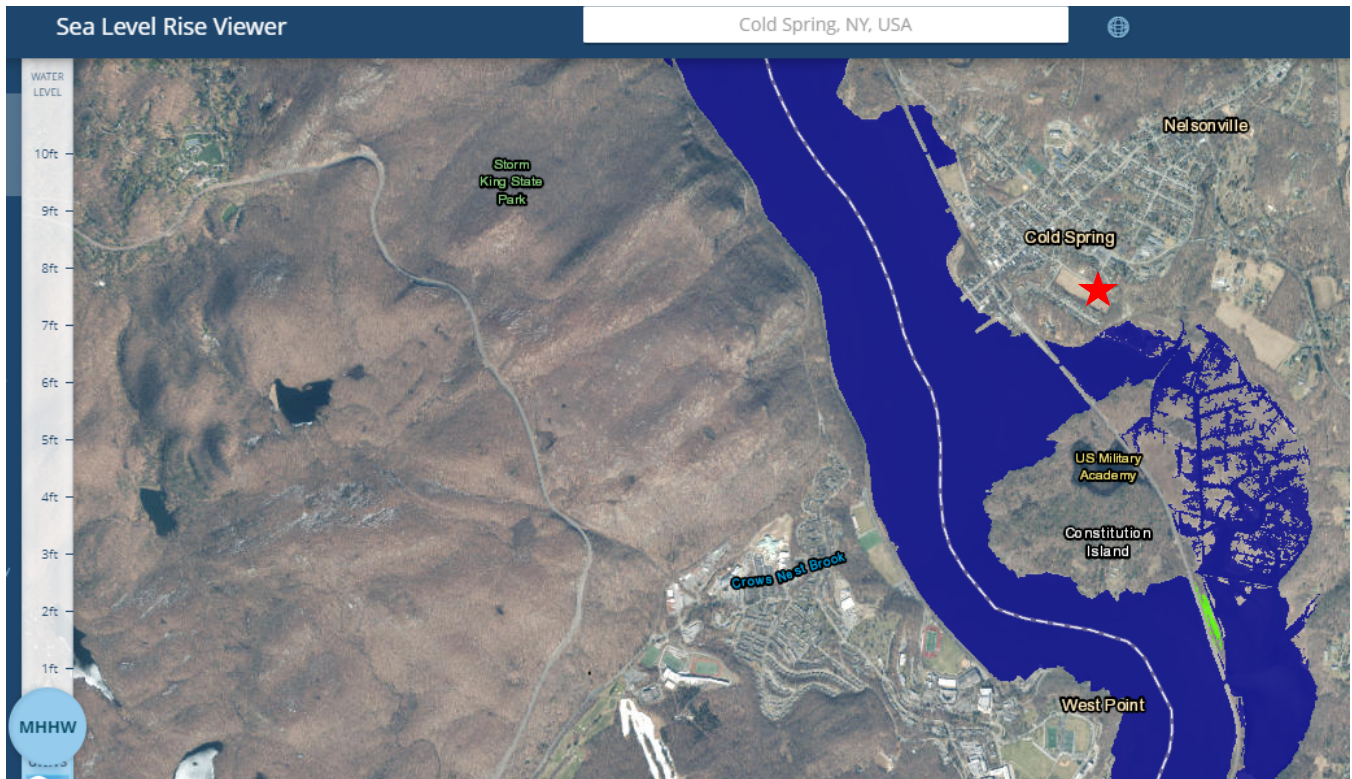


Figure C-5: Sea Level Rise Viewer

★ Site location