Contract No.: EP-W-09-002
WA #: 072-RICO-025J

Region 2 RAC2
Remedial Action Contract

Revised Draft Remedial Investigation Work Plan

Wappinger Creek Site

Remedial Investigation/Feasibility Study

Wappingers Falls, New York

November 11, 2019

CDM Smith

REMEDIAL ACTION CONTRACT 2
FOR REMEDIAL RESPONSE, ENFORCEMENT OVERSIGHT,
CRITICAL REMOVAL ACTIVITIES AT SITES OF RELEASE OR
THREATENED RELEASE OF HAZARDOUS SUBSTANCES
IN EPA REGION 2

REVISED DRAFT REMEDIAL INVESTIGATION WORK PLAN

WAPPINGER CREEK SITE
Remedial Investigation/Feasibility Study
Wappingers Falls, New York
Work Assignment No. 072-RICO-025J

U.S. EPA CONTRACT NO. EP-W-09-002
Document Control No.: 3323-072-04028
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November 11, 2019

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PROJECT:	RAC 2 Contract No.: EP-W-09-002 Work Assignment No.: 072-RICO-025J
Document No.:	3323-072-04028
SUBJECT:	Revised Draft Remedial Investigation Work Plan Remedial Investigation/Feasibility Study Wappinger Creek Site Wappingers Falls, New York

Dear Ms. Henry:

CDM Federal Programs Corporation (CDM Smith) is pleased to submit the Revised Draft Remedial Investigation Work Plan for the Wappinger Creek Site in Wappingers Falls, New York.

If you have any questions regarding this submittal, please contact me at (732) 590-4638.

Very truly yours,

CDM FEDERAL PROGRAMS CORPORATION

Brendan MacDonald, P.E., BCEE, LEED® AP
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RAC 2 Document Control

REMEDIAL ACTION CONTRACT 2
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WAPPINGER CREEK SITE
Remedial Investigation/Feasibility Study
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REVISED DRAFT REMEDIAL INVESTIGATION WORK PLAN

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Acronyms and Abbreviations

AALA	American Association for Laboratory Accreditation
ASC	analytical services coordinator
ARAR	applicable or relevant and appropriate requirement
BAP	benzo(a)pyrene
bgs	below ground surface
bss	below the sediment surface
BERA	baseline ecological risk assessment
CDM Smith	CDM Federal Programs Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
CLP	Contract Laboratory Program
COPC	chemical of potential concern
COPEC	contaminant of potential ecological concern
CR28	County Route 28
CSM	conceptual site model
DESA	Division of Environmental Science and Assessment
DQO	data quality objectives
EA	EA Engineering, Science, and Technology, Inc.
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ERAGS	Ecological Risk Assessment Guidance for Superfund
FASTAC	Field and Analytical Services Teaming Advisory Committee
FCN	field change notification
FS	feasibility study
FWIA	fish and wildlife impact analysis
HASP	health and safety plan
HHRA	human health risk assessment
HRS	Hazard Ranking System
IDW	investigation-derived waste
Industrial Park	Market Street Industrial Park
mg/kg	milligrams per kilogram
MGP	manufactured gas plant
mm	millimeter
NCP	National Contingency Plan
NELAP	National Environmental Laboratory Accreditation Program
ng/kg	nanograms per kilogram
non-RAS	non-routine analytical services
NYSDEC	New York State Department of Environmental Conservation
OBG	O’Brien and Gere Engineers, Inc.
OHWL	ordinary high-water level
OSWER	Office of Solid Waste and Emergency Response

OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PAR	pathway analysis report
PCB	polychlorinated biphenyl
PID	photoionization detector
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
QAS	quality assurance specialist
QC	quality control
QMP	quality management plan
RA	remedial action
RAC	Remedial Action Contract
RACMIS	RAC Management Information System
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
RQAS	Region 2 RAC 2 quality assurance specialist
ROD	record of decision
RPM	remedial project manager
SAT	Site Assessment Team
SGV	sediment guidance value
Site	Wappinger Creek site
SLERA	screening level ecological risk assessment
SM	site manager
SOW	statement of work
SPDES	State Pollution Discharge Elimination System
SQT	sediment quality triad
SVOC	semi-volatile organic compound
TAL	target analyte list
TCL	target compound list
Three Star Site	Three Star Anodizing Site
TOC	total organic carbon
TRC	technical review committee
µg/L	micrograms per liter
VOC	volatile organic compound
WA	work assignment
WAM	work assignment manager
Weston	Weston Solutions, Inc.

Section 1

Introduction

CDM Federal Programs Corporation (CDM Smith) received work assignment (WA) 072-RICO-A25J under the Remedial Action Contract (RAC) 2 (Contract No. EP-W-09-002) to conduct a remedial investigation/feasibility study (RI/FS) for the U.S. Environmental Protection Agency (EPA), Region 2, at the Wappinger Creek site (the Site), located in the Village of Wappingers Falls, Dutchess County, New York. The purpose of this WA is to investigate the overall nature and extent of contamination and develop remedial alternatives at the Site, as specified in the statement of work (SOW) dated January 19, 2017.

1.1 Site Description and History

Portions of Wappinger Creek have previously been studied as part of (1) the New York State Department of Environmental Conservation (NYSDEC) remedial investigation (RI) for the Three Star Anodizing site (Three Star Site), which is located along the southern bank of Wappinger Creek; and (2) the EPA Region 2 Site Assessment Team's investigation. This section provides a brief description and history of the Site based on these investigations.

1.1.1 Site Description

Wappinger Creek is a 41-mile creek that flows into the Hudson River south of Poughkeepsie, New York. The Site, located in the Village of Wappingers Falls, Dutchess County, New York, consists of a zone of sediment contamination in the tidal portion of Wappinger Creek. The Site begins downstream of Wappingers Falls, by the Market Street Industrial Park (the Industrial Park), which includes the Three Star Site. The Site extends downstream to the confluence with the Hudson River, and is approximately 2 miles long. A Site location map is presented as Figure 1-1. An overview of the Site, identifying the sections of Wappinger Creek and previously identified extent of contaminated sediment, is shown on Figure 1-2. A more detailed map of the Industrial Park is shown on Figure 1-3.

The Industrial Park, which has been active for over 100 years, is located along both the northern and southern banks of Wappinger Creek in the Village of Wappingers Falls approximately 0.2 miles downstream of Wappinger Falls. Currently, the Industrial Park is home to several commercial facilities that operate within the remaining historical industrial buildings.

The Reese Audubon Sanctuary, managed by the Putnam-Highland Audubon Society, borders the western bank of Wappinger Creek. Open space, residential properties, and a Department of Public Works facility make up the eastern bank of Wappinger Creek. The Wappinger Greenway, which includes the Wappinger Greenway Trail, is located along the west-northwestern bank of Wappinger Creek and includes an embayment area. The Wappinger Greenway Trail links historical, cultural, natural, and economic resources of local and regional significance.

The Site, for the purposes of this work plan, was divided into the sections listed below based on review of previous investigations and the physical characteristics of Wappinger Creek. Figure 1-2 presents the creek sections.

- Industrial Park section – The former Three Star Site and current Industrial Park are adjacent to the creek in this section. The Site begins at the base of Wappingers Falls, just upstream of the Industrial Park section.

- Upper Shoal section – The area downstream of the Industrial Park section and upstream of the embayment.

- Embayment section – The section of the creek that is part of and adjacent to the embayment (described further below).

- Lower Shoal section – The section of the creek downstream of the embayment but upstream of the confluence of the creek with the Hudson River.

- Confluence section – This section of the creek is downstream of the lower shoal section, extending to the confluence of the creek with the Hudson River.

The creek is an active recreational fishery containing wetland and riparian areas, including a shallow embayment located along the west-northwestern bank of Wappinger Creek approximately 0.75 mile downstream of the Industrial Park. This embayment is approximately 240,000 square feet (approximately 800 feet by 300 feet) and is fronted by the Palustrine Freshwater Forested/Shrub Wetland. Sediment in this embayment is primarily silt and organic matter and supports aquatic emergent and submerged plant growth throughout. The main currents of Wappinger Creek bypass the embayment, which experiences minimal water velocity and can generally be described as quiescent.

1.1.2 Site History

Industrial activities have occurred in the Industrial Park adjacent to the creek for more than 180 years. A detailed view of the Industrial Park is provided as Figure 1-3. Primary past uses of the facilities included textile dyeing operations, a manufactured gas plant (MGP), a metal plating facility, plastic mold injecting, chemical and ammunition production, and other industrial activities. Dutchess Print Works, also known as the Dutchess Bleachery, operated at the Site under several ownerships from 1832 to 1955. The plant was originally located across Wappinger Creek on the northern bank and later occupied land that was filled in on the southern side of the Wappinger Creek. By the late 1800s, buildings on the north side of the creek were utilized for the manufacture of acids and chemicals associated with the dye operations and the remainder of the operations were performed in buildings located on the south bank. Operations consisted of dyeing and finishing of rough cotton cloth from other mills. Aniline dye was also made at the facility during World War I. Textiles were bleached and dyed at the bleachery and wastewater was reportedly discharged into a raceway that emptied into a lagoon and subsequently into Wappinger Creek.

Long-term residents of the Village report that during the first half of the 20th century, the lagoon would appear different colors depending on activities at the mill. Mercuric chloride and arsenic pentoxide may have been used to dye cloth at the facility. The Dutchess Bleachery and the Wappinger Water, Gas, and Electric Company operated a MGP facility on the south bank of Wappinger Creek in the west portion of the Site from the late 1800s to approximately 1913. During operation of the MGP, coal was barged up the creek from the Hudson River and stored in large coal sheds located on the north and south banks of the creek as early as the 1870s. NYSDEC files indicate that the approximately 16 acres beyond the industrial properties were filled with coal cinders. Currently, most of these areas are either paved or developed. Coal cinders were used as fill behind the retaining wall built on the south bank of the creek near the industrial facilities, as shown on Figure 1-3. Coal cinders were also used as fill in an area downstream in the vicinity of Creek Road. Historical maps indicate that topographic changes have occurred in those areas, as well as the southwest portion of the former bleachery property on the north bank. The exact location of fill in these areas has not been delineated.

Three Star Anodizing, and later Watson Metals Products Corporation, operated a metal plating facility adjacent to the creek from 1958 to approximately 1995. From 1958 to 1980, plating waste was discharged to the lagoon and subsequently to Wappinger Creek at a rate of 20,000 to 60,000 gallons per day. Along with metal plating, the facility began reconditioning electronic equipment in 1972. The reconditioning process included paint stripping using caustics and a water rinse of gold components. Plating processes included the use of mild non-etching alkali cleaners, a proprietary mix of sodium dichromate or chromic acid, sulfuric acid with the addition of soda ash to lower pH, and a dyeing process that required ferric ammonium oxide and synthetic dyes. The paint stripping operation reportedly used chlorinated solvents in addition to fluoride, caustic soda, and kerosene.

Other tenants of the Industrial Park include:

- Axton Cross Company, a company that manufactured and distributed bulk chemicals, occupied the building located east of the lagoon in the 1960s. This building reportedly had floor drains that discharged to the lagoon (Dutchess County Department of Health [DCDH] 1971).
- Fabricare Products occupied the Axton Cross Building in the 1970s (O'Brien and Gere Engineers, Inc. [OBG] 2007a).
- Felt hat manufacturing reportedly took place at a building located on the southern bank of the Industrial Park at the same time Dutchess Bleachery was operating (Weston 2016).
- Page Print Systems, a printing company, occupied a building on the southern bank of the creek in the industrial park. They reportedly discharged rinse water from photographic development sinks to the ground adjacent to the building (DCDH 1971).
- Hanover PrintWorks, a printing company, occupied a building on the north side of the industrial park. They reportedly discharged approximately three quarts of paint per day to a lagoon located on the north side of the industrial park located next to the building (DCDH 1967). The lagoon appears to no longer be present.

- Olah Associates, a plating and stripping operator, occupied the north side of the Industrial Park. They reportedly discharged rinse water from plating tanks directly to the creek (OBG 2007a).

- Kemp & Beatley and IBM are also known occupants of the north side of the Industrial Park (OBG 2007a).

Regulatory History

The sanitary facilities in the Three Star buildings failed a dye test performed in 1971. At that time, wastewater was found to discharge through floor drains to the lagoon and the creek. Rinse water from plating tanks was discharged to the back of the plant, which subsequently drained into the lagoon via the raceway. A Phase I investigation conducted in the mid-1980s (EA Engineering, Science, and Technology, Inc. [EA] 1986) found that the waste stream from the Three Star operations at the Site contained sulfuric and phosphoric acids, caustic dyes, soaps, and various trace metals including copper, nickel, chromium, aluminum, and zinc. In 1975, the facility was required to obtain a State Pollution Discharge Elimination System (SPDES) permit to continue discharging via the raceway. In following years (1977-1979), NYSDEC documented that Three Star occasionally exceeded SPDES effluent limitations for nickel and copper.

NYSDEC performed investigations at the Three Star Site beginning in 2000. The Three Star Site includes the former Three Star property, former raceway, lagoon, former MGP area, former Axton-Cross building, and the portion of the former Dutchess Bleachery property on the south side of the creek. The Three Star Site did not include the industrial area on the north side of the creek or Wappinger Creek itself. Based on the findings in the NYSDEC RI and the recommendations in the feasibility study (FS), NYSDEC signed a record of decision (ROD) in March 2009 for the Three Star Site. The ROD designated the Three Star Site as Operable Unit (OU) 1, and the Wappinger Creek investigation area as OU2.

The NYSDEC OU2 RI (OBG 2007b) found sediment contamination in Wappinger Creek near the Three Star Site, and the Industrial Park located at the upstream end of the tidal portion of Wappinger Creek. As part of the OU2 RI, NYSDEC collected surface water and sediment samples from this tidally-influenced creek and from upstream in Wappinger Lake in 2001, 2002, 2003, and 2009. The analytical results for the samples indicated that creek sediments adjacent to and downstream of the Industrial Park are contaminated with several inorganic constituents, including mercury, lead, and chromium, as well as polycyclic aromatic hydrocarbons (PAHs), at concentrations above those detected in upstream samples. These investigations are summarized further in Section 1.3.

In 2015, Weston Solutions, Inc. (Weston), on behalf of EPA's Region 2 Site Assessment Team (SAT), collected soil, surface water, and sediment samples near the Industrial Park along Wappinger Creek as part of the Hazard Ranking System (HRS) evaluation of the Site (Weston 2015a). While Weston's 2015 investigation identified mercury and benzo(a)pyrene as the main contaminants of concern in sediment, the review of historical documents identified several other contaminants of concern at the Site including volatile organic compounds (VOCs), metals, and MGP cinders. VOCs were detected in shallow groundwater and sediments near the lagoon outfall at the Three Star Site. EPA placed the Site on the National Priorities List on September 9, 2016.

1.3 Previous Investigations

1.3.1 Fish and Wildlife Impact Analysis, 2007

Fish and wildlife impact analyses (FWIA) were completed in 2007 by OBG for Wappinger Creek and the adjacent Three Star Site. The FWIA Step IIC (OBG 2007c) evaluated the potential impacts of site-related constituents on fish and wildlife resources using data collected during the RI for the Three Star Site. RI data for surface water and sediment (from 0 to 6 inches below grade) collected from Wappinger Creek were used to select contaminants of potential ecological concern (COPECs). Contaminants that had concentrations in sediment above the 1999 NYSDEC sediment guidance values were considered a COPEC. Screening level risk calculations were performed which included the development of food chain models (no observed adverse effect level [NOAEL] toxicity reference value [TRV], maximum concentration, lowest body weights, highest ingestion rates) for aquatic and terrestrial ecosystems. Receptors evaluated included shrew, robin, great blue heron, and mink. Sediment COPECs resulting in hazard quotients greater than one included various metals (primarily antimony, cadmium, chromium, mercury, and zinc) and semi-volatile organic compounds (SVOCs) (particularly 2-dimethylphenol, phenol, and PAHs). The inorganic COPECs that resulted in the highest calculated hazard quotient values were mercury and antimony.

1.3.2 Remedial Investigation of Wappinger Creek, 2001-2007

OBG conducted an RI on behalf of NYSDEC to evaluate potential environmental contamination in Wappinger Creek associated with the Three Star Site which included an investigation of surface water and sediment in the tidal creek from 2001 to 2003 (OBG 2007b). Sampling locations in Wappinger Creek are shown on Figure 1-4.

The RI found that surface water quality in the creek at the time of the RI was generally within water quality screening values. However, sediment contained elevated levels of contaminants primarily consisting of PAHs and inorganic constituents above ecological screening values. Sediment sampling identified two hotspot areas, the shoal area and embayment, both of which appeared to be depositional areas for sediment accumulation. Highest concentrations were detected in deeper sediments, suggesting that historic inputs to surface sediments have been buried over time.

The RI concluded that the sediments of Wappinger Creek provided evidence of impacts from nearby activities at the Three Star Site; the constituents associated with past activities at the Three Star Site are consistent with the highest levels of constituents found in the creek. However, the RI also identified the following uncertainties regarding Three Star being the sole source of the creek contamination:

- Historical activities on the north side of the Industrial Park were similar to those that took place at the Three Star property, as noted in Section 1.1.2; potential impacts resulting from potential contamination in that area are not known, as the area has not previously been sampled.

- Among uncertainties associated with potential sources to the creek from the north side of the Industrial Park is the condition of the north lagoon, which was reportedly used by several industrial tenants as a discharge point, as noted in Section 1.1.2.

- The creek reportedly received paint wastes during the 1970s from a potential additional source.
- The Public Works garage and the railroad located along the creek are additional potential sources that were identified, but potential contributions from these sources could not be distinguished from other sources.

1.3.3 Supplemental Remedial Investigation for Tidal Portion of Wappinger Creek, 2010

EA collected sediment samples from Wappinger Creek near the Three Star Site as part of a supplemental RI focusing on inorganic contaminants of concern (EA 2010). Sediment samples were collected from 15 sampling locations along the tidal creek in October 2009. The locations are shown on Figure 1-4.

The sampling locations were categorized into four sampling areas: one sampling station in the Site area (adjacent to the Three Star Site down to the shoal area), six stations in the shoal area (from 1000 feet downstream to 2,500 feet downstream), three stations in the embayment (0.75 miles downstream of the Site on the north side of the creek), and three stations and two samples in the downstream area (from downstream of the embayment to the confluence with the Hudson River). Sediment samples were collected from the following depth intervals: 0-6-inch, 6-12 inch, and if sampling cores had not met refusal at 12 inches, a third depth interval below 12 inches to 24 inches or to refusal. A total of 39 samples were collected. Samples were analyzed for target analyte list (TAL) metals, mercury, and cyanide. Selected samples with elevated total mercury concentrations were also analyzed for methyl mercury. The supplemental RI concluded:

- Results were generally consistent with the RI and identified the following COPECs: antimony, arsenic, cadmium, chromium, lead, mercury, zinc, and cyanide.
- Cyanide was generally below the specified detection limit or consistent with background levels in samples from the 2009 sampling event, thus no longer appearing to be a contaminant of concern.
- Contaminants that exceeded severe effect level screening levels most frequently included lead (with 20 exceedances), mercury (19 exceedances), zinc (18 exceedances), chromium (17 exceedances), and copper (12 exceedances).
- The highest concentrations occurred with mercury and chromium and were generally observed in deeper samples (below 6 inches) from the embayment and from an island downstream of the embayment.
- The maximum mean concentrations for all constituents except for lead were also found in the embayment and adjacent shoal.
- Results also indicated mercury found in sediment is mostly in the inorganic form (not as the more readily bioavailable methylmercury).

Based on these results, EA concluded the results and findings of the supplemental sediment sampling in 2009 generally confirmed the findings of the RI. Concentrations of inorganic constituents in sediment were seen as a risk to aquatic biota and human users of the creek. EA proposed remedial action objectives (RAOs) that focused on eliminating, to the extent practicable, adverse impacts to ecological and human receptors of the contaminated sediment, and contaminated sediment as a source of contamination to Wappinger Creek surface water and the Hudson River.

1.3.4 EPA Region 2 Site Assessment Team Sampling

In August and October 2015, Weston, on behalf of EPA's Region 2 SAT, conducted intermittent site visits to Wappinger Creek to assess sampling accessibility and fishing activity along the creek, respectively.

In October 2015, Weston also collected soil samples around the 400 Market Street building in the approximate location of the former North Lagoon, and north of the 55 McKinley building. Contaminants of concern were noted to be VOCs, PAHs, metals, and MGP cinders.

In October and November 2015, Weston collected soil, surface water, and sediment samples near the Industrial Park along Wappinger Creek as part of the HRS evaluation of the Site (Weston 2015a). The creek sampling locations and sampling results for several key contaminants are included on Figure 1-5.

Forty-four sediment samples and 8 surface water samples were collected from the tidal portion of Wappinger Creek; and to evaluate background conditions, 12 sediment samples and 3 surface water samples were collected from Wappinger Lake and Wappinger Creek upstream of the industrial park 6 sediment samples were collected 10 miles south of the Industrial Park (at Moodna Creek, an analogous, tidally influenced environment also impacted by the Hudson River). Sediment samples were generally collected from 0 to 6 inches, 6 to 12 inches, and 12 to 24 inches. All surface water and sediment samples were analyzed for VOCs, SVOCs, and metals (including mercury), except for 6 sediment samples that were instead analyzed for methyl mercury and dioxins/furans. Six (including one environmental duplicate sample) of the sediment samples collected in November 2015 were analyzed for dioxins and furans (Weston 2015b). Twenty-six soil samples were collected from 10 boreholes in potential source areas upland of the creek and analyzed for VOCs, SVOCs, and metals (including mercury). Sampling depths varied from surface level to 15 feet below ground surface (bgs).

The results of the sampling are summarized in the preliminary conceptual site model (CSM) presented in Section 1.4.

1.4 Preliminary Conceptual Site Model

This section summarizes the physical characteristics of the Site and surrounding area, including topography, drainage and surface water, geology, and hydrogeology. Information in this section is gathered from previous investigations by others, reference materials, and observations from a site visit.

1.4.1 Physical Setting

Tidal Portion of Wappinger Creek

Wappinger Creek is a 41-mile creek that flows into the Hudson River south of Poughkeepsie, New York. The tidally influenced portion of Wappinger Creek extends from the confluence at the Hudson River upstream to the effluent of the hydroelectric facility. Wappinger Falls serves as the spillway for the hydroelectric facility, leading upstream to Wappinger Lake.

Water levels in the creek can typically fluctuate as much as 4 feet during the tidal cycle of the Hudson River (EA 2010). At the upstream end of the tidal portion of Wappinger Creek and adjacent to the Industrial Park, the tidal creek is approximately 90 feet wide with concrete/stone retaining walls bordering both sides of the creek in this reach.

Downstream, the width of Wappinger Creek varies from 300 to 800 feet. The width is constricted to approximately 140 feet and 250 feet wide by the County Route 28 (CR28) bridge and a railroad bridge, respectively, as the creek approaches the Hudson River.

The creek is deepest along a narrow channel extending laterally throughout the entire extent of the tidal portion of the creek. Water depths in the creek range from less than 5 feet to approximately 25 feet, with the greatest depth beneath the CR28 bridge. The center of the creek is approximately 10 feet deep in the Industrial Park area. The channel is flanked by shallow shoal areas, which are heavily vegetated with water chestnut during the summer months.

Flow for Wappinger Creek is measured and recorded at a U.S. Geological Survey station at the dam at Wappinger Lake. While flow is dependent on regional rainfall and season, the average daily flow rate is 84 cubic feet per second (cfs) with non-peak range of 6.1 to 1,060 cfs reported.

Surface water quality parameters collected from previous investigations collected at low tide and high flow (storm) events are summarized below:

- Average Conductivity: 0.26 to 0.46 microSiemens/centimeter
- Average Temperature: 12 to 23 degrees Celsius
- Average Dissolved Oxygen: 6.8 to 10.4 milligrams per liter
- Average Salinity: 0.0 to 0.3 parts per thousand (includes 2009 Data)
- pH: 6.9 to 7.8
- Turbidity: 2 – 34 nephelometric turbidity units (2009)

The composition of the creek bed varies from rocks and cobbles in the fast-moving reach near the Industrial Park at the most upstream part of the tidal portion of the creek, to silt in low-flow areas.

An embayment is located along the northwest bank of Wappinger Creek. The embayment is approximately 5.5 acres, shallow with water depths of less than 5 feet, and has a bottom comprising of mostly silt. The embayment is situated such that the currents of the main stem of Wappinger Creek do not directly impact the embayment area during normal flow conditions.

Two unnamed tributaries were observed during a site visit. One unnamed tributary flows through the Preservation Area north of the Industrial Park, while the other unnamed tributary flows into Wappinger Creek near the Reese Audubon Sanctuary. Both unnamed tributaries are shown on Figure 1-2. The unnamed tributary in the Reese Audubon Sanctuary is approximately 15 feet wide and has a shallow silt bottom. The observed flow was low during the site visit.

Stormwater

Stormwater from the Industrial Park enters Wappinger Creek through stormwater outflows and overland flow. Stormwater from the southern portion of the Industrial Park flows into the remaining portion of the raceway, which was remediated as discussed in Section 1.2, and then discharges to Wappinger Creek.

Several catch basins are located along Creek Road, along the southern bank of Wappinger Creek. The catch basins collect stormwater from along Creek Road and discharge directly to Wappinger Creek. The Preservation Area along the northern portion of Wappinger Creek is steeply sloped towards the creek, thus stormwater enters Wappinger Creek through overland flow from several of the properties north of the creek as well. These properties appear to be all residential areas or parks.

Geology

Wappinger Creek sits above glacial and fluvial deposits bound on either side by bedrock outcrops. The overburden was deposited above shale to shalely limestone bedrock. Previous investigations at the Three Star Site at the Industrial Park depict the bedrock ranging from depths of 0 to 66 feet bgs.

The natural alluvium, referred to as native material, is comprised of three primary layers: brown coarse-grained sand with little gravel, grayish medium to coarse sand and gravel, and medium sand with silt.

Previous investigations at the Three Star Site found non-native material, i.e., fill, above much of the glacial and alluvial deposits in the oxbow of the creek that make up the Industrial Area. Fill was comprised mostly of sandy gravel containing cinders, concrete, and brick.

Groundwater

During the RI at the Three Star Site, the groundwater table was observed in fill materials and alluvium at depths ranging from 3 to 14 feet bgs, roughly at the level of the creek surface. Locally, groundwater flow within the Industrial Park area flows towards and discharges to Wappinger Creek.

Though a full tidal study was not performed, groundwater appears to be influenced by tidal changes, with elevations varying up to 3 feet. Shallow groundwater is expected to flow directly into Wappinger Creek, while deep groundwater may emerge further downstream in Wappinger Creek after traveling through fractures in bedrock beneath the creek.

1.4.2 Sources and Extent of Contamination

Review of the results of sediment and surface water sampling from the previous investigations were used to describe the known extent of contamination within Wappinger Creek.

1.4.2.1 Potential Sources of Contamination

The past investigations did not identify a single source of the contamination within the creek. However, they did indicate that the potential sources are primarily the industrial activities that took place north and south of the creek in the Industrial Park area, including the Three Star Site, Dutchess Bleachery, and the MGP facility.

The Three Star Site operated a metal plating and electronic equipment reconditioning facility adjacent to the creek and discharged wastes to a lagoon, which subsequently discharged to Wappinger Creek. The Dutchess Bleachery manufactured acids and chemicals associated dye operations and discharged the wastewater into a raceway that emptied into a lagoon, which also subsequently discharged to Wappinger Creek. The MGP facility produced gas from coal which was stored in sheds on the banks of Wappinger Creek. Coal cinders have been found in Wappinger Creek.

1.4.2.2 Extent of Inorganic Contamination

Several inorganic contaminants including mercury, lead, chromium and other metals were present in sediment samples collected between 0 and 24 inches below the sediment surface (bss). Data from 2001 through 2009 indicate contamination is concentrated in sediments greater than 6 inches in depth and in areas outside the main channel of the creek, specifically the embayment and lower shoal areas.

In 2007, select locations were sampled by EA for methyl mercury, to determine the ratio of methyl mercury, a bioavailable form of mercury, to total mercury. Methyl mercury as a percent of total mercury ranged from 0.002 to 0.053 percent. Therefore, most mercury is present in the inorganic form, which is less likely to be available for uptake by organisms (EA 2010).

In 2015, the results from EPA sediment sampling showed a zone of contamination from WP-11A, (2001/2003 OBG sediment sample) near the Industrial Park, to SED-04 in the Lower Shoal area (**Figure 1-5**). Levels of inorganic contamination are highest in the embayment area. Sediments from the SED-04 to SED-10 zone contained inorganics (arsenic, cadmium, chromium, mercury, lead, and zinc) at concentrations exceeding their respective NYSDEC Sediment Guidance Values for Class C sediments meaning that sediments are considered to be highly contaminated and likely to pose a risk to aquatic life.

Elevated levels of inorganic contamination in Wappinger Creek indicate that contamination has migrated downstream from the Industrial Park and impacted the tidal portion of Wappinger Creek.

1.4.2.3 Extent of Organic Contamination

Organic contamination was found in the form of SVOCs, specifically as PAHs, which are linked to historical industrial processes including those conducted in the Industrial Park.

In 2007, total PAHs in surface sediments (0-6 inches) ranged from 0.2 to 214 milligrams per kilogram (mg/kg), with the highest concentrations observed in the shoal area just south of the Department of Public Works facility. Total PAHs in subsurface sediments (6-24 inches) ranged from 0.9 to 1,092 mg/kg, with the highest concentrations observed in the upper shoal area adjacent to the Department of Public Works facility. OBG noted that PAHs in surface sediment closely resembled the PAHs found at the Three Star Site.

In 2015, benzo(a)pyrene (BAP) results were presented as part of the HRS document. BAP results ranged from non-detect to 2,100 micrograms per kilogram, with maximum concentrations near the upper shoal and Industrial Park sections.

Historical sampling for other SVOCs found 1,2-dichlorobenzene, 1,4-dichlorobenezene, phenol, and dibenzofuran. OBG noted that the presence of these compounds in the sediment was minor in comparison to PAHs. Historical sampling for pesticides noted sporadic detections above screening levels. However, similar concentrations were found in background samples (OBG 2007b). These sampling results are indicative of PAH contamination in Wappinger Creek.

1.4.2.4 Dioxin/Furans

In 2015, EPA collected six sediment samples, which were analyzed for dioxins and furans. The results of the analyses were compared against NYSDEC freshwater sediment guidance values (SGVs). Two samples exceeded the NYSDEC SGV of 0.5 nanograms per kilogram (ng/kg) for 2,3,7,8-TCDD or equivalent, in Class B sediments:

- 0269-SED12-12-24 (0.9260 ng/kg)
- 0269-SED14-6-12 (9.424 ng/kg)

These sampling results indicate that dioxins and furans are potential contaminants in Wappinger Creek.

1.4.4 Contaminant Fate, Transport and Receptors

The release of contaminated liquids at the manufacturing facilities in the Industrial Park impacted adjacent soils and sediments and surface water in the lagoons and raceway. Contamination in the lagoon and raceway was transported by advection dissolved in the surface water and adsorbed to suspended sediments to Wappinger Creek. Additionally, surface water runoff from contaminated soils in the Industrial Park also potentially transported contamination to Wappinger Creek. In Wappinger Creek, dissolved contamination would potentially be transported by advection further downstream in Wappinger Creek. Suspended sediment would be transported with creek flow before falling out of suspension and being deposited in areas of sediment accumulation.

Contamination in sediments could reenter the water column through diffusion and desorption. However, those contaminants more likely to adsorb to organic carbon and sediments would not likely diffuse into the water column. These contaminations would be transported downstream while absorbed to sediments via bedload sediment transport and resuspension in the surface water during tidal flow and wet weather flows. Contamination in sediments is expected to act as a continuing source of contamination to surface water and downstream sediments within the creek.

Likely receptors of contamination in Wappinger Creek include ecological and human health receptors. Contamination is expected to bioaccumulate in organisms living in the benthic zone, fish, and other biota through aqueous update of dissolved chemicals and dietary update by ingestion of contamination food particles.

Human health receptors include recreational users of Wappinger Creek through incidental ingestion and dermal contact with contamination surface water and sediment, the inhalation of volatile chemicals (e.g., mercury) during use of the creek, and ingestion of fish tissue from recreational angling.

1.5 RI/FS Objectives

The purpose of this RI/FS is to develop and evaluate potential remedies to eliminate, reduce, or control risks to human health and the environment at the Site. This work plan is designed to provide the framework for conducting the RI/FS activities for the Site. The objectives of this investigation are to:

- Review and evaluate the studies and investigations performed at the Site to date
- Determine and collect the sampling data necessary to complete characterization of the Site and support the selection of an approach for Site remediation
- Provide adequate data to complete human health and ecological risk assessments
- Prepare an FS to develop and evaluate remedial alternatives to support developing a ROD

1.6 Work Plan Content

This work plan contains three sections as described below.

- Section 1 – Introduction: Presents the site description, site history, previous investigations, and format of the work plan.
- Section 2 – Work Plan Approach: Presents an overview of the technical approach to performing the RI/FS, the project schedule, the project management plan, quality assurance (QA), and document control.
- Section 3 – Task Plans: Discusses each task of the RI/FS in accordance with the EPA SOW, EPA guidance documents, and meetings and discussions with EPA.
- Section 4 – References: Lists references used to develop the work plan.

For presentation purposes, figures and tables are presented at the end of this Volume I Work Plan.

Section 2

Work Plan Approach

2.1 Project Organization

The proposed project organization is shown in Figure 2-1.

2.2 Technical Approach to the RI/FS

CDM Smith has developed the technical approach described herein in accordance with the EPA SOW to ensure that all field work and submittals meet the requirements of the following documents and policies:

- Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended
- Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, EPA/540/G-89/004, Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01 (EPA 1988)
- Other applicable federal, state, and local requirements

CDM Smith reviewed all available information for the Site prior to formulating the approach presented in this work plan and discussed a general approach with EPA during the contract scoping meeting on March 29, 2017 and during subsequent conversations. The RI/FS for the Site will include an RI report, a human health risk assessment (HHRA), a screening level ecological risk assessment (SLERA), and an FS report.

The investigation scope is intended to characterize the current nature and extent of Site contamination and is intended to address data gaps identified through review of previous investigation results. A list of the investigations evaluated is included in Section 1.3 of this document. Data generated during the EPA 2015 investigations (Weston 2015a) will be utilized along with newly generated data to complete the RI and risk assessments.

Previous data collected during the NYSDEC investigations (OBG 2007b and EA 2010) will not be utilized to assess the current extent of contamination or in the risk assessments as the data is generally more than ten years old, and there have been several large storms in the Site area that may have impacted the extent of contamination. This historical data was utilized to develop an understanding of the nature and extent of contamination within Wappinger Creek, which assisted in designing this field investigation. In addition, historic data will be compared to the newly generated data from the RI to assist in understanding how large storm events could impact the migration of contaminants within the creek.

The sampling approach is discussed in Section 3.3 and includes rationale for the proposed investigation activities. A site-specific quality assurance project plan (QAPP) detailing sample and analytical requirements for the field investigation and a health and safety plan (HASP) will be submitted separately. The RI report will provide an evaluation of new and historical data.

An HHRA will be conducted in accordance with EPA's Risk Assessment Guidance for Superfund (RAGS) (EPA 2001) or per the most recent EPA guidance and requirements. The risk assessments will include identification of chemicals of potential concern (COPCs) for each medium by comparison of maximum detected concentrations to regulatory-approved screening levels; toxicity information for COPCs; and characterization of potential risk of COPCs in the absence of any remedial action (RA).

A SLERA will be conducted in accordance with the current Superfund ecological risk assessment guidance, Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments (EPA 1997). CDM Smith will compare the maximum contaminant concentrations in each medium of concern to appropriate conservative ecotoxicity screening values (e.g., NYSDEC Ambient Water Quality Standards and Guidance Values and NYSDEC Sediment Guidance Values) and will use conservative exposure estimates to calculate risks to wildlife through food chain modeling. EPA will review and approve the SLERA and determine whether a full baseline ecological risk assessment (BERA) is required. At EPA's direction, CDM Smith will perform a BERA in accordance with ecological risk assessment guidance for Superfund (ERAGS).

An FS will be completed in accordance with the EPA's Interim Final Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988) or the most recent EPA FS guidance document.

A critical step in developing remedial alternatives is to understand what applicable or relevant and appropriate requirements (ARARs) apply to the Site. In development of the CSM, the potential ARARs were reviewed and are likely to include the following:

- New York State Department of Environmental Conservation Division of Fish, Wildlife and Marine Resources Bureau of Habitat. "Screening and Assessment of Contaminated Sediment" June 24, 2014
- New York State Department of Environmental Conservation Division of Fish, Wildlife and Marine Resources. "Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites" October 1994
- New York State Department of Environmental Conservation Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. June 1998.
- 40 CFR 300.430 - Remedial investigation/feasibility study and selection of remedy
- 40 CFR Part 307 - Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Claims

The FS will develop and screen remedial alternatives and provide detailed analysis of selected alternatives, including the "No Action" alternative. The remedial alternatives will be evaluated against seven criteria required by EPA guidance documents: (1) overall protection of human health and the environment; (2) compliance with applicable or relevant and appropriate requirements (ARARs); (3) long-term effectiveness and permanence; (4) reduction of toxicity, mobility, or volume through treatment; (5) short-term effectiveness; (6) implementability; (7) cost. Two additional EPA criteria include state acceptance and community acceptance. However, these are usually determined after the FS and as such, an evaluation of the remedial alternatives with respect to these criteria will not be included in the FS.

Remedial alternatives will be developed following review of the RI data, but likely remedial alternatives to be reviewed include:

- No action
- Monitored natural recovery
- In-situ capping
- Dredging and offsite disposal of dredged materials.

2.3 Quality Assurance

All work by CDM Smith on this WA will be performed in accordance with the CDM Smith RAC 2 Quality Management Plan (QMP) (CDM Smith 2012). The CDM Smith RAC 2 Region 2 quality assurance specialist (RQAS) will maintain quality assurance (QA) oversight for the duration of the WA and has reviewed this work plan for QA requirements.

The CDM Smith site manager (SM) is responsible for implementing appropriate quality control (QC) measures on this WA. Such QC responsibilities include:

- Implementing the QC requirements referenced or defined in this work plan
- Adhering to the CDM Smith RAC Management Information System (RACMIS) document control system
- Organizing and maintaining WA files
- Conducting planning meetings, as needed, in accordance with the RAC 2 QMP

Technical and QA review requirements as stated in the QMP will be followed on this WA, except that the SM will select reviewers with the experience outlined on the Independent Review Form.

Document control aspects of the program pertain to controlling and filing documents. CDM Smith has developed a program filing system that conforms to EPA's requirements to ensure that the documents are properly stored and filed. This system will be implemented to control and file all documents associated with this WA. The system includes document control procedures, a file review, an inspection system, and file security measures.

In addition to technical and QA review requirements, the RAC 2 QA program includes quality procedures and assessments to improve the quality of work by comparing the system or element to the specified requirements. Assessments can include quality assessments (such as audits) and technical self-assessments (such as calculation checking, data validation, and project self-assessments). Self-assessments applicable to this assignment include calculation checking. No audits are planned for this assignment.

2.4 Project Schedule

A rough project schedule is included as Figure 2-2. The project schedule assumes the provision of adequate funding and timely review of documents by EPA throughout the project.

2.5 General Requirements

General requirements include those relating to sustainable (or green) remediation and record-keeping, as described in the following sections.

2.5.1 Green Remediation

Green remediation is the practice of considering all environmental effects of the implementation of a remedy and incorporating options to maximize the net environmental benefit of cleanup actions. In accordance with EPA's strategic plan for compliance and environmental stewardship, EPA strives for cleanup programs that use natural resources and energy efficiently, reduce negative impacts on the environment, minimize or eliminate pollution at its source, and reduce waste to the maximum extent possible. EPA's Region 2 Superfund program supports the adoption of "green site assessment and remediation," which is defined as the practice of considering all environmental impacts of studies, selection, and implementation of a given remedy, and incorporating strategies to maximize the net environmental benefit of cleanup actions (see http://www.clu-in.org/greenremediation). In addition, EPA established a "Clean & Green" policy to enhance the environmental benefits of Superfund cleanups by promoting technologies and practices that are sustainable.

To the extent practicable, CDM Smith will explore and incorporate green remediation strategies and applications in the performance of the requirements of this WA to maximize sustainability, reduce energy and water usage, promote carbon neutrality, promote industrial materials reuse and recycling, and protect and preserve land resources. The following practices may be performed during RI/FS activities:

- Minimize printing, using electronic versions for document reviews and submittal, to the extent possible
- Print double-sided to minimize the number of papers used
- Use recycled products on-site
- Work with local staff to reduce fuel consumption
- Schedule field tasks to minimize mobilization/demobilization of large equipment and shipping
- Use greyscale, black and white, or optimized printing setup for printouts of draft versions
- Use conference calls in lieu of in-office meetings

- Evaluate low-energy remedial alternatives

CDM Smith will maintain records of strategies implemented and report this information to EPA in its monthly progress reports or as requested by EPA.

2.5.2 Record-Keeping Requirements

CDM Smith will maintain all technical and financial records for this WA in accordance with the requirements of the SOW and the direction of the EPA remedial project manager (RPM). These technical and financial records will be in sufficient detail to support decisions made during this RI/FS. At the completion of the WA, CDM Smith will submit three bound copies of the official record of the work and one copy of the major deliverables in electronic format to the EPA RPM, with one copy to the EPA records manager.

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Section 3

Task Plans

The tasks identified in this section correspond to EPA's SOW for the Site, dated January 19, 2017 structure provided in EPA's SOW.

3.1 Task 1 – Project Planning and Support

3.1.1 Project Administration

CDM Smith will provide the following project administration support in the performance of this WA.

The SM will:

- Prepare the technical monthly report
- Review weekly financial reports
- Review and update the schedule
- Communicate weekly with the EPA RPM
- Prepare staffing plans

The Program Support Office personnel will:

- Review WA technical/financial status reports
- Prepare monthly progress reports
- Manage technical resources
- Review the WA budget
- Respond to questions from the EPA project officer and contracting officer
- Prepare monthly invoices

3.1.2 Scoping Meeting

CDM Smith attended a contract scoping meeting at the EPA Region 2 office in New York City on March 29, 2017. A technical scoping meeting was not conducted prior to creation of this work plan.

3.1.3 Conduct Site Visit

CDM Smith, EPA, and NYSDEC conducted a site visit on May 11, 2017 to allow CDM Smith staff to conceptually understand the layout of the Site by visiting the creek, the Industrial Park area, and the confluence of the creek with the Hudson river.

3.1.4 Develop Draft Work Plan and Cost Estimate

CDM Smith has prepared this RI/FS work plan in accordance with the contract terms and conditions, utilizing existing and current site data and information, information from EPA guidance documents (as appropriate), and technical direction provided by the EPA RPM.

This work plan includes a comprehensive description of project tasks, the procedures to accomplish them, project documentation, and a project schedule. CDM Smith uses internal QA systems and QC procedures to ensure that the work plan and other deliverables are of professional quality requiring only minor revisions (to the extent that the scope is defined and is not modified). The work plan includes the information specified below.

- Identification of RI project elements including planning and conducting field activities, data evaluation and management, and report preparation. The detailed work breakdown structure of the RI/FS corresponds to the work breakdown structure provided in the EPA SOW (dated January 19, 2017) and discussions with EPA.

- CDM Smith's technical approach for each task to be performed, including a detailed description of each task, assumptions, information to be produced during and after each task, and a description of the work products that will be submitted to EPA. Issues relating to management responsibilities and contingency procedures are also addressed.

- An estimated schedule, with anticipated timeframes for each general activity. A more detailed schedule will be developed at a later date.

3.1.5 Negotiate and Revise Draft Work Plan/Budget

CDM Smith personnel will attend a work plan negotiation meeting with EPA to discuss and agree upon the final technical approach and costs required to accomplish the tasks detailed in the work plan. CDM Smith will submit a final work plan incorporating EPA comments and a negotiated work plan budget incorporating the agreements made in the negotiation meeting. The negotiated work plan budget will include a summary of the negotiations. CDM Smith will submit the final work plan and negotiated work plan budget in both hard copy and electronic formats.

3.1.6 Evaluate Existing Data and Documents

As part of the preparation of the work plan, CDM Smith reviewed existing site background information and documentation. Analytical data and other information from these background documents were incorporated, where applicable, into this planning document. Existing site background information and documentation included the documents summarized in Section 1.3 of this work plan.

3.1.7 Quality Assurance Project Plan

CDM Smith will prepare a QAPP in accordance with EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5) (2006), Uniform Federal Policy for Quality Assurance Project Plans (2005), current EPA Region 2 RAC QAPP guidance and procedures, and CDM Smith's currently approved QMP (2012) for the RAC 2 contract. The site-specific QAPP will be submitted as a standalone document.

The QAPP is a comprehensive document that describes the project objectives and organization, functional activities, and quality assurance/quality control (QA/QC) protocols that will be used to achieve the desired data quality objectives (DQOs). The DQOs will, at a minimum, reflect use of analytical methods for identifying and addressing contamination consistent with the levels for RAOs identified in the National Contingency Plan (NCP).

The QAPP will describe the number, type, and location of samples and type of analyses to be performed. It will include sampling objectives, sample locations and frequency, sampling equipment and procedures, sample handling and analysis, and a breakdown of samples to be analyzed through the EPA Contract Laboratory Program (CLP) and other sources, as well as the rationale for the field program design. The QAPP will use all existing data and the need for additional data will be justified. The QAPP will be written so that a field sampling team unfamiliar with the Site would be able to gather the necessary samples and field information in accordance with EPA Region 2's QA requirements. CDM Smith will document changes to the QAPP in a Field Change Notification (FCN) form to the EPA RPM and QA officer.

3.1.8 Health and Safety Plan

CDM Smith will prepare a site-specific HASP that specifies employee training, protective equipment, medical surveillance requirements, standard operating procedures and a contingency plan in accordance with 40 Code of Federal Regulations (CFR) 300.150 of the NCP and 29 CFR 1910.120 (l)(1) and (l)(2). The HASP will be submitted to EPA as a standalone document.

3.1.9 Non-Routine Analytical Services Analyses (Optional)

At the direction of EPA, CDM Smith will utilize an EPA-approved laboratory QA program that provides oversight of in-house and subcontracted laboratories through periodic performance evaluation sample analyses and/or onsite audits of operations and prescribes a system of corrective actions to be implemented in cases where the laboratory's performance does not meet the standards of this program. The minimum requirements are specified below.

- Prepare Laboratory Services Requests (including SOWs) for all non-routine analytical service (non-RAS) parameters. The Laboratory Services Requests will include the elements listed below.
  - digestion/analytical methods
  - data deliverable requirements
  - QC requirements
  - estimated number of samples
  - method restrictions and penalties for non-compliance
  - turnaround times
- Develop QC criteria for each parameter of the approved site-specific or contract-wide QAPP that will be incorporated into the Laboratory Service Request.

- Procure subcontract laboratory currently certified or accredited by one of the following programs: National Environmental Laboratory Accreditation Program (NELAP); American Association for Laboratory Accreditation (AALA); a current certification issued by another organization or State under an accredited program that operates to an international consensus standard and is acceptable to EPA; or the contracted laboratory currently participating in the EPA Contract Laboratory Program.

- Comply with all applicable and appropriate requirements in the acquisition and management of subcontracts for analytical services, including the requirements, terms, and conditions of the RAC 2 contract; the subcontract laboratory's corporate standard operating procedures; and the applicable requirements of the Federal Acquisition Requirements, EPA Acquisition Regulation, EPA Field and Analytical Services Teaming Advisory Committee (FASTAC) strategy, and other pertinent federal and agency acquisition requirements.

- At the request of the EPA RPM, submit the Laboratory Services Requests for EPA review prior to solicitation of an analytical services subcontract.

3.1.10 Meetings

CDM Smith will participate in various meetings with EPA during the WA; it is assumed that three meetings will be held at the EPA office in New York City and three teleconferences will be held to discuss technical challenges and paths forward (six meetings total). It is assumed that three CDM Smith personnel will attend each meeting. CDM Smith will prepare minutes, which will list the attendees and summarize the discussions in each meeting.

3.1.11 Subcontractor Procurement

CDM Smith will solicit and award subcontracts that are necessary to perform the field investigations for the Site, which are expected to include procurement of a drilling subcontractor, water based drilling subcontractor, surveyor (including aerial thermal infrared imagery), cultural resource surveyor, laboratory (via Master Services Agreement), and investigation-derived waste (IDW) subcontractors. The SOWs for all subcontracts will be subject to CDM Smith technical and QA reviews.

3.1.12 Perform Subcontract Management

CDM Smith will perform management and oversight of all subcontracts needed for RI/FS activities, including monitoring progress and maintaining systems and records to ensure that the work proceeds in accordance with the requirements of this WA and the RAC 2 contract. CDM Smith will review and approve subcontractor invoices and issue subcontract modifications that become necessary during the work.

3.1.13 Pathway Analysis Report

CDM Smith will prepare a pathway analysis report (PAR) in accordance with RAGS Part D (EPA 2001). The submittal will include the CSM, the RAGS Part D Standard Tables 1 and 4 series, and a description of how the draft HHRA will be prepared. The PAR will contain all the information necessary for a reviewer to understand how the risks at the Site will be estimated, including the statistical treatment of the data, the methods for selection of the COPCs, the exposure pathways, receptors and parameters to be used, and the sources for current toxicological values. The PAR tables will be prepared after all analytical data are collected, in accordance with the requirements of RAGS Part D Table 1 and Table 4 series. If modeling is recommended, a description of the model and an explanation of the inputs and assumptions will be included in the submittal so their appropriateness can be determined. CDM Smith will schedule a conference call with the EPA RPM and risk assessor to discuss the PAR. The results of the PAR will be included in the draft HHRA described under Subtask 3.7.1.

The following receptors and pathways are anticipated for evaluation in the HHRA:

Current and Future Land Use Scenario

Wappinger Creek

- Recreational User – Adult, Adolescent (12 to 18 years of age), and Child (6 to 12 years of age)
    - Incidental ingestion of and dermal contact with contaminated surface water while wading and swimming
    - Incidental ingestion of and dermal contact with contaminated sediment while wading and swimming
    - Inhalation of volatile chemicals (e.g., mercury) during recreational use of the creek
    - Ingestion of fish fillet tissue from recreational angling

Sitewide exposures will be evaluated for all media. In addition, sediment and fish tissue exposures may be evaluated for the sections of the creek discussed in Section 1.1.1.

Upon receipt of EPA comments on the PAR, CDM Smith will schedule a conference call with the EPA RPM and risk assessor to discuss EPA comments. Comment resolution will be documented in a meeting summary memorandum. The results of the PAR will be included in the draft HHRA described under Subtask 3.7.1.

3.2 Task 2 – Community Relations

CDM Smith will provide technical support to EPA during the performance of the following community involvement activities throughout the RI/FS in accordance with the EPA Superfund Community Involvement Handbook (EPA 2005a).

3.2.1 Community Interviews

CDM Smith will perform the following under this subtask:

- Community Interviews Preparation. CDM Smith shall review relevant background documents as provided by EPA, and shall provide technical support for the community interviews, as directed by EPA.

- Community Interviews Questions. CDM Smith shall prepare draft and final interview questions, if directed by EPA.

3.2.2 Community Involvement Plan

CDM Smith will prepare a draft community involvement plan that presents an overview of the community's concerns and cover the following elements: (1) site background including location, description and history; (2) community overview including a community profile, concerns and involvement; (3) community involvement objectives and planned activities, with a proposed schedule for performance of these activities; (4) a mailing list of contacts and interested parties; (5) names and addresses of the information repositories and public meeting facility locations; (6) a list of acronyms; and (7) a glossary. CDM Smith will submit the final community involvement plan incorporating EPA review comments.

3.2.3 Public Meeting Support

CDM Smith will perform the following activities to support two public meetings and one availability session:

- Make reservations for a meeting space per EPA direction
- Attend two public meetings and one availability session, and prepare draft and final meeting summaries
- Reserve a court reporter for each of the two public meetings
- Provide full-page originals of meeting transcripts, five additional copies of the transcripts, and an electronic copy of each transcript in Microsoft Word 2007 or latest version
- Provide and maintain a sign-in sheet for each public meeting and use the names on the sign-in sheet to update the site mailing list

CDM Smith will develop draft visual aids (i.e., slides and handouts) as instructed by EPA. CDM Smith will develop final visual aids incorporating all EPA comments.

3.2.4 Fact Sheet Preparation

CDM Smith will prepare draft information letters, updates and fact sheets in accordance with the approved community involvement plan for this Site, as directed by the EPA work assignment manager (WAM). For budgeting purposes, it is assumed that two fact sheets will be prepared (one fact sheet each for the public meeting and the availability session), with each fact sheet 2 to 4 pages in length and with 3 illustrations. CDM Smith will research, write, edit, design, layout, and photocopy the fact sheets, prepare the final information letters, updates and fact sheets incorporating EPA review comments. CDM Smith will attach mailing labels to the final fact sheets before delivering them to EPA, who will be responsible for mailing.

3.2.5 Proposed Plan Support

Per the EPA SOW, this subtask is not applicable.

3.2.6 Public Notices

CDM Smith will prepare newspaper announcements/public notices in the three most widely read local newspapers, covering the beginning of the comment period for the proposed plan (including the public meeting), the execution of the ROD for OU2 (including the public meeting), and the availability session.

3.2.7 Information Repositories

Per the EPA SOW, this subtask is not applicable.

3.2.8 Site Mailing List

CDM Smith will prepare a mailing list for community relations activities at this Site. For budgeting purposes, it is assumed that the mailing list will contain approximately 50 entries and will be updated twice. At the request of the EPA WAM, an electronic copy of the mailing list and mailing labels for each mailing will be provided. EPA will do the actual mailing of any information to the community.

3.2.9 Responsiveness Summary Support

CDM Smith will provide support for the site responsiveness summary. The draft document will be prepared by compiling and summarizing the public comments received during the public comment period on the proposed plan. CDM Smith will prepare technical responses for selected public comments for EPA review and use in preparing formal responses.

3.3 Task 3 – Field Investigation

Data acquisition covers the collection of environmental samples and information required to support the RI/FS. Data acquisition begins with EPA's approval of the QAPP and ends with the demobilization of field personnel and equipment from the Site. Field investigations are focused on the creek sections as shown on Figures 3-1a through 3-1e. CDM Smith will perform the following field activities in accordance with the EPA-approved QAPP:

- Site Reconnaissance
- Mobilization and Demobilization
- Hydrogeological Assessment
- Sediment Sampling Program
- Surface Water Sampling
- Groundwater Sampling
- Air Sampling
- Ecological Characterization

3.3.1 Site Reconnaissance

General site reconnaissance activities will be performed to support mobilization and prepare for sampling activities by evaluating logistical problems relevant to implementation of various field activities.

Detailed Site Reconnaissance

A CDM Smith field team will perform a detailed pre-sampling reconnaissance to assist in locating sampling transects. This reconnaissance will assess general bank condition, presence/absence of mudflats, locate tributaries, seeps or point sources (outfalls that discharge water) to the creek, general water flow (fast/slow), presence/absence of sheens, presence/absence of ebullition, presence/absence of turbidity plumes, presence/absence of impediments (dams, log jams, powerline crossings, bridges, etc.), approximate water depths, current water level versus ordinary high water level (OHWL), if visible, and sediment type (sand, silt, clay). CDM Smith will identify and locate all potential locations and notable features with a Global Positioning System unit. CDM Smith will confirm the final sampling locations with EPA prior to performing the sampling tasks.

Site, Topographic, and Bathymetric Survey

CDM Smith will oversee a surveying subcontractor that will conduct a bathymetric survey of the Site with a resolution of 2-foot contours. The bathymetric survey will be conducted by a licensed surveyor covering creek boundaries and channel dimensions and its tributaries, locations and elevations of culverts, locations of access points, and the topography of the sediment floor of the Site. The approach to the bathymetric survey would include rapid data collection methods such as towed sonar arrays and photogrammetric topography combined with traditional survey methods to correlate and field truth the measurements (transects and manual measurements).

Cultural Resources Survey

In accordance with the National Historical Preservation Act, a Stage IA cultural resources survey will be conducted to determine the presence or absence of cultural resources that may be impacted by the implementation of the RI or RA.

3.3.2 Mobilization and Demobilization

CDM Smith will mobilize personnel, equipment, and materials necessary to perform the field investigation. CDM Smith assumes one mobilization event will be necessary to complete this field investigation. Initial mobilization activities will include a field planning meeting, an initial health and safety debriefing for project team members, leasing of temporary facilities including siting and electrical hookup of a field trailer, and purchase and mobilization of equipment and supplies.

Demobilization activities will include removal of all equipment and facilities brought to the Site by CDM Smith.

Site Access Support

Access to areas outside the Site and private property will be needed to execute the field investigation. EPA will be responsible for obtaining site access. CDM Smith will assist EPA with site access. CDM Smith will provide a list of owners of properties (public and private) to be accessed during the field activities. The list will include the mailing addresses and telephone numbers of the property owners. Once EPA has established that access has been granted, sampling activities can begin. CDM Smith will contact and coordinate with property owners, local officials, and appropriate government agencies to schedule sampling activities.

3.3.3 Hydrogeological Assessment

The purpose of the hydrogeologic assessment is to determine if there are contaminants discharging from groundwater into the creek in areas with previously known environmental concerns (primarily from the Industrial Park section of the creek). Figure 1-3 shows the areas of the Industrial Park that are of interest based on the past site use.

The investigation will focus on the industrial areas, will use existing wells if the monitoring well assessments determines they are useable, and will be defined based on previous investigations and past site use. Key areas will include: the former raceway, the lagoon, the former MGP plant, the Market Street Industrial Park area, and the former Axton Cross and Three Star properties. A limited number of additional screening samples will be collected further downstream in accessible areas that show potential for GW discharge into the creek during reconnaissance.

Data will not be collected during the limited hydrogeological investigations to provide a detailed estimate of groundwater flux and contaminant loading to the creek, but that information could be collected in a separate phase if determined that groundwater contamination could be a significant input of contamination into the creek. These additional investigations could include seepage monitoring using SPMEs and peepers, additional monitoring well installation, in-creek piezometers and hydrogeologic/ contaminant modeling activities. Any additional activities would be discussed following an RI data summary meeting and scoped at a later date.

The hydrogeologic assessment will include reconnaissance activities, collection of groundwater screening samples, and installation, development, and sampling of monitoring wells (monitoring well sampling is included in Task 3.3.5.4). A summary of the investigation activities is presented on Table 3-1.

3.3.3.1 Existing Monitoring Well Assessment and Groundwater Discharge Reconnaissance

Existing monitoring well evaluation

Reconnaissance will be conducted to locate existing wells in the Industrial Park area and assess their viability for groundwater elevation measurements and sampling. This will include locating previously installed monitoring wells, assessing their condition, and measuring the depth to bottom.

Thermal-infrared camera drone-based aerial photography

Thermal infrared camera (TIC) drone-based imagery will be collected by the subcontract surveyor during winter or summer to locate areas where groundwater is discharging to the creek. The dataset will be reviewed to determine locations at which to perform groundwater screening (upland and in-creek).

3.3.3.2 Groundwater Screening

Prior to installing monitoring wells, groundwater screening samples will be collected in upland areas adjacent to Wappinger Creek and below the creek (in-creek) to assess the groundwater quality and determine potential monitoring well locations. Locations will be identified based on-site reconnaissance, thermal-infrared aerial imagery, and site history. It is assumed that groundwater screening will be performed at 24 locations (12 upland and 12 in-creek) using screen-point samplers. The upland groundwater screening samples will be collected from the upper portion of the unconfined aquifer. The in-creek groundwater screening samples will be collected from the upper portion of the glacial substrate.

Upland Groundwater Screening (Figure 3-1a)

- Nine groundwater screening samples will be collected from shallow groundwater in areas immediately adjacent to the creek in the Industrial Park area.
- Three groundwater screening samples will be collected from shallow groundwater in areas immediately adjacent to the creek in downstream areas that show significant potential for groundwater discharge in the creek.
- Locations will be based on areas of previously identified groundwater impacted and past site use as well as a review of TIC imagery.
- Samples will be collected using Geoprobe screen-point samplers from the upper portion of the unconfined aquifer.

In-Creek Groundwater Screening (Figure 3-1a)

- Seven groundwater screening samples will be collected from within the creek in the Industrial Park area.
- Five groundwater screening samples will be collected from within the creek in downstream areas that show potential for groundwater discharge in the creek.
- Groundwater screening samples from within the creek will target the upper portion of the glacial substrate within the creek, just below the interface of the fluvial sediments and the more consolidated glacial substrate.
- Locations will be based on TIC imagery and installed adjacent to areas of previously identified groundwater impacts.
- Samples will be collected using temporary piezometers.

3.3.3.3 Monitoring Well Installation and Development

Shallow monitoring wells will be installed based on groundwater screening sample results. It is assumed that groundwater contamination is limited to the Industrial Park area and that following groundwater screening, a limited number of wells would be installed where contamination is observed. It is assumed that 6 new shallow monitoring wells will be installed and developed, and installation activities will include collecting, screening, and logging soil cores. This work plan assumes the following:

- Four monitoring wells will be installed in shallow groundwater in the Industrial Park area (one on the north side and three on the south side).

- Two monitoring wells will be installed in downstream areas where groundwater contamination was detected during groundwater screening. If no groundwater contamination is detected downstream, monitoring wells will be installed adjacent to the two downstream creek gauging transects.
- The six new monitoring wells will be developed. Two existing monitoring wells will also be developed, if necessary.

The scope for the installation of monitoring wells may be reduced if monitoring wells are located and deemed usable during the groundwater discharge reconnaissance.

3.3.3.4 Groundwater/Surface/Tidal Water Interaction Investigation

An investigation will be conducted to investigate the nature of groundwater/surface/tidal water interactions in the creek and understand stream flow response in relation to precipitation events. The monitoring will include stream flow gauging and 3-week continuous water level/ salinity measurements at three locations during wet (post-snow melt) and dry (late summer) seasons.

The three transect locations will be established in the Industrial Park, embayment, and lower shoal/confluence sections. A staff gauge and stilling well will be installed in each transect and a profile of water depth and groundwater velocity will be created for each transect to facilitate estimates of creek discharge.

The data will be utilized along with data from the gauging station at Wappingers Falls to understand surface water inputs into the Site and better characterize the nature of the various creek sections (fresh water vs. estuarine). If monitoring wells are installed or existing wells located as part of the hydrogeologic assessment described above, a limited number of these monitoring wells will also be monitored during the 3-week period to characterize the connection between the shallow aquifer and Wappingers Creek. It is assumed that three monitoring wells will be monitored.

3.3.4 Soil Boing, Drilling, and Testing

Per the EPA SOW, this subtask is not applicable.

3.3.5 Environmental Sampling

Environmental samples will be collected at the Site to fill data gaps in previously sampled site media. Samples will be collected including:

- Sediment Sampling
- Surface Water Sampling
- Groundwater Sampling
- Mercury Vapor Sampling

The Site has been divided into five sections due to the differing physical characteristics and access limitations of each section. The sections of the Site are identified on Figure 1-2. The sections are the Industrial Park section (Figure 3-1a), upper shoal section (Figure 3-1b), the embayment section (Figure 3-1b), the lower shoal section (Figure 3-1c), and the confluence (Figure 3-1d). One additional area was selected to provide representative data from an upstream area (Wappinger Lake) (Figure 3-1e). Sample numbers and locations are assumed, but with the consent of EPA, may be adjusted following site reconnaissance. Sampling will be performed as described in the following subsections.

3.3.5.1 Sediment Sampling

The purpose of sediment sampling is to delineate the horizontal and vertical extent of contamination at the Site. Sediment cores will be collected via a barge-mounted vibracore system in transects along the length of the Site and in Wappinger Lake. The transects span the width of the creek and are spaced approximately 200 to 250 feet apart in areas of known contamination. Sediment cores for each transect in areas of known contamination are spaced approximately 30 to 50 feet apart. Moving downstream past the embayment section in the lower shoal and confluence sections, the transect spacing is approximately 500 feet. Sediment cores in these transects are spaced approximately 100 feet apart. A total of 166 sediment cores will be advanced including:

- 136 in Wappinger Creek
- 10 in Wappinger Lake
- Additional Cores – it is assumed an additional 20 cores will be advanced based on the site reconnaissance or field observations

A mix of deep and shallow sediment cores will be collected. Sediment cores will be advanced to the contact between fluvial sediment deposits and glacial material and will include a maximum of 2 feet of glacial material. If glacial material is not encountered or cannot be identified, deep cores will be collected to a maximum depth of 8 feet bss or to refusal if refusal is less than 8 feet bss, and shallow cores will be collected to a maximum depth of 4 feet bss or to refusal if refusal is less than 4 feet bss.

Cores will be scanned with a mercury vapor detector and a photoionization detector (PID) for mercury vapor and organic vapors, respectively, and will be described for lithology. It is expected that four analytical samples will be collected from each shallow sediment core, and five analytical samples will be collected from each deep sediment core. Sample intervals may need to be adjusted based on depth to glacial material in sediment. Changes in sample intervals will be reviewed and approved by EPA. Sediment core locations are also subject to change based on the width of the channel and the bathymetry survey.

The rationale for collecting a mixture of shallow and deep cores is to collect enough data to complete the RI and risk assessments, and to provide information to develop remedial alternatives in the FS. The sampling approach is focused on collection of all analytical parameters from the 0-inch horizon in support of risk assessments, and collection of the known creek contaminants in the deeper intervals to support delineation of the depth of contamination. VOCs will be collected from the 6-12 inch interval to minimize the likelihood of VOCs volatilizing in sediments in the top 6 inches. Sample analyses are presented in Tables 3-1 and 3-2. Sampling and analytical methods will be detailed in the QAPP.

Industrial Park Section (Figure 3-1a)

- Eleven transects of sediment cores (T1 - T11) will be collected within the industrial area section.
- The number of sediment cores collected along each transect ranges from 3 to 4. A total of 37 sediment cores will be collected in this area, which includes 4 shallow cores and 33 deep cores.

Upper Shoal Section (Figure 3-1b)

- Three transects of sediment cores (T12 - T14) will be collected within the upper shoal section.
- Five sediment cores, will be collected along each transect for a total of 15 cores, including 6 shallow cores and 9 deep cores.

Embayment Section (Figure 3-1b)

- Three transects of sediment cores (T15 - T17) will be collected within the embayment section.
- The number of sediment cores collected along each transect ranges from 6 to 7. A total of 19 sediment cores will be collected in this area, which includes 9 shallow cores and 10 deep cores.

Lower Shoal Section (Figure 3-1c)

- Eight transects of sediment cores (T18 – T25) will be collected within the lower shoal section.
- The number of sediment cores collected along each transect ranges from 4 to 7 due to the varying widths of the channel. A total of 43 sediment cores will be collected in this area, which includes 18 shallow cores and 25 deep cores.

Confluence (Figure 3-1d)

- Five transects of sediment cores (T26 – T30) will be collected within the confluence area, which includes one transect in the Hudson River (T30).
- The number of sediment cores collected along each transect ranges from 3 to 5 due to the varying widths of the channel. A total of 22 sediment cores will be collected in this area, which includes 9 shallow cores and 13 deep cores.

Wappinger Lake (Figure 3-1e)

- Two transects of sediment cores (U1 – U2) will be collected in Wappinger Lake, upstream of the Site.

- A total of 10 deep sediment cores will be collected in this area. No shallow cores are planned.

Waste Characterization Sediment Sampling

In order to better characterize the types of wastes in the creek and develop remedial alternatives in the FS, two composite samples will be collected from one sediment core location in each section of the creek from 0 to 2 feet bss, for a total of 10 composite samples. The two composite sample locations will be biased to represent different contaminant levels, different types of soil, and depth intervals. Sample analyses are presented in Tables 3-1 and 3-2.

Bank and Floodplain/Wetland Sampling

Bank and wetland sampling will be conducted to characterize the presence of contaminants within potentially erodible material along the bank of the creek and also in low-lying floodplains or wetland areas immediately adjacent to the creek. Any contamination in these areas may act as a continuing source of contamination as storm events may redistribute this sediment contamination into the creek.

Erodible bank sampling locations will be identified in areas of the creek bank with visual evidence of potentially erodible material between the OHW level and the mean low water level. Floodplain and wetland sampling locations will be determined following review of the topographic/ bathymetric mapping, wetland maps, and site reconnaissance. It is assumed the sampling locations will be biased toward the industrial area in areas of previously known contamination. Following the determination of sampling locations, sediment samples will be collected from 0 to 2 feet bgs during low tide at each location. Sediment cores will be collected using a hand auger as sampling locations should not be inundated at the time of sediment sampling.

Sediment cores will be scanned with a mercury vapor detector and a PID for mercury vapor and organic vapors, respectively, and the lithology will be described and logged. Sample analyses are presented in **Tables 3-1** and **3-2**. For planning purposes, it is assumed that one sample will be collected per creek transect for a total of 30, 2-foot sediment cores.

3.3.5.2 Surface Water Sampling

The purpose of surface water sampling is to characterize contaminants present within the surface water in Wappinger Creek. Two rounds of surface water samples will be collected – one under low-flow conditions (baseflow to the extent possible) in the late summer and one under high-flow conditions in the spring (post snow-melt) or following a rainfall event. The purpose of low-flow sampling is to assess baseline transport conditions. The purpose of high-flow sampling is to assess contaminant transport under conditions when contaminants are likely to be mobilized from creek sediments. Both rounds will target the same locations.

Low and high flow conditions will be determined following review of the data generated during the tidal/surface water interaction Investigation described above. Mobilization protocol for the dry and wet weather sampling will be detailed in the QAPP.

Surface water samples will be collected at a rate of two samples per transect – one in the main creek channel and one in shallower shoal or other areas determined during reconnaissance including from point sources (storm sewer discharges, pipe discharges etc.) or at the confluence of smaller tributaries. Samples will be collected at least 6 inches from the bottom of the creek. Surface water sampling will be performed separately from the sediment sampling. The sampling locations will be sampled starting with downstream locations moving in the upstream direction to minimize potential mobilization of contamination into the water column. Sample analyses are presented in Tables 3-1 and 3-2. Sampling and analytical methods will be detailed in the QAPP.

Industrial Area Section (Figure 3-1a)

- Surface water samples will be collected from 22 surface water locations, approximately two from each transect, including several adjacent to the raceway, lagoon, or any active or inactive pipe discharges to the creek from the former industries.

Upper Shoal Section (Figure 3-1b)

- Surface water samples will be collected from 6 surface water locations, approximately two from each transect, including one at T14 at the discharge of the unnamed tributary.

Embayment Section (Figure 3-1b)

- Surface water samples will be collected from 6 surface water locations, approximately two from each transect, including three within the embayment.

Lower Shoal Section (Figure 3-1c)

- Surface water samples will be collected from 16 surface water locations, approximately two from each transect.

Confluence (Figure 3-1d)

- Surface water samples will be collected from 10 surface water locations, approximately two from each transect.

Wappinger Lake (Figure 3-1e)

- Upstream surface water samples will be collected from 4 surface water locations, approximately two from each transect.

3.3.5.3 Groundwater Sampling

The purpose of groundwater sampling is to further characterize groundwater in areas where contamination was observed during the hydrogeologic assessment. Two rounds of groundwater sampling from new and existing monitoring wells (those deemed usable) will be conducted. It is assumed that a total of eight groundwater samples will be collected in each round. Sample analyses are presented in Tables 3-1 and 3-2. Sampling and analytical methods will be detailed in the QAPP.

Industrial Area Section (Figure 3-1a)

- Groundwater samples will be collected from the 4 newly installed monitoring wells in the Industrial Park Area (one on the northern side of the Industrial Park area and one on the southern side of the Industrial Park area).
- Groundwater samples will be collected from the 2 existing monitoring wells in the Industrial Park Area that are determined to be accessible and usable.

Downstream Areas

- Groundwater samples will be collected from the two newly installed monitoring wells downstream of the Industrial Park Area.

3.3.5.4 Air Sampling

Ambient air samples for mercury vapor will be collected at locations along the banks of the creek. Samples will be biased to areas of known mercury contamination, elevated mercury vapor readings during sediment sampling, and areas accessible to recreators.

- Sample analysis is presented in Tables 3-1 and 3-2. Active (versus passive) air sampling for mercury vapor will be conducted using sorbent tubes and calibrated air pumps. Sampling methods will be detailed in the QAPP.

3.3.6 Ecological Characterization

An ecological field investigation of the Site will be conducted to characterize ecological conditions along potential contaminant migration pathways to support the RI, SLERA and likely a BERA. Activities include a review of existing information, identification of federal- and state-listed threatened/endangered species and critical habitats and an ecological field investigation for habitat characterization, and identification of impacted ecological receptors.

3.3.6.1 Ecological Reconnaissance

Habitat Characterization

The purpose of the field effort is to identify site habitats both within and near the Site that may potentially be affected by site contaminants. Conditions of the Site and adjacent area will be visually inspected. CDM Smith will take representative photographs to document field activities. Observations of general site habitats, wildlife utilization, and potential contaminant exposure pathways will be made, and will include the types of information summarized below.

- Vegetation cover types on and in areas immediately adjacent to the Site
- Dominant vegetation species and general visual observations of abundance/diversity
- Topographic features (e.g., drainages)
- Location of surface waters and their general aquatic habitat characteristics (e.g., approximate size, flow and direction, bottom substrate, and plant coverage)

- Observations of wildlife use, including (to the extent practicable) species identification and evidence of usage
- Indications of environmental stress that may be related to site contaminants

The results of this characterization will be included in the SLERA and in the ecological characterization section of the RI report.

Identification of Threatened and Endangered Species and Critical Habitats

Information regarding the presence of threatened and endangered species, and ecologically sensitive environments that may exist at or near the Site will be requested in writing from EPA and NYSDEC. Correspondence received will be reviewed and may be used during the ecological reconnaissance to verify agency findings. Agency search results will be presented, summarized, and discussed in the RI report and provided to EPA for the SLERA report.

3.3.6.2 Wetland Delineation

The Clean Water Act regulations define wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (40 CFR 230.3(t)).

No formal jurisdictional wetland delineation has been performed for the Wappinger Creek study area, and no delineation is proposed for this work plan. The NYSDEC Environmental Resource Mapper (http://www.dec.ny.gov/gis/erm/) does not list any state-regulated freshwater wetlands downstream of the Wappingers Lake dam. However, NYSDEC does indicate that there are significant natural communities along and around Wappingers Creek (Figure 3-2).

The U.S. Fish and Wildlife Service National Wetlands Inventory Wetlands Mapper (https://www.fws.gov/wetlands/data/Mapper.html) lists the length of Wappingers Creek downstream of the Wappingers Lake dam to the CR28 bridge as Riverine (R1UBV), and the creek downstream of the CR28 bridge to the Hudson River as Estuarine and Marine Deepwater (E1UBL6). The low-lying area on the upstream end of the embayment is classified as Freshwater Forested/Shrub Wetland (PFO1S) (Figure 3-2).

3.3.7 Geotechnical Survey

Per the EPA SOW, this subtask is not applicable.

3.3.8 Investigation-Derived Waste Characterization and Disposal

CDM Smith will characterize and dispose of IDW in accordance with local, state, and federal regulations as specified in the QAPP and the Guide to Management of Investigation-Derived Wastes (EPA 1992).

3.4 Task 4 – Sample Analysis

3.4.1 Innovative Methods/Field Screening Sample Analysis

Per the EPA SOW, this subtask is not applicable.

3.4.2 Analytical Services Provided via CLP or DESA

CDM Smith will request analytical services for the samples collected during this field program. Analysis of these samples will be performed by Region 2 Division of Environmental Science and Assessment (DESA) or CLP. Table 3-**1** summarizes the sampling program. Samples will be analyzed in compliance with EPA's FASTAC procedure.

3.4.3 Non-Routine Analytical Services (Optional)

Non-RAS may be necessary based on the final analyte list selected, and EPA CLP laboratory availability. CDM Smith will procure a subcontract laboratory if necessary, once directed by EPA to do so.

3.5 Task 5 – Analytical Support and Data Validation

CDM Smith will ensure that all subcontracted laboratory analyses are performed in accordance with generally-accepted EPA methods, and all analytical data from subcontract laboratories will be submitted to EPA in a CLP-deliverable format.

3.5.1 Prepare and Ship Samples

CDM Smith will prepare and ship the analytical samples collected under Task 3 in accordance with the approved QAPP.

3.5.2 Sample Management

CDM Smith will perform sample management for the activities described below. Sample management will be coordinated by the analytical services coordinator.

- Coordinate with the EPA Sample Management Office, the Region 2 sample control coordinator, DESA, and other applicable EPA sample management offices regarding analytical, data validation, and QC issues.
- Implement the EPA-approved laboratory QA program to provide oversight of in-house and subcontract laboratories. (This activity will be performed only if Subtask 3.1.9 is performed under this WA.)
- Provide chain-of-custody, sample retention, and data storage functions in accordance with the approved QAPP, QMP, and RAC 2 contract requirements. CDM Smith will ensure that accurate chain-of-custody procedures are implemented and carried out for sample tracking, protective sample packing is performed, and proper sample preservation techniques are used.

3.5.3 Data Validation (optional)

If directed to do so by EPA, CDM Smith will validate/evaluate 100 percent of any non-RAS sample data to ensure that the data meets the quality objectives for data use. CDM Smith will perform the activities summarized below for surface water and sediment samples analyzed by the subcontract laboratory for review results against validation/evaluation criteria:

- Review the data and make a data usability determination

- Provide a data validation report to the EPA RPM after all data have been validated

3.6 Task 6 - Data Evaluation

This task includes efforts related to the compilation of analytical and field data. All validated data generated during this RI will be entered in an EQuIS database to meet EPA Region 2 electronic data deliverable (EDD) requirements. Tables, figures, and maps will be generated from the data to support preparation of the RI report, the HHRA report, the SLERA report, and the FS report. The data will be reviewed and carefully evaluated to identify the nature and extent of site-related contamination.

3.6.1 Data Usability Evaluation

CDM Smith will evaluate the usability of the data, including any uncertainties associated with the data. The data validation reports will be reviewed and field sampling techniques, results of self or independent assessments, laboratory analytical methods and techniques, and data validation will all be considered in evaluating the usability of the data. The usability of the data will be evaluated using the DQOs as defined in the QAPP. Any rejected data will be discussed in the data evaluation meeting (see **Section 3.6.4**).

3.6.2 Data Reduction, Tabulation, and Evaluation

This subtask will include reduction, tabulation, and evaluation of the data collected during the RI field activities. This subtask includes the activities described below.

Database Management

Data will be stored in EQuIS and can be exported as required to support the analysis and presentation of data using gINT, Microsoft Excel, ArcMAP, graphic software, AutoCAD, Surfer, and other applications. Database management activities, including upload of field sample information, will be performed for the samples to be collected during the RI field program (including field quality control samples), as summarized on Table 3-1.

All data entry will be QC checked. Tables that compare analytical result with both state and federal groundwater standards will be prepared and evaluated.

Core Logs

Core logs will be created for all sediment core locations installed during the field investigations. At the end of the project, boring data will be transferred to EQuIS.

Figures

CDM Smith will create a geographic information system to facilitate spatial analysis of the data and to generate figures for the RI, HHRA, SLERA, and FS reports, and presentations.

Electronic Data Deliverable

CDM Smith will prepare an EDD in accordance with EPA Region 2 EDD requirements. The EDD will include the analytical and geologic data generated during the RI.

3.6.3 Modeling (Optional)

If EPA determines that performance of this subtask is necessary, EPA will issue a WA amendment to formally incorporate performance of this requirements into the WA.

CDM Smith will evaluate the existing data collected under the field investigation and assess the need for modeling to complete an accurate characterization of the nature, extent, distribution, and movement of site contamination. This evaluation will also cover the historical distribution and movement of site contamination (forensic modeling) to help identify potential source areas, utilizing the results of the chemical fingerprinting analysis.

CDM Smith will provide a technical memorandum to the EPA RPM summarizing the results of this evaluation and recommendations concerning performance of modeling for this Site. Based on its review of this technical memorandum, EPA will determine whether modeling will be conducted for this RI/FS, and will direct CDM Smith to perform a modeling effort, if required.

3.6.4 Data Evaluation Report

CDM Smith will evaluate and present results in a data evaluation summary meeting in lieu of data evaluation report, to be arranged through the EPA RPM. The meeting will include an evaluation of historical data, identification of gaps that may be addressed as part of the RI, summary of data gathered as part of the field investigation, and identification of data gaps for future investigations. If additional analytical data are needed or if significant data problems are identified, CDM Smith will provide a separate memorandum describing these problems for review by the EPA RPM.

3.7 Task 7 - Assessment of Risk

The risk assessment will determine whether site contaminants pose a future potential risk to human health and the environment in the absence of any RA. The RA will be used to determine whether remediation is necessary at the Site, provide justification for performing an RA, and determine which exposure pathways need to be remediated. CDM Smith will perform the risk assessment, addressing the contaminant identification, exposure assessment, toxicity assessment, and risk characterization, in accordance with the requirements of the following subtasks.

3.7.1 Baseline Human Health Risk Assessment

CDM Smith will perform a baseline HHRA in accordance with the Risk Assessment Guidance for Superfund, Volume I – Human Health Evaluation Manual (EPA 2001), using the most current toxicity values. CDM Smith will prepare the HHRA in accordance with the approach and parameters described in the approved PAR. The currently-envisioned scenarios and receptors are described in Section 3.1.13.

Draft Baseline Human Health Risk Assessment

Hazard Identification. CDM Smith will identify and describe the COPCs based on their intrinsic toxicological properties.

Dose-Response Assessment. CDM Smith will select the contaminants of concern based on their intrinsic toxicological properties.

Characterization of Site and Potential Receptors. CDM Smith will identify and characterize human populations in the exposure pathways.

Exposure Assessment. The exposure assessment will identify the magnitude of actual or potential human exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. The exposure assessment will include an evaluation of the likelihood of such exposures occurring and will provide the basis for the development of acceptable exposure levels. In preparing the exposure assessment, CDM Smith will develop reasonable maximum estimates and central tendencies of exposure (when appropriate) for potential future land use conditions at the Site. CDM Smith will clearly explain and justify the rationale for use of site-specific over default exposure factors.

<u>Toxicity Assessment</u>. CDM Smith will list all toxicity values (slope factors and reference doses) for the COPCs and the sources of the toxicity values, in accordance with EPA's current toxicity hierarchy specified in Human Health Toxicity Values in Superfund Risk Assessments (EPA 2003). CDM Smith will submit chemicals without assigned toxicity values in Tiers 1 and 2 to EPA for determination of the appropriate value.

<u>Risk Characterization</u>. During risk characterization, CDM Smith will compare chemical-specific toxicity information, combined with quantitative and qualitative information from the exposure assessment, to measured levels of contaminant exposure and the levels predicted through environmental fate and transport modeling. These comparisons will determine whether concentrations of contaminants at or near the Site are affecting or could potentially affect human health. Based on these results, CDM Smith will also address other concerns important to the risk characterization, such as a qualitative discussion of chemicals without toxicity data and how concentrations found onsite relate to background concentrations.

<u>Identification of Limitations/Uncertainties</u>. CDM Smith will identify critical assumptions and uncertainties (e.g., background concentrations and conditions, modeling inputs, toxicity data, environmental data, etc.) in the report.

<u>CSM</u>. CDM Smith will develop a conceptual model of the Site based on the contaminant identification, exposure assessment, toxicity assessment, and risk characterization. The model will initially be submitted as part of Subtask 3.1.13.

Final Baseline Human Health Risk Assessment Report

CDM Smith will submit the final baseline HHRA report, which will incorporate EPA review comments.

3.7.2 Baseline Screening Level Ecological Risk Assessment

CDM Smith will perform SLERA in accordance with the current Superfund ecological risk assessment guidance Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments (EPA 1997). CDM Smith will compare the maximum contaminant concentrations in each medium of concern to appropriate conservative ecotoxicity screening values (e.g., NYSDEC Ambient Water Quality Standards and Guidance Values, and NYSDEC Sediment Guidance Values), and will use conservative exposure estimates. COPCs will be identified, and representative species identified along with applicable toxicity reference values. EPA will review and approve the SLERA and determine whether a full BERA is required. At EPA's direction, CDM Smith will perform a BERA in accordance with ERAGS. The SLERA will evaluate and assess the risks to the environment posed by site contaminants. The activities described below will be performed.

Draft Screening Level Ecological Risk Assessment Report

CDM Smith will prepare a draft SLERA report that addresses the topic described below.

Hazard Identification (sources). CDM Smith will review available information on the hazardous substances present at the Site and identify the major contaminants of concern.

Dose-Response Assessment. CDM Smith will identify and select contaminants of concern based on their intrinsic toxicological properties.

Characterization of Site and Potential Receptors. CDM Smith will identify and characterize environmental exposure pathways.

Select Chemicals, Indicator Species, and End Points. In preparing the assessment, CDM Smith will select representative chemicals, indicator species (species that are especially sensitive to environmental contaminants), and end points on which to concentrate.

Exposure Assessment. The exposure assessment will identify the magnitude of actual or environmental exposures, the frequency and duration of these exposures, and the routes by which receptors are exposed. The exposure assessment will include an evaluation of the likelihood of such exposures occurring and will provide the basis for development of acceptable exposure levels. In preparing the exposure assessment, CDM Smith will develop reasonable maximum estimates of exposure for both current and potential land use conditions at the Site.

Toxicity Assessment/Ecological Effects Assessment. The toxicity and ecological effects assessment will address the types of adverse environmental effects associated with chemical exposures, the relationships between magnitude of exposure and adverse effects, and the related uncertainties for contaminant toxicity (e.g., weight of evidence for a chemical's carcinogenicity).

Risk Characterization. As part of the risk characterization, CDM Smith will compare chemical-specific toxicity information, combined with quantitative and qualitative information from the exposure assessment, to measured levels of contaminant exposure levels and the levels predicted through environmental fate and transport modeling. These comparisons will determine whether concentrations of contaminants at or near the Site are affecting or could potentially affect the environment.

Identification of Limitations/Uncertainties. CDM Smith will identify critical assumptions (e.g., background concentrations and conditions) and uncertainties in the report.

CSM. CDM Smith will develop a conceptual model of the Site based on contaminant identification, exposure assessment, toxicity assessment, and risk characterization.

Final Screening Level Ecological Risk Assessment Report

CDM Smith will submit the final SLERA report incorporating EPA review comments.

3.8 Task 8 - Treatability Study and Pilot Testing

In accordance with the SOW, this task is currently not applicable to this WA.

3.9 Task 9 – Remedial Investigation Report

CDM Smith will develop and submit an RI report that accurately establishes site characteristics including the identification of contaminated media, definition of the extent of contamination in site media, and delineation of the physical boundaries of contamination. CDM Smith will obtain detailed sampling data to identify key contaminants and determine the movement and extent of contamination in the environment. Key contaminants will be identified in the report and will be selected based on toxicity, persistence, and mobility in the environment.

3.9.1 Draft Remedial Investigation Report

A draft RI report will be prepared in accordance with the format described in EPA guidance documents such as the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA 1988). A draft outline of the report, adapted from the 1988 guidance, is shown in Table 3-3. This outline should be considered draft and subject to revision based on the data obtained. EPA's SOW for this WA provides a detailed description of the types of information, maps, and figures to be included in the RI report. CDM Smith will incorporate such information to the fullest extent practicable.

Upon completion, the draft RI report will be submitted to EPA, state, and federal agencies, as directed by EPA, for formal review and comment.

3.9.2 Final Remedial Investigation Report

Upon receipt of all EPA and other federal and state comments, CDM Smith will develop responses to significant comments, and finalize the report incorporating EPA approved responses prior to submittal.

3.10 Task 10 – Remedial Alternative Screening

This task covers the development of appropriate remedial alternatives that will undergo full evaluation. The alternatives will encompass a range, including innovative treatment technologies, consistent with the regulations outlined in the NCP, 40 CFR Part 300, the Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (EPA 1998), and other applicable OSWER directives, policies and guidance, including Contaminated Sediment Remediation Guidance for Hazardous Waste Sites (EPA 2005b), and Remediating Contaminated Sediment Sites – Clarification of Several Key Remedial Investigation/Feasibility Study and Risk Management Recommendations and Updated Contaminated Sediment Technical Advisory Group Operating Procedures (EPA 2017).

Preliminary RAOs will be refined and developed in accordance with guidance. Based on the RAOs and the results of the risk assessment (Task 7), general response actions will be established, and technologies will be identified and screened per the EPA-recommended procedures (EPA 1988).

CDM Smith will investigate alternatives that will remediate or control contaminated media related to the Site, as defined in the RI, to provide adequate protection of human health and the environment. The potential alternatives will encompass, as appropriate, a range of alternatives in which treatment is used to reduce the toxicity, mobility, or volume of wastes but vary in the degree to which long-term management of residuals or untreated waste is required. Innovative treatment technologies will be included. One or more alternatives will be included that involve containment with little or no treatment, as well as a no-action alternative.

It is assumed that technologies and alternatives will be screened for sediment contamination.

The alternatives will be screened qualitatively against three criteria: effectiveness, implementability, and relative cost. A brief description of the application of these criteria is presented below.

- Effectiveness – The evaluation focuses on the potential effectiveness of technologies in meeting the remedial action goals; the potential impacts to human health and the environment during construction and implementation; and how proven and reliable the process is with respect to the contaminants and conditions at the Site.

- Implementability – This evaluation encompasses both the technical and administrative feasibility of the technology. It includes an evaluation of treatment requirements, waste management, and relative ease or difficulty in achieving the operation and maintenance requirements. Technologies that are clearly unworkable at the Site are eliminated.

- Relative Cost – Both capital cost and operation and maintenance cost are considered. The cost analysis is based upon engineering judgment, and each technology is evaluated as to whether costs are high, moderate, or low relative to other options within the same category.

The screening evaluation will generally focus on the effectiveness criterion, with less emphasis on the implementability and relative cost criteria. Technologies surviving the screening process are those that are expected to achieve the RAOs for the Site, either alone or in combination with others.

3.10.1 Draft Remedial Alternatives Screening Technical Memorandum

CDM Smith will prepare a technical memorandum and attend a meeting with EPA to describe the results of the remedial technology screening. The memorandum will include the information summarized below.

- <u>RAOs</u>. CDM Smith will identify site-specific RAOs that protect human health and the environment. The objectives will specify the contaminant(s) and media of concern, the exposure route(s) and receptor(s), and an acceptable contaminant level or range of levels for each exposure route (i.e., preliminary remediation goals).

- <u>General RAs</u>. CDM Smith will identify general response actions for each medium of interest by defining containment, treatment, removal, disposal, or other actions, singly or in combination to satisfy RAOs. The RAs will consider requirements for protectiveness as identified in the RAOs and the chemical and physical characteristics of the Site.

- <u>Identification and Screening of Applicable Remedial Technologies</u>. CDM Smith will identify and screen technologies based on the general RAs. Hazardous waste treatment technologies will be identified and screened to ensure that only those technologies applicable to the contaminants present, their physical matrix, and other site characteristics

CDM Smith

will be considered. This screening will be based primarily on a technology's ability to address the contaminants at the Site effectively but will also consider that technology's implementability and relative cost. CDM Smith will select representative process options, as appropriate, to carry forward into alternative development and will identify the need for treatability testing for those technologies that are probable candidates for consideration during the detailed analysis.

- Development of Remedial Alternatives in accordance with the NCP. After the screening of the applicable remedial technologies and process options, CDM Smith will develop remedial action alternatives by combining the retained remedial technologies and process options. Remedial alternatives are developed from either stand-alone process options or combinations of the retained process options.

- Screening of Remedial Alternatives. Depending on the number of alternatives developed, CDM Smith will provide recommendations whether screening of remedial alternatives will or will not be necessary. EPA's guidance indicates that when the number of viable or appropriate alternatives for addressing site problems are limited, the screening efforts may be eliminated. If screening of remedial alternatives is necessary, CDM Smith will screen alternatives with respect to effectiveness, implementability, and costs. Only alternatives judged as the best or most promising on the basis of these evaluation factors will be retained for further consideration and analysis.

The technical evaluations completed as part of this task will also be summarized and presented to EPA in a technical meeting following submission of the technical memorandum.

3.10.2 Final Technical Memorandum

As directed by EPA, this subtask is not applicable. EPA's review comments on the technical memorandum will be incorporated into the draft FS report as described in Section 3.12.1.

3.11 Task 11 – Remedial Alternatives Evaluation

CDM Smith will develop detailed descriptions of individual remedial alternatives, initiate the assessment of the alternatives against seven evaluation criteria, and complete the comparative analysis of remedial alternatives with respect to the evaluation criteria. The analysis will be consistent with the NCP, 40 CFR Part 300 and will consider the Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA (EPA 1988) and other pertinent guidance.

The nine criteria are: (1) overall protection of human health and the environment; (2) compliance with ARARs; (3) long-term effectiveness; (4) reduction of toxicity, mobility, or volume; (5) short-term effectiveness; (6) implementability; (7) cost; (8) state acceptance; and (9) community acceptance. State acceptance and community acceptance are usually determined after the FS and as such, an evaluation of the remedial alternatives with respect to these criteria will not be included in the FS.

3.11.1 Technical Memorandum

CDM Smith will prepare a technical memorandum that addresses the following: (1) a technical description of each alternative; (2) identifies the key ARARs associated with each alternative and how the alternative will achieve the RAOs and meet ARARs; (3) a discussion that profiles the performance of that alternative with respect to each of the evaluation criteria; and (4) any potential implementation issues.

Alternatively, CDM Smith will meet with EPA (in lieu of a technical memorandum) to discuss the remedial alternatives and their evaluation using the screening criteria. The meeting will cover the topics discussed in the paragraph above.

3.11.2 Final Technical Memorandum

CDM Smith will incorporate EPA's review comments on the draft technical memorandum or from the technical memorandum meeting into the draft FS report prepared under Task 12. Per the SOW, CDM Smith will not submit a separate final technical memorandum.

3.12 Task 12 – Feasibility Study Report

CDM Smith will develop an FS report consisting of a detailed analysis of alternatives and a cost-effectiveness analysis, in accordance with the NCP (40 CFR Part 300) as well as the most recent guidance.

3.12.1 Draft Feasibility Study Report

CDM Smith will submit a draft FS report to EPA that includes the following detailed information. The draft FS report will address comments received from EPA and other reviewers on the technical memorandum submitted under Task 10 and the technical memorandum submitted or the meeting held under Task 11.

- Summary of the RI – CDM Smith will summarize key elements of the RI including the nature and extent of contamination in all site media of concern, the fate and transport factors that affect the identified contamination, and the results of the site risk assessments.
- Establishment of the RAOs.
- Summary of general response actions.
- Screening of applicable remedial technologies – EPA may, if applicable, request that CDM Smith develop a model to support evaluation of groundwater flow and plume capture at the Site and surrounding area.
- Development of remedial alternatives in accordance with the NCP – CDM Smith will assemble technologies into remedial alternatives to address the identified contamination at the Site.
- Screening of remedial alternatives for effectiveness, implementability, and cost, if necessary.

- Development of detailed alternative descriptions – CDM Smith will develop detailed technical descriptions of each alternative that outlines the remediation strategy involved and identifies the key ARARs associated with each alternative.

- Detailed analysis of remedial alternatives against evaluation criteria – CDM Smith will present discussions that describe the performance of each alternative with respect to the evaluation criteria described in Section 3.11. The results of the analysis will be summarized in a table.

- Comparative analysis of alternatives – CDM Smith will compare the alternatives to each other, with respect to each of the evaluation criteria.

The technical feasibility considerations will include a comprehensive study of any problems that may prevent a remedial alternative from mitigating site problems. Therefore, the site characteristics from the RI will be kept in mind as the technical feasibility of the alternative is studied. Specific items to be addressed will be reliability (operation over time), safety, operation and maintenance, impact to local community, ease with which the alternative can be implemented, and time needed for implementation.

The FS report format is shown on Table 3-4. The detailed evaluation criteria for remedial alternatives is presented in Table 3-5. The executive summary will be a brief overview of the FS and the analysis underlying the RAs that were evaluated.

The draft FS report will be reviewed by a CDM Smith technical review committee (TRC). TRC comments will be addressed prior to submittal to EPA, state, and other federal agencies as directed by EPA for formal review and comment.

3.12.2 Final Feasibility Study Report

Upon receipt of all EPA and other federal and state comments, CDM Smith will prepare and submit responses to the comments. After EPA approves the responses, the FS report will be revised and the final FS report will be submitted to EPA.

3.13 Task 13 – Post RI/FS Support

CDM Smith will provide technical support required for the preparation of the ROD, excluding community involvement activities already addressed under Task 2. Support activities will include the following items.

- Attendance at public meetings, briefings, and technical meetings to provide site updates

- Review of presentation materials

- Technical support for presentation of draft and final responsiveness summary, proposed plan, and ROD

- Preparation and review of a draft and final FS addendum (if required), based on the final ROD adopted for this Site, covering issues arising after finalization of the RI/FS documents

3.14 Task 14 – Work Assignment Closeout

Project closeout includes work efforts related to the project completion and closeout phase. Project records will be transferred to EPA.

3.14.1 Document Indexing

CDM Smith will organize its WA files in accordance with the currently approved file index structure.

3.14.2 Document Retention/Conversion

All relevant paper files will be converted into the appropriate long-term electronic storage format. The project files will be delivered to the EPA Records Center when the WA is complete.

Section 4

References

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Tables

Table 3-1
Field Sampling Program Summary
Wappinger Creek Site
Wappingers Falls, New York

Task	Description	Creek Section	Sample Locations	Sample Types	Sampling/Measurement Activities						
					Frequency / Intervals	Analytical Parameters				Field Parameters	Total Samples[1]
						Standard Laboratory Samples	Other Laboratory Samples	Geotechnical Parameters	Other		
3.1 Site Reconnaissance - Detailed Creek Reconnaissance	Detailed pre-sampling reconnaissance to assist in locating samples. Will assess general bank condition, presence/absence of mudflats, locate tributaries, seeps or point sources to the creek, general water flow (fast/slow), presence/absence of sheens, presence/absence of ebullition, presence/absence of turbidity plumes, presence/absence of impediments (dams, log jams, powerline crossings, bridges, etc.), approximate water depths, current water level vs OHW, if visible, and sediment type (sand, silt, clay).										
3.3 Groundwater Discharge Reconnaissance	Groundwater discharge reconnaissance will include an initial reconnaissance to locate existing wells in the Industrial Park area and determine all surface water/point source impacts to the creek. Following the initial reconnaissance, thermal infrared camera (TIC) drone-based imagery will be collected during winter or summer to locate areas where groundwater is discharging to the creek.										
3.3 Groundwater Screening	12 groundwater screening samples will be collected using Geoprobe screen-point samplers to target the shallow groundwater in areas immediately adjacent to the creek.	Upland - Industrial Park Area	9 locations	Screening	10-15	TCL VOCs, SVOCs, PCBs, Pest, CN, filtered and unfiltered TAL metals and total Hg	NA	NA	NA	pH, Temp, Cond, DO, Redox Potential, Turbidity, Salinity	24 sample locations
		Upland - Downgradient	3 locations								
	12 groundwater screening samples will be collected from within the creek using barge-based Geoprobe screen-point samplers to target the groundwater below the creek.	In-Creek - Industrial Park Area	7 locations		2-4						
		In-Creek - Downgradient	5 locations								
3.5.1 Sediment Sampling	32 (2 upstream, 30 in creek) transects of sediment cores to be collected using vibracore technology (or similar). Additional 20 cores will be located based on surveys or field observations. Sediments sampled to define nature and extent of contamination, complete human health and ecological risk assessments, and to provide information to develop remedial alternatives.	Wappinger Lake - upstream (U1, U2)	10 cores (10 Deep Cores)	Shallow Cores	0-0.5	TCL VOCs, SVOCs, PCBs, Pest, CN, TAL metals, Total and methyl Hg, TOC	Dioxins/ Furans from three core locations of each transect (96 total (0-0.5 feet only); % total solids	10 locations (2 from each of the creek sections). 2 samples from each location for grain size (plus hydrometer), bulk density, porosity	NA	mercury vapor and organic vapors (PID)	184 sample intervals (46 shallow cores x 4 sample intervals)
		Industrial Park Section (T1-T11)	37 cores (33 Deep/ 4 Shallow)								
		Upper Shoal Section (T12-T14)	15 cores (9 Deep/ 6 Shallow)		0.5-1, 1-2, 2-4	TCL VOCs (Only 0.5-1), SVOCs, TAL Metals, TOC					
		Embayment Section (T15-T17)	19 cores (10 Deep/ 9 Shallow)	Deep Cores	0-0.5	TCL VOCs, SVOCs, PCBs, Pest, CN, TAL metals and Total and methyl Hg, TOC					600 sample intervals (120 deep cores x 5 sample intervals)
		Lower Shoal (Downstream) Section (T18-T25)	43 cores (25 Deep/ 18 Shallow)								
		Confluence Section (T26-T30)	22 cores (13 Deep/9 Shallow)		0.5-1, 1-2, 2-4, 4-8	TCL VOCs (Only 0.5-1), SVOCs, TAL Metals, TOC					
		Additional Locations	20 cores (20 Deep)								
3.5.2 Bank/Floodplain/Wetland Sampling	Bank / Floodplain/ Wetland Sampling - would look at erodible material along bank of creek and in low floodplain or wetland areas immediately adjacent to the creek (limited) that is potentially contaminated.	Various to be determined by reconnaissance	30 2-ft cores (assume 1 per creek transect)	2-feet Core	0-2	TCL VOCs, SVOCs, PCBs, Pest, CN, TAL metals, Total and methyl Hg, TOC	NA	NA	NA	mercury vapor and organic vapors (PID)	30 samples
3.5.3 Waste Characterization Sediment Sampling	10 composite samples - 2 collected from each portion of the creek to assist in developing remedial alternatives in the FS.	Two composite sample from each creek section	10 samples	Composite	Composite 0-2	NA	Leachability (modified SPLP for 8 RCRA metals); TCLP for 8 RCRA metals; Cyanide and sulfide reactivity	NA	NA	none	10 composite samples

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Field Sampling Program Summary
Wappinger Creek Site
Wappingers Falls, New York

Task	Description	Creek Section	Sample Locations	Sample Types	Sampling/Measurement Activities							
					Frequency / Intervals	Analytical Parameters				Field Parameters	Total Samples[1]
						Standard Laboratory Samples	Other Laboratory Samples	Geotechnical Parameters	Other		
3.5.4 Monitoring Well Sampling	Four monitoring wells will be installed in the Industrial Park area. Two rounds of monitoring well sampling will be conducted.	Industrial Park Area - North Side	1 location	Monitoring Well Sample	TBD	TCL VOCs, SVOCs, PCBs, Pest, filtered and unfiltered TAL metal and total Hg	TDS, TOC, and wet chemistry	NA	NA	pH, Temp, Cond, DO, Redox Potential, Turbidity, Salinity	8 sample locations
		Industrial Park Area - South Side	3 locations								
	Two monitoring wells will be installed in downgradient areas where groundwater contamination was detected during groundwater screening. Two rounds of monitoring well sampling will be conducted.	Downgradient	2 locations								
	Two groundwater samples will be collected from existing monitoring wells in the Industrial Park Area. Two rounds of monitoring well sampling will be conducted.	Industrial Park Area	2 locations								
3.5.4 Surface Water Studies - Surface Water Sampling (Baseflow/Low Tide)	Two rounds of 64 surface water sample, two collected at each sampling transect to understand nature and extent of contamination, complete human health and ecological risk assessments and to provide information to develop remedial alternatives. Samples will be collected in two rounds. One during the dry season at baseflow conditions, the other during the wet season following a storm event.	Wappinger Lake - upstream (U1, U2)	4 locations	Sample during dry season at low tide (baseflow)	Samples collected at least 6" off sediment surface	TCL VOCs, SVOCs, PCBs, Pest, CN, filtered and unfiltered TAL metals and total and methyl Hg	TDS, TSS, POC, DOC, and Wet chemistry	NA	NA	pH, Temp, Cond, DO, Redox Potential, Turbidity, Salinity	64 sample locations
		Industrial Park Section (T1-T11)	22 locations								
		Upper Shoal Section (T12-T14)	6 locations								
		Embayment Section (T15-T17)	6 locations								
		Lower Shoal (Downstream) Section (T18-T25)	16 locations								
		Confluence Section (T26-T30)	10 locations								
3.5.4 Surface Water Studies - Surface Water Sampling (Wet Weather/ High Tide)	Two rounds of 68 surface water sample, two collected at each sampling transect to understand nature and extent of contamination, complete human health and ecological risk assessments and to provide information to develop remedial alternatives. Samples will be collected in two rounds. One during the dry season at baseflow conditions, the other during the wet season following a storm event.	Wappinger Lake - upstream (U1, U2)	4 locations	Sample during wet season (snow-melt) at low tide.	Samples collected at least 6" off sediment surface	TCL VOCs, SVOCs, PCBs, Pest, CN, filtered and unfiltered TAL metals and total and methyl Hg	TDS, TSS, POC, DOC, and Wet chemistry	NA	NA	pH, Temp, Cond, DO, Redox Potential, Turbidity, Salinity	64 sample locations
		Industrial Park Section (T1-T11)	22 locations								
		Upper Shoal Section (T12-T14)	6 locations								
		Embayment Section (T15-T17)	6 locations								
		Lower Shoal (Downstream) Section (T18-T25)	16 locations								
		Confluence Section (T26-T30)	10 locations								

Table 3-1
Field Sampling Program Summary
Wappinger Creek Site
Wappingers Falls, New York

Task	Description	Creek Section	Sample Locations	Sample Types	Sampling/Measurement Activities						
					Frequency / Intervals	Analytical Parameters				Field Parameters	Total Samples[1]
						Standard Laboratory Samples	Other Laboratory Samples	Geotechnical Parameters	Other		
3.5.4 Surface Water Studies - Tidal/ SW Interaction	Investigation to determine the nature of tidal/surface water interaction in the creek and understand stream flow response in relation to precipitation events. Will include the installation of staff gauges and stilling wells at 3 sediment transects and the installation of transducers in 3 stilling wells and 3 monitoring wells to collect continuous water level/ salinity measurements during wet and dry seasons.	Staff gauges and stilling wells will be installed at three transect locations (Industrial Park Section, Embayment section, and Lower Shoal/Confluence Section). 3 monitoring wells will also have continuous water level/salinity measurements.	3 transects and 3 monitoring wells	Monitoring	NA	NA	NA	NA	NA	water level, temp and salinity	NA
3.5.5 Air Investigation	10 samples collected onshore in areas adjacent to mercury sediment contamination.	Various. Will be biased to areas accessible to recreators, mudflats and areas of Hg contamination.	10 samples	Composite	Grab	Total Hg	NA	NA	NA	none	10 composite samples
3.6.1 Ecological Characterization - Ecological Reconnaissance	Ecological reconnaissance will include habitat characterization and identification of T&E species and critical habitat areas.										
3.6.2 Ecological Characterization - Wetland Delineation	Wetland mapping will be taken from the NYSDEC Environmental Resource Mapper and from the USFWS National Wetlands Inventory. No formal jurisdictional wetland delineation will be performed.										

Notes:

1: Totals do not include QC samples

Abbreviations:

BOD - biochemical oxygen demand
CLP - Contract Laboratory Program
CN - Cyanide
COD - chemical oxygen demand
Cond - conductivity
DESA - Division of Environmental Science and Assessment
DO - dissolved oxygen
DOC - dissolved organic carbon

TCL - Target compound list
TOC - Total organic carbon
TDS - Total Dissolved Solids
Temp - Temperature
TSS - Total Suspended Solids
TCLP - Toxicity Characteristics Leaching Procedure
UVA - Ultraviolet absorbance

Table 3-2
Field Analytical Program Summary
Wappinger Creek Site
Wappingers Falls, New York

Analysis	Environmental Sample Count	Duplicates	Field Blanks[1]	Trip Blanks[2]	MS/MSD	Total[3]
3.3 Groundwater Screening						
TCL VOCs	24	2	8	8	2	42
TCL SVOCs	24	2	8	0	2	34
TCL Pesticides	24	2	8	0	2	34
TCL PCBs	24	2	8	0	2	34
TAL Metals + Hg (unfiltered)	24	2	8	0	2	34
TAL Metals + Hg (filtered)	24	2	8	0	2	34
Cyanide (unfilitered)	24	2	3	0	2	29
3.5.1 Sediment Sampling						
TCL VOCs	332	17	30	30	17	409
TCL SVOCs	784	40	30	0	40	854
TCL Pesticides	166	9	30	0	9	205
TCL PCBs	166	9	30	0	9	205
TAL Metals	784	40	30	0	40	854
Cyanide	166	9	30	0	9	205
Mercury	166	9	30	0	9	205
TOC	784	0	30	0	0	814
Methylmercury	46	3	30	0	3	79
Dioxins/furans	96	5	30	0	5	131
Grain Size	10	0	0	0	0	10
Bulk Density	10	0	0	0	0	10
Porosity	10	0	0	0	0	10
3.5.2 Bank/Floodplain/Wetland Sampling						
TCL VOCs	30	2	5	5	2	42
TCL SVOCs	30	2	5	0	2	37
TCL Pesticides	30	2	5	0	2	37
TCL PCBs	30	2	5	0	2	37
TAL Metals	30	2	5	0	2	37
Cyanide	30	2	5	0	2	37
Mercury	30	2	5	0	2	37
TOC	30	2	0	0	0	32
3.5.3 Waste Characterization Sediment Sampling						
Leachability (modified SPLP)	10	0	0	0	0	10
TCLP for 8 RCRA Metals	10	0	0	0	0	10
Cyanide Reactivity	10	0	0	0	0	10
Sulfide Reactivity	10	0	0	0	0	10
3.5.4 Round 1 Monitoring Well Sampling						
TCL VOCs	8	1	3	3	1	15
TCL SVOCs	8	1	3	0	1	12
TCL Pesticides	8	1	3	0	1	12
TCL PCBs	8	1	3	0	1	12
TAL Metals + Hg (unfiltered)	8	1	3	0	1	12
TAL Metals + Hg (filtered)	8	1	3	0	1	12
Cyanide (unfilitered)	8	1	3	0	1	12
TDS, TSS, TOC, chloride, sulfate, phosphate, nitrate, bicarbonate, ammonia, and alkalinity	8	1	0	0	0	9
3.5.4 Round 2 Monitoring Well Sampling						
TCL VOCs	8	1	3	3	1	15
TCL SVOCs	8	1	3	0	1	12
TCL Pesticides	8	1	3	0	1	12
TCL PCBs	8	1	3	0	1	12
TAL Metals +Hg (unfiltered)	8	1	3	0	1	12
TAL Metals + Hg (filtered)	8	1	3	0	1	12
Cyanide (unfilitered)	8	1	3	0	1	12
TDS, TSS, TOC, chloride, sulfate, phosphate, nitrate, bicarbonate, ammonia, and alkalinity	8	1	0	0	0	9

Table 3-2
Field Analytical Program Summary
Wappinger Creek Site
Wappingers Falls, New York

Analysis	Environmental Sample Count	Duplicates	Field Blanks[1]	Trip Blanks[2]	MS/MSD	Total[3]
3.5.4 Surface Water Sampling (Baseflow/Low Tide)						
TCL VOCs	64	4	6	6	4	80
TCL SVOCs	64	4	6	0	4	74
TCL Pesticides	64	4	6	0	4	74
TCL PCBs	64	4	6	0	4	74
TAL Metals + Hg (unfiltered)	64	4	6	0	4	74
TAL Metals + Hg (filtered)	64	4	6	0	4	74
Cyanide (unfiltered)	64	4	6	0	4	74
Methylmercury	64	4	6	0	4	74
TDS, TSS, POC, DOC, chloride, sulfate, phosphate, nitrate, bicarbonate, ammonia, and alkalinity	64	4	0	0	0	68
3.5.4 Surface Water Sampling (Wet Weather/High Tide)						
TCL VOCs	64	4	6	6	4	80
TCL SVOCs	64	4	6	0	4	74
TCL Pesticides	64	4	6	0	4	74
TCL PCBs	64	4	6	0	4	74
TAL Metals + Hg (unfiltered)	64	4	6	0	4	74
TAL Metals + Hg (filtered)	64	4	6	0	4	74
Cyanide (unfiltered)	64	4	6	0	4	74
Methylmercury	64	4	6	0	4	74
TDS, TSS, POC, DOC, chloride, sulfate, phosphate, nitrate, bicarbonate, ammonia, and alkalinity	64	4	0	0	0	68
3.5.4 Air Investigation						
Mercury	10	1	1	0	1	12

Assumptions:
1. It is assummed one field blank is collected per day.
2. One trip blank per cooler of VOC samples is needed. It is assumed one cooler a day will have VOC samples.
3. The total does not include MS/MSD.
4. Color coding:

CLP
LSASD
Sub Lab

Table 3-2
Field Analytical Program Summary
Wappinger Creek Site
Wappingers Falls, New York

Spreadsheet Inputs:

Groundwater Screening Locations	
Upland Groundwater Screening Locations	12
In-Creek Groundwater Screening Locations	12
Total Groundwater Screening Locations	24
Sampling Days (Assumed)	8

Number of Sediment Transects	
Upstream	2
In Creek	30
Total Transects	32
Sampling Days (Assumed)	30

Deep Sediment Cores	
Number of Sample Intervals per Core	5
Wappinger Lake (Upstream)	10
Industrial Park Section	33
Upper Shoal Section	9
Embayment Section	10
Lower Shoal (Downstream) Section	25
Confluence Section	13
Additional Locations	20
Total Deep Cores	120

Shallow Sediment Cores	
Number of Sample Intervals per Core	4
Industrial Park Section	4
Upper Shoal Section	6
Embayment Section	9
Lower Shoal (Downstream) Section	18
Confluence Section	9
Total Shallow Cores	46

Number of Bank/Floodplain/Wetland Cores	30
Number of Sample Intervals per Core	1
Sampling Days (Assumed)	5

Monitoring Well Sample Locations	
Existing Monitoring Wells	2
New Monitoring Wells	6
Total Monitoring Well Sample Locations	8
Number of sampling events	2
Sampling Days (Assumed)	3

Surface Water Sample Locations	
Wappinger Lake (Upstream)	4
Industrial Park Section	22
Upper Shoal	6
Embayment Section	6
Lower Shoal (Downstream) Section	16
Confluence Section	10
Total Surface Water Sample Locations	64
Number of sampling events	2
Sampling Days (Assumed)	6

Shallow Core Sediment Samples per Core	
TCL VOCs	2
TCL SVOCs	4
TCL Pesticides	1
TCL PCBs	1
TAL Metals	4
Cyanide	1
Mercury	1
TOC	4
Methylmercury	1

Deep Core Sediment Samples per Core	
TCL VOCs	2
TCL SVOCs	5
TCL Pesticides	1
TCL PCBs	1
TAL Metals	5
Cyanide	1
Mercury	1
TOC	5
Methylmercury	1

Total Samples	992
Total Cores	166
Total sediment samples	784

Table 3-3
Proposed Remedial Investigation Report Format
Wappinger Creek Site
Wappingers Falls, New York

1.0 Introduction
- 1.1 Purpose of Report
- 1.2 Site Background
  - 1.2.1 Site Description
  - 1.2.2 Site History
  - 1.2.3 Previous Investigations
- 1.3 Report Organization

2.0 Study Area Investigation
- 2.1 Sediment Investigation
- 2.2 Surface Water Investigations
- 2.3 Air Investigations
- 2.4 Ecological Characterization

3.0 Physical Characteristics of Site
- 3.1 Topography and Bathymetry
- 3.2 Surficial Water Flow
- 3.3 Geology
- 3.4 Hydrogeology
- 3.5 Meteorology Demographics and Land Use

4.0 Nature and Extent of Contamination
- 4.1 Data Usability
- 4.2 Selection of Site-Related Contaminants
- 4.3 Screening Criteria
- 4.4 Sediment Results
- 4.5 Surface Water Results
- 4.6 Air Results

5.0 Contaminant Fate and Transport
- 5.1 Routes of Migration
- 5.2 Contaminant Persistence
- 5.3 Contaminant Migration
- 5.4 Conceptual Site Model

6.0 Summary of Risk Assessments
- 6.1 Summary of the Baseline Human Health Risk Assessment (full report submitted separately from RI report)
- 6.2 Summary of the Screening Level Ecological Risk Assessment (full report submitted separately from RI report)

7.0 Conclusions and Recommendations
- 7.1 Conclusions by Media
- 7.2 Recommendations for Future Work

Table 3-4
Proposed Feasibility Study Report Format
Wappinger Creek Site
Wappingers Falls, New York

1.0 Introduction and Site Background
- 1.1 Purpose and Organization of Report
- 1.2 Site Description and History
- 1.3 Site Background
- 1.4 Source(s) of Contamination
- 1.5 Nature and Extent of Contamination
- 1.6 Conceptual Site Model
- 1.7 Risk Assessment Summaries

2.0 Identification and Screening of Remedial Technologies
- 2.1 Remedial Action Objectives
  - Contaminants of Interest
  - Allowable Exposure Based on Risk Assessment
  - Allowable Exposure Based on ARARs
  - Development of Remedial Action Objectives
- 2.2 Identification of Potential Applicable or Relevant and Appropriate Requirements
- 2.3 Preliminary Remediation Goals
- 2.4 Identification of Remediation Target Area
- 2.5 General Response Actions
- 2.6 Identification and Screening of Technology and Process Options
  - 2.6.1 Technology and Process Options for Groundwater
  - 2.6.2 Technology and Process Options for Offsite Soil/Sediment

3.0 Development and Initial Screening of Alternatives
- 3.1 Development of Alternatives
  - 3.1.1 Development of Common Elements
  - 3.1.2 Development of Alternatives for Groundwater
  - 3.1.3 Development of Alternatives for Offsite Soil/Sediment
- 3.2 Screening of Alternatives
  - 3.2.1 Screening of Alternatives for Groundwater
  - 3.2.2 Screening of Alternatives for Offsite Soil/Sediment

4.0 Description and Detailed Analysis of Alternatives
- 4.1 Description of Evaluation Criteria
  - Short-Term Effectiveness
  - Long-Term Effectiveness and Permanence
  - Implementability
  - Reduction of Mobility, Toxicity, or Volume Through Treatment
  - Compliance with ARARs
  - Overall Protection
  - Cost
  - State Acceptance
  - Community Acceptance
- 4.2 Individual Analysis of Alternatives for Groundwater
  - 4.2.1 Alternative 1
  - 4.2.2 Alternative 2
  - 4.2.3 Alternative 3
- 4.3 Individual Analysis of Alternatives for Offsite Soil/Sediment
  - 4.3.1 Alternative 1
  - 4.3.2 Alternative 2
  - 4.3.3 Alternative 3
- 4.4 Summary

5.0 Comparative Analysis of Alternatives

Appendices: Alternative Cost Estimates

Table 3-5
Detailed Evaluation Criteria for Remedial Alternatives
Wappinger Creek Site
Wappingers Falls, New York

- OVERALL PROTECTION OF HUMAN HEALTH AND ENVIRONMENT

- COMPLIANCE WITH ARARs
  - Compliance with chemical-specific ARARs
  - Compliance with action-specific ARARs
  - Compliance with location-specific ARARs
  - Compliance with appropriate criteria, advisories and guidance

- LONG-TERM EFFECTIVENESS
  - Magnitude of risk remaining at the site after the response objectives have been met
  - Adequacy of controls
  - Reliability of controls

- REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT
  - Treatment process and remedy
  - Amount of hazardous material destroyed or treated
  - Reduction in toxicity, mobility or volume of the contaminants
  - Irreversibility of the treatment
  - Type and quantity of treatment residuals

- SHORT-TERM EFFECTIVENESS
  - Protection of community during remedial action
  - Protection of workers during remedial actions
  - Time until remedial response objectives are achieved
  - Environmental impacts

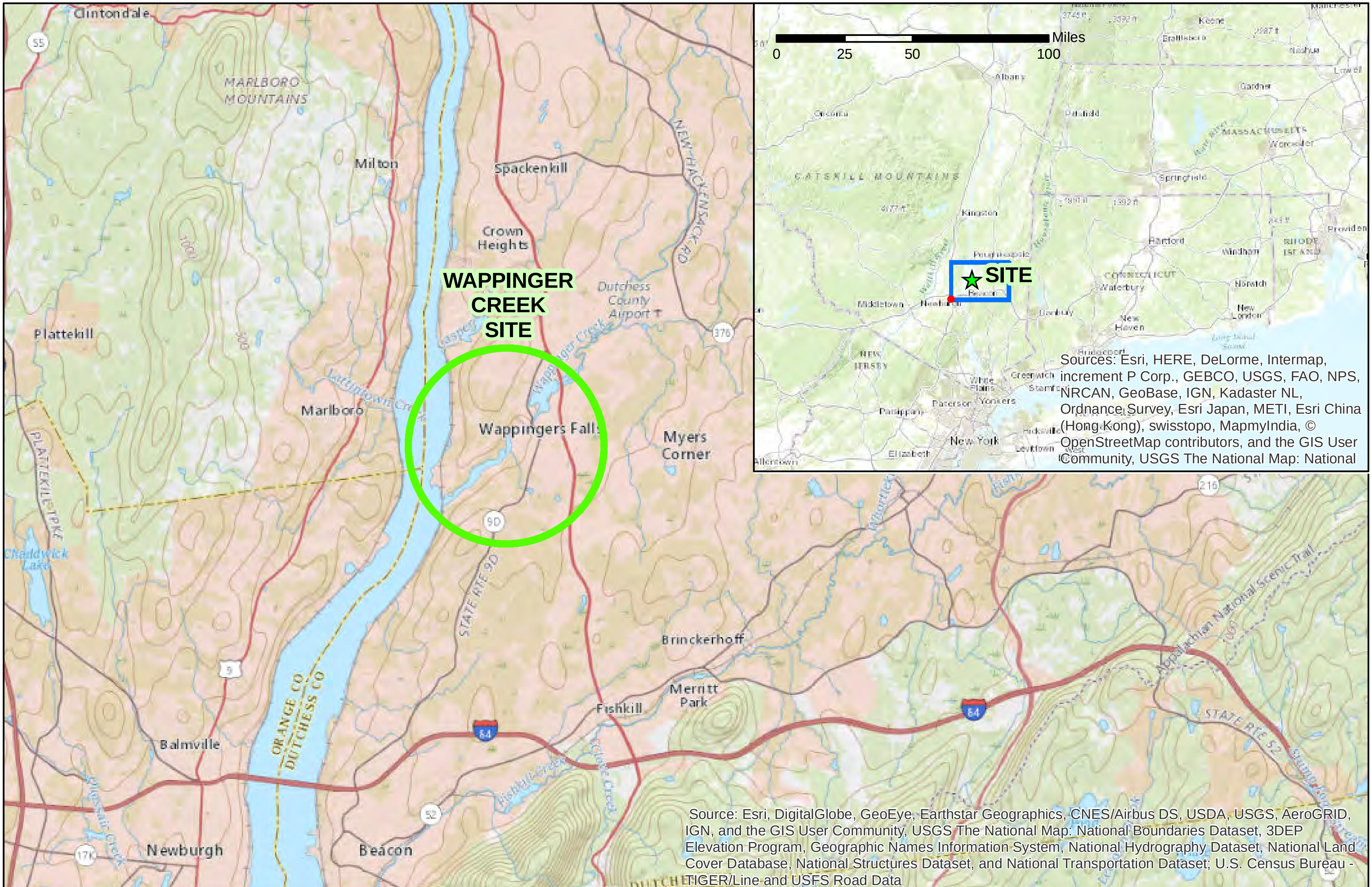
- IMPLEMENTABILITY
  - Ability to construct technology
  - Reliability of technology
  - Ease of undertaking additional remedial action, if necessary
  - Monitoring considerations
  - Coordination with other agencies
  - Availability of treatment, storage capacity, and disposal services
  - Availability of necessary equipment and specialists
  - Availability of prospective technologies

- COST
  - Capital costs
  - Annual operating and maintenance costs
  - Present worth
  - Sensitivity Analysis

- COMMONWEALTH ACCEPTANCE

- COMMUNITY ACCEPTANCE

Figures



N

Miles
0 1 2 4

Figure 1-1
Site Location
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith

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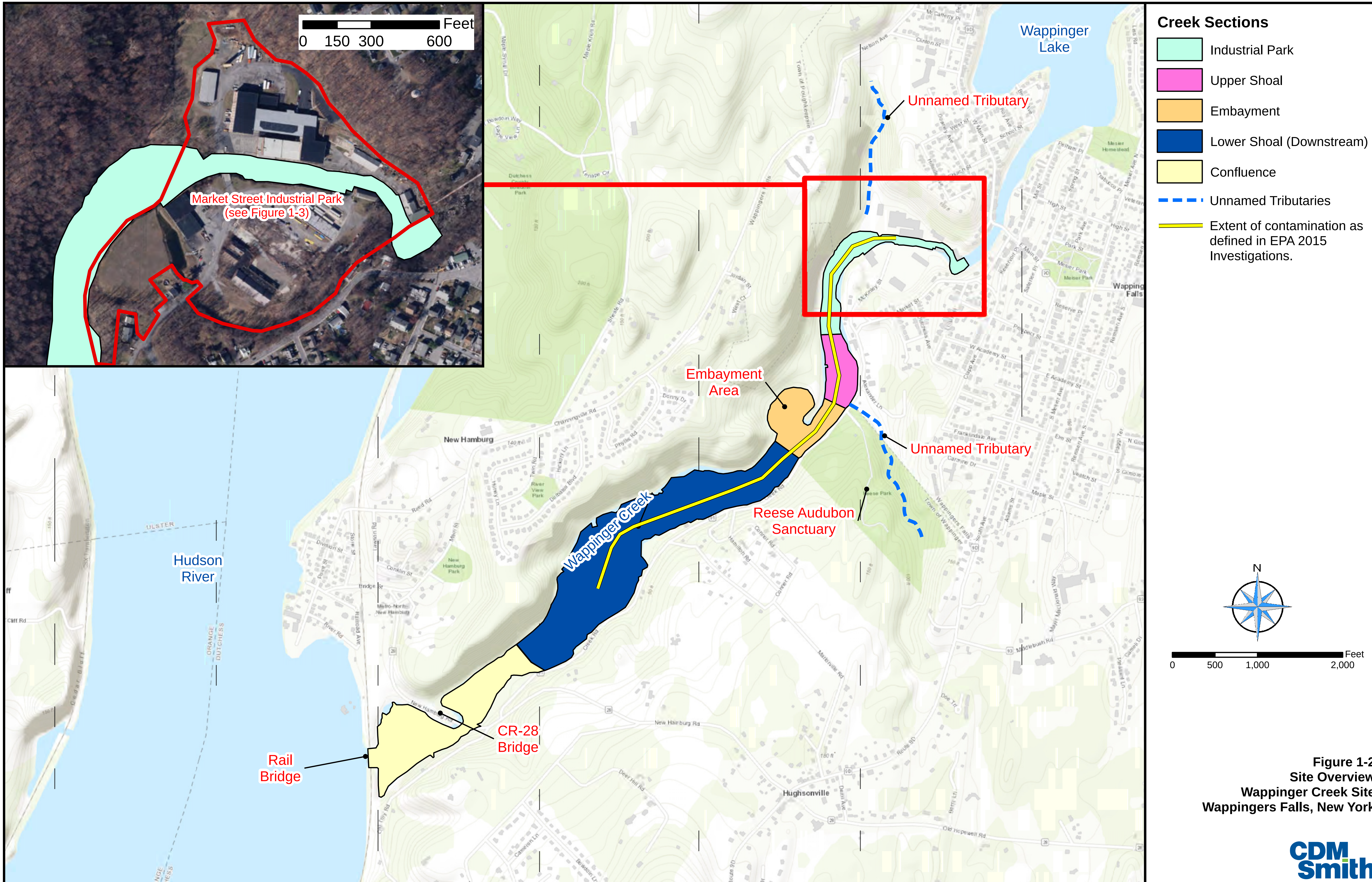

Figure 1-2
Site Overview
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith

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Figure 1-3
Industrial Park Area
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith

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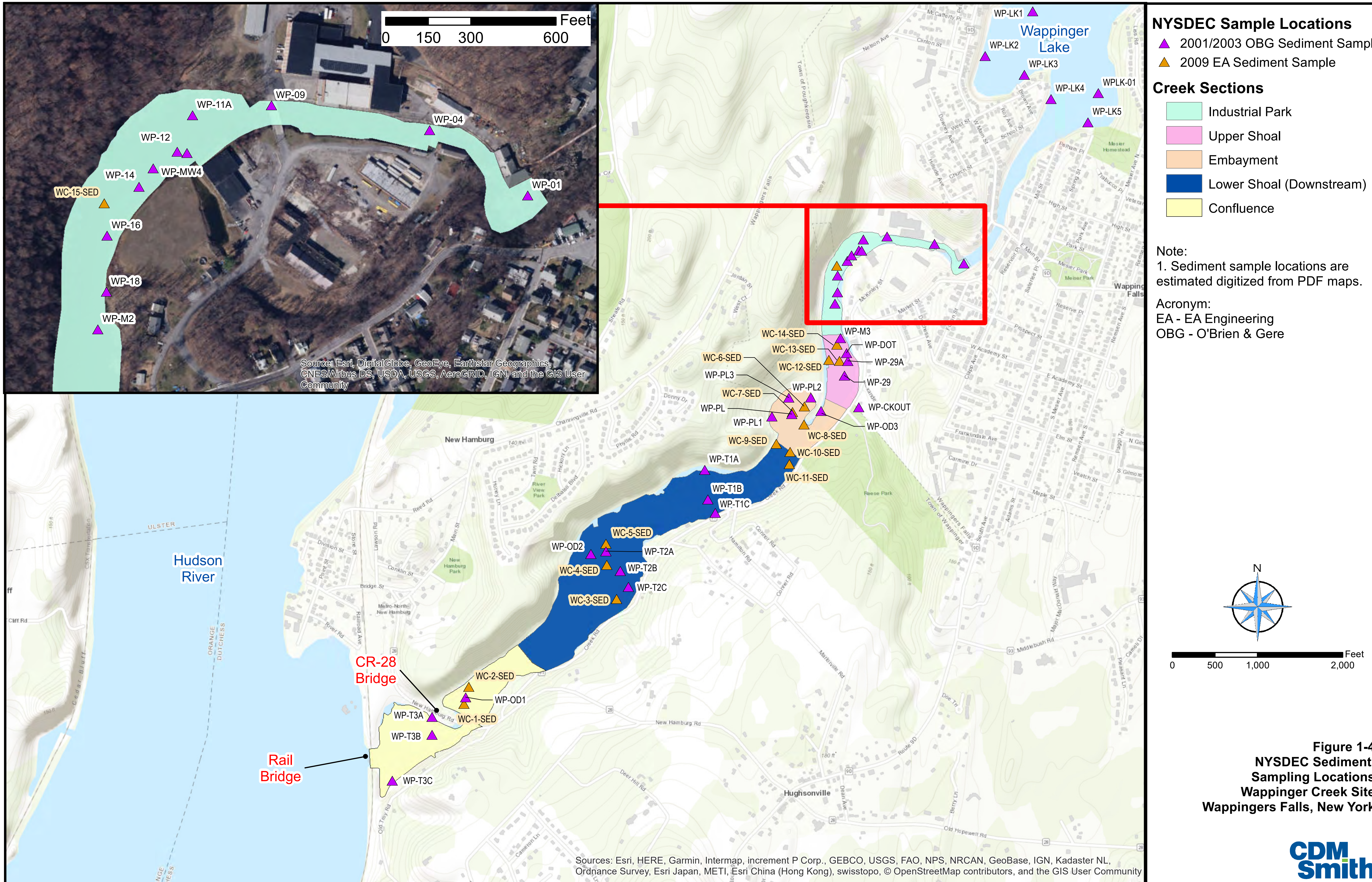

Figure 1-4
NYSDEC Sediment Sampling Locations
Wappinger Creek Site
Wappingers Falls, New York

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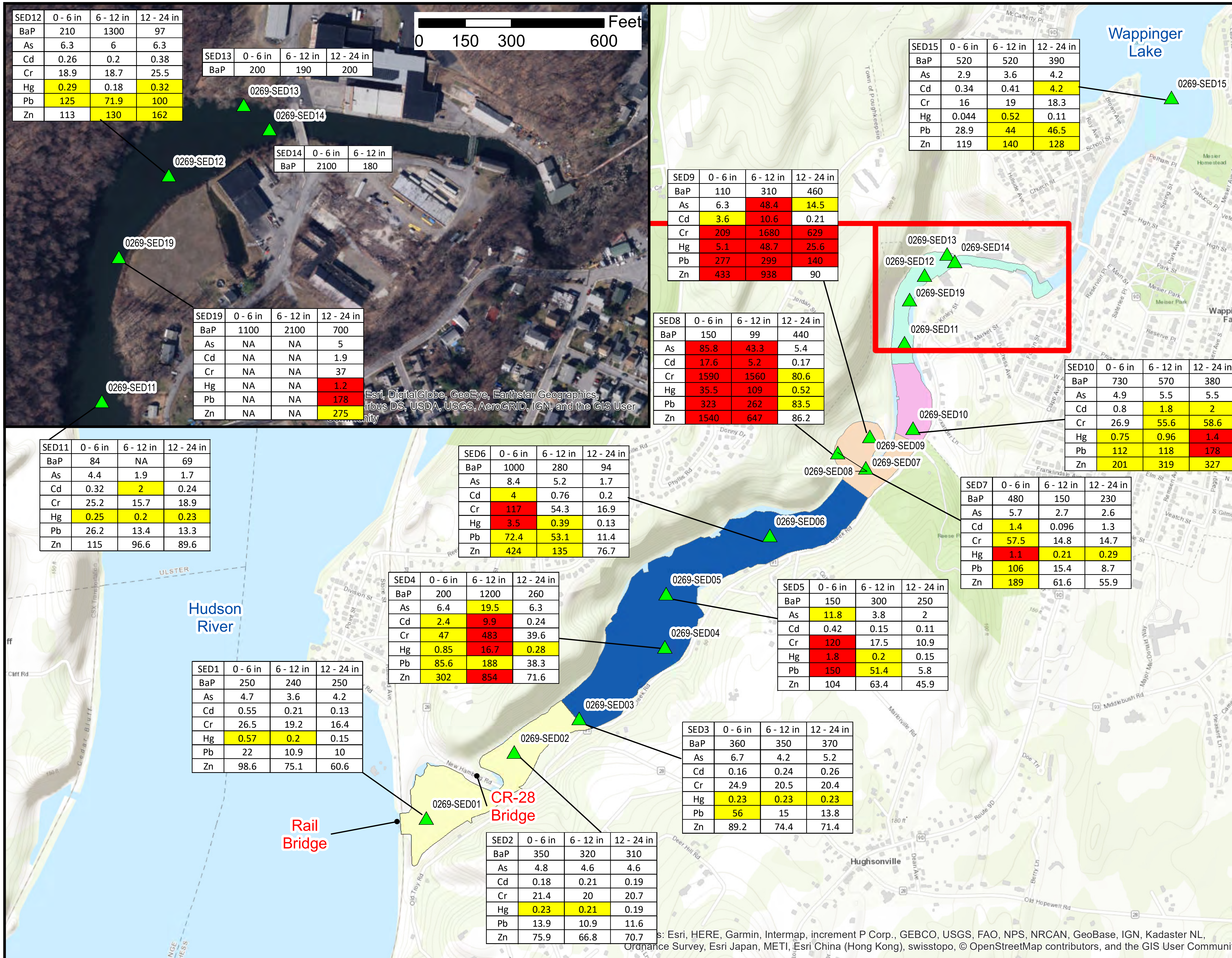

SED12	0 - 6 in	6 - 12 in	12 - 24 in
BaP	210	1300	97
As	6.3	6	6.3
Cd	0.26	0.2	0.38
Cr	18.9	18.7	25.5
Hg	0.29	0.18	0.32
Pb	125	71.9	100
Zn	113	130	162

SED13	0 - 6 in	6 - 12 in	12 - 24 in
BaP	200	190	200

SED14	0 - 6 in	6 - 12 in
BaP	2100	180

SED19	0 - 6 in	6 - 12 in	12 - 24 in
BaP	1100	2100	700
As	NA	NA	5
Cd	NA	NA	1.9
Cr	NA	NA	37
Hg	NA	NA	1.2
Pb	NA	NA	178
Zn	NA	NA	275

SED11	0 - 6 in	6 - 12 in	12 - 24 in
BaP	84	NA	69
As	4.4	1.9	1.7
Cd	0.32	2	0.24
Cr	25.2	15.7	18.9
Hg	0.25	0.2	0.23
Pb	26.2	13.4	13.3
Zn	115	96.6	89.6

SED15	0 - 6 in	6 - 12 in	12 - 24 in
BaP	520	520	390
As	2.9	3.6	4.2
Cd	0.34	0.41	4.2
Cr	16	19	18.3
Hg	0.044	0.52	0.11
Pb	28.9	44	46.5
Zn	119	140	128

SED9	0 - 6 in	6 - 12 in	12 - 24 in
BaP	110	310	460
As	6.3	48.4	14.5
Cd	3.6	10.6	0.21
Cr	209	1680	629
Hg	5.1	48.7	25.6
Pb	277	299	140
Zn	433	938	90

SED8	0 - 6 in	6 - 12 in	12 - 24 in
BaP	150	99	440
As	85.8	43.3	5.4
Cd	17.6	5.2	0.17
Cr	1590	1560	80.6
Hg	35.5	109	0.52
Pb	323	262	83.5
Zn	1540	647	86.2

SED10	0 - 6 in	6 - 12 in	12 - 24 in
BaP	730	570	380
As	4.9	5.5	5.5
Cd	0.8	1.8	2
Cr	26.9	55.6	58.6
Hg	0.75	0.96	1.4
Pb	112	118	178
Zn	201	319	327

SED6	0 - 6 in	6 - 12 in	12 - 24 in
BaP	1000	280	94
As	8.4	5.2	1.7
Cd	4	0.76	0.2
Cr	117	54.3	16.9
Hg	3.5	0.39	0.13
Pb	72.4	53.1	11.4
Zn	424	135	76.7

SED7	0 - 6 in	6 - 12 in	12 - 24 in
BaP	480	150	230
As	5.7	2.7	2.6
Cd	1.4	0.096	1.3
Cr	57.5	14.8	14.7
Hg	1.1	0.21	0.29
Pb	106	15.4	8.7
Zn	189	61.6	55.9

SED4	0 - 6 in	6 - 12 in	12 - 24 in
BaP	200	1200	260
As	6.4	19.5	6.3
Cd	2.4	9.9	0.24
Cr	47	483	39.6
Hg	0.85	16.7	0.28
Pb	85.6	188	38.3
Zn	302	854	71.6

SED5	0 - 6 in	6 - 12 in	12 - 24 in
BaP	150	300	250
As	11.8	3.8	2
Cd	0.42	0.15	0.11
Cr	120	17.5	10.9
Hg	1.8	0.2	0.15
Pb	150	51.4	5.8
Zn	104	63.4	45.9

SED1	0 - 6 in	6 - 12 in	12 - 24 in
BaP	250	240	250
As	4.7	3.6	4.2
Cd	0.55	0.21	0.13
Cr	26.5	19.2	16.4
Hg	0.57	0.2	0.15
Pb	22	10.9	10
Zn	98.6	75.1	60.6

SED3	0 - 6 in	6 - 12 in	12 - 24 in
BaP	360	350	370
As	6.7	4.2	5.2
Cd	0.16	0.24	0.26
Cr	24.9	20.5	20.4
Hg	0.23	0.23	0.23
Pb	56	15	13.8
Zn	89.2	74.4	71.4

SED2	0 - 6 in	6 - 12 in	12 - 24 in
BaP	350	320	310
As	4.8	4.6	4.6
Cd	0.18	0.21	0.19
Cr	21.4	20	20.7
Hg	0.23	0.21	0.19
Pb	13.9	10.9	11.6
Zn	75.9	66.8	70.7

Legend

Creek Sections

- Industrial Park
- Upper Shoal
- Embayment
- Lower Shoal (Downstream)
- Confluence

Note:
1. Sediment sample results from 2015 EPA sampling.
2. Red shading represents sample results above NYS Freshwater SGVs - Class C (highly contaminated)
3. Yellow shading represents sample results above NYS Freshwater SGVs - Class B (slightly to moderately contaminated)
4. Organic results in ug/kg.
5. Inorganic results in mg/kg

BaP - benzo(a)pyrene
NYS - New York State
SGV - Sediment Guidance Value

Figure 1-5
2015 EPA Sampling Summary
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith

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Figure 2-1
Project Organization
Wappinger Creek Site
Wappingers Falls, New York

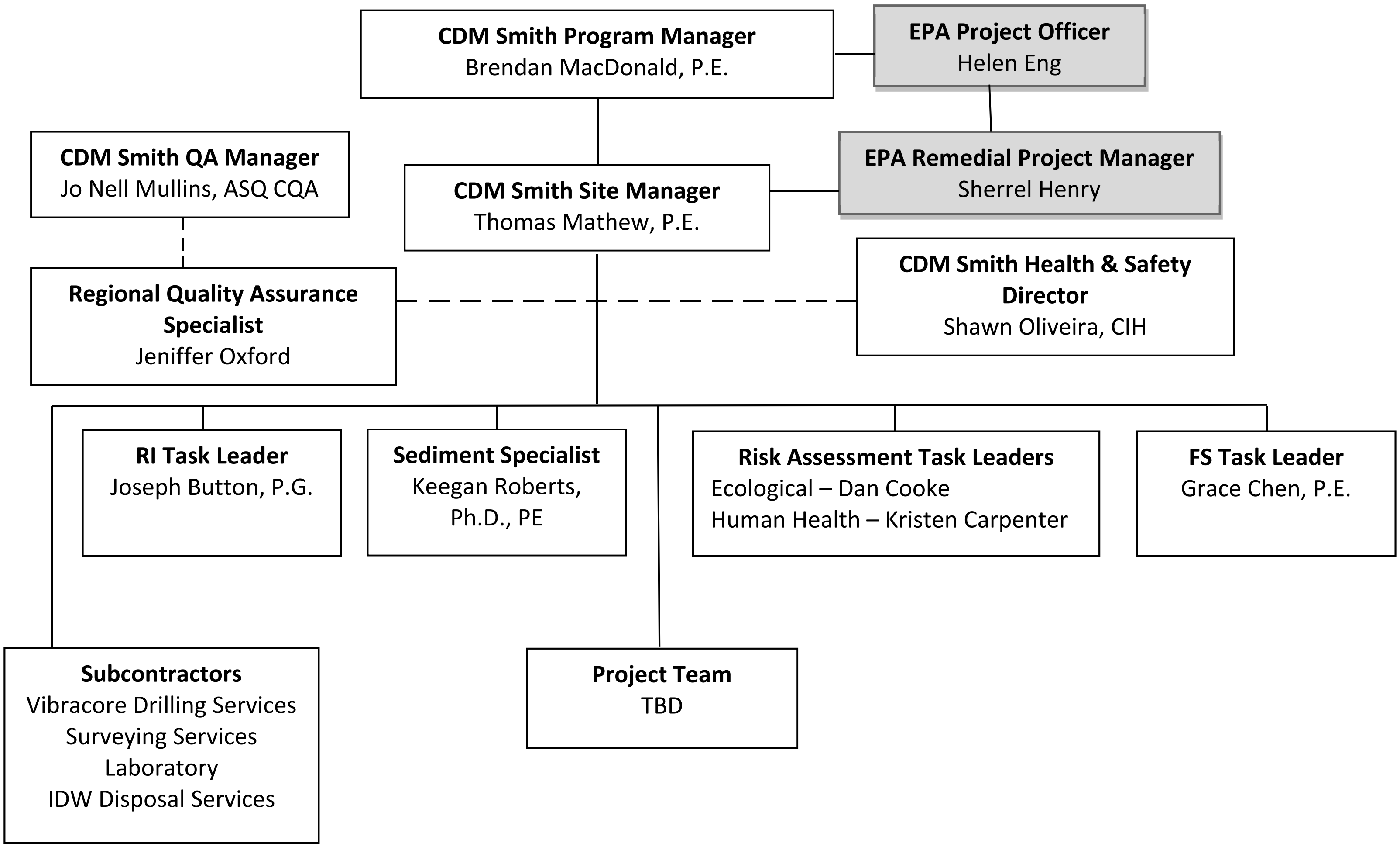
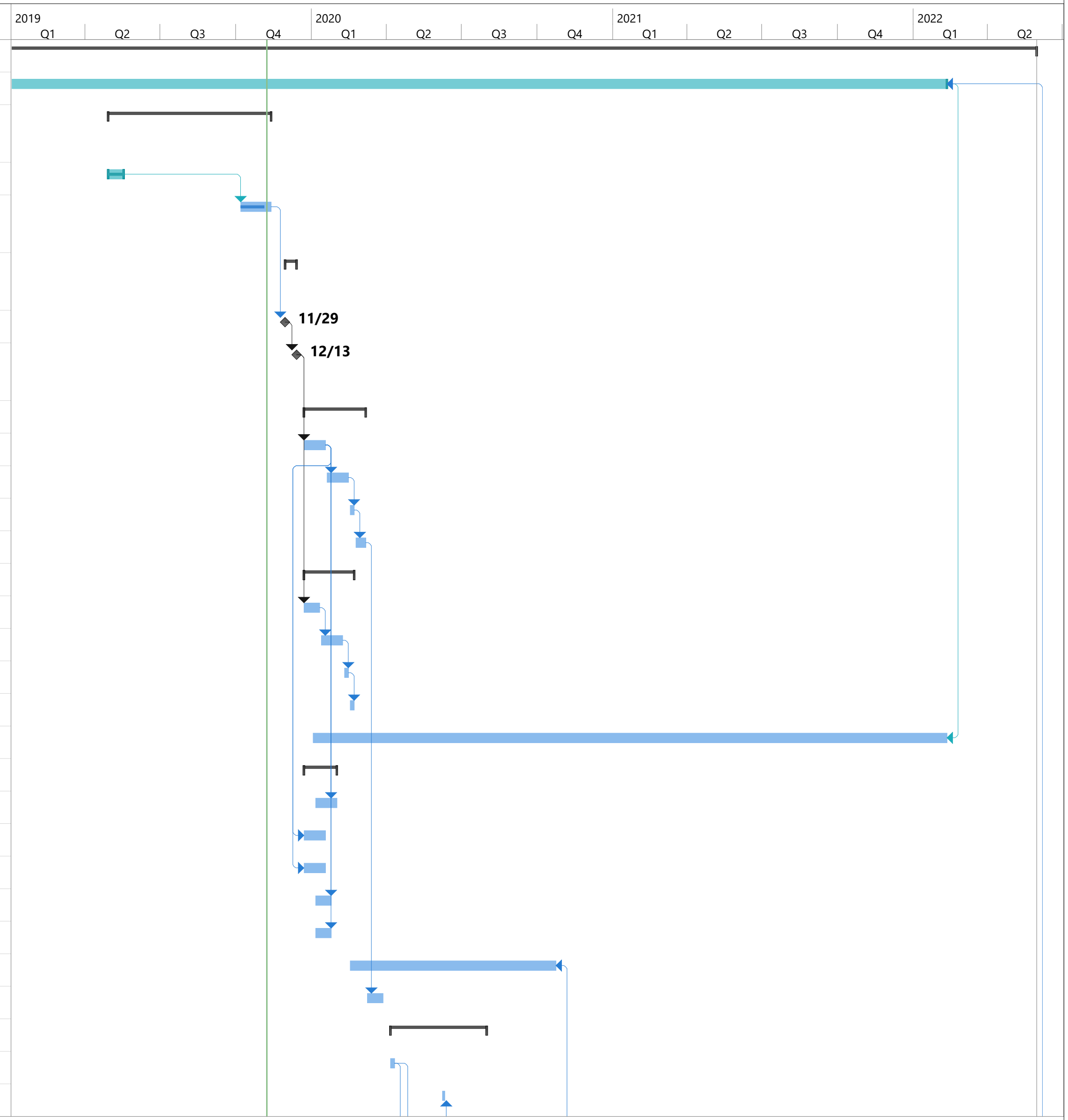


Figure 2-2
Estimated Project Schedule
Wappinger Creek Site
Wappinger Falls, New York

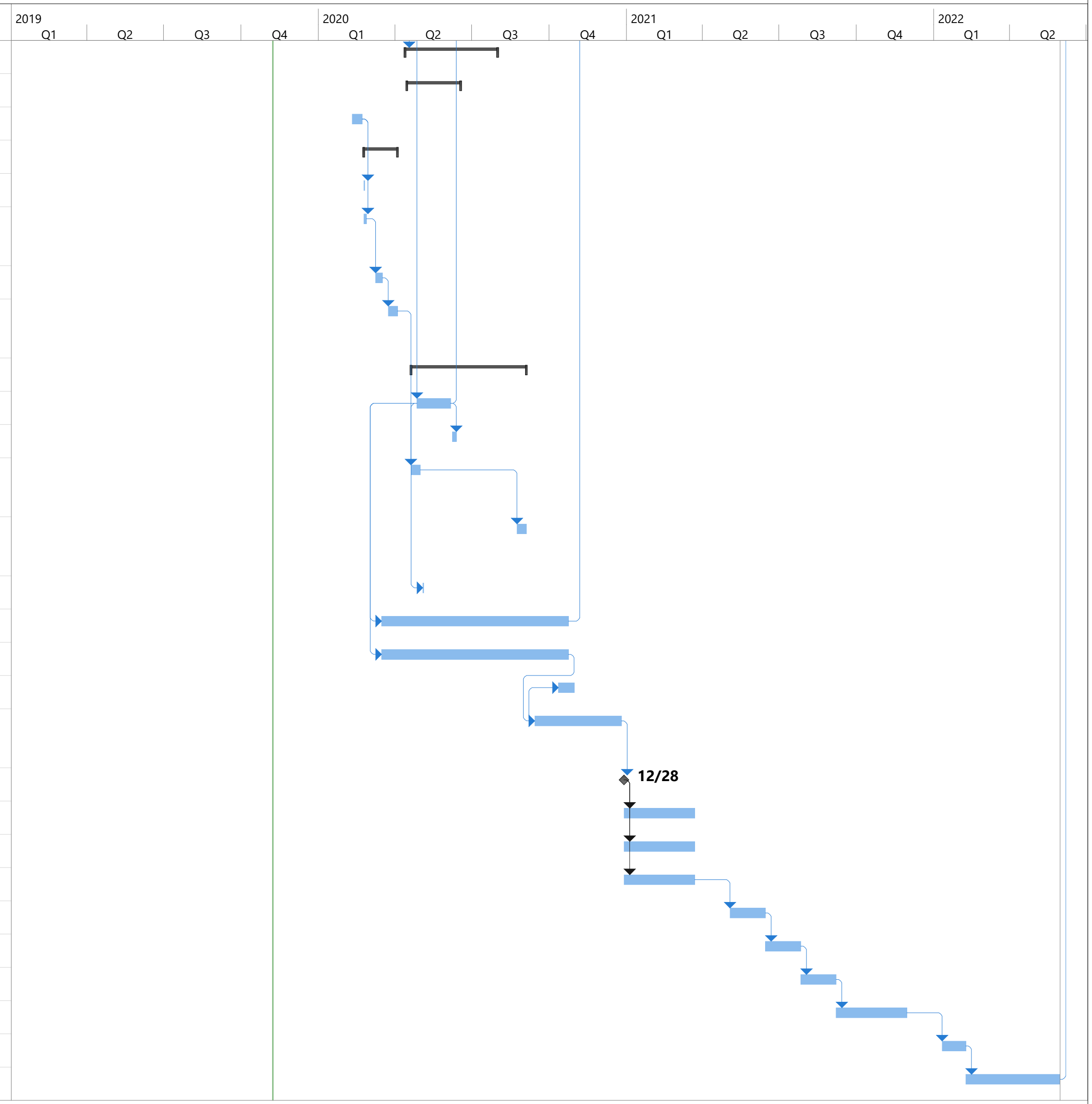
ID		Task Name	Duration	Start	Finish
1		**Wappinger Creek RI/FS**	**1398 days**	**Thu 1/19/17**	**Mon 5/30/22**
2		**1.1 Project Administration**	1321 days	Thu 1/19/17	Thu 2/10/22
3		**1.4 Draft Work Plan Volume 1 and Volume 2**	**142 days**	**Mon 4/29/19**	**Tue 11/12/19**
4	✓	Respond to EPA Comments	15 days	Mon 4/29/19	Fri 5/17/19
5		Submit Revised Work Plan Volume 1 and Draft Work Plan Volume 2	27 days	Mon 10/7/19	Tue 11/12/19
6		**1.5 Negotiate and Prepare Final Workplan and Budget**	**10 days**	**Fri 11/29/19**	**Fri 12/13/19**
7		Negotiations	0 days	Fri 11/29/19	Fri 11/29/19
8		Submit Final Work Plan Volume 1 and Volume 2	10 days	Mon 12/2/19	Fri 12/13/19
9		**1.7 Quality Assurance Project Plan (QAPP)**	**55 days**	**Mon 12/23/19**	**Fri 3/6/20**
10		Prepare and Submit Draft QAPP	20 days	Mon 12/23/19	Fri 1/17/20
11		EPA Review of Draft QAPP	20 days	Mon 1/20/20	Fri 2/14/20
12		Respond to EPA Comments	5 days	Mon 2/17/20	Fri 2/21/20
13		Prepare and Submit Final QAPP	10 days	Mon 2/24/20	Fri 3/6/20
14		**1.8 Health and Safety Plan (HASP)**	**45 days**	**Mon 12/23/19**	**Fri 2/21/20**
15		Prepare and Submit Draft HASP	15 days	Mon 12/23/19	Fri 1/10/20
16		EPA Review of Draft HASP	20 days	Mon 1/13/20	Fri 2/7/20
17		Respond to EPA Comments	5 days	Mon 2/10/20	Fri 2/14/20
18		Prepare and Submit Final HASP	5 days	Mon 2/17/20	Fri 2/21/20
19		**1.10 Meetings**	550 days	Fri 1/3/20	Thu 2/10/22
20		**1.11 Subcontractor Procurement**	**30 days**	**Mon 12/23/19**	**Fri 1/31/20**
21		Cultural Resources	20 days	Mon 1/6/20	Fri 1/31/20
22		Surveyor	20 days	Mon 12/23/19	Fri 1/17/20
23		Drillers	20 days	Mon 12/23/19	Fri 1/17/20
24		IDW (MSA)	15 days	Mon 1/6/20	Fri 1/24/20
25		Laboratories (MSA)	15 days	Mon 1/6/20	Fri 1/24/20
26		**1.12 Subcontractor Management**	180 days	Mon 2/17/20	Fri 10/23/20
27		**1.13 Pathways Analysis Report**	15 days	Mon 3/9/20	Fri 3/27/20
28		**3.1 Site Recon**	**85 days**	**Mon 4/6/20**	**Fri 7/31/20**
29		Detailed Creek Reconnaissance	5 days	Mon 4/6/20	Fri 4/10/20
30		Ecological Characterization Field Work	3 days	Mon 6/8/20	Wed 6/10/20



Task		Project Summary		Manual Task		Start-only		Deadline	
Split		Inactive Task		Duration-only		Finish-only		Progress	
Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks		Manual Progress	
Summary		Inactive Summary		Manual Summary		External Milestone			

Figure 2-2
Estimated Project Schedule
Wappinger Creek Site
Wappinger Falls, New York

ID		Task Name	Duration	Start	Finish
31		Cultural Resources	**80 days**	**Mon 4/13/20**	**Fri 7/31/20**
37		Civil Survey	**46 days**	**Wed 4/15/20**	**Wed 6/17/20**
41		**3.2 Mobilization/Demobilization**	10 days	Mon 2/10/20	Fri 2/21/20
42		**3.3 Hydrogeological Assessment**	**30 days**	**Mon 2/24/20**	**Fri 4/3/20**
43		Existing Monitoring Well Evaluation	1 day	Mon 2/24/20	Mon 2/24/20
44		Thermal-infrared camera drone-based survey	3 days	Mon 2/24/20	Wed 2/26/20
45		Groundwater Screening	6 days	Mon 3/9/20	Mon 3/16/20
46		Monitoring Well Installation and Development	9 days	Tue 3/24/20	Fri 4/3/20
47		**3.5 Environmental Sampling**	**99 days**	**Mon 4/20/20**	**Thu 9/3/20**
48		Sediment Sampling	30 days	Mon 4/27/20	Fri 6/5/20
49		Flood Plain and Wetland Sampling	5 days	Mon 6/8/20	Fri 6/12/20
50		Surface Water and Groundwater Sampling Event 1 (High flow)	9 days	Mon 4/20/20	Thu 4/30/20
51		Surface Water and Groundwater Sampling Event 2 (Low flow)	9 days	Mon 8/24/20	Thu 9/3/20
52		Air Sampling	1 day	Mon 5/4/20	Mon 5/4/20
53		**4.2 Analytical Services**	160 days	Mon 3/16/20	Fri 10/23/20
54		**5.2 Sample Management**	160 days	Mon 3/16/20	Fri 10/23/20
55		**5.3 Data Validation**	15 days	Mon 10/12/20	Fri 10/30/20
56		**6.2 Data Reduction, Tabulation, and Evaluation**	15 wks	Mon 9/14/20	Fri 12/25/20
57		**6.4 Data Evaluation Summary Meeting**	1 day	Mon 12/28/20	Mon 12/28/20
58		**7.1 BHHRA**	60 days	Tue 12/29/20	Mon 3/22/21
59		**7.2 BSLERA**	60 days	Tue 12/29/20	Mon 3/22/21
60		**9.1 Draft RI**	60 days	Tue 12/29/20	Mon 3/22/21
61		**9.2 Final RI**	30 days	Tue 5/4/21	Mon 6/14/21
62		**10.1/10.2 Remedial Alternatives Screening**	30 days	Tue 6/15/21	Mon 7/26/21
63		**11.1/11.2 Remedial Alternatives Tech Memo**	30 days	Tue 7/27/21	Mon 9/6/21
64		**12.1 Draft FS**	60 days	Tue 9/7/21	Mon 11/29/21
65		**12.2 Final FS**	20 days	Tue 1/11/22	Mon 2/7/22
66		**13.1 Post RI/FS Support**	80 days	Tue 2/8/22	Mon 5/30/22



Task
Split
Milestone
Summary
Project Summary
Inactive Task
Inactive Milestone
Inactive Summary
Manual Task
Duration-only
Manual Summary Rollup
Manual Summary
Start-only
Finish-only
External Tasks
External Milestone
Deadline
Progress
Manual Progress

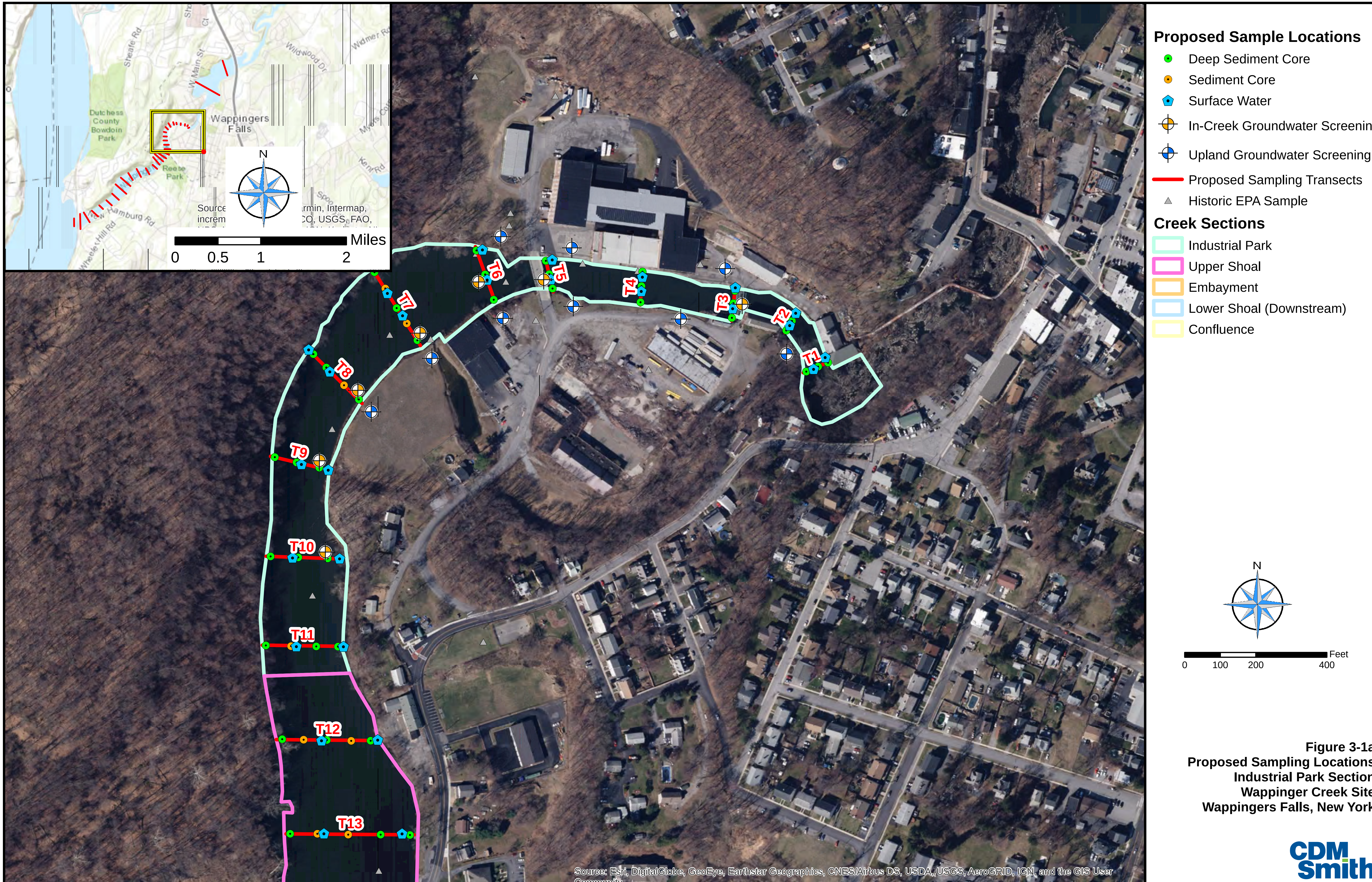


Figure 3-1a
Proposed Sampling Locations
Industrial Park Section
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith

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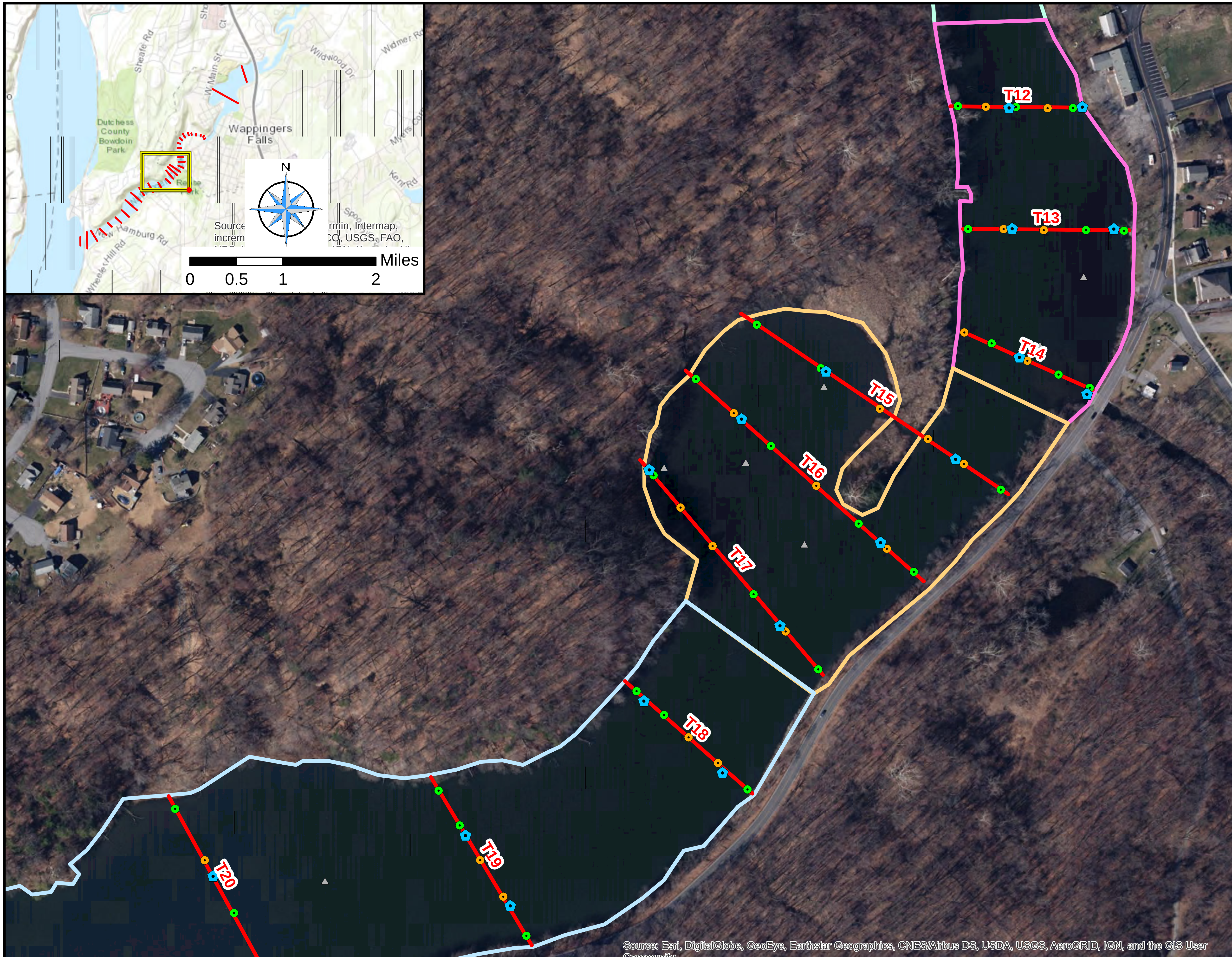

Proposed Sample Locations

- Deep Sediment Core
- Sediment Core
- Surface Water
- Proposed Sampling Transects
- Historic EPA Sample

Creek Sections

- Industrial Park
- Upper Shoal
- Embayment
- Lower Shoal (Downstream)
- Confluence

N

0 100 200 400 Feet

Figure 3-1b
Proposed Sampling Locations
Upper Shoal and
Embayment Section
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith

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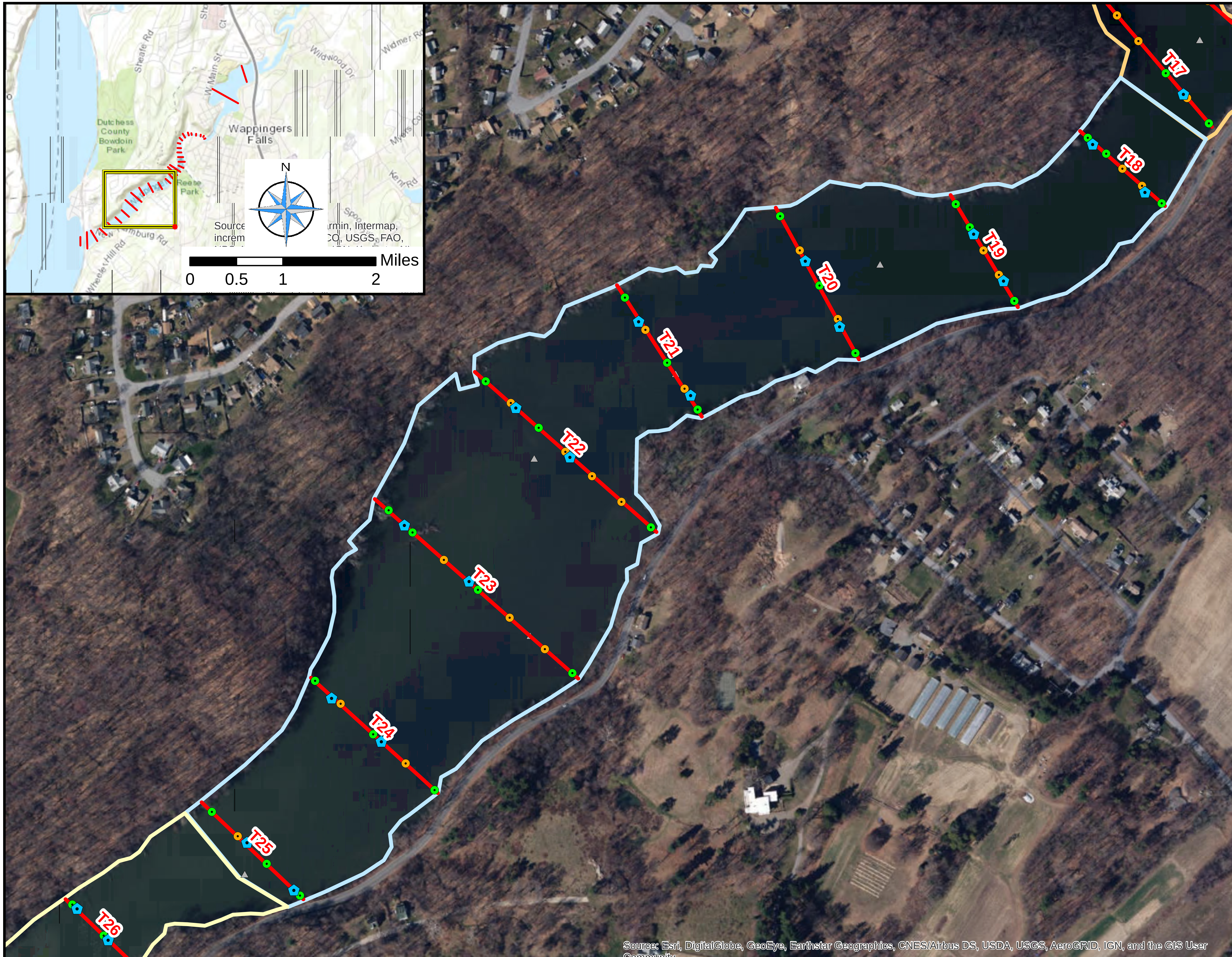

Proposed Sample Locations

- Deep Sediment Core
- Sediment Core
- Surface Water
- Proposed Sampling Transects
- Historic EPA Sample

Creek Sections

- Industrial Park
- Upper Shoal
- Embayment
- Lower Shoal (Downstream)
- Confluence

N

0 150 300 600 Feet

Figure 3-1c
Proposed Sampling Locations
Lower Shoal (Downstream) Section
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith

Proposed Sample Locations

- Deep Sediment Core
- Sediment Core
- Surface Water
- Proposed Sampling Transects
- Historic EPA Sample

Creek Sections

- Industrial Park
- Upper Shoal
- Embayment
- Lower Shoal (Downstream)
- Confluence

N

Feet: 0, 100, 200, 400

Figure 3-1d
Proposed Sampling Locations
Confluence Section
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith

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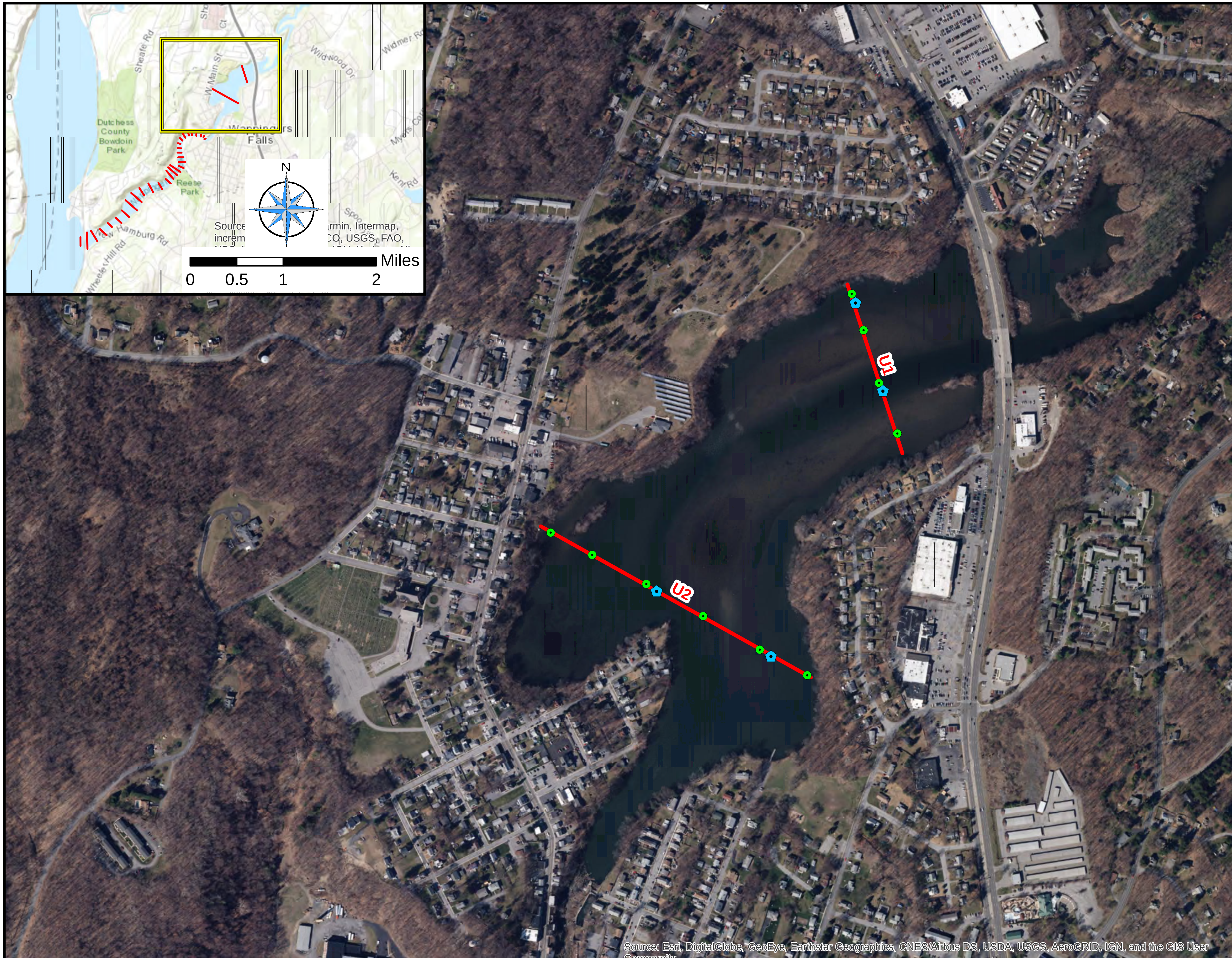


Proposed Sample Locations

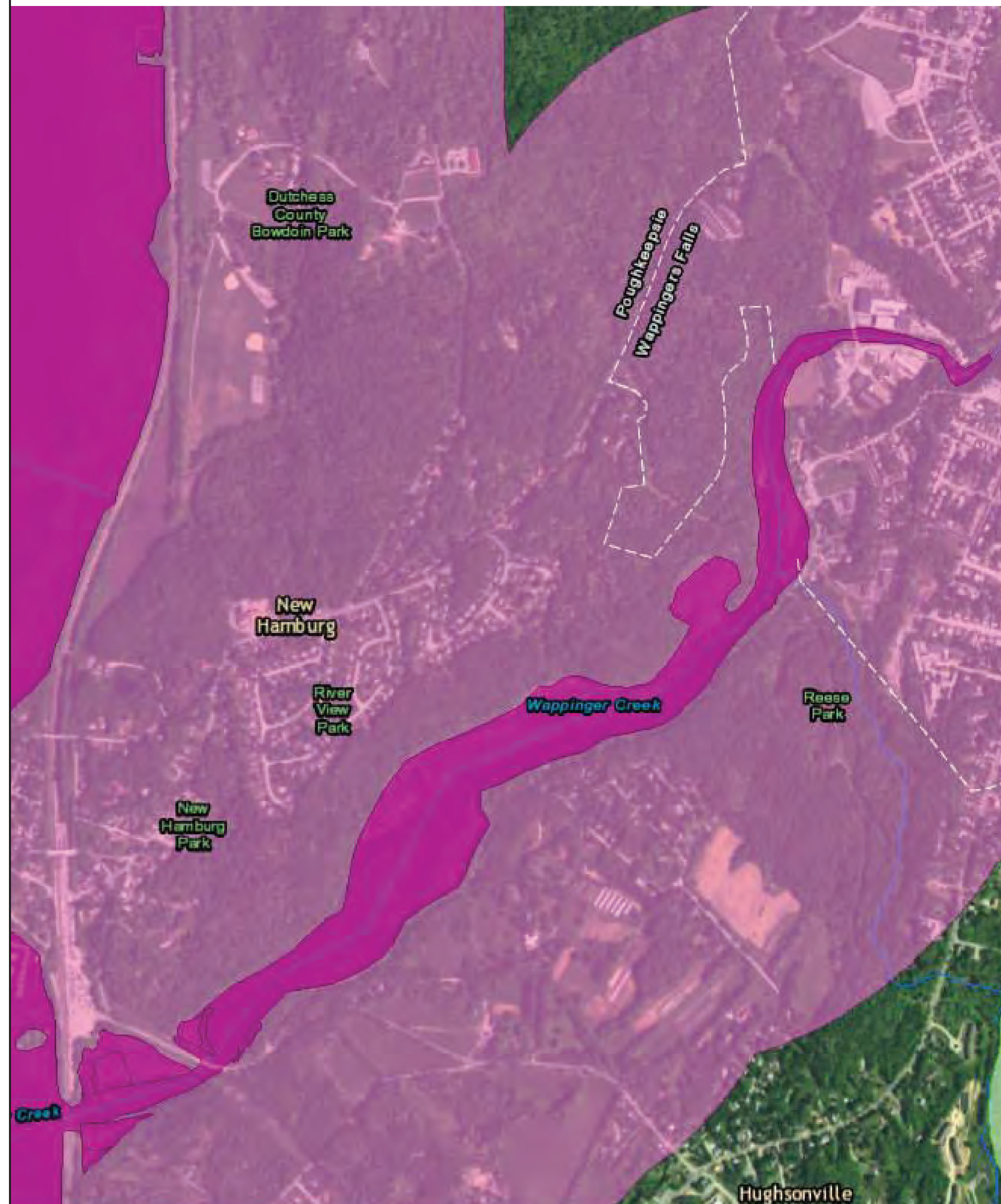
- Deep Sediment Core
- Sediment Core
- Surface Water
- Proposed Sampling Transects

N

Feet
0 250 500 1,000

Figure 3-1e
Proposed Sampling Locations
Wappinger Lake (Background)
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith



Source (left): United States Fish and Wildlife Service National Wetlands Inventory
Source (right): New York State Department of Environmental Conservation Environmental Resource Mapper

Legend

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine
- Significant Natural Communities

N

Figure 3-2
Wetlands Map
Wappinger Creek Site
Wappingers Falls, New York

CDM Smith