# Biological Field Sampling and Analysis Plan

Supplement to the Baseline Human Health and Ecological Risk Assessment Work Plans

McCaffrey Street Site
14 McCaffrey Street
Village of Hoosick Falls
Rensselaer County, New York

29 July 2021

Project No.: 0405697

Honeywell


*The business of sustainability*

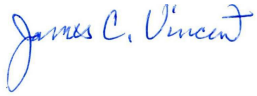
ERM

***Biological Field Sampling and Analysis Plan***

***Site No. 442046***

***Village of Hoosick Falls, Rensselaer County, New York***

I, James C. Vincent, P.G., certify that I am currently a Qualified Environmental Professional as defined in Title 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 and that this Biological Field Sampling and Analysis Plan (Biota SAP) was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).



James C. Vincent P.G.

**ERM Consulting & Engineering, Inc.**
95 Glastonbury Boulevard
Suite 101
Glastonbury, Connecticut 06033

**ERM Consulting & Engineering, Inc.**
105 Maxess Road
Suite 316
Melville, New York 11747

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## Acronyms and Abbreviations

| Name | Description |
|---|---|
| ASP | Analytical Services Protocol |
| BAF | bioaccumulation factor |
| bgs | below ground surface |
| Biota SAP | Biological Field Sampling and Analysis Plan |
| BERA | Baseline Ecological Risk Assessment |
| BHHRA | Baseline Human Health Risk Assessment |
| CDCP | Center for Disease Control and Prevention |
| COPC | chemicals of potential concern |
| COPEC | chemicals of potential ecological concern |
| DER | Division of Environmental Remediation |
| DO | dissolved oxygen |
| DQO | data quality objective |
| DUSR | Data Usability Summary Report |
| EPC | exposure point concentration |
| ERM | ERM Consulting & Engineering, Inc. |
| eV | electron volt |
| GPS | global positioning system |
| GSI | GSI Environmental, Inc. |
| HASP | Health and Safety Plan |
| HDPE | high-density polyethylene |
| IDW | investigation derived waste |
| MS/MSD | matrix spike / matrix spike duplicate |
| NYCRR | New York Codes, Rules, and Regulations |
| NYSDEC | New York State Department of Environmental Conservation |
| ORP | oxidation reduction potential |
| PAHs | polycyclic aromatic hydrocarbons |
| PCBs | polychlorinated biphenyls |
| PFAS | per- and polyfluoroalkyl substances |
| PFOA | perfluorooctanoic acid |
| PFOS | perfluorooctane sulfonic acid |
| PID | photoionization detector |
| QAPP | Quality Assurance Project Plan |
| QA/QC | Quality Assurance / Quality Control |
| RI/FS | Remedial Investigation / Feasibility Study |
| Site | McCaffrey Street Site located at 14 McCaffrey Street, Hoosick Falls, Rensselaer County, New York |
| SOP | Standard Operating Procedure |
| SpC | specific conductance |
| SPDES | State Pollutant Discharge Elimination System |
| SU | sampling unit |
| SVOCs | semi-volatile organic compounds |
| TAL | target analyte list |
| TOC | total organic carbon |
| USEPA | United States Environmental Protection Agency |
| ww | wet weight |

# 1.0 INTRODUCTION

## 1.1 Purpose and Objectives

This Biological Field Sampling and Analysis Plan (Biota SAP) describes the proposed field sampling and laboratory analyses designed to characterize uptake of chemicals into plant and animal prey tissues from potential exposure media at the McCaffrey Street Site (the Site). The Site is located at 14 McCaffrey Street in the Village of Hoosick Falls, Rensselaer County, New York (see **Figure 1-1**). The objective of the field program is to generate Site-specific data that can be applied to baseline risk assessments for the Site. The Site has been listed on the Registry of Inactive Hazardous Waste Sites with the New York State Department of Environmental Conservation (NYSDEC) as a Class 2 site (Site No. 442046).

The activities outlined in this Biota SAP will follow the United States Environmental Protection Agency (USEPA) guidance(s) (see companion risk assessment work plans and Section 3.6.3 below) and the NYSDEC's Division of Fish and Wildlife guidance(s) outlined in Section 3.6.3 below (NYSDEC 1994, 2014, 2021).

Analytical concentrations measured in biota, and characterization of uptake into biota tissues, will be used to support exposure assessments for the baseline human health and ecological risk assessments (BHHRA/BERA). This Biota SAP is responsive to discussions with USEPA Region 2 and NYSDEC personnel who provided preliminary feedback on the proposed risk assessment work plans during teleconferences on 21 July 2020 and 11 December 2020. Additional comments were received from NYSDEC on 1 April 2021. Specifically, the regulatory agencies recommended supplementing the data collected under the Remedial Investigation/ Feasibility Study (RI/FS) investigations to include measurements of chemical concentrations in biota and environmental media representative of the base of the aquatic and terrestrial food chains (e.g., soil, surface water, sediment, aquatic macroinvertebrates, aquatic vegetation and emergent plants, terrestrial invertebrates, vegetation, small mammals, and fish). Data obtained as part of this field investigation (as described in this Biota SAP) are primarily intended to support the BERA. However, the data may also be considered for use in the BHHRA (e.g., recreational fishing / gardening scenario) if the risk assessors/decision makers see its potential usefulness (see Appendix C of the human health risk assessment work plan).

This Biota SAP describes the objectives and scope of the sampling and analysis of biotic and abiotic media from aquatic and terrestrial systems in the vicinity of the Site ("Study Area"). Specific habitats targeted for sampling include:

- Wooded and open areas within the facility tax parcel boundary;
- Open areas in the vicinity of a ballfield located east of the facility;
- Wetlands located within 1 mile south of the facility; and
- The Hoosic River located west of the facility (both near-Site, upstream and downstream).

Target analytes were selected based on the results of the preliminary screening for chemicals of potential (ecological) concern (COPC for human health; and COPEC for ecological risk assessment)[1] and include constituents in the following classes of chemicals: per- and polyfluoroalkyl substances (PFAS), target analyte list (TAL) metals (including mercury), total and hexavalent chromium (discrete "grab" sample of

[1] COPCs/COPECs are Site-related chemicals that may adversely affect receptors. COPCs/COPECs do not necessarily signify a risk. Rather, they are chemicals that have been identified to advance for further analysis.

upland soils only), semi-volatile organic compounds (SVOCs)[2], and polychlorinated biphenyls (PCBs). Additionally, general chemistry parameters will be analyzed including total organic carbon (TOC), pH, percent moisture, and/or grain size for one or more medium, field geochemical parameters and hardness for surface water, and lipid analysis on tissue samples.[3] Soil, surface water, and sediment will be collected within the same sampling units (SUs) (see **Table 2-1**) as biota sampling locations to support Site-specific estimates of bioconcentration and bioaccumulation in aquatic and terrestrial food webs for the BERA.

## 1.2 Site Description and Physical Conditions

The Site is located at 14 McCaffrey Street and is situated on a 6.41-acre tax parcel in the Village of Hoosick Falls, Rensselaer County, New York (Rensselaer County Tax Map, Tax Parcel 37.6-3-1; NYSDEC 2019a). The Study Area includes the aforementioned tax parcel, residential neighborhoods to the north and northeast, a ballfield to the east, wetlands to the south, and wooded areas to the west along approximately 0.75-mile of the riparian corridor of the Hoosic River (**Figures 1-1** and **3-2**). The Hoosic River Greenway (2011), a railroad bed that has been converted to a 2-mile recreation trail, runs parallel to the river along the western border of the Site. Land to the west and south are primarily owned by the Village of Hoosick Falls, New York, which will facilitate access to proposed sampling areas.

The tax parcel is largely developed (light industry) and includes a 60,000-square-foot manufacturing facility built in 1961 (NYSDEC 2019a). Surrounding the building is an access road (driveway) to the west, paved parking lots to the north, east and south, and maintained open areas with grassy coverage surrounding the parking areas. The edges of the tax parcel include shrub/ scrub areas and mixed forests.

## 1.3 Scientific Collection Permits

In April and May 2021, ERM Consulting & Engineering, Inc. (ERM) submitted applications for scientific collection licenses (License to Collect or Possess Scientific Application) to NYSDEC. The license applications are currently being processed.

[2] SVOCs included for this Biota SAP include a reduced list of 19 compounds, primarily consisting of polycyclic aromatic hydrocarbons (PAHs).

[3] Lipid analysis will only be conducted on tissue samples that are analyzed for PCBs, with the exception of plant tissues, as required by the organic laboratory protocols to produce an accurate dataset.

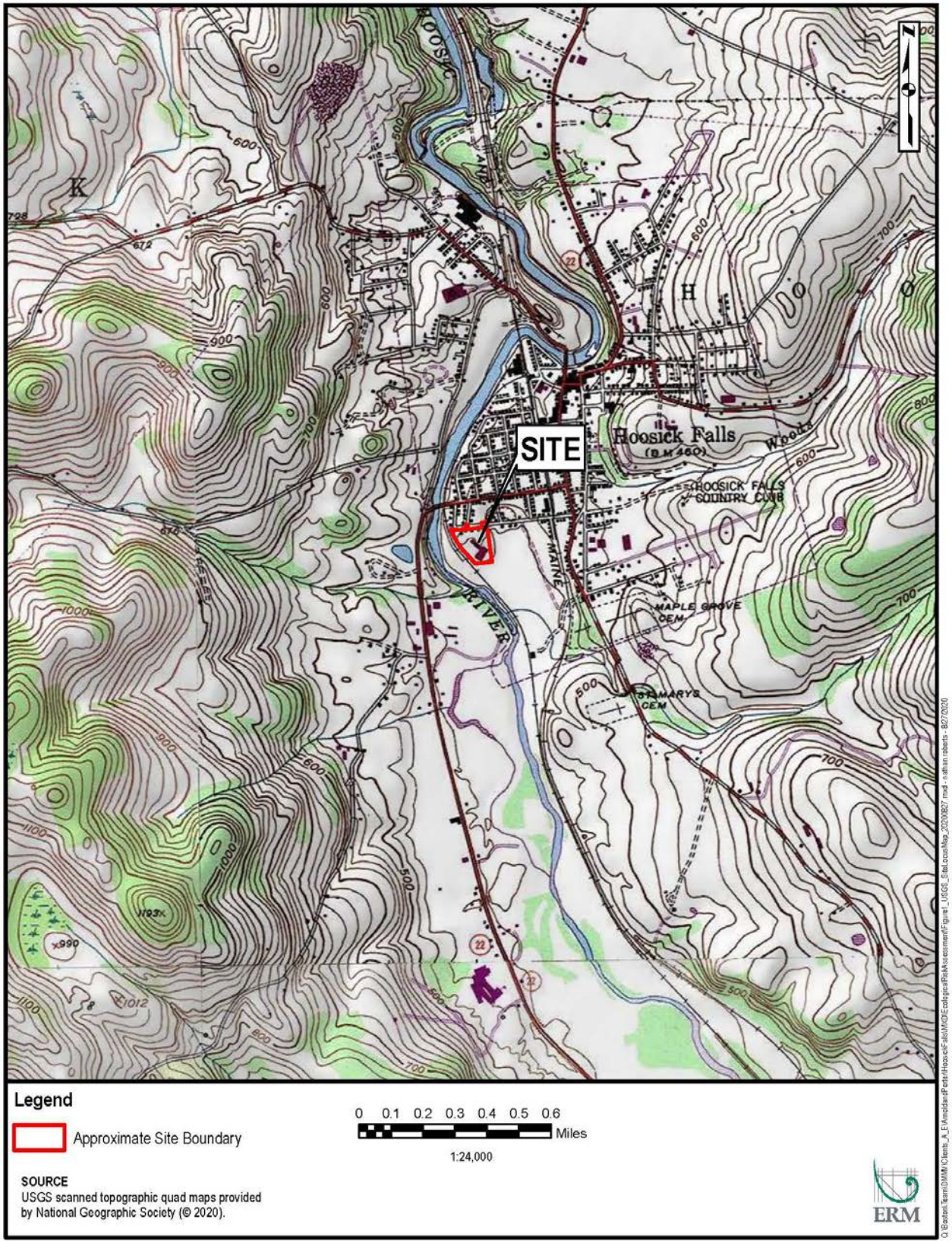


**Figure 1-1: United States Geological Survey Site Locus**

## 2.0 DATA QUALITY OBJECTIVES

The primary data quality objectives (DQOs) are to develop Site-specific estimates of COPC/COPEC concentrations in soil, surface water, sediment, and in representative prey (e.g., aquatic/terrestrial vegetation and emergent plant, aquatic/terrestrial invertebrate/macroinvertebrate, small mammal, and fish tissues).

The data generated from this Biota SAP is intended to reduce uncertainty in estimates of exposure for the baseline risk assessments. Specifically, the data will be used to support the following calculations:

- Exposure point concentrations (EPCs) of food items potentially consumed by herbivores, invertivores/insectivores, piscivores, and carnivores will be included in the conceptual Site model for representative receptors for the aquatic and terrestrial ecological risk assessment.
- EPCs for surface water from the in-river sampling locations.
- EPCs for fish tissue (whole body and fillet) in near-Site and upstream (baseline) locations.
- EPCs for soil and sediment (supplementing the current RI/FS dataset for these media).
- Site-specific bioaccumulation factors (BAFs) and/or regression models (relationships) to generate estimates of concentrations in terrestrial plants based on measurements of concentrations in abiotic media throughout the Study Area.
- Site-specific bioconcentration factors and/or regression models (relationships) to generate estimates of concentrations in aquatic vegetation and aquatic invertebrates based on measurements of concentrations in abiotic media throughout the Study Area.
- Site-specific BAFs and/or regression models to generate estimates of concentrations in prey items consumed by wildlife (herbivores, invertivores/insectivores, piscivores, and carnivores) based on measurements of concentrations in soil throughout the Study Area.
- Site-specific biota to sediment accumulation factors and/or regression models to generate estimates of concentrations in fish consumed by wildlife based on measurements of concentrations in sediment throughout the Study Area.

## Table 2-1: Terms and Definitions

| Term | Definition† |
|---|---|
| Study Area | The Area within which the biota samples and environmental media are being collected. |
| Sampling Area | Areas within the Study Area that are targeted for sampling and have been stratified by habitat type: upland††, wetland, and in-river habitats. |
| SUs | Areas within the upland sampling area where sampling will occur. Locations within an SU generally have a shared feature of interest (e.g., geographic location, substrate conditions). |
| Sampling Transect (or Transects) | A path along which samples are collected within the wetlands sampling area. Sampling Transects are typically aligned along a gradient or feature of interest. |
| Sampling Location | A location within an SU or along a Sampling Transect where a suite of co-located abiotic and biotic samples are collected. |
| Sampling Stations | Sampling Stations are multiple points within a Sampling Location (defined above) where co-located abiotic and biotic specimens are collected and composited (for each sample type†††) to represent the Sampling Location. |

*† For the purposes of this Biota SAP.*

*†† Upland habitat in the vicinity of the Site.*

*††† For example, soil, sediment, surface water, and plant, invertebrate, fish, and small mammal tissue types.*

The sampling areas have been selected to support bioaccumulation models (i.e., match exposure-based terrestrial, wetland, and in-river models) and to quantify variability in uptake of COPCs/COPECs (hereafter simply referred to as COPCs) under different habitat conditions and potential differences in uptake across the range of concentrations measured in soil, surface water, and sediment. It is anticipated that separate bioaccumulation models will be developed for each sampling area (upland, wetland, and in-river). Site-specific constituent concentrations (modeled or measured) in biota will replace model-based estimates reported in the literature (Sample et al. 1998; Bechtel 1998). Model-based estimates reported in the literature may not be representative of Site conditions and may result in an unspecified level of uncertainty when characterizing exposures to wildlife.

The seven-step DQO process provides the systematic basis for designing a plan for effectively collecting data that are of the appropriate type, quantity, and quality to support their expected use (USEPA 2006). DQOs for this Biota SAP are presented below in **Table 2-2**.

## Table 2-2: Data Quality Objectives

| | DQO Step | Site-Specific DQOs |
|---|---|---|
| 1. | State the Problem | ■ Data gap identified for chemical measurements in prey items that introduce uncertainty in exposures to upper trophic level receptors. |
| 2. | Identify Goals | ■ Collect and analyze representative samples of soil, surface water, and sediment to characterize abiotic media and support bioaccumulation modeling.<br>■ Collect and analyze representative, co-located (with abiotic samples) prey (biota) to support characterizations of food chain exposures for higher trophic level receptors†.<br>■ Document the location, general taxa composition, mass, and ease of capture (e.g., mass per unit effort) of prey samples to support qualitative characterizations of prey assemblages and foraging by wildlife. |

| | DQO Step | Site-Specific DQOs |
|---|---|---|
| 3. | Identify Information Inputs | ■ Characterize the relationship between COPC concentrations in co-located abiotic medium (soil, surface water, sediment) and representative prey tissues to support the development of bioaccumulation models.<br>■ Collect minimum target sample mass by tissue type to support chemical analyses for multiple target analyte classes (**Table 3-1**). |
| 4. | Define Boundaries | ■ *Spatial Boundary*: sampling areas within the Study Area.<br>■ *Temporal Boundary*: Pending approval and during a biologically active period.[††] |
| 5. | Develop Analytical Approach | In order of preference (based on the data obtained in this study):<br>■ *Generalized Linear Model*: To be developed by evaluating mathematical and visual (graphical) fits of co-located (paired) abiotic medium and tissue concentration data (both untransformed and log-transformed).<br>■ *BAF*: Determine the mean (or median) ratio (i.e., BAF) of co-located concentrations in tissue divided by the concentrations in abiotic medium (i.e., bivariate relationship).<br>■ *Mean (Median) Tissue Concentration*: Determine the mean (or median) concentration in a tissue. |
| 6. | Specify Performance Criteria | When[†††]:<br>■ *Generalized Linear Model*:<br>– Significant relationship exists (slope differs from zero $p < 0.1$); (if not, then calculate summary statistics for tissue, independent of abiotic medium);<br>– Sufficiently reliable predictive ability ($R^2 \geq 0.36$); and<br>– Slope differs from one ($p < 0.1$); (if not, then use the BAF approach instead of a generalized linear model)<br>■ *BAF*:<br>– Significant relationship and sufficient reliable predictive ability; but the slope does not differ from one<br>■ *Mean (Median) Tissue Concentration*:<br>– When not a generalized linear model and not a BAF, or there are less than eight detected pairs (paired abiotic medium-tissue data) |
| 7. | Develop Plan for Obtaining Data | ■ See Sections 3.0 through 5.0. |

*† Development of bioaccumulation models.*

*†† See Section 3.5.*

*††† Bevelhimer et al. 1997; USEPA 2007.*

*p Probability of obtaining test results at least as extreme as the results actually observed, assuming that the null hypothesis is correct.*

*R2 Coefficient of determination, or the proportion of the variance, in the dependent variable that is predicted from the independent variable (i.e., it is a measure of how well the model fits (explains) the observed data).*

# 3.0 SAMPLING DESIGN/SCOPE

This section of the Biota SAP describes the sampling design, biota collection methods, and reporting that will be employed to achieve the DQOs described in Section 2.0 above. Methods for field sample collection, handling, transport, and chemical analyses are also included and/or referenced herein.

Key features of this Biota SAP include, but are not limited to, the following:

- Applying a stratified random sampling design in which strata are selected to represent different habitat conditions and concentration ranges.
- Obtaining tissue samples from different taxonomic groups: herbaceous plants; soil invertebrate (both annelid earthworm and soil arthropods[4]); aquatic vegetation and emergent plants; aquatic macroinvertebrates, fish, and small mammals.
- Characterizing variability in COPC concentrations by collecting and analyzing samples from multiple Sampling Locations within a sampling area (see **Figure 3-1**).
- Collecting samples in 2021, pending approval (i.e., likely during late summer/ fall months to reduce the potential for high-water levels associated with snow-melt and overland water run-off).
- Applying best practices for sample collection and handling to minimize potential PFAS cross-contamination, including quality assurance/quality control (QA/QC) sampling to conform to acceptable data usability guidelines.
- Including a local upstream sampling location for in-river sampling areas to characterize upstream (baseline) conditions and chemical concentrations in biota[5].
- Characterizing the relationship between surface water, substrate (soil and/or sediment), and biota tissue under current conditions.
- Identifying taxonomic groups of biota available for consumption by ecological receptors within each habitat type.

## Table 3-1: Biological Sample Types by Sampling Area

| Biological Sample Type | Upland† | Wetland | In-River |
|---|---|---|---|
| Herbaceous Plants | ● | ● | |
| Soil Invertebrates: Arthropods | ● | ● | |
| Soil Invertebrates: Earthworms | ● | ● | |
| Small Mammals | ● | ● | |
| Aquatic and Emergent Plants | | | ● |
| Aquatic Macroinvertebrates | | | ● |
| Fish | | | ● |

† *Area immediately surrounding the facility. If similar predominant biota are present, tissue samples will be composited across both wooded, shrub/scrub, and/or open areas.*

4 Separate and distinct tissue samples will be collected for earthworm and soil arthropods at Sampling Locations.

5 Results of historical fish tissue sampling and analysis reported by NYSDEC include suitable upstream locations; however, analytical results are limited to PFAS.

## 3.1 Upland and Wetland Sampling Locations

The terrestrial sampling area will be stratified (i.e., two separate sampling areas) by [i] upland habitat (surrounding the facility) and [ii] wetland habitat. Co-located specimens will be collected at sampling locations within each sampling area. Proposed sampling locations may be adjusted in the field based on access constraints or in-field observations/obstructions.

### *3.1.1 Reconnaissance Survey*

Before implementing field sampling activities, a reconnaissance survey of the upland habitat (grassy, shrub/scrub, and/or wooded habitat immediately surrounding the facility) and wetland habitat (wetland habitat just south of the facility) where a State Pollutant Discharge Elimination System (SPDES)-permitted storm water outfall is located, (see **Exhibit 1**) will be conducted. The objectives of the reconnaissance survey are as follows:

- Identify safe access pathways to each sampling location and access locations via pathways that can be used by emergency vehicles (if necessary).
- Confirm overall conditions in each habitat are safe for sampling.
- Confirm sampling locations are likely to render sufficient volume (e.g., soil, sediment, and/or tissue sample mass), or whether repositioning of sampling locations is necessary/preferred to meet sampling objectives. This includes field observations of vegetation types and small mammal activity.
- Confirm sampling layouts are appropriate for current conditions at each sampling location or whether modifications are required.
- Confirm sampling methods proposed for sample collection are appropriate to obtain adequate sample mass to achieve DQOs based on Site-specific conditions.
- Identify the center of each sampling location, mark with a pin flag or wooden stake, and record the position using a hand-held global positioning system (GPS) device to facilitate accurate and efficient positioning of field sampling activities and sample locations.[6]

A summary of findings from the field reconnaissance survey will be conveyed to the project team prior to implementation of sampling activities.

[6] The center point coordinates will be used for the sample location identifier with the laboratory. GPS coordinates will be collected and recorded for all sampling stations within a given sampling location.


**Exhibit 1: North End of Wetland Area, Adjacent to SPDES Permitted Discharge Point**

### *3.1.2 Allocation/Distribution of Sampling Locations (Upland/Wetland)*

Grassy, shrub/scrub, and wooded habitats immediately surrounding the facility will be considered as a single upland habitat type given anticipated similarities in predominant upper trophic level receptors and prey assemblages (see **Figure 3-1**).[7] Upper trophic level consumers (herbivores, invertivores/insectivores, piscivores, and carnivores) are typically mobile and populations are likely to forage and integrate across a combination of grassy, shrub/scrub, and wooded habitats.

To promote representative sampling coverage to evaluate the range of environmental PFAS and COPC concentrations, the SUs in the uplands and transects in the wetlands are roughly aligned to represent low, medium, and high concentrations of perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS) in substrate materials for both upland and wetland habitats (**Figure 3-1**). Categorizations of transects as low, medium, or high for PFOA and PFOS are based on results from 170 samples collected from ground surface to less than 2 feet below ground surface (bgs) at locations included in the RI/FS (**Figures 3-2** and **3-3**). The general areas of the SUs presented in the figure were selected to provide representative coverage in the upland and wetland areas over the habitat and range of environmental soil COPC concentrations.

[7] It is presumed that the same predominant herbaceous plants and soil invertebrates are anticipated to be consumed by the same upper trophic level wildlife consumers. Consequences of this simplifying assumption will be discussed in the uncertainty analysis of the risk assessment.

## Table 3-2: Sampling Locations per Unit or Transect, by Habitat Type

| Habitat Type | | SU (Upland) or Transect (TR) (Wetland) | Sampling Locations per Unit or Transect |
|---|---|---|---|
| Upland | SU1 | wooded, tax parcel, low PFAS | 2 |
| | SU2 | open, tax parcel, high PFAS | 3 |
| | SU3 | open, tax parcel, low PFAS | 3 |
| | SU4 | open, ballfield, low PFAS | 2 |
| Wetland | TR1 | gradient of flow path | 3 |
| | TR2 | gradient of flow path | 3 |
| | TR3 | gradient of flow path | 3 |
| | | **Total Sampling Locations** | **19** |

*TR = transect*

A total of 10 upland sampling locations are distributed within four sampling units (SU1 through SU4) located within the facility boundary and adjacent ballfield. A total of nine wetland sampling locations are distributed along three transects in the wetland just south of the facility boundary. The wetland sampling locations are located in the area of the SPDES-permitted storm water outfall (see **Exhibit 1**) and along transects beginning near the discharge point and extending into the wetland area (**Figure 3-1**).

Prey tissue sampling locations will be systematically allocated amongst, and distributed within, the SUs and along transects. Locations will be targeted to maximize the likelihood of obtaining sufficient biota sample masses, as reviewed by the lead field biologist and discussed between sampling and managerial team members.

### *3.1.3 Number of Upland/ Wetland Sampling Locations*

A sampling location will have a radius of approximately 30 feet (**Figure 3-4**). The center coordinates of each sampling location will be recorded using a hand-held GPS and marked with a pin flag or wooden stake. Within each upland SU or wetland transect, two to three sampling locations will be targeted for sampling of abiotic media and biota for a total of 19 sampling locations. Attempts will be made to position sampling locations at least 65 feet apart to decrease potential overlapping use by mobile target invertebrates and small mammals. This approach will generate a total of 10 paired (co-located) soil and biota samples representative of upland habitat conditions and nine paired (co-located) soil and biota samples representative of wetland conditions.

Given previous challenges with collecting sufficient prey tissue mass at other sites, the strategy is to sample more locations than are needed to support the development of bioaccumulation models for herbaceous plants and soil invertebrates[8] (**Figure 3-1**, see also Section 3.4 below).

### *3.1.4 Types, Numbers, and Sampling Layout at Each Upland/Wetland Sampling Location*

To provide a general sense of the sampling layout, hypothetical sampling locations are shown on **Figure 3-4**. Sampling stations, within a sampling location, are intended to maximize the chance of collecting sufficient tissue to support chemical analyses of all COPCs (see Section 3.3). Field sampling

[8] Where sufficient data exist, separate and distinct bioaccumulation models will be developed for earthworm and soil arthropods. Accordingly, separate and distinct tissue samples will be collected for earthworm and soil arthropods at sampling locations.

teams will attempt to collect sufficient tissue mass (i.e., 69 grams wet weight [ww])[9] for the laboratory to conduct homogenization protocols and implement analytical analyses for PFAS, TAL metals (including mercury), SVOCs, PCBs, and general chemistry parameters (summarized in **Appendix A**).

Compositing across sampling stations (within a sampling location) will be performed to obtain the minimum target sample mass necessary to complete all chemical analyses. Multiple stations within a sampling location are intended to increase the chances of capturing sufficient biological specimens to produce the minimum target sample mass. Composite samples amongst sampling stations are designed to address anticipated challenges in collecting sufficient sample mass and maintaining the number of paired (co-located) samples, which promote the most robust characterizations of the relationship between soil and tissue samples. For each sampling location, soil and biota samples (with the exception of small mammals), will be collected from 10 co-located stations to produce a composite sample for each sample type (i.e., soil, plant, earthworm, or soil arthropod[10]). Small mammals will be captured at five of the 10 co-located stations and will only be combined to produce species-specific composite samples. Where target sample mass is attained, up to five species-specific replicate composite samples will be generated for each sampling location for small mammals, as requested by NYSDEC (see Section 3.4).

Given prior experience and studies at other sites, the collection of sufficient and representative sample mass is likely to be challenging for some tissue types (e.g., soil arthropods) even when compositing across sampling stations. If insufficient sample mass is available for a given sample type, there are options (considerations) to address this short-coming (see Section 3.4). These options may be used alone or in combination, based on the 'catch' experienced in the field. Should it be necessary, the overall strategy (comprised of one or more options) for attaining the minimum target sample mass will be discussed with the oversight regulatory agency (USEPA and/or NYSDEC) (Sections 3.4 and 6.0) and conducted in accordance with this Biota SAP before initiating chemical analyses. If insufficient sample mass is available for a given sample type (e.g., soil invertebrate tissue), the laboratory will be instructed to prioritize analyses in the following order of importance:

> PFAS > TAL metals (including mercury) > PCBs > SVOCs > general chemistry parameters.

The number of samples, sample medium, and target analytes are outlined in **Appendix A**.

### *3.1.5 Discrete Samples for Analysis of Total Chromium and Hexavalent Chromium*

An understanding of the relationship between total chromium and hexavalent chromium concentrations in Site soils is required to support the baseline risk assessments. To facilitate this understanding, a single discrete soil sample will be collected at the center of each of the 10 upland sampling locations (**Figure 3-4**). The discrete "grab" sample will provide a baseline concentration for each of the sampling locations and be collected in conjunction with one another due to the short hold time of the equipment rinsate blank for hexavalent chromium submittal and analysis. These discrete soil samples will be analyzed for both total chromium and hexavalent chromium.

9 69 grams for tissue samples with the exception of plant tissues where the minimum volume is 49 grams due to the absence of lipid analysis (20 grams).

10 Earthworm and soil arthropods will be composited into separate composite samples. Note that collection of soil arthropods and earthworms may necessitate several rounds of collection during the period of sampling.

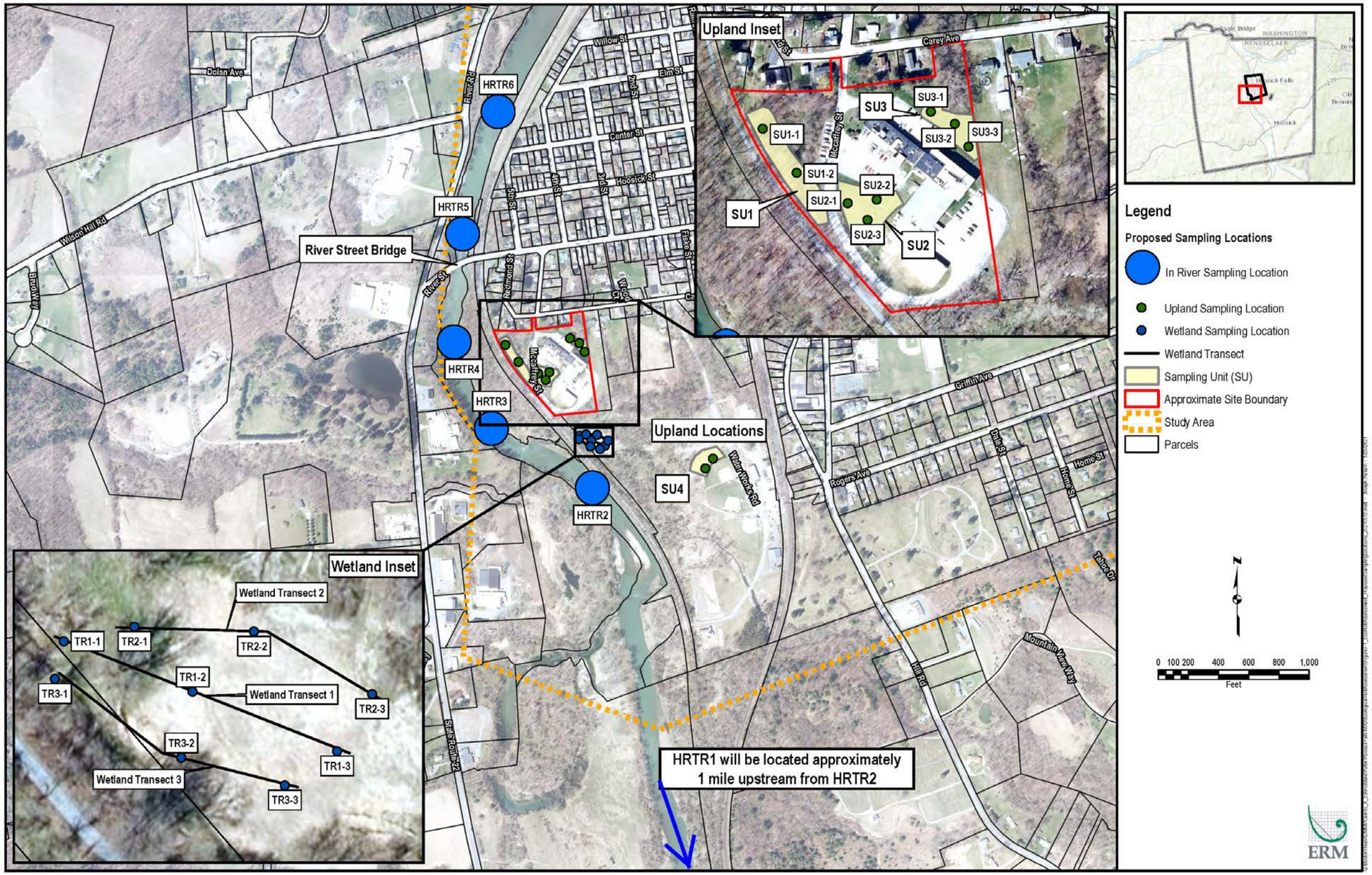


**Figure 3-1: Proposed Sampling Locations (All Habitat Types)**

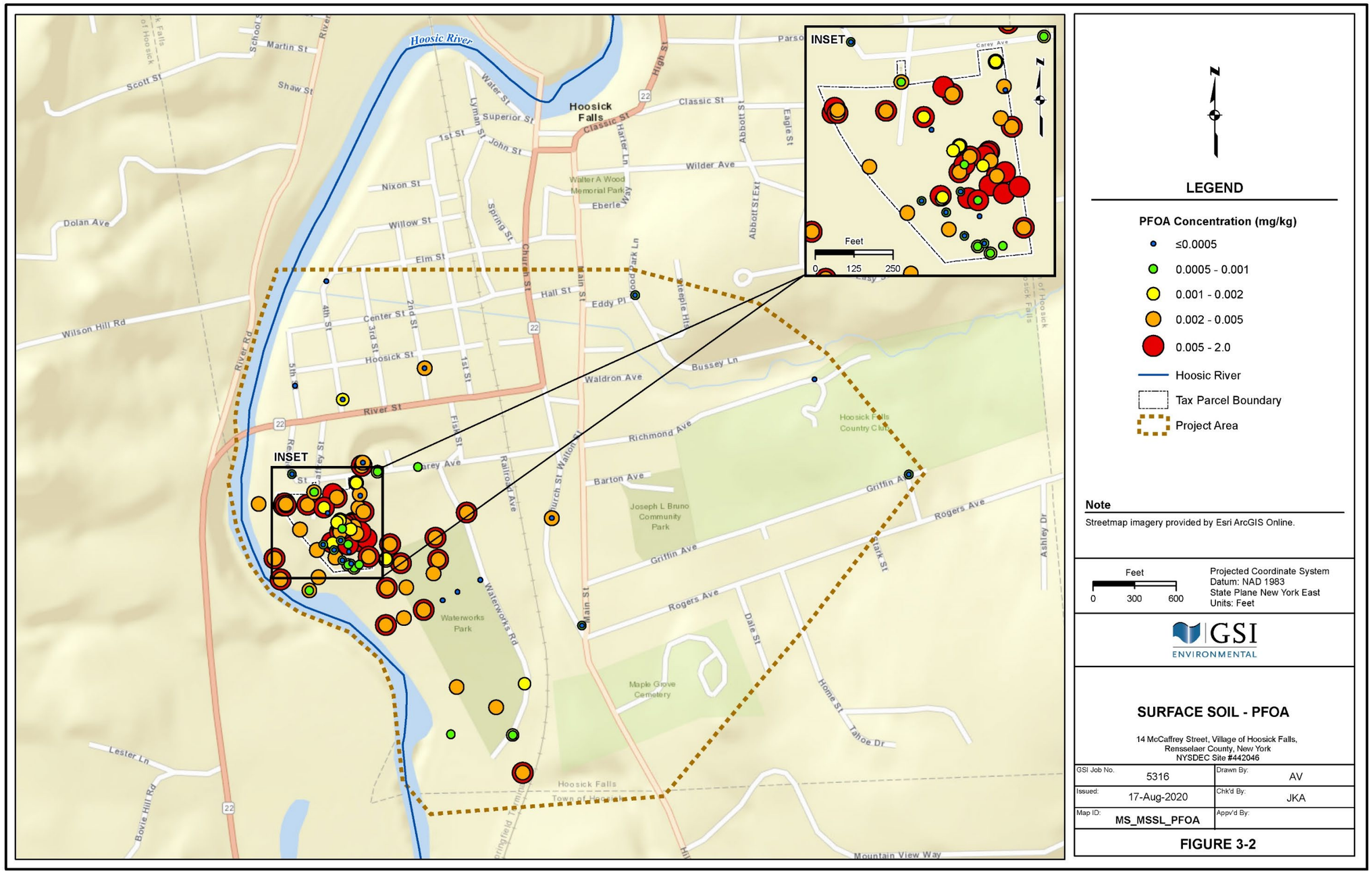


**Figure 3-2: Surface Soil—PFOA (GSI 2020)**

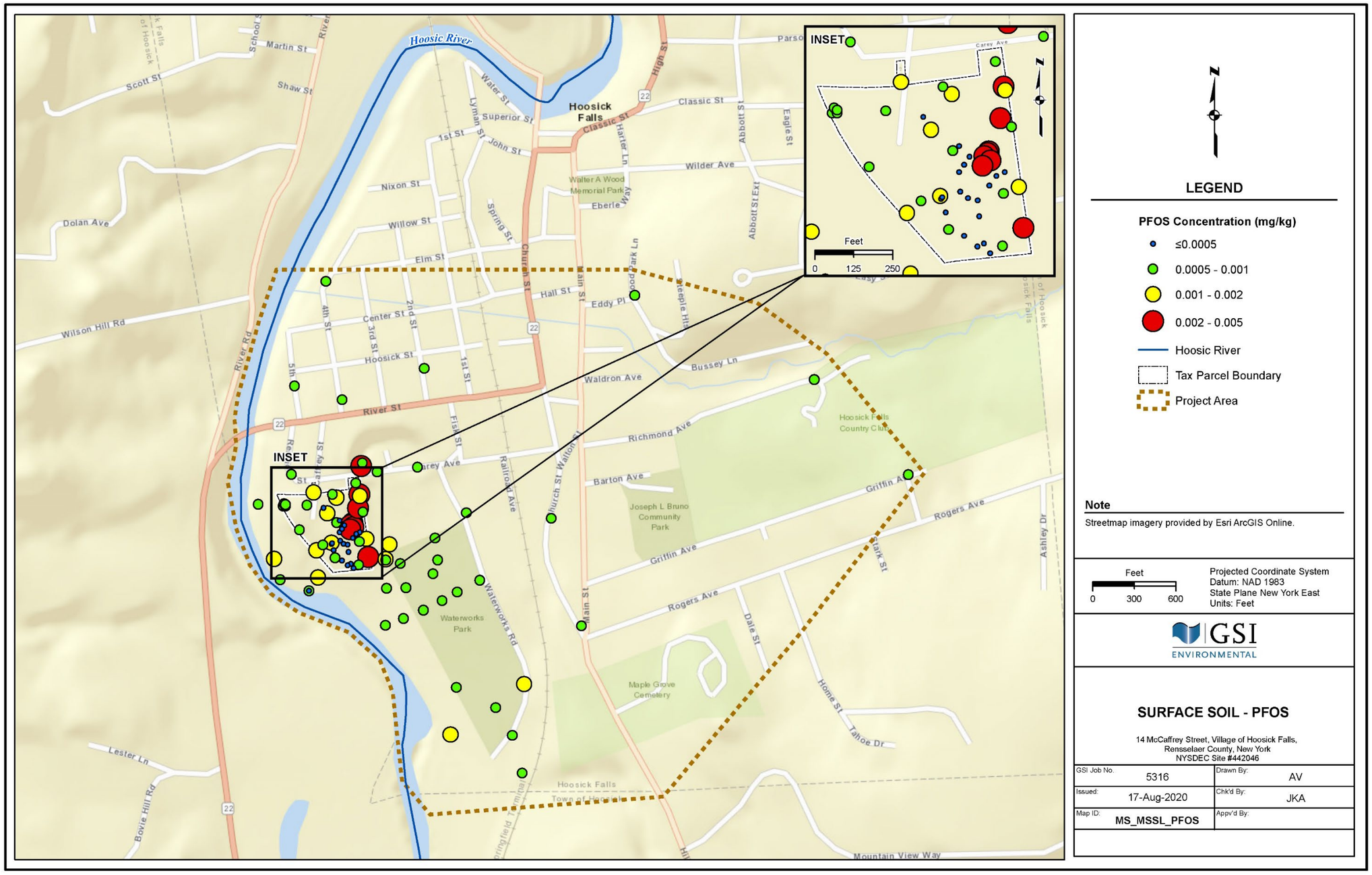


**Figure 3-3: Surface Soil—PFOS (GSI 2020)**

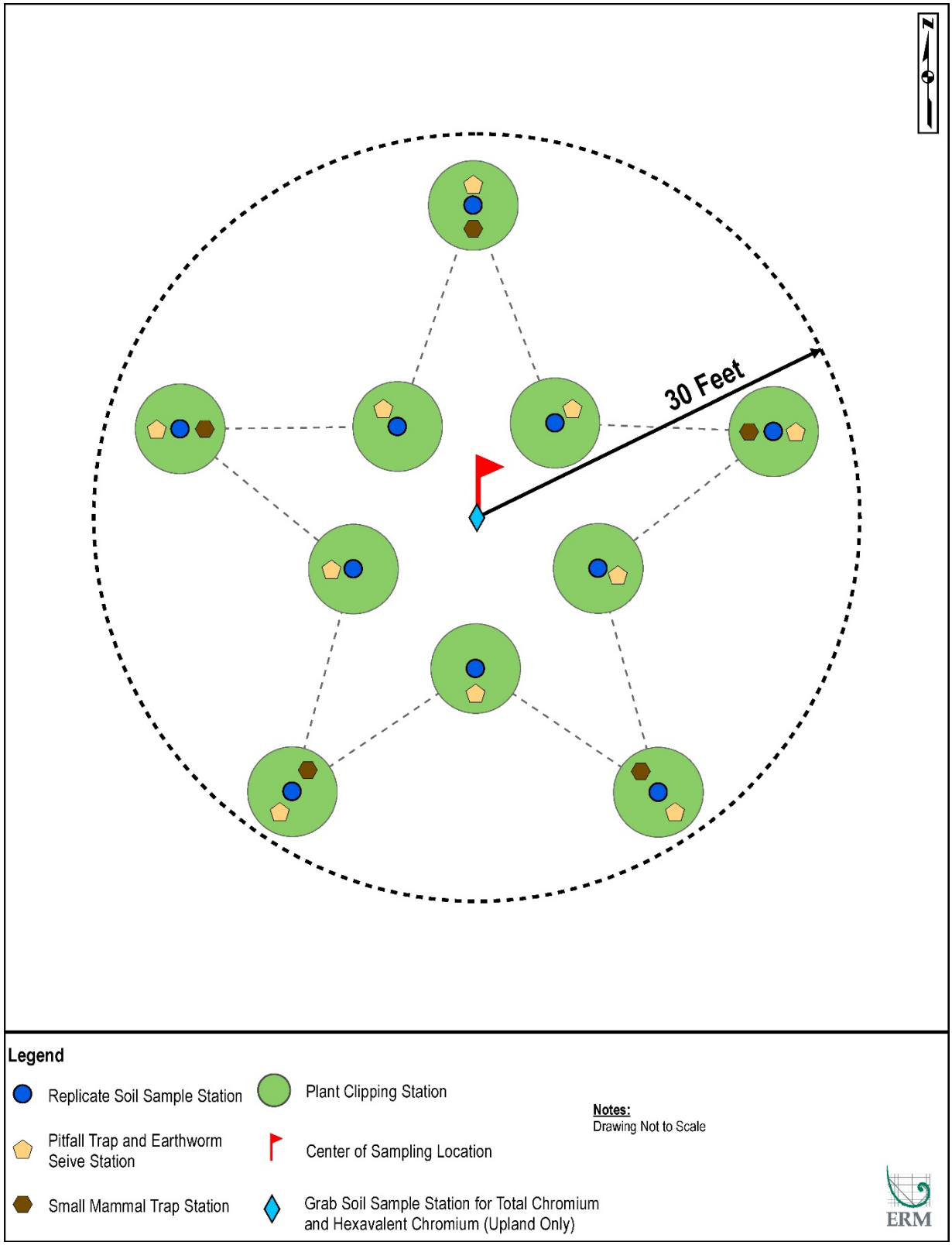


**Figure 3-4: Representative Layout of Upland/Wetland Sample Locations**

## 3.2 In-River Sampling Locations

### *3.2.1 In-River Reconnaissance Survey*

Before implementing field sampling activities in the Hoosic River, a reconnaissance survey of the reach of in-river sampling locations will be conducted. The objectives of the field reconnaissance survey are as follows:

- Identify safe access pathways to each sampling location and access locations via pathways that can be used by emergency vehicles (if necessary).
- Confirm overall conditions in the river are safe for sampling by means of wading (i.e., non-flood conditions, non-high-flow weather conditions).
- Confirm the physical characteristics (e.g., flow regime, substrate conditions, and water depths) are similar across the proposed sampling locations.
- Confirm sampling methods proposed for sample collection are appropriate to obtain adequate sample volume to achieve DQOs on Site-specific river conditions.

A summary of findings from the field reconnaissance survey will be conveyed to the project team prior to implementation of sampling activities.

### *3.2.2 Allocation/Distribution of In-River Sampling Locations*

Similar to terrestrial sampling, the aquatic sampling approach will promote representative sampling coverage to evaluate the expected range of environmental PFAS and other COPC concentrations. To achieve this evaluation, six aquatic sampling locations are proposed in the river: two adjacent to the terrestrial (land) sample collection area (i.e., Site-adjacent), one adjacent to the wetland (near river) sample collection area, one upstream of the aforementioned locations, and two downstream in the area north of the River Street Bridge (**Figure 3-1**).

The upstream sample location will be in the river south of the Village, adjacent to a parcel with access to the river, and to which access has been previously granted by the property owner. This location is anticipated to be approximately 1 mile upstream of the southernmost Site-proximal locations. The remaining five downstream locations will be spaced at approximately 600 feet from one another. The furthest two downstream locations will be north of the River Street Bridge.

The sampling location within the river at each of these locations will have an approximate 30-foot radius for surface water, sediment, aquatic macroinvertebrate, and aquatic vegetation sampling. In addition, each sampling location will contain a 100-foot long transect stretching along the river (on both the eastern and western shorelines) for fish sampling, and sampling stations along each shoreline or riverbank for collection of emergent vegetation and soil (**Figure 3-5**).

### *3.2.3 Number of In-River Sampling Locations*

The six proposed aquatic sampling locations are anticipated to adequately obtain representative surface water, sediment, macroinvertebrate, vegetation-, and fish-tissue samples from the Hoosic River and adjacent wetlands (for emergent vegetation and soil). If inadequate amounts of tissue are available for sampling, the radius will be expanded and/or sample locations may be added to provide additional locations in the river for sample collection. These additional locations would likely be located adjacent to those originally proposed herein.

### *3.2.4 Types, Numbers, and Sampling Layout at Each In-River Sampling Location*

The center coordinates of each sampling location will be recorded using a hand-held GPS device and marked with a weighted buoy in the field. Attempts will be made to position sampling locations at least 600 feet apart to minimize potential overlapping use by aquatic organisms. Sampling locations or areas surrounding a given sample location are intended to allow collection of representative surface water and sediment samples and to maximize the chance of collecting sufficient tissue to support chemical analyses for all COPCs (see Section 3.3). Similar to the approach for tissue analyses of upland and wetland samples, if there is insufficient sample mass for the proposed analytical tests, the laboratory will be instructed to prioritize analyses in the following order of importance:

> PFAS > TAL metals (including mercury) > PCBs > SVOCs > general chemistry parameters.

To provide a generalization of the sampling layout, a hypothetical/representative in-river sampling location layout is shown on **Figure 3-5**.

Samples from within a sampling location are designed to provide paired (co-located) data that promote the most accurate characterizations of the relationship between surface water, sediment/soil, and tissue samples. Tissue samples will consist of a single targeted taxa to the extent possible. If this cannot be achieved due to minimum target mass requirements, the primary taxa comprising any composite sample will be identified. The sampling level-of-effort for aquatic macroinvertebrates will be consistent with those indicated in USEPA's *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers* (USEPA 1999) and the NYSDEC's *Standard Operating Procedure (SOP) for Biological Monitoring of Surface Waters in New York State* (NYSDEC 2019b). The number of samples, sample medium, and target analytes are outlined in **Appendix A**.

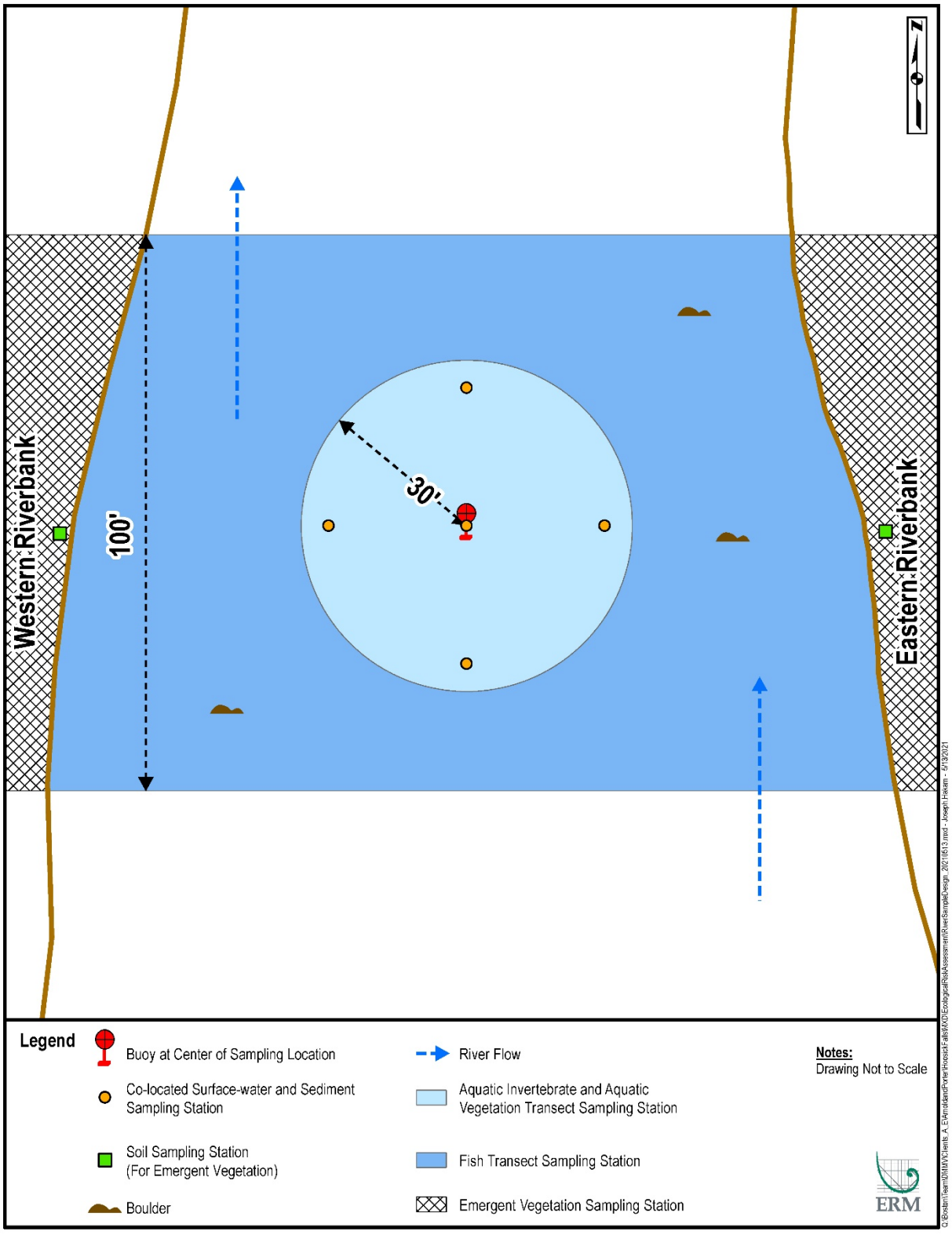


**Figure 3-5: Representative Layout of In-River Sample Locations**

## 3.3 Sampling Mass Targets

Target analytes and sample mass per analytical method and medium (sediment and tissues) are listed in **Table 3-3** below. A minimum target sample mass for tissues of 69 grams[11] (ww) is required to conduct analyses for all target analytes, including percent lipid content. When sample mass is partially sufficient, but limited (i.e., between 5 and 69 grams [ww]), prioritization of laboratory analyses will be discussed with the oversight regulatory agency (USEPA and/or NYSDEC) and conducted in accordance with this Biota SAP (unless requested otherwise) before initiating chemical analyses (**Appendix A**). As agreed with the oversight regulatory agency, analysis of PFAS will be the first priority where a minimum target sample mass of 5 grams is collected.[12]

### *3.3.1 Upland and Wetland Sampling Mass Targets*

A 10-to-1 composite sample[13] of each medium (soil, plant, and soil invertebrate) will be obtained for each sampling location. For small mammals, a species-specific composite sample will be obtained to meet the minimum sample mass requirement. The composite soil sample will represent the average environmental (substrate) concentration and each composite plant and soil invertebrate tissue sample will represent the average tissue burden at a particular sampling location.[14] Co-located substrate and tissue samples will be analyzed for the same suite of target analytes. Additionally, a single discrete "grab" soil sample will be collected at the center of each of the 10 upland sampling locations for analysis of total and hexavalent chromium. The following additional general chemistry analyses will be conducted to support the development of Site-specific bioaccumulation models (see Section 5.0):

- So il: TOC, pH, grain size, and percent moisture.
- Tissue: Lipid content (in conjunction with analyses of PCBs), not including plant tissues.

Ww units are used to calculate food chain exposures for wildlife. Consequently, all concentrations in tissues will be reported in ww and no analyses of tissue moisture content will be required.

### *3.3.2 In-River Sampling Mass Targets*

Similar to the terrestrial tissue collection approach, sampling of aquatic organisms will involve collecting composite samples of each of the following from every sample location: aquatic macroinvertebrates, aquatic vegetation, emergent vegetation, and fish tissue. To the extent possible, a given fish-tissue sample will consist of a single species and a single individual, if mass requirements can be met by a single fish. To meet tissue mass requirements, composite samples of a single species may be required. In some instances, if multiple fish species must be composited to meet the tissue mass requirements for a sampling location (e.g., for the smallest 0 to 6-inch size class), data on the species composition of the composite fish sample will be recorded. Additionally, for the aquatic vegetation, emergent vegetation, and aquatic macroinvertebrates, taxa will be targeted for sampling to the extent possible, and data will be collected on the relative composition of composite samples by taxa, if multiple taxa must be collected. Additional information on targeted taxa for collection and the number of individuals required to meet tissue mass requirements is provided in Section 4.2. The aquatic organism collection methods will involve kick-netting, dip netting / hand-picking, and/or electrofishing, respectively, over specified distances or

[11] 69 grams for tissue samples with the exception of plant tissues where the minimum volume is 49 grams due to the absence of lipid analysis (20 grams).

[12] If insufficient tissue mass is available for field collection, standard laboratory bioaccumulation bioassays may, in the future, be considered (if deemed necessary). Laboratory requires a minimum of 1 gram for tissue PFAS analysis.

[13] From specimens collected across the 10 sampling stations within a sampling location.

[14] Note that separate and distinct composite tissue samples will be collected for [i] earthworms and [ii] other soil arthropods (see Section 4.1.3).

areas within the river and are expected to generate the minimum target sample mass of 69 grams ww per tissue type at each sampling location.

A pre-determined number of sub-samples to be combined to form aquatic macroinvertebrate, aquatic vegetation, and emergent vegetation composite samples is not necessary because, in these instances, the sample collection will occur across an area within, or adjacent to, the river, and not at discrete sampling stations (i.e., sub-sampling locations).

In these instances for aquatic macroinvertebrates, vegetation, and fish, if tissue mass is insufficient for the specified analyses, the collection area at the sampling location will be expanded in an attempt to collect additional tissue to achieve sufficient mass for the full analytical suite.

Co-located surface water, sediment, and tissue samples will be analyzed for the same suite of target analytes. Additionally, the following general chemistry analyses will be conducted to support the development of Site-specific bioaccumulation models (see Section 5.0):

- Surface Water: TOC, hardness, and the following field parameters: temperature, specific conductance (SpC), dissolved oxygen (DO), pH, oxidation reduction potential (ORP), and turbidity.
- Sediment: TOC, grain size, and percent moisture (pH to be conducted in the field).
- Tissue: Lipid content (in conjunction with analyses of PCBs), not including plant tissues.

Surface water and sediment sub-sampling will only occur within the macroinvertebrate sampling station (minimum 30-foot radius from center of sampling location) at a particular sampling location and not across the entire fish SU, which is anticipated to be larger in area. To minimize disturbance, surface water will be collected first, followed by the collection of fish (minimum disturbance), then benthic macroinvertebrates.

## Table 3-3: Target Analytes and Minimum Target Sample Mass

| | Target Analytes | Surface Water Volume per Analytical Method (milliliters) | Soil Sample Mass per Analytical Method (grams, dry weight) | Sediment Sample Mass per Analytical Method (grams, dry weight) | Tissue Sample Mass per Analytical Method (grams, ww) |
|---|---|---|---|---|---|
| 1 | PFAS | 250 | 5 | 5 | 1 |
| 2 | TAL Metals† | 200† | 10 | 100 | 2 |
| 3 | Mercury†† | 40 | 5 | 1 | 1 |
| 4 | PCBs | 1,000 | 100 | 30 | 15 |
| 5 | SVOCs | 1,000 | 50 | 30 | 15 |
| 6 | TOC | 50 | 100 | 10 | — |
| 7 | Hardness | 50 | — | — | — |
| 8 | pH | — | 20 | — | — |
| 9 | Grain Size | — | 100 | 50 | — |
| 10 | Lipid Content††† | — | — | — | 20 |
| 11 | Loss for Homogenization†††† | — | — | — | 10-15 |
| 12 | Hexavalent Chromium††††† | — | 2.5 | — | — |
| | **Minimum Target Sample Mass:** | **2,630 milliliters** | **393.5 grams** | **227 grams** | **69 grams** |

*— = Not applicable*

*† TAL Metals includes 22 compound list by USEPA Methods 6020B (solids) and 6020A (aqueous). Aqueous volume includes both total and dissolved analyses*

*†† Mercury analysis to be conducted using USEPA Method 7471B (soil/ sediment), 7470A (water), and USEPA Method 1631E (tissue). The methods for soil and water are consistent with the methods for samples previously collected at the Site and should remain consistent to support the sources of data for the risk assessment. Method 1631E is a low-level method recommended for use to achieve lower reporting detection limits*

*††† Only required when analysis of PCBs is conducted, with the exception of plant tissue. If PCBs analysis is not conducted, a separate analysis for lipid content may be requested to the laboratory.*

*†††† Laboratory will make all efforts to keep loss for homogenization and sample transfer to a minimum. A maximum loss of 15 grams has been accounted for in the minimum target sample mass.*

*††††† Hexavalent chromium to be conducted on discrete "grab" soil samples in the upland area only*

## 3.4 Meeting the Minimum Target Sample Mass

Given the minimum target sample mass of 69 grams ww (49 grams ww for plant tissue), the collection of sufficient and representative sample mass is likely to be challenging for some tissue types. If insufficient sample mass is available for a given sample type, there are four reasonable strategies to address this short-coming:

- Modify the sampling period (as described in **Table 3-4**);
- Reduce the number of replicate samples;
- Prioritize laboratory analyses; and/or
- Composite samples (within and amongst sampling locations).

These strategies will only be considered if insufficient mass is collected to meet the minimum target sample mass. These strategies may be used alone or in combination, based on the 'catch' experienced in the field. Decisions regarding compositing and/or prioritization will be discussed with the oversight regulatory agency (USEPA and/or NYSDEC) and conducted in accordance with this Biota SAP before initiating chemical analyses (**Appendix A**).

### *3.4.1 Decision Framework to Provide Minimum Target Sample Mass*

Environmental media or biological specimens will be collected at sampling locations until the minimum target sample mass (target mass) is obtained or the end of the 7-day[15] field sampling effort transpires, whichever occurs first. If target mass is not acquired within the 7-day field sampling effort, modifications to the sampling duration are subject to consultation and approval with the NYSDEC and the Clients. To facilitate these decisions, collection progress will be discussed with NYSDEC representatives daily starting no later than the third day of collection. Upon approval from both the NYSDEC and Client, field sampling efforts may be extended or terminated and rescheduled if required.

Given past experience at other sites, the number of specimens to obtain the target mass at each sampling location will likely be a challenge for fish, soil invertebrates, and small mammals. For example, **Figure 3-6** gives a breakdown of the number of deer mice (*Peromyscus maniculatus*) that would be required for the proposed number of sampling locations, replicates per location, and target sample mass (needed for all target analytes). Achieving this target number would require an overall percent capture rate of 84 percent at 95 traps[16] over five nights of trapping—this capture rate is considered to be optimistic.

*[see **Table 4-1**]*

Minimum Target Sample Mass = 69 g
Average Body Weight = 21 g
Number of individuals per sample = 4
(= 69 g ÷ 21 g, rounded)
Number of replicate samples per *Sample Location* = 5
Number of individuals per *Sample Location* = 20
Number of *Sample Locations* = 19
(= 10 locations in upland and 9 locations in wetland)
Total number of samples = 95

***Total number of individuals*** = 400 mice
(Includes field duplicates)

**Figure 3-6: Example: Deer Mouse**

Given uncertainties in collecting sufficient biological tissue mass, an adaptive management program for sampling will be implemented. The program will require daily tracking of sample mass collection (by species and by location) and then assessing the progress of biota collection approximately halfway into the sampling effort, as follows:

[15] 7-days include: 1 day of trap deployment and trap acclimation, 5 days of trapping, and 1 day of trap retrieval and restoration.

[16] Where 95 traps = 5 traps per location • 19 locations (= 10 upland + 9 wetland).

## Table 3-4: Adaptive Management Program for Sampling

| If… | Consider |
|---|---|
| Less than 10% of target mass is collected | Consider terminating sampling and reschedule remaining days |
| 10% to 45% of target mass is collected | Consider terminating/rescheduling as above, or modify the plan † |
| Greater than 45% of target mass is collected | Continue sampling |

† *see framework below*

If 'the end of sampling' occurs first, then the target mass will not have been obtained for all target species or for each sampling location and the below stepwise decision framework will be executed. Since a high priority goal of this study is to develop compelling Site-specific bioaccumulation models, the decision framework generally prefers options that promote robust models, which improves with increased numbers of paired data.[17] Note that this decision framework will be applied as needed on a sample location basis.

Once reaching an agreement, the specific selected scheme(s) will then be provided to the laboratory for implementation.

### *3.4.2 Reduce Number of Replicate Samples*

Currently, the plan is to collect five replicate samples per sampling location for each fish and small mammal target species. As shown in **Table 4-2** below, this design feature would necessitate the collection of approximately 400 mice during the field effort. Collection of this number of specimens would require the capture of mice using more than four or five traps at all 19 locations on each day of the five-day sampling period (i.e., at an unlikely 84 percent catch-per-unit-effort). By reducing the number of replicates to three per sampling location, the total number is reduced to 240 mice and an optimistic 51 percent catch-per-unit-effort.[18]

### *3.4.3 Prioritize Laboratory Analysis*

If other considerations alone will not result in sufficient sample mass, then reducing the analyte list may also be considered to allocate sufficient mass for the preferred chemical analyses. This option maintains the number of abiotic medium-tissue paired data (i.e., statistical power) to develop bioaccumulation models. The laboratory will be instructed to prioritize analyses in the following order of importance (i.e., analysis for PFAS is the first priority) (see minimum volumes in **Table 3-3**):

> PFAS > TAL metals (including mercury) > PCBs > SVOCs
> > general chemistry parameters.

The number of samples, sample medium, and target analytes are outlined in **Appendix A**.

### *3.4.4 Compositing Strategy*

If other considerations will not result in sufficient sample mass, then a compositing strategy may also be contemplated to allocate sufficient mass for the preferred chemical analyses. Compositing of samples will be conducted/arranged at the laboratory to maintain controlled "clean" conditions (as compared to field conditions) and reduce the overall number of staff that handle the samples. Compositing among

[17] Confidence in characterizations of the relationship between biotic and abiotic concentrations improves with increased numbers of paired data.

[18] The same concept applies to fish (see **Table 4-3**).

sampling locations is generally less preferred as it will reduce the number of paired (abiotic medium-biotic) data used to derive Site-specific bioaccumulation models.

When sampling locations do not have sufficient mass to perform the proposed laboratory analyses, compositing across multiple sampling locations (within an SU, transect or area) may be considered. This would obtain sufficient sample mass to complete prioritized chemical analyses. Biological samples that are captured as part of this field sampling effort will be processed at the laboratory in preparation for compositing/homogenization and chemical analyses. This would maximize the flexibility in selecting and/or creating tissue samples with sufficient mass to support concentration determination.

Where there is insufficient mass for chemical analyses, tissue samples amongst sampling locations will be composited as follows:

- Only within the same habitat type (i.e., upland, wetland, or in-river).
- Only within the same species for small mammals and fish samples.
- Only within the same prey type: plant, soil invertebrate, aquatic plant, or aquatic macroinvertebrate.
- Preferably, among locations with the same PFAS category (low, medium, high), based on known or presumed environmental media (soil, surface water, or sediment) concentrations.
- Preferably, among locations with similar taxa composition (where possible).
- Preferably in relatively close proximity to one another (where possible).

Other factors that are discovered when collecting samples and discussed with oversight regulatory agency may also be considered in the final compositing strategy.

When deciding which samples to composite across multiple nearby sampling locations, similarity in substrate (soil/sediment) concentration range will be preferred to avoid combining across categories (low, medium, high) which is unlikely to capture the range of concentrations sought when developing bioaccumulation models. Therefore, where feasible, soils sample results will be considered in the selection of tissue samples for compositing. In addition, different species assemblages of plants, soil invertebrates, or aquatic macroinvertebrates will likely be collected at different sampling locations; therefore, compositing samples among locations with a similar taxon mix will be preferred (i.e., composite samples with similar assemblages).

## 3.5 Timing and Duration of Sampling

This Biota SAP has been prepared under an expedited schedule to respond to feedback received from USEPA and NYSDEC at the end of December 2020 (see comments in the human health risk assessment work plan). Additional comments were received from NYSDEC in April 2021. Given the pending administrative steps, including obtaining necessary permits / permit waivers and input from the agencies on this Biota SAP and final regulatory approval, it is anticipated that late summer/early fall 2021 is the earliest the field sampling program could be implemented, if conditions are favorable. The collection of samples is anticipated to occur over a period of approximately 4 to 5 weeks, depending on field conditions. Laboratory analyses, validation, and reporting will require an additional 8 to 10 weeks. Therefore, it is anticipated that validated data from this program will be available by late 2021. The variable weather conditions in upstate New York may require an adjustment to the outlined schedule. Any such modifications will be communicated to USEPA and NYSDEC as soon as practicable.

It is expected that sufficient sample mass can be collected for soil and plants on the first day of sampling at upland and wetland sampling locations. However, it is expected that recurring collection of soil invertebrates (and possibly, small mammals) will be required to collect sufficient tissue mass at upland

and wetland sampling locations. Because recurring visits and collection of soil invertebrates is likely to be required to collect sufficient tissue mass, the upland and wetland field sampling effort is anticipated to require a minimum of 7 field days.

The in-river sampling effort will require collection of aquatic macroinvertebrates and co-located surface water/sediment samples by a three-person sampling team and collection of aquatic/emergent vegetation and fish by a separate three-person sampling team. The on-shore personnel will provide sample processing support and health and safety monitoring. Following the initial sample collection, it should not be required to return to the field for recurring sample collection at the aquatic sampling locations.

It is expected that sufficient sample volume/mass can be collected for surface water, sediment, aquatic macroinvertebrates, and aquatic/emergent vegetation during one field day at a single sampling location, at a minimum. However, to obtain the minimum target fish-tissue mass for five samples of the same species at a given sampling location, it is possible that the sample location boundary will need to be expanded. This field collection level of effort will lead to a sampling duration of approximately 1 to 2 weeks for the six aquatic sampling locations.

## 3.6 Additional Site-Specific Sampling Considerations

### *3.6.1 Subsurface Clearance*

Dig Safely New York will be notified prior to the initiation of intrusive activities to cover each sampling location and will be requested to identify, locate, and mark member-company utilities in areas proposed for subsurface intrusive investigations. A private utility location subcontractor will be retained to evaluate proposed intrusive locations using ground penetrating radar, magnetometry/metal detection, inductive cable/pipe location, and/or other appropriate location techniques. A minimum 10-foot radius around each intrusive location will be evaluated for subsurface utilities prior to initiating work.

Proposed sampling locations will be adjusted in the field as necessary based on the results of the subsurface clearance effort to facilitate the health and safety of field sampling personnel, prevent property damage, and/or to avoid or minimize interference of sensitive areas.

### *3.6.2 Sampling Precautions for PFAS*

Special considerations are required for Site sampling activities when collecting and analyzing samples for PFAS. To avoid or minimize contamination of environmental samples with PFAS from sampling equipment or Site materials, guidelines have been developed for sampling procedures and equipment decontamination. These guidelines involve avoiding the use of, or contact with, materials that may contain PFAS (USEPA 2009; NYSDEC 2021). The following procedures will be implemented during sampling activities:

- Do not wear new clothing or clothing that has been treated with stain- or water-resistant coatings (e.g., Gore-Tex®). All clothing must be washed at least six times before use. Wash clothes without fabric softener.
- Do not wear Tyvek® clothing.
- No Post-It-Notes® will be used during sampling.
- Personnel should not handle pre-wrapped food or snacks while working at the Site.
- Do not use any material or equipment that contains Teflon® (e.g., Teflon® tubing, sample-container cap liners, tape, etc.).

- Do not use any materials or equipment that contains polytetrafluoroethene (e.g., polytetrafluoroethene-coated aluminum foil, Gore-Sorbers™) or any other material containing a fluoropolymer.
- Regular/thick size markers (Sharpie® or otherwise) are to be avoided and labels are to be completed outside the work exclusion zone (where samples are to be collected).
- Use only laboratory-supplied sampling containers/caps made of either polyethylene, high-density polyethylene (HDPE), or polypropylene for samples to be analyzed for PFAS.
- Field personnel must wash hands with soap and potable water prior to sampling activities, especially after contact with any materials potentially containing PFAS.
- Do not use waterproofed paperwork (i.e., Rite in the Rain® field books).
- Preserve samples on wet ice only; do not use chemical ice packs ("blue ice"). Polyethylene bags can be used to store ice.
- A clean pair of new, disposable nitrile gloves will be worn each time a different location is sampled.
- Sample containers shall be placed into separate, re-sealable polyethylene plastic bags immediately after collection and labeling.
- Samples shall be contained in a "PFAS-only" cooler for preservation.
- Water used during sampling or decontamination efforts will be obtained from a practicable source verified in advance to be PFAS-free through laboratory analysis or certification. Dedicated potable water containers will be used in the field throughout the duration of the project.
- A standard two-step decontamination using Alconox® and PFAS-free water will be performed for non-dedicated sampling equipment.
- Appropriate rain gear, bug spray, and sunscreen should be used that does not contain PFAS and should not contain ingredients with "fluor" in their name.
- Cosmetic products including, but not limited to, makeup, hair care products, perfumes, and lotions shall not be worn to the Site.

Dedicated potable water used during the sampling and decontamination efforts will be obtained from an approved and previously tested source with non-detectable laboratory concentrations of PFAS prior to mobilization into the field.

Dedicated potable water containers will be used in the field (as needed) throughout the duration of the project. Aqueous field rinse blank samples will be collected from the containers prior to use for laboratory analysis of PFAS to ensure that the potable water containers are not a potential source of PFAS concentrations.

Acceptable materials for sampling media for PFAS include the following (NYSDEC 2021):

- Stainless steel
- HDPE
- Polyvinyl chloride
- Silicone
- Acetate
- Polypropylene

The preferred material for containers is HDPE (NYSDEC 2021). Additional materials may be acceptable if preapproved by the oversight regulatory agency.

### *3.6.3 Quality Assurance Project Plan*

Field activities will follow the guidelines established under the Quality Assurance Project Plan (QAPP) for the overall project and will be conducted in accordance with this Biota SAP and the Site-specific Health and Safety Plan (HASP). Activities will be performed using the existing QAPP, as supplemented by the following guidance/technical information related to the collection of soil, surface water, sediment, and various tissue samples:

- NYSDEC. 1994. *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites. October 1994*.
- NYSDEC. 2010. *Division of Environmental Remediation (DER)-10: Technical Guidance for Site Investigation and Remediation.*
- NYSDEC. 2014. *Screening and Assessment of Contaminated Sediment*.
- NYSDEC. 2019. *Standard Operating Procedure for Biological Monitoring of Surface Waters.*
- NYSDEC. 2019. *Standard Operating Procedure: Collection of Sediment Samples*.
- NYSDEC. 2021. *Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS), Under NYSDEC's Part 375 Remedial Programs.*
- USEPA. 1999. *Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers—Periphyton, Benthic Macroinvertebrates, and Fish*.
- USEPA. 2003. *Fish Collection by Seining or Electrofishing, Technical Standard Operating Procedure SOP#EH-06.*
- USEPA. 2011. *Fish Field Sampling, Operating Procedure SESDPROC-512-R3*.

The reduced QAPP with applicable portions to this Biota SAP only, is attached as **Appendix B**. The QAPP outlines the specific sampling methodologies, field activities, considerations, and protocols which are required for Site-specific investigations.

# 4.0 SAMPLING METHODS

## 4.1 Upland and Wetland Sampling Methods

Collection of upland and wetland soil, plant, and biota tissue samples will generally occur within a 30-foot radius of the center of the sampling location. Site-specific sampling protocols for the collection of soil are outlined within this Biota SAP, the SOPs, and the project-specific QAPP. Sampling protocols for the collection of soil, plant, and biota tissue samples applicable to the upland and wetland sampling are included in **Appendices C** through **G**. Samples will be handled, labeled, and shipped in accordance with the QAPP and **Appendix B**.

Once collection of soil, plant, and/or biota at a particular sampling location is complete, re-usable sampling equipment used to collect samples (e.g., shears) will be properly decontaminated before moving to the next location (see Section 4.5 below). Dedicated sampling equipment (e.g., traps, nets) will be properly contained and disposed of, thereby eliminating the need for decontamination after use.

If a particular method is ineffective in capturing biota specimens, that method will be abandoned and sampling effort will focus on alternative, more effective sampling methods.

### *4.1.1 Soil*

#### *4.1.1.1 Collection of Soil Samples*

A representative soil sample will be collected at each upland and wetland sampling location (see Section 3.1). In upland and wetland sampling locations, soil samples will be comprised of 10 replicate samples (i.e., 10-to-1 composite sample) collected within the sampling location. The 10 replicate samples will be systematically distributed throughout the sampling location (**Figure 3-4**).[19]

Surface soil sample collection will involve the following:

- Consistent with NYSDEC's PFAS sampling guidance, soil samples will be collected from 0 to 1 foot below the surficial vegetative cover, including root mass, using a decontaminated stainless steel trowel, hand auger, shovel, or similar (NYSDEC 2021). This method will ensure that data are representative and comparable and will reduce variability due to procedural inconsistencies among sampling events.
- A volume of soil from each station's sampling interval will be placed directly into re-sealable HDPE bags that will be labeled with the unit name and depth interval on the outside.
- The physical characteristics of the soil will be evaluated in the field and descriptions recorded on electronic boring logs. As a matter of practice, screening of the soil using a photoionization detector (PID) equipped with an 11.7 electron volt (eV) lamp will be conducted and measurements recorded. The soil will be allowed to equilibrate within a re-sealable HDPE bag for approximately 5 minutes to facilitate headspace screening.
- The 10 replicate samples will be combined for homogenization on new polyethylene sheeting for each sampling location. The soil will be mixed (homogenized) using a decontaminated or dedicated stainless steel spoon, trowel, or similar and gravels discarded before being placed directly into sample containers provided by the analytical laboratory.

[19] Star-shaped configuration for circular upland and wetland sampling locations is intended to facilitate systematic sampling and the collection of a representative composite sample (**Figure 3-4**).

- Sample collection and processing tools and/or equipment will be properly decontaminated prior to sub-sample collection at each sample location in accordance with project protocols and in support of the project-specific QAPP (**Appendix B**).

It is anticipated that sufficient soil mass will be collected on the first day of sampling at each sampling location. Soil sampling in the upland and wetland areas will be submitted for analyses of the COPCs listed in **Table 5-1**. Surface soil collection methods will be conducted in accordance with the methodologies outlined in **Appendix C**, *Soil Sampling SOP* and the NYSDEC's *2021 PFAS Sampling Guidance*. QA/QC samples will be collected as specified (types and frequencies) in the QAPP (**Appendix B**).

### *4.1.2 Herbaceous Plants*

Further information pertaining to the collection of plant samples and methodologies are outlined in **Appendix D** *Plant Sampling SOP*.

#### *4.1.2.1 General Description of Plant Community*

A general observation-based characterization of the plant community at the sampling location will be conducted during the field implementation. The relevé method will be used because, for the purposes of this investigation, only a visual estimate of plant cover/composition is required rather than quantitative accounts of the occurrence of a particular species along a transect or precise measure of cover/biomass by planimetric or weighing techniques (USFWS 1993; California Native Plant Society 2007; Minnesota Department of Natural Resources 2007). Because the relevé method employs visual estimates instead of empirical measures, it is generally faster than other survey techniques and is particularly useful when observers are trying to quickly classify the range of diversity of plant cover over large units of land.

Each sampling location will also be documented to include the following information:

- Photographs of plants at a sampling location (at a minimum, in four cardinal directions—north, east, south, west).
- Surface cover (barren to 100-percent vegetation).
- General habitat description and level of disturbance (scaled from 1 [minimal] to 5 [high]).
- Vegetation structure (e.g., canopy layers, habitat classification).
- General taxa composition (i.e., relative abundance).
- Identification and estimated percent cover of dominant herbaceous grasses and forbs.
- Other notable features.

Field personnel will be provided the field datasheets or electronic forms to record the required sample information.

#### *4.1.2.2 Collection of Plant Samples*

Herbivorous small mammals generally prefer to browse on herbaceous grasses and/or forbs (USEPA 1993). Consequently, plant tissue sampling will focus on the collection of herbaceous grasses and forbs. Herbaceous grasses and forbs will not be targeted on a species-specific basis—rather, herbaceous plants will be collected relative to their visual percent composition (qualitative) within a sampling location (see relevé method in Section 4.1.2.1).

Herbaceous grasses and forbs will be clipped off at ground level (less than 1 centimeter) in concentric circles of increasing size around the center of each soil sampling station.[20] Where herbaceous plants are abundant, collection of plant tissue mass will be equally distributed among all 10 plant sampling stations at a particular sampling location. Collection of plant tissue mass will continue in concentric circles of increasing distance around each of 10 soil sampling stations until the target sample mass for tissue is collected (minimum of 49 grams per sampling location) for that sampling location, or until all herbaceous plants have been collected, whichever comes first. Only herbaceous plant tissue will be collected and care will be taken to avoid collecting woody tissue from plants.

It is anticipated that collection of sufficient plant tissue mass will be collected on the first day of sampling at each sampling location. Plant sampling will generate a single composite sample from each sampling location for analyses of the COPCs listed in **Table 5-1**. Plant tissue collection methods will be conducted in accordance with the methodologies outlined in **Appendix D**, *Plant Sampling SOP*.

The laboratory will remove, to the extent practicable, any external soils that may be present from collected plant tissue specimens prior to analyses. The laboratory will also weigh and determine the final sample tissue mass.

### *4.1.3 Soil Invertebrates*

Further information pertaining to the collection of earthworm and arthropod samples, including methodologies and general descriptions to be noted are outlined in **Appendix E** (*Earthworm / Soil Infauna Sampling SOP*) and **Appendix F** (*Soil Arthropod Sampling SOP*).

#### *4.1.3.1 Collection of Soil Invertebrates*

Collection of terrestrial invertebrates will employ methods that target (separately) earthworms and soil arthropods.

##### *Collection of Earthworms (Annelids)*

Annelids are segmented worms and the ‘earthworm’ is the common name for members (species) of the suborder *Lumbricina*[21]. Earthworms will be collected at the same sampling locations for soil as identified on **Figure 3-4**. Earthworm collection will include the following:

- Field personnel will dig into the soil using a decontaminated stainless steel trowel, shovel, or similar to an initial depth of approximately 1 foot bgs within a 1 square-foot area. The dug soil will then be placed onto an adjacent section of new, polyethylene sheeting placed on the ground surface.
- The decontaminated intrusive device (i.e., shovel, trowel) will be used to dissect the soil clods to locate earthworms for sample collection.
- Wearing new nitrile gloves for each sampling location, and using decontaminated hand tools, field sampling personnel will examine the dissected soil clods to remove the earthworms. A wire mesh sieve with 0.25- to 0.5-inch openings will be used to sieve the soil to obtain additional earthworm specimens.
- Collected earthworms shall be placed into dedicated laboratory-supplied containers.
- This procedure will be repeated at each of the 10 soil invertebrate sampling stations associated with a given sampling location.

[20] Hence, herbaceous plant material will be collected in proportion to their relative cover at the sampling location.

[21] Specifically, of the *Phylum Annelida*, Class *Clitellata*, Subclass *Oligochaeta*, Order *Opisthopora*, suborder *Lumbricina.*

- Field sampling personnel will combine earthworms collected from the 10 sampling stations, associated with a given sampling location to form a single composite sample. The sample container(s) will be placed within a single laboratory-approved storage bag and sample identification placed on container labels within the bag.
- Soil unearthing and dissection/sieving will continue until the target tissue mass (i.e., a minimum of 69 grams per sampling location) of earthworms has been collected, unless achieving such mass is deemed unfeasible by field sampling personnel. It is anticipated that collection of greater than 5 large or 20 small earthworms will likely be required to meet the above sample mass requirement for the composite sample(s).
- Upon completion of earthworm collection, the soil will be backfilled into the intrusive location in relative order and the vegetative cover shall be replaced on top of the soil at ground level.
- The location of intrusive sampling locations will be marked in the field with a pin flag or wooden stake.

If earthworm collection at the initial locations yields insufficient tissue mass for laboratory analyses, field sampling personnel will advance additional 1 square-foot areas of soil to a depth of approximately 1 foot bgs, as needed, to collect additional earthworm tissue mass to meet analytical needs, unless reaching such mass is deemed unfeasible by field personnel.

Earthworm sampling will generate a single composite sample from each sampling location for analyses of the COPCs listed in **Table 5-1**. Additional sampling details are provided in the *Earthworm/Soil Infauna Sampling SOP* in **Appendix E**. QA/QC samples will be collected as specified (types and frequencies) in the QAPP (**Appendix B**).

### *Collection of Soil Arthropods*

Soil arthropods will not be targeted on a class- or order-specific basis—rather, all classes of *Arthropoda*[22] will be captured on an opportunistic basis.

A total of 10 pitfall traps will be deployed at each sampling location.[23] Within the sampling location, pitfall traps will be preferentially deployed where there is conspicuous evidence of ground insects (e.g., tracks) with the intent to maximize the success of capture. A depression will be advanced into the substrate to emplace pitfall traps and accommodate an area of approximately up to 100 square inches and up to 1 foot bgs. HDPE containers may be buried level with the soil's organic horizon to capture invertebrates moving along the soil's surface (Rousseau et al. 2012). Pitfall traps will be partially filled with a mixture of water and phosphate-free detergent such as Alconox® powder that is available in a cardboard carton.[24]

If the sample station contains shrub/scrub areas, beat sheets and sweep nets will be used to collect any organisms which may be present on the plant surfaces (Spafford and Lortie 2013) (see **Appendix F**). Beat sheets will be placed under the shrub/scrub while it is shaken/jostled to collect insects that may fall out of the plant onto the sheet. Similarly, sweep nets may be used to sample arthropods that may be 'flushed' from low-lying bushes or shrub/scrub areas. Where applicable, field sampling personnel will employ heavy duty sweep nets to prevent tearing or damage to less robust nets.

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22 Terrestrial arthropods include, but are not limited to, insects, spiders, millipedes, centipedes, isopods, springtails, and 'lawn shrimp'.

23 The substrate conditions and/or density of plant root mass may preclude the deployment of some (or all) pitfall traps at a particular sampling location and capture of terrestrial invertebrates (arthropods) may be limited to beat sheets and/or sweep nets.

24 Phosphate-free detergent is used to immobilize/kill soil arthropods entering pitfall traps to mitigate consumption by predaceous soil arthropods (e.g., spiders) that may also be captured in traps.

For each sampling method, specimens will be placed into new laboratory-provided containers. Sample containers will be immediately labeled. The approximate weight of each sample will be measured in the field to inform the field team as to whether further effort is needed to collect sufficient tissue mass.

Given the anticipated challenge associated with the collection of sufficient soil arthropod tissue mass for laboratory analysis (minimum of 69 grams ww per sampling location), recurring visits may be required for sampling locations (up to 10 times), or until the targeted sample mass is collected, whichever occurs first. In addition, daily emptying and deployment of pitfall traps will minimize disturbance/consumption of trap contents by carnivorous arthropods (e.g., spiders) captured in traps and/or invertivore wildlife that may find the traps.

Soil arthropod sampling will generate a single composite sample from each sampling location for analysis of the COPCs listed in **Table 5-1**. Additional sampling details are provided in the *Soil Arthropod Sampling SOP* in **Appendix F**. QA/QC samples will be collected as specified (types and frequencies) in the QAPP (**Appendix B**).

### *4.1.4 Small Mammals*

Small mammal collection will focus on capturing rodents. Efforts will be made to minimize stress when collecting mammals for this study (Sikes et al. 2011; Animal Care and Use Committee 1998). Additional sampling details are provided in the *Small Mammal Sampling SOP* in **Appendix G**.

#### *4.1.4.1 General Description of Small Mammals*

Small mammal targets for collection within the Study Area are listed in **Table 4-1** below.

**Table 4-1: Small Mammal Targets for Collection**

| Primary Target | Secondary Target |
|---|---|
| Deer mouse | White-footed mouse<br>House mouse |
| Meadow vole | Pine vole |
| Short-tailed shrew | Masked shrew |

In **Table 4-2**, the number of individuals needed to attain the minimum target sample mass are shown: [i] on a species-specific basis and [ii] presuming a percent capture similar to the Hudson River's 2001 small mammal sampling (Hudson River Natural Resource Trustees (HRNRT 2010).

Information required to estimate the capture per sampling location (e.g., number of traps, number of visits) will be recorded on field datasheets or electronic forms that will be provided to field personnel. A photograph of the specimen will be collected and saved to the project file.

## Table 4-2: Number of Small Mammal Individuals Needed to Obtain Minimum Target Sample Mass

| Small Mammal Species | Average Weight (grams) | Target Tissue Mass (grams) † | Number Small Mammal Per Sample | Number of Samples†† | Total Number of Samples | Number of Individuals | Percent Capture†††† | Number Individuals (Predicted) |
|---|---|---|---|---|---|---|---|---|
| Deer Mouse | 21.2 | 69 | 4 | 95 | 95 | 380 | 66 | 251 |
| White-Footed Mouse | 22.4 | 69 | 4 | 95 | 95 | 380 | | |
| House Mouse | 19.3 | 69 | 4 | 95 | 95 | 380 | | |
| Meadow Vole | 32.9 | 69 | 3 | 95 | 95 | 285 | 10 | 29 |
| Eastern Chipmunk | 124 | 69 | 1 | 95 | 95 | 95 | | |
| Short-tailed Shrew | 16.8 | 69 | 5 | 95 | 95 | 475 | 24 | 114 |

† *Minimum target sample mass of 69 grams.*

†† *Assumes 19 Locations (10 upland locations, nine wetland locations) and five samples per location.*

††† *Field duplicates at a frequency of 1 per 20 samples.*

†††† *Assumes 66% mice, 24% shrew, and 10% volume [captured during 2001 Hudson River collection effort] (HRNRT 2010).*

### *4.1.4.2 Collection of Small Mammals*

While many types of traps are available for the collection of small mammals, Sherman Live traps are preferred for small mammals. Sherman Live traps (H. B. Sherman, Inc., Tallahassee, FL), folding or non-folding, are a type of box trap that are the most effective for the unharmed capture of small terrestrial mammals (Wilson et al. 1996). These box traps are recommended over simple snap traps due to reduced occurrences of predation and trap disturbance by other animals. Additionally, animals collected from kill traps may be affected in other ways (e.g., decomposition) prior to collection, making tissue examination impossible.

A total of five small mammal traps will be deployed at each sampling location. As many small mammals are crepuscular or nocturnal, traps will be set, opened, and baited in the late afternoon (just before dusk) and visited and closed before morning (just after dawn). As trapping of small mammals will occur during the night, heat is not anticipated to be a stress or sample concern. Traps will be closed during daylight hours to avoid inadvertent trapping when temperatures can reach critical levels that may stress the small mammals or negatively impact the specimen.

Trapping locations will be co-located with soil, plant, and invertebrate sampling locations. The exact trap placement will be based on the availability of suitable habitat and evidence of small mammal presence. Whenever possible, traps will be placed near known preferred habitat features (e.g., burrows, base of shrubs, runways). Preference should be placed on areas that provide cover from adverse weather conditions (e.g., under shrubs or in tall grass). When possible, traps will be placed under debris to camouflage the traps.

Traps will be baited to attract small mammals in the area. A small amount of bait will be placed in the back of the trap and scattered toward the trap entrance. PFAS-free batting (e.g., sawdust) will also be placed in traps (an approximate 2-inch diameter ball) towards the back of the trap to provide warmth and nesting material.

Animals caught live will be euthanized in the field by cervical spine dislocation or asphyxiation. According to the American Veterinary Medical Association (AVMA 2013) and the American Society of Mammalogists (Sikes et al. 2011), cervical dislocation and asphyxiation are acceptable methods of euthanasia for mice and small or immature rats (less than 200 grams).

The approximate weight of the specimens will be measured in the field to inform the field team as to whether further effort is required to collect sufficient tissue mass (minimum of 69 grams ww per sampling location). Sampling locations will be visited up to five times (once per each day of sampling) or until the targeted sample tissue mass is collected, whichever occurs first. Euthanized mammals will be transferred to individual containers labeled for identification and laboratory analyses.

### *4.1.4.3 Hantavirus Precaution and Safety*

According to the Center for Disease Control and Prevention (CDCP), several species of small mammals (e.g., *Peromyscus maniculatus, Sigmodon hispidus, Microtus pennsylvanicus*) have been found to carry and potentially transmit a hantavirus to humans (CDCP 1996). Field biologists and sampling personnel who are exposed to small mammal bodily fluids and excreta are particularly at risk of hantavirus infection (Mill et al. 1995). This virus can cause hantavirus pulmonary syndrome, which has been fatal to a high percentage of exposed individuals. Field personnel who plan to trap, handle, process, or otherwise be involved in activities related to small mammals will be educated about the inherent risks of such activities and ways to minimize those risks.

When setting and checking traps, personnel should wear surgical gloves underneath an exterior pair of leather, Kevlar, or nitrile gloves to prevent the interior gloves from tears on the sharp surfaces of the traps. Care will be taken when handling the traps to avoid injury. Protective equipment, gear, precautions, and safety procedures for the capture and handling of small mammals will be used in accordance with ERM's Site-specific HASP, the laboratory's safety practices, and CDCP recommendations.

## 4.2 In-River Sampling Locations

The six proposed in-river aquatic sampling locations are anticipated to be adequate to obtain representative surface water, sediment, aquatic macroinvertebrate-, vegetation-, and fish-tissue samples from the Hoosic River and adjacent wetlands (for emergent vegetation and soil). If inadequate amounts of tissue are available for sampling, the sample location radius/boundary will be expanded and/or the sampling level of effort may be increased. For example, if necessary, an additional electro-shocking event may be conducted on a different day in an attempt to collect adequate fish-tissue mass at a given sample location (as shown on **Figures 3-1** and **3-5**).The following NYSDEC requirements will be met, to the extent possible given variable field conditions, during the aquatic biota sampling:

- For the aquatic vegetation, emergent vegetation, and aquatic macroinvertebrates, taxa will be targeted for sampling to the extent possible, and data will be collected on the relative composition of composite samples by taxa if multiple taxa must be collected.
- Fish species will also be targeted for collection.
- A minimum of five fish samples will be collected for each size class (0- to 6-inch, 6- to 12-inch, and > 12-inch) at each sampling location.
- Fish must be grouped by species within each composite sample. Multiple fish species shall not be composited in one sample.
- Fish in the 6 to 12 inch size class should be analyzed individually as stand-alone samples, if possible (i.e., the individual fish meets the minimum sample mass requirement).
- Composite samples should only be taken for smaller fish (0 to 6 inches) and where sample mass requirements cannot be met. Data will be collected on the relative composition of fish-tissue composite samples if multiple species must be combined to form a composite sample.

These requirements for various aquatic tissue samples are addressed in greater detail below as part of the sample collection methods for each tissue type.

### *4.2.1 Collection of Co-located Surface Water and Sediment Samples*

Co-located surface water and sediment samples will be collected at the sub-sampling locations identified on **Figure 3-5**, within the macroinvertebrate sample collection unit at a particular in-river sampling location (identified on **Figure 3-1**). Sampling protocols for the collection of surface water, sediment, plant, and biota tissue samples applicable to the in-river sampling are included in **Appendices H** through **L**. All samples will be handled, labeled, and shipped in accordance with the QAPP and **Appendix B**. Surface water will be collected prior to sediment sample collection to minimize the potential for entrainment of sediments in the surface water samples. In addition, surface water samples for metals analysis, including low-level mercury analyses, will be collected in accordance with the "clean hands / dirty hands" sampling technique in USEPA's Method 1669 (USEPA 1996) titled "Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels". This technique involves one sampler handling all equipment (i.e.,

"dirty") and the other sampler handling the sample bottles only (i.e., "clean") as described in the SOP for surface water sampling (**Appendix H**).

Surface water sample collection will involve the following:

- Surface water samples will be collected directly into laboratory-supplied sample containers if shallow water conditions are encountered and a sample can be adequately collected without washing the container preservative from the container. Total and dissolved TAL metals sampling will require a peristaltic pump with dedicated HDPE/silicone tubing for connection to a 0.45 micron in-line (capsule) field filter.
- A water sampling device, such as a Kemmerer or Van Dorn sampler made of polycarbonate or peristaltic pump with dedicated appropriate tubing (i.e., HDPE or similar material acceptable for PFAS sampling) will be used for deeper water collections.
- Samples will be collected from the mid-depth of the water column at the proposed sample locations shown on **Figure 3-1**, and sub-sampling locations shown on **Figure 3-5**.
- As indicated on **Figure 3-5**, five sub-samples will be collected, one from each sampling station, at each sampling location in the river, and will be combined and mixed in a new/dedicated HDPE container to form a single composite surface water sample representative of that sampling location.
- In-river surface water sampling locations will be measured in the field to provide general geochemical data on the surface water quality. Collected geochemical parameters will include temperature, SpC, DO, pH, ORP, and turbidity collected using a calibrated multi-parameter meter and recorded on field or electronic datasheets. Calibration protocols will follow those outlined in the Site-specific QAPP.
- Sample collection and processing tools and/or equipment will be properly decontaminated prior to sub-sample collection at each sample location in accordance with project protocols and in support of the project-specific QAPP (**Appendix B**).

Surface water sampling in the Hoosic River will generate a single mid-depth surface water composite sample at each in-river sampling location for analysis of the COPCs listed in **Table 5-1**. Additional sampling details are provided in the *Surface Water Sampling SOP* in **Appendix H**.

Sediment sample collection will involve the following:

- Sediment samples will be collected from the in-river sampling locations by a three-person field team using a universal percussion coring device, hand-held Petite Ponar dredge, or similar approved device.
- Samples will be collected from the upper 6 inches (i.e., 0 to 0.5 feet) of sediment at the proposed sampling locations indicated on **Figure 3-1** and sub-sampling locations (i.e., sampling stations) shown on **Figure 3-5**. In addition, two deeper intervals of sediment (i.e., 0.5 to 1 feet and 1 to 2 feet deep) will also be collected from each sampling station for compositing on a depth-interval basis (i.e., only samples from the same depth interval will be composited to form a single sediment sample representative of that depth interval at that sampling location).
- Intervals deeper than the upper 6 inches will be sampled to the extent possible; however, due to rocky conditions in the river bed at many locations, refusal of the coring device may prevent the collection of sediment from the deeper intervals. If encountered, these conditions of refusal will be noted by the field team and a decision to cease sampling at that station will be made in the field at the time of sampling.
- The sediment samples will be biased to depositional areas (e.g., areas just downstream of larger rocks and boulders) to the extent possible, but should be representative of the sampling locations

where aquatic invertebrates and vegetation are collected. This method will ensure that data are representative and comparable and will reduce variability due to procedural inconsistencies among sampling events.

- The physical characteristics of the sediment will be evaluated in the field and descriptions recorded in the field notebook and on electronic boring logs, if available. As a matter of practice, screening of the sediment using a PID equipped with an 11.7-eV lamp will be conducted and measurements recorded.
- As indicated on **Figure 3-5**, a sediment sub-sample will be collected from each of the five sampling stations at a given sampling location in the river and combined for homogenization in a decontaminated stainless steel bowl to form a single composite sediment sample representative of that sampling location. As indicated above, this compositing will be depth-interval specific with only samples from the same depth interval being combined to form a single composite sample. The sediment will be mixed (homogenized) using a decontaminated stainless steel spoon, or similar, and large debris, wood fragments, and leaves will be removed and discarded. Sediment will then be placed directly into sample containers provided by the analytical laboratory.
- Sample collection and processing tools and/or equipment will be properly decontaminated prior to sub-sample collection at each sample location in accordance with project protocols and in support of the project-specific QAPP (**Appendix B**).

Sediment sampling in the river will generate three sediment composite samples, one corresponding to each sediment depth interval, at each in-river sampling location for analyses of the COPCs listed in **Table 5-1**. Additional sampling details are provided in the *Sediment Sampling SOP* in **Appendix I**.

Additionally, soil/sediment co-located with emergent vegetation along the riverbanks or shoreline of each sampling location will be collected from 0 to 12 inches in accordance with the above methods and composited to form a single composite sample per sampling location. These soil/sediment samples will be handled in the manner indicated above and will be subject to the same analytical suite.

### *4.2.2 Collection of Aquatic and Emergent Plant Samples*

Aquatic vegetation targeted for collection includes the following species:

- Wild celery (*Vallisneria americana*); and
- Waterweed (*Elodea canadensis*).

Additional aquatic vegetation expected to be encountered includes:

- Ribbon-leaf pondweed (*Potamogeton epihydris*);
- Slender water-nymph (*Najas gracillima*);
- Pipewort (*Eriocaulon septangulare*);
- Greater bladderwort (*Utricularia vulgaris*); and
- Eurasian water-milfoil (*Myriophyllum spicatum*).

These additional species will be considered for collection if the collected tissue mass associated with the target species is inadequate to meet analytical requirements.

Aquatic vegetation will be collected for tissue analysis according to the following procedures:

- Aquatic vegetation, including submerged aquatic vegetation and algal masses, will be collected by field sampling personnel from wadeable areas of the river at the locations indicated on **Figures 3-1**

and **3-5** using a dip net and by hand-picking in shallow-water areas. Efforts will be made to minimize disturbance to the aquatic habitat while sampling.

- Submerged aquatic vegetation and algae in the upper 1 or 2 feet of the water column of the river will be preferentially collected versus vegetation at depths of 3 feet or greater).
- To the extent practicable, the collection of aquatic vegetation will be conducted in conjunction with other sampling efforts on the river (e.g., aquatic macroinvertebrate and fish sampling) within the same sampling areas established by the sampling transects (**Figure 3-5**). In these areas, fish collection should be conducted prior to aquatic macroinvertebrate sampling due to the disturbance caused by the kick-netting of benthic macroinvertebrates.
- Plant material will be transferred to a holding container (e.g., polycarbonate/ HDPE container or re-sealable HDPE bags) until the appropriate sample volume is achieved for each location. Vegetation samples for the river will include composite aquatic vegetation that reflects the types of vegetation readily available at a given transect.
- Plant material will be rinsed in the river water when collected and at the time of collection to remove excess sediment, placed temporarily in re-sealable HDPE bags, and transferred to the on-shore processing station for compositing into a single sample for laboratory analyses.
- During final rinsing prior to compositing and sample collection, the presence of aquatic macroinvertebrates on the vegetation will be evaluated and these organisms will be separated from the vegetation and added to the macroinvertebrate composite sample for the corresponding sampling location.
- If macrophytes (i.e., larger rooted plant material) are not available at all locations, additional algae may be collected using similar netting and/or hand-picking methods.
- Plant species will be identified to the extent possible or practical. The types of vegetation included in each sample will be generally described, and data on the relative composition of the sample by taxa will be recorded if multiple taxa must be collected. Observations and details will be recorded on field datasheets (handwritten or electronic). When sampling is completed, individual vegetation will be identified to the lowest taxonomic level practical.

Emergent vegetation targeted for collection includes the following species:

- Cattail (*Typha* sp.); and
- Sedges (*Carex* sp.).

Additional emergent vegetation expected to be encountered includes:

- Bulrush (*Schoenoplectus* or *Scirpus* sp.);
- Arrow arum (*Peltandra* sp.); and
- Bur reed (*Sparganium* sp.).

These additional species will be considered for collection if the collected tissue mass associated with the target species is inadequate to meet analytical requirements. The above methods will also be used to collect the roots and shoots of emergent vegetation by hand from shallow-water areas and wetland areas adjacent to the river shoreline at each sampling location (NYSDEC 1994). The roots and stems of these macrophytes are expected to be consumed by muskrats (*Ondatra zibethicus*) as their preferred food, and data from the emergent vegetation analyses will be used in the ecological modeling effort. If present, muskrat feeding stations will be observed for signs of the types/species of emergent vegetation being consumed.

As indicated in Section 4.2.1 and on **Figure 3-5**, soil/sediment co-located with emergent vegetation along the riverbanks or shoreline of each sampling location will also be collected from 0 to 12 inches below grade, composited to form a single composite sample per sampling location, and handled in the same manner as described for sediment samples in Section 4.2.1. The abundance of the vegetation material available for collection at any transect in the river is dependent upon the presence of the vegetation in specified areas. Because vegetation material may not be present in all areas of the river, the sampling stations identified on **Figure 3-5** may need to be expanded to obtain the required mass of plant tissue material for laboratory analyses.

Aquatic vegetation sampling in the river will generate a single composite sample of aquatic vegetation and a single composite sample of emergent vegetation at each in-river or near-river sampling location for analyses of the COPCs listed in **Table 5-1**. Additional sampling details and protocols are provided in the *Aquatic and Emergent Vegetation Sampling SOP* in **Appendix J**.

### *4.2.3 Collection of Aquatic Macroinvertebrate Samples*

Aquatic macroinvertebrates targeted for collection include the following taxa:

- Stoneflies (Order *Plecoptera*);
- Mayflies (Order *Ephemeroptera*);
- Caddisflies (Order *Trichoptera*);
- Aquatic worms (Order *Annelida*);
- Malacostracan crustaceans (Order *Amphipoda*);
- Dragonflies and damselflies (Order *Odonata*);
- True bugs (Order *Hemiptera*); and
- Alderflies, dobsonflies, fishflies (Order *Megaloptera*).

It is likely that composite samples of some, or all, of these taxa will be required to meet the tissue mass requirements for aquatic macroinvertebrates at a given sampling location. If this is the case, data on the relative composition of the sample by taxa will be recorded at the time of sample collection.

Aquatic macroinvertebrates for tissue analyses will be collected by a three-person field sampling team using a kick-net method at sample locations in the river as indicated on **Figures 3-1** and **3-5**. At each in-river sample location, a 30-foot radius in the river will be used for sample collection. The NYSDEC describes kick-net sampling as a method of sampling benthic organisms by disturbing bottom sediments and catching the dislodged organisms downstream with an aquatic net (NYSDEC 2019b and c).

More specifically, the kick-net method involves the following:

- The first field team member wades to the sampling location and places the net on the stream bottom in a relatively flat, undisturbed area with the mouth facing upstream.
- The second field team member wades to a location in-river approximately 3 feet upstream of the net and begins shuffling the stream bottom by foot while moving steadily downstream toward the net. The net is then repositioned a few feet further downstream and this process is repeated for a distance of approximately 15 feet on a diagonal path in the downstream direction.
- Following the collection of the traveling kick-net sample for a distance of approximately 15 feet, the person holding the net lifts the net out of the water with a gentle upward scooping motion.

- The netter (first field team member) will carry the contents of the net to a processing area on shore with the assistance of the second field team member for safety precautions and specimen protection. A third field team member will empty the contents into a white polyethylene pan, and with gloved hands will remove organisms as well as any debris after inspection for clinging organisms. When this process is completed, the contents of the white pan will be transferred into a laboratory-provided container.
- The traveling kick-net collection method will be repeated within the 30-foot radius as many times as necessary to collect sufficient sample mass for laboratory analyses. The collected organisms from the kick-net efforts at a given sampling station will be combined into a single composite sample representing that sampling station.
- General observations of the number and types of organisms collected will be recorded on field datasheets or electronic forms during field processing of the sampling efforts. The organisms are to be used for tissue analyses, and not as direct bio-indicators of water quality; therefore, the identification of benthic macroinvertebrates will only be made to a higher taxonomic level, such as order, as indicated above.
- Benthic macroinvertebrate organisms for tissue analyses will be placed into laboratory-supplied containers with ethyl alcohol preservative, sealed tightly, and stored on wet ice prior to submission to the laboratory.

As indicated, kick-net sampling in the river will generate a single shallow benthic macroinvertebrate composite sample at each in-river sampling location for analyses of the COPCs listed in **Table 5-1**. Additional sampling details are provided in the *Aquatic Macroinvertebrate Sampling SOP* in **Appendix K**.

Additional aquatic invertebrates, such as water fleas, are typically associated with aquatic vegetation, so areas with submerged aquatic vegetation or emergent vegetation will be targeted for dip netting for these organisms. The net will be passed through submerged aquatic vegetation within the sampling station (**Figure 3-5**) and aquatic invertebrates will be removed from the net (with gloved hands) and placed into laboratory-supplied containers. The compositing of non-benthic aquatic invertebrates and handling of these samples will be similar to the method for benthic macroinvertebrates indicated above.

### *4.2.4 Collection of Fish Samples*

**Table 4-3** provides a summary of fish-tissue data collected by NYSDEC in 2016 from the Hoosic River near Hoosick Falls.

## Table 4-3: Expected Fish Species and Estimated Numbers for Collection from Hoosic River

| Fish Species | n | Length (millimeters) | Length (inches) | Weight (grams) | Target Tissue Mass (grams) | Min No. Individuals to meet target Mass | Max No. Individuals to meet target Mass | Potential Size Class (inches) |
|---|---|---|---|---|---|---|---|---|
| Blunt-nose minnow | 196 | 32.6–61.8 | 1.3–2.5 | 0.3–2.2 | 69 | 32 | 234 | 0–6 |
| Tesselated darter | 97 | 47–84 | 1.9–3.4 | 0.6–3.6 | 69 | 20 | 117 | 0–6 |
| White sucker | 21 | 314–509 | 12.6–20.4 | 359–1604 | 69 | 1 | 1 | > 12 |
| Common Carp | 10 | 495–740 | 19.8–29.6 | 1601–5870 | 69 | 1 | 1 | > 12 |
| Smallmouth bass | 9 | 171–356 | 6.8–14.2 | 60–597 | 69 | 1 | 2 | 6–12 and > 12 |
| Rainbow Trout | 6 | 219–365 | 8.8–14.6 | 100–462 | 69 | 1 | 1 | 6–12 and > 12 |
| Brown Trout | 2 | 260–480 | 10.4–19.2 | 100–130 | 69 | 1 | 1 | 6–12 and > 12 |
| Largemouth bass | 4 | 145–180 | 5.8–7.2 | 44–80 | 69 | 1 | 2 | 0–6 and 6–12 |
| Yellow Perch | 1 | 140 | 5.6 | 28 | 69 | 3 | 3 | 0–6 |
| Pumpkinseed | 1 | 110 | 4.4 | 27 | 69 | 3 | 3 | 0–6 |

*Notes:*

*Fish data from NYSDEC 2016 Fish Collection Records for sampling in Hoosic River near Hoosick Falls, New York.*

*n = number of individual fish captured in Hoosic River near Hoosick Falls, New York.*

Based on these data, fish species targeted for collection include:

- Blunt-nose minnows (0- to 6-inch size class only);
- Tesselated darters (0- to 6-inch size class only);
- Smallmouth bass (6- to 12-inch and > 12-inch size classes);
- Rainbow Trout (6- to 12-inch and > 12-inch size classes); and
- White Sucker (> 12-inch size class).

Additional fish species expected to be encountered include:

- Brown trout (6- to 12-inch and > 12-inch size classes); and
- Largemouth bass (6- to 12-inch and > 12-inch size classes).

Fish tissue collection and processing shall be conducted in accordance with Appendix F of the NYSDEC's Part 375 Remedial Programs publication entitled *Guidelines for Sampling and Analysis of PFAS* (NYSDEC 2021). This appendix, entitled "*General Fish Handling Procedures for Contaminant Analysis*", provides specific guidelines for PFAS, which will also be applicable to other contaminant classes as well, including metals and PCBs.

For the Hoosic River, backpack electrofishing is proposed as the primary fish collection method, and seine fishing or gill netting would be considered as an alternate or contingency sample collection method based on river conditions. Backpack electrofishing is best for shallow-water areas that are easily accessed and wadeable. Backpack electrofishing involves the following:

- One field team member will operate the electroshocker unit and a second field team member will serve as the dip netter. A third field team member will serve as on- or near-shore sampling and safety support.
- The sampling team will wade in an upstream direction, with the dip netter(s) beside or behind the electrode handler. All stunned fish, regardless of size or species, will be collected with a long-handled dip net.
- The sampling area will be fished slowly and methodically, especially areas with in-stream cover, if any. Captured fish will be placed in water-filled new HDPE containers with aeration, if available. Fish lengths will be grouped into three size classes: [ii] less than 6 inches (15 centimeters); [ii] 6 to 12 inches (30 centimeters)[25]; and [iii] greater than 12 inches. Collection and processing of these size classes will include:
    - Collection of the 0 to 6 inch size class will involve compositing a single species (likely either blunt-nose minnows or tesselated darters), if possible, to meet mass requirements. If tissue mass requirements will not be met using a single species in this size class and multiple species must be combined to form a composite sample, data will be collected on the relative composition of the fish-tissue composite samples.
    - Fish in the 6 to 12 inch size class (represented by smallmouth bass and rainbow trout to the extent possible) will be analyzed individually as stand-alone samples, if possible (i.e., the

[25] Size classes reflect the range of fish prey sizes reported in the literature for Great Blue Heron (median = 17.5 centimeters, range = 5–30 centimeters), as summarized by Gerztel et al. (2018). The purpose for compositing small and larger size classes separately is to determine if there is a notable difference in bioaccumulation potential of the targeted analytes as a function of size class. Species and lipid content will also be examined as potential correlates with tissue concentration (organic analyses only).

individual fish meets the minimum sample mass requirement). Also, to the extent possible, the same species will represent the five samples of this size class collected from a given location.

- Smallmouth bass and rainbow trout greater than 12 inches in length will be collected at three of the six sampling locations (i.e., locations HRTR1, HRTR3 and HRTR5 as indicated in **Figure 3-1**), and submitted as individual samples to the laboratory. Five individuals of the same species will be collected at each location, if possible, and the 15 samples will be processed in the laboratory by filleting in accordance with the NYSDEC's standard fillet protocol/fish preparation SOP (NYSDEC 2016).
- The fillets from each sample as well as the remaining fish carcass/entrails will be analyzed separately for the COPCs listed in **Table 5-1**. The fillet analytical results will be used as part of the human health risk assessment for the Site. In addition, the fillet results will be added to the carcass/entrail sample results for a given fish sample to arrive at a whole-body concentration for a given sampling location that can be used in the ecological risk assessment. If white suckers need to be collected to meet tissue mass requirements for fish > 12 inches, they will be processed and analyzed in a similar manner.

- Following collection, fish will be maintained in HDPE containers or mesh bags with aerated water until they can be transported to an on-shore staging area for field processing by field team members.
- A visual inspection for morphological abnormalities (e.g., lesions, "tumor-like" growths, fin erosion) will be conducted and documented to note potential nutritional deficiencies and/or bacterial infections. Measurements of total length and mass will be recorded for each individual fish, and the individual fish will be grouped into size classes based on length as indicated above.
- All observations and measurements will be recorded in the field notebook, field datasheets, and/or electronic forms as well as the *"Fish Collection Record"* form*"* provided in Appendix F of NYSDEC's PFAS guidance document (NYSDEC 2021) will be used to record information/data for each individual fish collected and processed.

If fish are visually observed in portions of the river where backpack electrofishing is precluded, other fish collection methods, such as seine netting, will be considered.

Backpack electrofishing and possibly seine netting in the river will be used to collect fish and generate five fish-tissue samples to the extent possible, for the 0 to 6 inch and 6 to 12 inch size classes, at each in-river sampling location for analysis of the COPCs listed in **Table 5-1**. In addition, individual fish in the > 12-inch size class, will be collected at three in-river sampling locations, and processed as indicated above, for analysis of the indicated COPCs. Additional sampling and tissue processing details are provided in the *Fish-Tissue Sampling SOP* in **Appendix L**.

## 4.3 Sampling Observations and Recordkeeping

Photographs and the relative composition of the samples will be recorded in the field logbook and/or on field datasheets. Field data will include information about the sampling location, sample identification, and analyses to be conducted, as well as notable observations and characteristics about the specimens collected. Examples of the recorded information may include, but are not limited to, the following:

- Soil/ Sediment: Physical properties including color, texture, composition, moisture content, odor, and visual evidence of staining, discoloration, product/sheen, benthic communities, organic matter content, and level of saturation.
- Plant: habitat community, plot size, surface cover, disturbance, species, etc.

- Soil Invertebrates/Arthropods: habitat community, collection methods, weight, and taxa
- Mammals: habitat, trapping method, sex, weight, taxa, and location details
- Surface Water: collection method, appearance, odor, SpC, DO, pH, ORP, and turbidity
- Aquatic Plants: species, weight, weather conditions, and plant health
- Aquatic Macroinvertebrates: collection method, weather conditions, taxa, and weight
- Fish: collection method, species, age, sex, length, and weight

Additional sampling details will be recorded on electronic forms/datasheets that will be provided to field personnel.

## 4.4 Sample Handling, Labeling and Storage

Samples will be handled, labeled, and stored in accordance with the project-specific QAPP (**Appendix B**) and protocols in SOPs appended to this Biota SAP (**Appendices C** through **L**). The appended documents describe procedures for identification, chain-of-custody (COC) documentation, handling, storage, and shipping of samples in association with the sampling activities included in this Biota SAP. Labeled sample containers from each sampling location will be stored in pre-chilled coolers (sub-freezing temperature) for on-Site preservation and transport to the analytical laboratory. Soil, sediment, and surface water will be temporarily stored with wet ice while tissue samples will be stored with dry ice (solid carbon dioxide) prior to shipment, followed by wet ice for transport prior to relinquishing/ shipment to the laboratory. Steps will be taken (to the extent possible) to remove soil and to avoid/minimize the probability of contamination sources to tissue samples.

## 4.5 Decontamination Methods

Temporary decontamination pads will be constructed with two layers of polyethylene sheeting that will be bermed at the sides. Re-usable sampling equipment and tools will be cleaned with Alconox® and potable water solution followed by approved and tested PFAS-free bottled or distilled water rinse between uses. Decontamination water from the pad will be transferred to properly labeled waste containers and managed as discussed in Section 4.6 below.

## 4.6 Investigation-Derived Wastes

Investigation-derived waste (IDW) is anticipated to include the following:

- Water: Fluids from decontamination procedures conducted between sample collections.
- Disposables: Personal protective equipment, paper towels, field filters, tubing, and HDPE sampling and compositing supplies.
- Solids: Excess soil and sediment from sampling activities which will not be submitted for laboratory analyses or is deemed inappropriate to backfill at the original sampling location.

IDW generated from the field sampling efforts will be placed in new Department-of-Transportation approved 55-gallon steel drums or other appropriate containers and staged at the facility for as-required waste characterization sampling in advance of proper treatment and disposal. Containers of IDW will be properly labeled per applicable regulations. The IDW containers will be staged at the Site prior to manifesting and proper shipment for off-Site treatment and/or disposal. The appropriate parties will coordinate for proper shipment and disposal.

## 4.7 Health and Safety

The project-specific HASP has been previously presented to NYSDEC and will be updated to reflect the activities in this Biota SAP. The procedures set forth in the HASP are designed to minimize the risk of exposure to chemical, physical, and biological hazards that may be present at the properties. These procedures generally conform to applicable federal, state and local regulations, including Occupational Safety and Health Administration requirements governing activities at hazardous waste sites and the requirements in 29 Code of Federal Regulations 1910.120 (Hazardous Waste Operations). Specific practices and procedures, including the level of personal protective equipment, are based on a review of currently-available information for the properties.

## 4.8 Supporting Project Documents

Field activities will be supported by the following appended documents and key project personnel responsible for implementing the work.

- **Appendix A:** The number of samples, sample medium, and target analytes are outlined in **Tables 1a** through **1d** of **Appendix A**.
- **Quality Assurance Project Plan:** The project-specific QAPP has been updated to include the activities and DQOs of this Biota SAP. The QAPP is consistent with the requirements of DER-10 Section 2.4 and the NYSDEC's 2021 *Sampling, Analysis, and Assessment of PFAS* (NYSDEC 2021). The QAPP identifies the necessary procedures for an orderly, accurate, and efficient data collection and analytical procedures for implementation of the work along with QA/QC criteria and ensures that data meet DQOs. DQOs are qualitative and quantitative criteria required to support the decision making process. DQOs define the uncertainty in an analytical data set and are expressed in terms of precision, accuracy, representatives, completeness, and comparability.
- **Personnel and Qualifications:** The experience and qualifications of key ERM project personnel who will be involved in implementation of this Biota SAP are included within the QAPP.
- **Standard Operating Procedures:** The SOPs included in **Appendices C** through **L**, as well as the information presented in this Biota SAP, serve as the field sampling and analysis plan. These documents describe field operations, protocols, and sampling and analysis procedures that are consistent with the requirements of DER-10 Section 2.4.
- **Field Datasheets:** Field datasheets will be used to record all pertinent information required by the project objectives and will be provided to field personnel.
- **Site-Specific Health and Safety Plan**: The Site-specific HASP will be updated to include the activities included in this Biota SAP to minimize the risk of exposure to chemical, physical, or biological hazards that may be present in the Study Area. The HASP will include job hazard analyses for all activities and ensure safe practices are carried out by field sampling personnel.

# 5.0 LABORATORY ANALYTICAL METHODS

The laboratory analytical methods include:

- Compositing (homogenizing) samples as directed by the ERM/GSI Environmental, Inc. (GSI) project team members to produce samples with sufficient mass to conduct analyses of COPCs.
- Weighing samples to report accurate sample mass and conduct proper analytical calculations.
- Conducting requested chemical analyses and issuance of reports.
- Conducting laboratory QA/QC protocols to render high quality results.

The laboratory will be responsible for determining the reported weight of the samples that will be entered in the database. Compositing of samples will be conducted at the laboratory because of the controlled "clean" conditions (as compared to field conditions) and to reduce the occurrence of staff in handling and manipulating samples.

Although the laboratory will remove, to the extent practicable, any external soils that may be present on plant and biota specimens before homogenization and chemical analyses, none of the biota tissue samples will be depurated given practical handling and dissection of prey. The presence of soil in the gastrointestinal tract may affect characterizations of tissue burdens; however, these effects are anticipated to be minor in relation to other extrapolations/inferences when using data to characterize environmental exposure. Nonetheless, uncertainties and the consequences associated with the lack of depuration of prey will be discussed in as part of an uncertainty analyses.

## 5.1 Laboratory Analytical Precautions for PFAS

Laboratory analyses will be conducted in accordance with NYSDEC's Part 375 Remedial Programs publication titled *Sampling, Analysis, and Assessment of PFAS* (NYSDEC 2021). Acceptable materials under this guidance include:

- Stainless steel
- HDPE
- Polyvinyl chloride
- Silicone
- Acetate
- Polypropylene

The preferred material for containers is HDPE. Additional materials may be acceptable if preapproved by NYSDEC. Additional precautions are included in Section 3.6.2 above.

## 5.2 Laboratory Analyses

Laboratory analytical data used for development of bioaccumulation models will meet applicable criteria for definitive data as defined under USEPA guidance (USEPA 2005) and for PFAS under NYSDEC guidance (NYSDEC 2021).

COPCs of interest which are persistent and can bioaccumulate into biota are listed below in **Table 5-1**:

## Table 5-1: COPCs

| Type of COPC |
|---|
| **PFAS (21)** |
| PFOA |
| PFOS |
| Perfluorobutanesulfonic acid |
| (additional 18 PFAS as required by NYSDEC [see **Appendix B**]) |
| **TAL Metals (23)** |
| Aluminum |
| Antimony |
| Arsenic |
| Barium |
| Beryllium |
| Cadmium |
| Calcium |
| Chromium |
| Cobalt |
| Copper |
| Iron |
| Lead |
| Magnesium |
| Manganese |
| Mercury |
| Nickel |
| Potassium |
| Selenium |
| Silver |
| Sodium |
| Thallium |
| Vanadium |
| Zinc |
| **PCBs** |
| **SVOCs** |

If insufficient sample mass is available for a given sample and a reduction in lab analyses is the preferred option (see Section 3.4), the laboratory will be instructed to prioritize analyses in the following order of importance:

> PFAS > TAL metals (including mercury) > PCBs > SVOCs[26] > general chemistry parameters.

The analytical procedures specified in this Biota SAP are the most sensitive commercially available methods that are sufficiently robust to accommodate the challenging sample matrices to be collected in the Study Area.

### 5.2.1 Analyses of Soil, Surface Water, and Sediment Samples

Laboratory sample custody procedures will follow the laboratories' internal SOPs. Laboratory analyses of soil, surface water, and sediment samples will be performed following the laboratory analytical SOPs and project-specific QAPP.

Surface water, soil, and sediment samples will be analyzed for the full suite of target analytes, including:

- PFAS by liquid chromatography / mass spectrometry using methodologies based on modifications of USEPA Method 537.1—analytes will include the 21 PFAS specified by NYSDEC;
- Metals by USEPA Methods 6020B (soil/sediment) and 6020A (water);
- Mercury by USEPA Method 7471B (soil/sediment) and Method 7470A (water);
- Hexavalent chromium using USEPA Method 7196A (upland discrete "grab" soil samples only);
- SVOCs with a reduced list of PAHs by USEPA Method 8270E Selective Ion Monitoring; and
- PCBs by USEPA Method 8082A.[27]

Surface water will also be analyzed for TOC using USEPA Method 9060A. Soil and sediment samples will also be analyzed for TOC using the Lloyd Kahn Method and pH by USEPA Method 9045D[28]. The 10 discrete "grab" soil samples collected at the upland location will be analyzed for hexavalent chromium using USEPA Method 7196A (total chromium using USEPA Method 6020B).

Target analytes and their reporting limits and method detection limits for soil/sediment matrices are provided in the QAPP. Laboratory QC sample analyses will be performed as described in the laboratory SOPs incorporated into the QAPP and will include matrix spike / matrix spike duplicates (MS/MSDs)[29], laboratory duplicates, laboratory control samples, and method blanks for all analytes.

### 5.2.2 Analyses of Tissue Samples

Chemical analyses of tissue residues will be conducted as follows:

- Terrestrial plants: entire composite sample;
- Terrestrial invertebrates: entire composite sample;
- Terrestrial small mammals: whole body;
- Aquatic plants (aquatic): entire composite sample;

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[27] USEPA Method 8082A analyzes for Aroclors (PCBs) and is consistent with analytical methods of previous investigations.

[28] pH analysis for soil will be conducted by the laboratory while pH for sediment will be collected in the field.

[29] Field MS/MSDs will not be collected for PFAS analysis.

- Aquatic plants (emergent): entire composite sample;
- Aquatic macroinvertebrates: entire composite sample;
- Fish (0 to 6 inch): entire composite sample;
- Fish (6 to 12 inch): whole-body analysis; and
- Fish (greater than 12 inch): fillet analysis and analysis of carcass/entrails separately.

If insufficient sample tissue mass is available for a given sample, the laboratory will be instructed to prioritize analyses in the following order of importance (i.e., analysis for PFAS is the first priority):

> PFAS > TAL metals (including mercury) > PCBs > SVOCs > general chemistry parameters.

Analysis for PFAS is the first priority and the remaining analyses will follow the above order once all representative prey tissue samples have been collected and weighed (**Table 3-3**). Note that a minimum of 69 grams ww is required to conduct analyses for all target analytes, with the exception of plants (49 grams ww), which does not include lipid content. Prioritization of laboratory analyses will be discussed with NYSDEC prior to initiating chemical analyses.

The procedure for sample preparation and analyses by the laboratory will include the following steps:

- Step 1: Thaw sample overnight in refrigerator.
- Step 2: Rinse using deionized water or blow using air the tissue sample to remove external debris and/or soil/sediment particles.
- Step 3: Grind/homogenize the sample using a grinder or blender.
- Step 4: Prepare and weigh sub-samples for individual analyses.
- Step 5: Extract and analyze sub-sample.

Any ground/homogenized sample mass remaining after obtaining sub-sample aliquots for extraction and analysis may be retained by the laboratory for one year or until notified by ERM.

Where sufficient sample mass is collected, tissue samples will be analyzed for the full suite of target analytes, including:

- PFAS by liquid chromatography/ mass spectrometry using methodologies based on modifications of USEPA Method 537.1—analytes will include the 21 PFAS specified by NYSDEC;
- Metals by USEPA Methods 6020B;
- Low-Level Mercury by USEPA Method 1631E;
- SVOCs with a reduced list of PAHs by USEPA Method 8270E Selective Ion Monitoring; and
- PCBs by USEPA Method 8082A.

The analytical procedures specified in this Biota SAP are the most sensitive commercially available methods that are sufficiently robust to accommodate the challenging sample matrices to be collected in the Study Area. In addition to the target analytes listed above, tissue samples will also be analyzed for

percent lipid content. [30] Ww units are used to calculate food chain exposures for wildlife, hence, tissue concentrations (burdens) will be reported in ww units (e.g., milligrams per kilogram, ww).[31]

Laboratory QC sample analyses will be performed as described in the laboratory SOPs incorporated into the QAPP.

## 5.3 Laboratory Quality Assurance / Quality Control Activities

Quality assurance/ quality control activities include:

- Reconnaissance effort prior to the field sampling effort to ensure proper selection of sampling locations. The reconnaissance effort will:
  - Identify final sampling locations within sampling areas; and
  - Identify potential hazards to be avoided when sampling within a sampling location.
- For each representative (aquatic and terrestrial) plants and (aquatic and terrestrial) invertebrate samples, field duplicates will be collected where the target sample mass (minimum of 69 grams) can be obtained. Field duplicates will be collected at a frequency of one per 20 prey samples. For example, if the targeted plant sample mass is obtained at each of the 15 sampling locations and additional mass can be collected, then one field duplicate will be collected.[32]
- In addition, MS/MSD samples of each tissue type, soil, and sediment will be collected and submitted to the laboratory for analysis, with the exception of MS/MSDs for PFAS where laboratory MS/MSDs are conducted.
- Equipment rinsate blanks will be collected at a rate of one per day, or one per 20 samples (whichever is greater) for soil and sediment sampling equipment, as necessary.
- For pitfall traps (soil arthropods), trap liquid blanks will be collected when new trap liquid is prepared or once per week, whichever is more frequent.

Sampling equipment (e.g., clippers, traps) will not be used at more than one upland or wetland sampling location to avoid cross contamination. For each sampling location, all dedicated, disposable equipment will be properly disposed at the completion of sampling.

## 5.4 Electronic Data Deliverable

The laboratory will provide NYSDEC Analytical Services Protocol (ASP) Category B deliverables and EQuIS electronic data deliverables for each sample delivery group to facilitate data validation and data usability evaluations. Electronic data packages including the laboratory reports and data usability summary reports (DUSRs) will be provided to Integral Consulting Inc. for use by GSI in the baseline risk assessments for the Site.

Data usability will be evaluated for each sample delivery group and DUSRs will be generated in accordance with:

- DER-10 (NYSDEC 2010) and the protocols and QC requirements of the analytical methods (the NYSDEC ASP);

[30] Analysis of lipid content will require a minimum sample tissue mass of 20 grams, which will increase the tissue mass requirement for laboratory analyses.

[31] No moisture content of tissues will be measured, which will reduce the tissue mass requirement for laboratory analyses.

[32] For fish and small mammals, field duplicates will not be collected because five replicate samples per sampling location are being collected.

- USEPA Contract Laboratory Protocol National Functional Guidelines for Organic Data Review (USEPA 2017a);
- USEPA Contract Laboratory Protocol National Functional Guidelines for Inorganic Data Review (USEPA 2017b); and
- The reviewer's professional judgment.

Validation of PFAS data will also be performed in general accordance with the *"Guidelines for Sampling and Analysis of PFAS"* under NYSDEC's Part 375 Remedial Programs, Appendix I. The laboratory may need to provide PFAS data in a USEPA Level IV format as the ASP B format does not contain all data required for review as described in Appendix I. The validation will be performed by an independent third party and reviewed by the ERM QA Officer. The independent third-party reviewers have been provided with the NYSDEC guidance for review of PFAS data. The results of the data usability evaluation will be presented in an electronic data summary consistent with the requirements of DER-10 Section 3.14.

# 6.0 DEVIATIONS FROM THE WORK PLAN

If necessary, based on field conditions encountered, deviations from the procedures outlined in this Biota SAP will be discussed with NYSDEC's field representative (or project manager if a field representative is not present) and the client prior to implementing any deviations from this Biota SAP.

# 7.0 REPORTING AND MAPPING

A summary of the activities conducted under this work plan will be included in the Site monthly progress report that is prepared by Saint-Gobain Performance Plastics Corporation for submission to the NYSDEC by the 10th day of each month commencing with the month subsequent to approval of this Biota SAP. The monthly progress reports will include actions performed, including approved modifications (e.g., changes in work scope and/or schedule relative to the work plan tasks during the reporting period), and the actions anticipated for the next reporting period.

## 7.1 Electronic Data Deliverable

As indicated above in Section 5.4, electronic data packages including the laboratory reports and DUSRs will be provided for use by GSI in the BHHRA and BERA for the Site.

## 7.2 Biological Sampling Report

A report will be prepared to document the biological sampling field effort. The report will include the following:

- A summary of sampling locations and features;
- A summary of the numbers and types of samples taken in each habitat type;
- Summary of deviations from the work plan, if any; and
- Photographs and field notes.

A draft report will be provided to GSI for incorporation as an appendix to the risk assessment reports. Responses to comments and a final report will be prepared.

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