Sediment Pre-Design Investigation Work Plan

Orrington Reach Capping Remedy

Prepared for

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ACRONYMS AND ABBREVIATIONS

ASTM	ASTM International
bss	below sediment surface
DQO	data quality objectives
ERP	emergency response plan
FSP	field sampling plan
Greenfield	Greenfield Penobscot Estuary Remediation Trust LLC
HASP	health and safety plan
Integral	Integral Consulting Inc.
PDI	pre-design investigation
QA/QC	quality assurance and quality control
QAPP	quality assurance project plan
Remediation Trust	Penobscot Estuary Mercury Remediation Trust
SOP	standard operating procedure
SWAC	surface weighted average concentration
SWMP	site-wide monitoring plan
TLC	thin layer cap
TOC	total organic carbon
WSP	WSP USA Environment & Infrastructure, Inc.

1 INTRODUCTION

This Sediment Pre-Design Investigation Work Plan (Sediment PDI Work Plan) has been prepared by Integral Consulting Inc. (Integral) on behalf of the Greenfield Penobscot Estuary Remediation Trust LLC (Greenfield), Trustee of the Penobscot Estuary Mercury Remediation Trust (the Remediation Trust) for Work on the Penobscot River Estuary located in Hancock, Penobscot, and Waldo counties, Maine. This Work Plan has been prepared in accordance with the Consent Decree[1] and appendices, including Paragraph 6(a) of the Statement of Work (Appendix A to the Consent Decree), as summarized in Table 1.

The Consent Decree defines portions or components of the Site subject to remediation activities as "Reaches," which may be defined geographically (e.g., East Channel, Mendall Marsh, Orland River, and Orrington Reach; as shown on Figure 1) or based on hydrodynamic, geophysical, or other scientific bases (e.g., Mobile Sediments and Surface Deposits). Several of the Reaches have been combined in the Consent Decree to form three Work Categories with separate Committed and Contingent Funding specifically allocated to complete remedial activities intended to accelerate the recovery of the Penobscot River Estuary. The Work Categories and remedies specified in the Consent Decree are:

- Orrington Reach: Capping 130 acres of intertidal sediments, primarily on the east side of the Penobscot River Estuary between Orrington and Bucksport (Figure 1). This area is directly south (downstream) of the former HoltraChem facility in Orrington, Maine. The remediation measures identified in the Consent Decree are intended to accelerate the natural recovery of the Site.
- Mobile Sediments and Surface Deposits: Removal of a portion of the mobile sediments and surface deposits from the site. Mobile Sediments are defined as the mineral or organic sediment, including wood waste, that may be mobilized and homogenized by natural processes in the Penobscot River over timescales relevant to affect the fate and transport of mercury within the site. Surface Deposits are defined as any subtidal or intertidal region of Mobile Sediment accumulation, including any comingled materials or debris that can be identified by physical, chemical, geophysical, or other scientific methods.
- Orland River and East Channel around Verona Island: This is the area directly east of Verona Island and in the Orland River (Figure 1). The remedy for this Work Category

[1] The Consent Decree was approved and entered by the U.S. District Court for the District of Maine (in the case *Maine People's Alliance and NRDC v. HoltraChem Manufacturing Company LLC, et al.,* No. 1:00-cv-00069-JAW (D. Me.) (ECF No.1187, October 11, 2022).

was not specified in the Consent Decree and will be selected with consideration given to information developed for the other Work Categories.

The Orrington Reach Work Category will involve the placement of a thin layer cap (TLC) over intertidal sediment. The TLC will reduce surface sediment concentrations and minimize potential negative impacts of thicker isolation caps to the intertidal flat ecosystems. The TLC Design Work Plan (Integral 2023) provides the background for the Orrington Reach Work Category; identifies the objectives, requirements, and preliminary design basis to be met by the Orrington Reach remediation work based on the currently available data/understanding; describes the project approach and identifies the data collection and analyses recommended to support the design; and includes a summary of the rationale for why the information is needed and a recommended scope of data collection and analyses for the investigations.

This Sediment PDI Work Plan addresses data gaps identified in the TLC Design Work Plan that require investigation of intertidal sediment in Orrington Reach and documents the scope, process, and strategy for sample collection (Figure 1). The Orrington Reach Sediment PDI will be conducted in two phases:

- Phase I: This phase will include collection of intertidal surface sediment samples for mercury and total organic carbon (TOC) analysis, and for assessment of geotechnical index properties.
- Phase II: This phase will include collection of cores of intertidal sediment for more detailed geotechnical analysis. The scope (e.g., the number and location of cores) of the Phase II investigation will be informed by the results of the Phase I investigation and the variability in the geotechnical index parameters across Orrington Reach.

This Sediment PDI Work Plan describes Phase I investigation and includes i) an evaluation and summary of existing data, and a description of data gaps; ii) a description of data quality objectives (DQOs); iii) a detailed sampling plan; iv) a sampling schedule; and v) a description of the quality assurance and quality control (QA/QC) measures to be undertaken. A Sediment Geotechnical PDI Work Plan will be prepared separately to describe the methods and analyses for Phase II.

2 SUMMARY OF EXISTING DATA AND DATA NEEDS

This section provides a summary of existing sediment mercury concentration and geotechnical data, evaluates whether the data set is sufficient, and identifies the further investigation needed to support the TLC design.

2.1 MERCURY CONCENTRATION IN INTERTIDAL SEDIMENT

Sediment mercury concentration data will be evaluated to identify the extent of intertidal flats to be capped to reduce the surface weighted average concentration (SWAC) for mercury within Orrington Reach. Capping intertidal sediments with the highest concentrations of mercury will have the largest effect on reducing average concentrations and accelerating natural recovery of the Penobscot River Estuary. To maximize the environmental benefit of the remedial action, a current, comprehensive data set of mercury concentration in surface sediment is necessary to identify the areas of Orrington Reach intertidal flat sediment to be targeted for capping. The current understanding of the Site and recommended data collection and analyses to support the design of the cap are summarized below.

2.1.1 Current Understanding and Data Needs

Existing Orrington Reach sediment mercury concentration data were obtained from investigations performed between 2006 and 2016 and presented in the Phase III Engineering Study (Amec Foster Wheeler 2018a) on a reach and subarea basis. These data include those collected during Southern Cove PDIs for delineation of sediment removal areas (Anchor QEA and CDM Smith 2017). A subset of the available sediment mercury concentration data for the Orrington Reach intertidal zones from Table 5-2 of the Phase III report is summarized as follows:

Orrington Reach, Intertidal Zone	Acres	Number of Surface (0–0.5 ft) Sediment Samples	Mean Mercury Concentration (ng/g)[2]
Eastern Bank	130	42	1,208.5
Western Bank	112	10	978.6

[2] The Phase III Engineering Study presented mean mercury concentrations that were calculated via bootstrapping (Amec Foster Wheeler 2018a); the approach and justification for the use of bootstrapping to generate mean concentrations are presented in the "Alternatives Evaluation Report" (Amec Foster Wheeler 2018b). Generally, bootstrapping is a statistical method that estimates parameters, such as the mean, by continually resampling the sample population to generate a mini-population; each mini-population produces slightly different sample statistics that converge over many iterations to provide a value for interpretation.

These data suggest that capping focus on the east side of Orrington Reach. However, given that the sample density is considerably greater on the east side of the reach, there is greater uncertainty about concentrations of mercury on the west side.

In 2019, Integral completed a preliminary analysis of the sediment mercury and bathymetric data presented in the Phase III Engineering Study and identified seven coves with intertidal flats on the east side of Orrington Reach with elevated mercury concentrations in surface sediment (0–0.5 ft below sediment surface [bss]) that total approximately 130 acres. These seven areas (Figure 2) are sheltered from higher river velocities. The lower river velocities support the net depositional and broadly stable conditions characteristic of intertidal flats.

Table 2 and Figure 2 present the available data for mercury in surface sediment for each of the seven coves on the east side of the river, which include data collected from the period spanning from 2006 through 2021. In addition, Table 2 provides a summary of the more recent mercury data for surface sediment, which includes data collected in 2016 and 2017 as part of the Phase III investigation and subsequent focused investigations (e.g., samples collected as part of the Southern Cove removal action). With the exception of the Southern Cove, which was more extensively characterized to support the prior removal action, there are limited sample data for intertidal surface sediment in Orrington Reach, with the majority of the data collected prior to 2016. As shown in Figure 2, mercury concentrations measured in the top 0.5 ft of sediment are elevated, with the exception of one location in East Cove 5, and the highest concentrations are in the Southern Cove and East Cove 4.

Additional mercury concentration data collection is needed to augment the limited data set, refine the area of Orrington Reach to be capped, and inform a prioritization of areas to be capped. The existing mercury concentration data set is limited (e.g., there is an average of one sample location per 6 acres in intertidal flats outside of Southern Cove) and was primarily collected prior to 2016 and may not be representative of current conditions.

Although data for the western bank intertidal areas are limited compared to eastern bank intertidal zones, the available data indicate intertidal sediment in coves on the western bank, specifically, within Bald Hill Cove, contains elevated mercury concentrations (albeit at concentrations potentially lower than intertidal sediment on the east side) that could allow for achievement of capping objectives. Further characterization of Bald Hill Cove intertidal areas could provide flexibility in the design should access be denied for a portion of the eastern bank intertidal zone sediment or if capping in those areas is determined to be otherwise not Feasible.

2.1.2 Proposed Data Collection

Mercury, in both inorganic and organic (methylmercury) forms, enters the food web through direct ecological exposure to surface sediment and to particulates in the water column that interact with the sediment bed surface. Additional surface (0 to 0.5 ft bss) sediment sampling for

mercury and TOC analysis is proposed for the intertidal flats on both the east and west sides of Orrington Reach. Approximately 216 acres of intertidal flats is proposed for investigation. To provide adequate spatial coverage for each cove, approximately 60 sample locations are proposed, using the following criteria:

- A minimum of three recent (post-2016) samples for each cove
- Minimum of one recent (post-2016) sample for every ~4 acres of potential TLC area.

The following factors were used to select sample locations:

- Collect a subset of the samples at recent historical sample locations to evaluate whether mercury concentrations have changed at these locations.
- Avoid tidal creeks, rivulets, or narrow areas that are not suitable for capping.
- Locate samples in the center of parcels to minimize number of properties that will require access for sampling.

Proposed sampling locations for each of the seven coves on the east side of Orrington Reach and for Bald Hill Cove on the west side of Orrington Reach are shown on Figure 3. The sample locations for each cove are presented in Table 3. The sample locations may be adjusted based on the updated bathymetric and topographical surveys that are planned as part of the TLC Design Work Plan (Integral 2023), if access is denied by the property owner, or based on conditions observed during the field event.[3]

Surface sediment samples will be collected as grab samples using a Ponar dredge (or similar) device following the methodology indicated in the Penobscot Estuary Remediation Field Sampling Plan (FSP; WSP 2023a) and this Work Plan. Chemistry sample collection, analyses, and documentation methods are described further in Section 4.

2.2 GEOTECHNICAL CHARACTERIZATION

Geotechnical data will be evaluated to support design of a TLC that is compatible with the underlying sediment and minimize disturbance of the sediment during placement of the TLC. There are relatively limited geotechnical data available for intertidal sediment in Orrington Reach. The current understanding of the Site and recommended data collection and analyses to support the design of the cap are summarized below.

[3] Any field adjustment of sampling locations will remain within the areas where access has been granted by the property owner(s).

2.2.1 Current Understanding and Data Needs

Limited geotechnical data exist for intertidal sediments in the Penobscot River Estuary. Figure 4 presents the locations of samples with geotechnical data that were collected from Orrington Reach intertidal flats.

The U.S. Army Corps of Engineers conducted a cohesive sediment erosion field study in 2017 and analyzed intertidal sediments throughout the estuary. Sediment cores were collected from Orrington Reach as a part of this study, including one sample (ON-MU2-SF-1) from intertidal sediments located within East Cove 4 (Amec Foster Wheeler 2018b). Although the geotechnical analyses conducted on this core were limited, sediment grain size and bulk densities were determined for depth intervals 1.5, 5, and 11.25 cm bss. Sediment grain sizes from this sediment core consisted of primarily sand (38.0%–55.9%) and silt (41.8%–59.6%), with a minimal clay fraction (2.3%–2.9%). Bulk density of the sediment ranged from 1.16 to 1.19 g/cm^3.

A geotechnical evaluation was performed in 2015 as part of Southern Cove PDI to support design of a turbidity barrier and an equipment access road across the intertidal flats prior to sediment dredging and capping (Anchor QEA and CDM Smith 2017). Three samples were collected from Southern Cove intertidal flats from the following three locations (Figure 4):

- Core SD-SC-04. Collected by hand auger, to a termination depth of 1.5 ft bss. Sediment was classified as poorly graded sand.
- Core SD-SC-05. Collected using split-spoon samplers to a termination depth of 8 ft bss. Alluvium material was encountered from 3.5 to 6 ft bss, layered between an upper silt and lower clay layer. Sediment samples were classified as follows, from top of core to bottom: elastic (high-plasticity) silt, poorly graded sand, silty sand, lean (low-plasticity) clay. Field measurements using a pocket penetrometer and handheld vane shear tester were performed on the lean clay layer at the time of sampling.
- Core SD-SC-06. Collected via vibracore to a termination depth of 1.9 ft bss. Sediment was classified as a lean clay, and field measurements using a pocket penetrometer and handheld vane shear tester were performed at the time of sampling.

Geotechnical samples were also collected in subtidal sediment via split-spoon samplers in the vicinity of the Southern Cove and reached a maximum termination depth of 22.5 ft. Samples were submitted for laboratory analysis of Atterberg limits, particle size, and moisture content. Lithology data collected during Southern Cove PDIs indicated a brown sandy silt between 0.5 and 2 ft bss within most of the intertidal flat, then a sand and gravel alluvium, underlain by metamorphic rock that varies substantially in elevation. These data will be considered in the capping design as well as in the design of additional geotechnical evaluations in Orrington Reach.

Additionally, a limited number of sediment cores were collected from intertidal flats as a part of the Phase III investigation, as reported in the Thin Interval Core Sampling Report (Amec Foster Wheeler 2018c) and the Intertidal and Subtidal Characterization Report (Amec Foster Wheeler 2018d). The Phase III investigation included collection of sediment cores from two Orrington Reach intertidal flat locations (Figure 4), as summarized below:

- Core PBR-19 was collected from East Cove 4 at a depth interval of 0–59 cm (approximately 2 ft) bss. Sediment from PBR-19 had a particulate organic carbon content that ranged from 2.7% to 14.3%, consisted primarily of silt (55.3%–87.4%), and had a lithology classification of clayey silt.
- Core ON-10-01 was collected from Bald Hill Cove at a depth interval of 0–0.5 ft bss. Sediment from ON-10-01 had an organic content that ranged from 12.1% to 14.7% and had a lithology classification of clay/silt. If investigations indicate capping along the western shore is necessary, these data may be utilized.

The existing geotechnical data set for Orrington Reach intertidal sediment, including grain size, is limited and was collected at least five years ago. For intertidal sediment outside of Southern Cove in Orrington Reach, collection of representative geotechnical data, including sediment grain size, bulk density, Atterberg limits, and shear strength, is recommended to support an evaluation of the capping material grain size requirements to minimize intermixing with the underlying sediment due to cap placement and subsequent settling. Previous geotechnical data were utilized to develop a generalized understanding of Site conditions; however, additional information is required to confirm sediment conditions and design criteria in each major capping location (e.g., each cove area, contiguous capping sections). Although the exact location and footprint of the cap are not yet determined, sampling sediment in these areas is recommended for geotechnical analyses. It is also recommended that geotechnical data be collected in Bald Hill Cove on the western bank of the river, should further investigations and design work determine capping would be beneficial in this area.

2.2.2 Proposed Geotechnical Data Collection

A phased approach for collecting the geotechnical data is proposed. The Phase I data collection will involve collection of geotechnical index data (sediment type/lithology, grain size, bulk density, and Atterberg limits) for intertidal flat surface sediment across a range of locations within the preliminarily identified capping areas and Bald Hill Cove. These data will support an understanding of the variability in physical and geotechnical properties in the surface sediment, which, based on the existing geotechnical data and visual observations of field conditions, are anticipated to be relatively uniform within a given cove and between different coves. This understanding will allow for detailed geotechnical characterization during Phase II at a select subset of locations that are representative of the range of conditions in the area to be

capped. The methods for the Phase I geotechnical investigation are described further in Section 4.

The information obtained from the Phase I geotechnical investigation will be used to support the scoping of the Phase II geotechnical investigation, which may include collection of undisturbed cores for laboratory testing of additional parameters (e.g., permeability, shear strength, consolidation) in surface and subsurface sediment, shear testing, and evaluation of other geotechnical characteristics. A Sediment Geotechnical PDI Work Plan will be prepared under separate cover to describe the methods and analyses for this subsequent phase.

In Phase I, visual logging of sediment lithology (e.g., sand, silt) will be completed at each of the surface sediment (0 to 0.5 ft bss) grab sample locations shown on Figures 5 through 9. In addition, at 11 of the sample locations, a box core will be deployed to collect samples to 1.5 ft bss and allow for further observations of lithology variability with depth. The locations of the box core samples, shown on Figures 5 through 9, include at least one box core location for each cove and two box core locations for the larger coves. Locations may be adjusted in the field based on observations of sediment lithology to provide an understanding of geotechnical characteristic variability within each of the coves.

At each of the box core locations and at a subset of the grab sample locations, assumed to be one-third of the locations, samples will be collected for analysis of select geotechnical properties. The subset of geotechnical samples to be analyzed from grab sample locations will be determined based on field observations of sediment lithology and will be distributed to provide an understanding of geotechnical characteristic variability within each of the identified Orrington Reach coves.

Geotechnical sample collection, analyses, and documentation methods are described further in Section 4.

2.3 ADDITIONAL DATA NEEDS

Focused field observations and potential opportunistic sample collection will be performed during the Orrington Reach sediment PDI to provide additional data to support design and implementation of the TLC:

- Redox conditions and bioturbation. There is limited information regarding the depth at which redox conditions transition from oxic to anoxic conditions (i.e., the redox potential depth) and associated bioturbation depth in Orrington Reach intertidal sediment. Visual observations on the depth of redox conditions and bioturbation will be recorded at all box core locations. These data will support the design of the minimum protective cap thickness to limit mixing of cap material with underlying sediment due to bioturbation.

- Wood waste. Wood waste has been observed as an ephemeral deposit on the surface of intertidal flats during past investigations at the site. There is no information on the extent or persistence of wood waste. Limited available data indicate that wood waste may be enriched in mercury relative to inorganic sediment, on a dry weight basis. Additional information is needed to understand the potential for recontamination of Orrington Reach by wood waste following placement of the TLC. The presence or absence of wood waste on and/or in intertidal flat sediment will be recorded for all samples collected as part of the Sediment PDI. Should a discrete wood waste layer of sufficient thickness (>0.5 in) be identified at a sample location, a separate wood waste sample will be collected for mercury and TOC concentration analysis. A maximum of 10 wood waste samples will be analyzed.

3 DATA QUALITY OBJECTIVES

The DQOs associated with this Work Plan, and the proposed data collection to meet overall objectives of the PDI studies, are summarized in Table 3. The data collection described in this Work Plan will be used during TLC design to:

- Identify and prioritize areas for capping.
- Define the depth of bioturbation and minimum cap thickness.
- Estimate whether the native sediment will support the proposed TLC and minimize intermixing of the cap material with underlying sediments during cap placement.
- Estimate native sediment strength and stability by evaluating geotechnical characteristics of underlying sediment to minimize intermixing with cap material and ensure slope stability during and following cap placement.
- Identify the absence or presence of wood waste on and/or within Orrington Reach intertidal flat surface sediment to better understand the potential impact of wood waste to serve as an ongoing source of mercury to Orrington Reach intertidal sediment.

4 SAMPLING PLAN AND METHODOLGY

The following section presents the sampling plan and methodologies to obtain the mercury concentration and geotechnical characterization data required to complete the TLC design. Sediment samples will be collected in accordance with the FSP and Quality Assurance Project Plan (QAPP; WSP 2023b) as modified by the following sections. The FSP provides the methods and standard operating procedures (SOPs) for the sediment sampling described in this section, including packaging and transport of the samples and the management of investigation-derived waste. Deviations from the methods described below, the FSP, and QAPP will be documented.

4.1 SAMPLE LOCATIONS

Proposed sample locations are shown on Figures 5 through 9 and summarized in Table 4. The rationale for sample location selection is described in Section 2.1.2.

Access to private and municipally owned property is required for each of the intertidal sediment sample locations, as described in Section 6. Sample locations may be adjusted before this data collection event takes place based on the outcome of property access agreements and proposed bathymetric and topographical surveys that are anticipated to be conducted before this event, as described in the TLC Design Work Plan.

Additionally, sample locations may be adjusted based on field observations, including the presence of structures, accessibility issues, rivulets or channels, or other unanticipated conditions. With any field adjustment, the sample locations will remain within the areas where access has been granted by the property owner(s). Should conditions warrant, a sample location may be offset up to 25 ft from the original location. Sample locations that require an offset greater than 25 ft will be discussed with the Integral project director prior to sample collection. All sample location adjustments will be documented and provided in the investigation report.

4.2 GRAB SAMPLE COLLECTION

Sediment grab samples will be collected from 0 to 0.5 ft bss using a Ponar dredge (or similar) in accordance with procedures described in SOP S-6 and S-6A of the FSP (WSP 2023a). Should field observations of the grab sample indicate that a discrete layer of wood waste is present on the sediment surface, a box core will be deployed and the wood waste thickness will be measured. The measured thickness of the wood waste layer will determine next steps for sample collection, as described in further detail under Section 4.2.2.2, below.

Each sample will be photographed and the following recorded on a field log form based on field observations:

- Sediment texture (e.g., sandy, silty, clayey)
- Color
- Presence or absence of wood waste
- Other relevant observations.

Following logging, the sample will be homogenized using a decontaminated stainless steel bowl and spoon, and aliquots will then be placed in the appropriate sample containers for analysis of:

- Mercury by EPA Method 1631E
- TOC by EPA Method 9060 (Lloyd-Kahn)
- Atterberg limits by ASTM International (ASTM) D4318
- Bulk density by ASTM 7263
- Moisture content by ASTM D2216
- Sediment grain size by ASTM D6913-sieve and ASTM D7928-hydrometer.

All of the samples containers will be brought to the processing facility.

As discussed in Section 4.1, above, the geotechnical analyses (Atterberg limits, bulk density, moisture content, grain size) will only be performed at a subset of the locations. The samples selected for geotechnical analysis will include all of the locations where box cores are collected (Section 4.3) and a subset of the grab sample locations selected based on field observations of sediment lithology and to provide an understanding of geotechnical characteristic variability within each of the identified Orrington Reach coves. In the larger coves (e.g., Bald Hill Cove), and to the extent practicable, the locations where samples are selected for geotechnical analysis may be positioned along a transect oriented perpendicular to the shoreline to evaluate conditions across the intertidal flat area from the nearshore area toward the subtidal interface. For coves with few proposed sample locations (e.g., East Cove 2), samples for geotechnical analysis will be selected to be near the center of the cove. It is estimated that approximately one-third of the samples will be submitted for geotechnical analysis. Sample containers for geotechnical characteristics collected at locations that were not selected for geotechnical analysis will be disposed of as investigation-derived waste in accordance with the FSP (WSP 2023a).

A matrix summarizing sample naming conventions and analyses to be collected at each location is provided as Appendix A. Samples will be packaged and submitted to the laboratory in

accordance with SOPs S-19 and S-20 of the FSP. Geotechnical samples brought to the processing facility and not selected for analysis will be disposed of in accordance with the FSP.

4.3 BOX CORE SAMPLE COLLECTION

Box core sample collection will occur at 11 of the proposed grab sample locations to observe lithology and collect samples for geotechnical characterization from 0 to 1.5 ft bss. In addition, box core samples will be collected at up to an additional 10 of the proposed grab sample locations for collection of wood waste samples for mercury and TOC analysis should visual inspection of the grab samples suggest a discrete layer of wood waste is present on the sediment surface at the sample location.

Box cores will be collected in accordance with procedures described in SOP S-6 of the FSP (WSP 2023a). Box core material will be visually logged for lithology and other relevant observations by the field geologist/geotechnical engineer following ASTM D2488. Lithology will be recorded following the classification system specified in the FSP (WSP 2023a). In addition, the redox potential depth, presence or absence of wood waste, and any other relevant observations will be documented.

4.3.1 Geotechnical Characterization

Geotechnical samples from box cores will be collected within the upper 1.5 ft of sediment. Sample intervals will be selected to collect a sample of each lithology layer identified in the core. Up to 3 samples from each core are anticipated. If soil lithology and other observations indicate the material from 0 to 1.5 ft bss lacks variability, a single sample will be analyzed and the remaining samples may be archived.

A representative sample of sediment will be collected from each layer interval and homogenized using a decontaminated stainless-steel bowl and spoon. An aliquot of the homogenized sample will be placed in the appropriate sample container and submitted for laboratory analysis of the following properties:

- Atterberg limits (ASTM D4318)
- Bulk density (ASTM 7263)
- Moisture content (ASTM D2216)
- Sediment grain size (D6913-sieve and D7928-hydrometer).

A matrix summarizing sample naming conventions and analyses for samples to be collected at each location is provided as Appendix A. Samples will be packaged and submitted to the laboratory in accordance with SOPs S-19 and S20 of the FSP. Excess material brought to the processing facility and not used for analysis will be disposed of in accordance with the FSP.

4.3.2 Wood Waste Sampling

Field personnel will photograph and document any and all wood waste observed in the sediment PDI samples. In addition, field personnel will record any other relevant observations of wood waste, such as any accumulations of wood waste on the surface of intertidal flats at low tide. Should observations at a given grab sample location suggest that a discrete layer of wood waste is present on the sediment surface, a box core will be collected at the location and the thickness of the wood waste layer recorded and photographed. If the wood waste layer is less than 0.5 in. thick, the grab sample material will be used for analysis. If sufficient thickness of wood waste is present (0.5 in. or more), samples will be collected from the box core as follows:

- Wood waste will be scraped off the sediment surface and collected for mercury and TOC analysis via the methods indicated above. Wood waste samples will be sent to the analytical laboratory and initially placed on hold. Once the sampling effort is complete, the Integral project director and Remediation Trust lead will identify the wood waste samples to be analyzed (maximum of 10 samples).
- Once the wood waste is removed to the extent practical, the top 0.5 ft of underlying sediment will then be sampled from the core. Following logging and removal of the wood waste layer, the top 0.5 ft of the core will be homogenized using a decontaminated stainless steel bowl and spoon, and aliquots collected and placed in appropriate sample containers for chemistry and geotechnical properties analysis following the methods indicated above.

Samples will be packaged and submitted to the laboratory in accordance with SOPs S-19 and S-20 of the FSP.

5 QUALITY CONTROL AND QUALITY ASSURANCE

Field quality control samples are collected to assess variability within samples (e.g., duplicates), to evaluate if potential sources of sample contamination are present (e.g., equipment rinsate and trip blanks), or to confirm proper storage conditions of samples (e.g., temperature blanks). All QA/QC procedures are detailed in the FSP and QAPP (WSP 2023a,b).

Requirements for field quality control samples, including a summary of all field quality control sample numbers, are provided in Table 5. Field duplicates and other field quality control samples, such as trip blanks, temperature blanks, and rinsate blanks, will be collected as outlined in the QAPP. Rinsate blanks will be collected by pouring deionized water over the sampling equipment after field decontamination. One rinsate blank will be collected per day.

6 PERMITS AND ACCESS REQUIREMENTS

Permits are not required for implementation of this Sediment PDI Work Plan.

Based on the current understanding of Maine law, permission to access intertidal flats to collect sediment samples will be required from each landowner for parcels to be sampled. Parcels and ownership have been identified for the proposed sampling locations along the eastern side of Orrington Reach and in Bald Hill Cove on the western side of the river (Figures 5 through 9). The Remediation Trust has completed the following efforts to secure access:

- Greenfield has met with elected officials from Orrington, Bucksport, and Winterport to introduce the Remediation Trust, present the proposed Work, solicit feedback, and discuss communication with landowners.
- Access agreement packages will be sent to all identified landowners via U.S. Postal Service. The packages will include a cover letter, access agreement, fact sheets to provide an overview of work to be done, and a self-addressed, stamped envelope to return the access agreement.

7 ROLES AND RESPONSIBILITIES

The roles, responsibilities, and authorities of Greenfield, Integral, and WSP USA Environment & Infrastructure, Inc. (WSP) for implementation of this Work Plan are presented below.

Task	Greenfield Role	Integral Role	WSP Role
Beneficiary communication	Lead	Technical support	Technical support
Sample collection	Oversight, and project management	Provide support	Lead. Responsible for securing contractor and implementation of Work Plan.
Data management including analysis, validation, and database management	Oversight, and project management	Provide support	Lead. Responsible for securing contractor and implementation of Work Plan and database management.
Investigation report	Oversight, deliverable review, and project management	Lead	Provide support

8 SCHEDULE

The following the schedule milestones have been established for this Sediment PDI WP:

- Acquire parcel access June–July, 2023
- Implement Orrington Reach Sediment PDI August 2023
- Complete sediment laboratory analysis September 2023
- Complete analytical results data validation October 2023
- Draft Sediment PDI Report December 2023.

The field sampling schedule will depend on obtaining access to the proposed sampling locations and on weather. To the extent feasible, the sediment PDI sample collection described herein will take place in conjunction with other sediment data collection events to maximize efficiency and reduce the number of field mobilizations.

Assuming field teams will be able to collect samples from four locations per day, sediment PDI sample collection will likely require 3 weeks. Samples will be submitted for laboratory analysis on a standard turnaround time; subsequent data validation will be performed prior to incorporation of the data into the project database. Validated data will be provided in an investigation report.

9 SUPPORTING DELIVERABLES

As described in Section 4, this Sediment PDI Work Plan references and augments the Site-Wide Supporting Deliverables (Health and Safety Plan, Emergency Response Plan, QAPP, and FSP) and provides the core plans for the proposed field events.

10 REPORTING

Data collected during this investigation will be provided in an investigation report that conforms to the Investigation Report requirements identified in Paragraph 6(b) of the Statement of Work (Appendix A to the Consent Decree), including:

- A summary of the investigations performed
- A summary of the investigation results
- Summaries of validated data (i.e., tables and graphics)
- Summaries of data validation reports and laboratory data reports
- Narrative interpretation of data and results, including how the Investigation objectives and DQOs were satisfied
- Results of statistical and modeling analyses
- Summary photographs documenting the work conducted
- Conclusions and recommendations for Work Design, including any resulting modifications to design parameters and criteria provided for in the Basis of Design or other Deliverables.

11 REFERENCES

Amec Foster Wheeler. 2018a. Phase III engineering study report, Penobscot River Estuary, Maine. September. Prepared for United States District Court District of Maine. Amec Foster Wheeler Environment & Infrastructure, Inc., Portland, ME. September.

Amec Foster Wheeler. 2018b. Alternatives evaluation report, Penobscot River Phase III engineering study, Penobscot River Estuary, Maine. September. Prepared for United States District Court District of Maine. Amec Foster Wheeler Environment & Infrastructure, Inc., Portland, ME. March.

Amec Foster Wheeler. 2018c. Thin interval core sampling report, Penobscot River Phase III engineering study, Penobscot River Estuary, Maine. Prepared for United States District Court District of Maine. Amec Foster Wheeler Environment & Infrastructure, Inc., Portland, ME. September.

Amec Foster Wheeler. 2018d. 2017 Intertidal and subtidal characterization report, Penobscot River Phase III engineering study, Penobscot River Estuary, Maine. Prepared for United States District Court District of Maine. Amec Foster Wheeler Environment & Infrastructure, Inc., Portland, ME. June.

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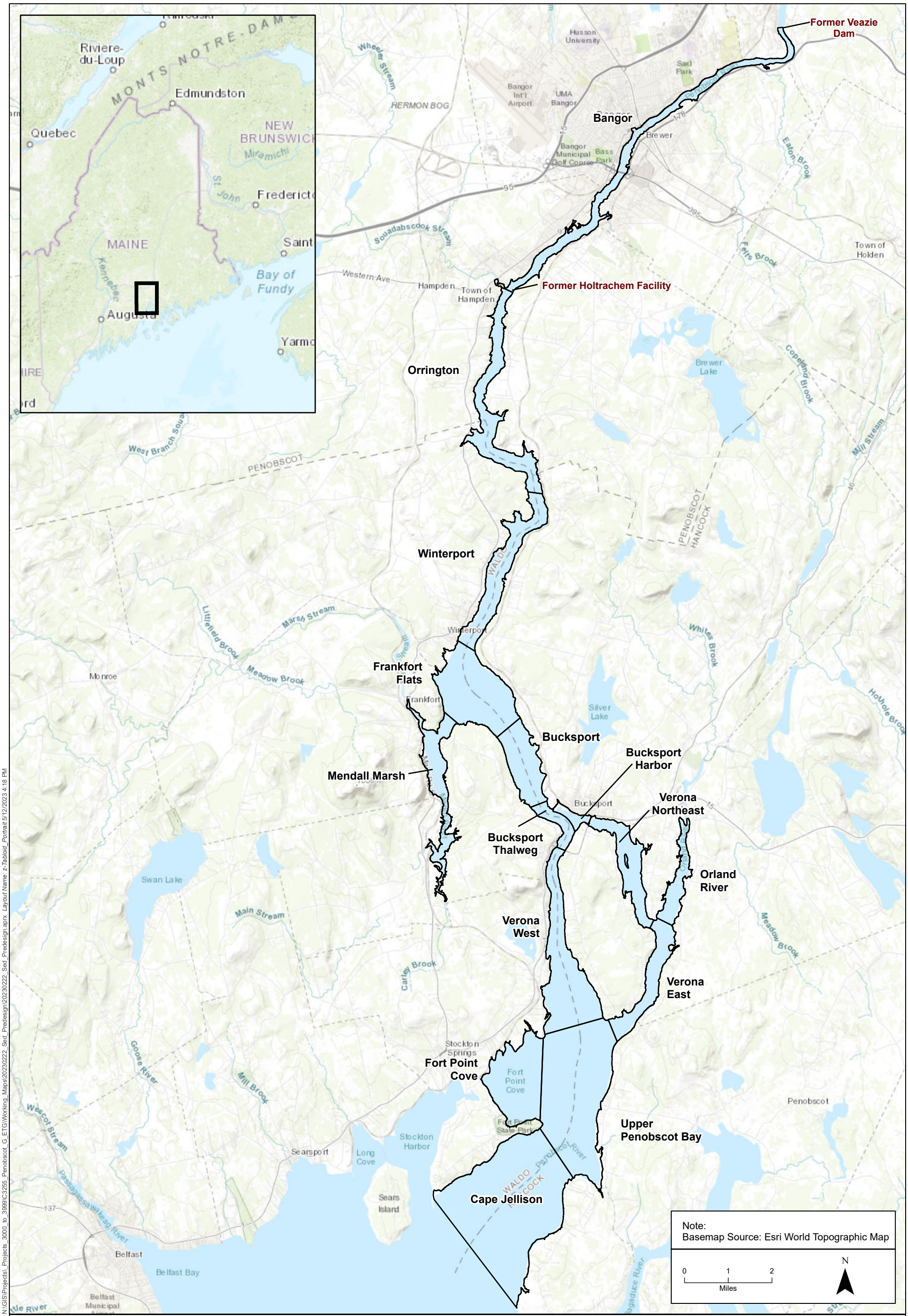
WSP. 2023a. Field sampling plan, Penobscot Estuary remediation. Greenfield Penobscot Estuary Remediation Trust LLC. WSP USA Environment & Infrastructure, Inc. March 10.

WSP. 2023b. Quality assurance project plan, Penobscot Estuary remediation. Greenfield Penobscot Estuary Remediation Trust LLC. WSP USA Environment & Infrastructure, Inc. March 10.

Figures



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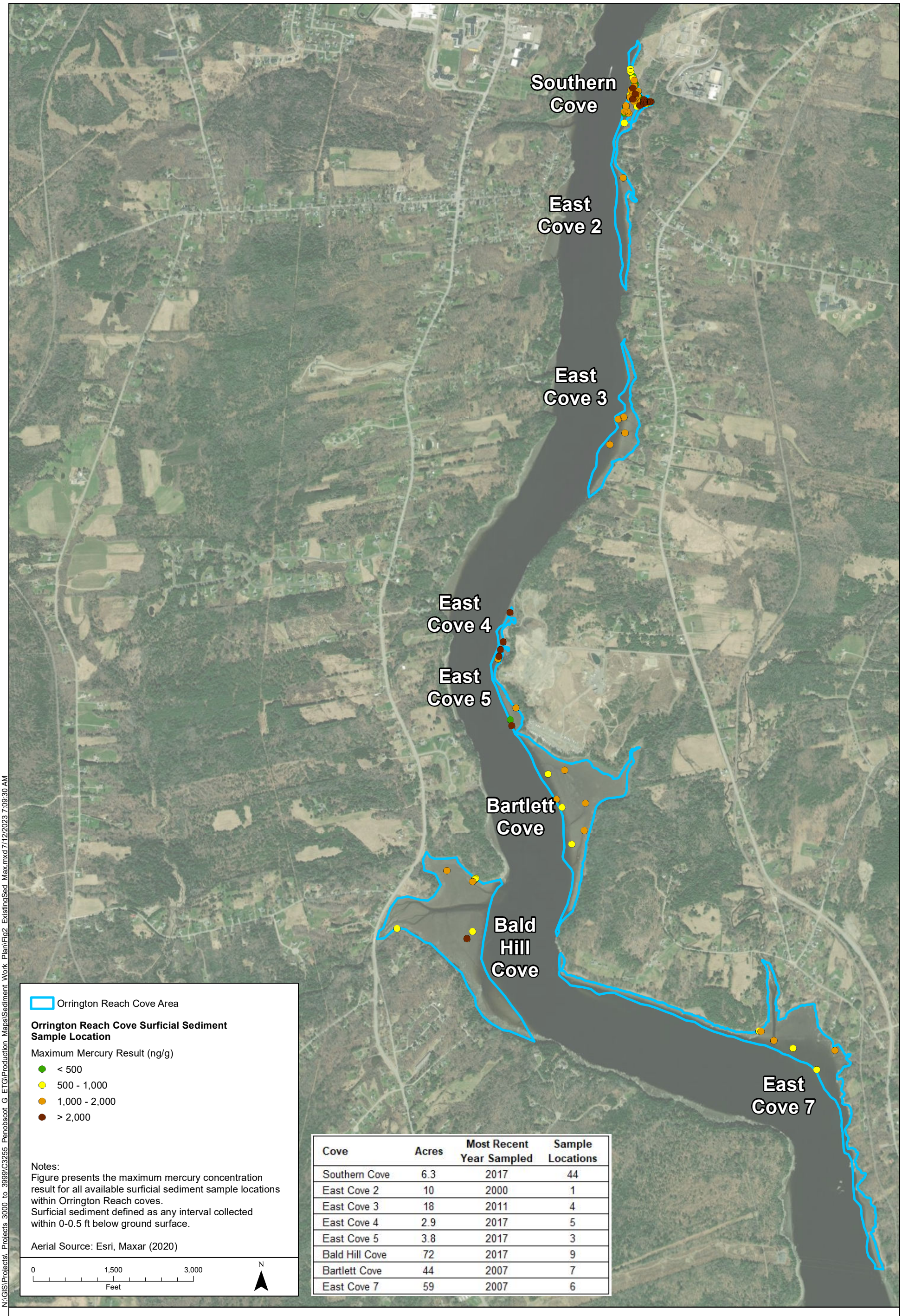
Prepared for: Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared by: integral consulting inc.

Figure 1.
Penobscot River Reaches
Sediment Pre-Design Investigation Work Plan
August 2023



Cove	Acres	Most Recent Year Sampled	Sample Locations
Southern Cove	6.3	2017	44
East Cove 2	10	2000	1
East Cove 3	18	2011	4
East Cove 4	2.9	2017	5
East Cove 5	3.8	2017	3
Bald Hill Cove	72	2017	9
Bartlett Cove	44	2007	7
East Cove 7	59	2007	6

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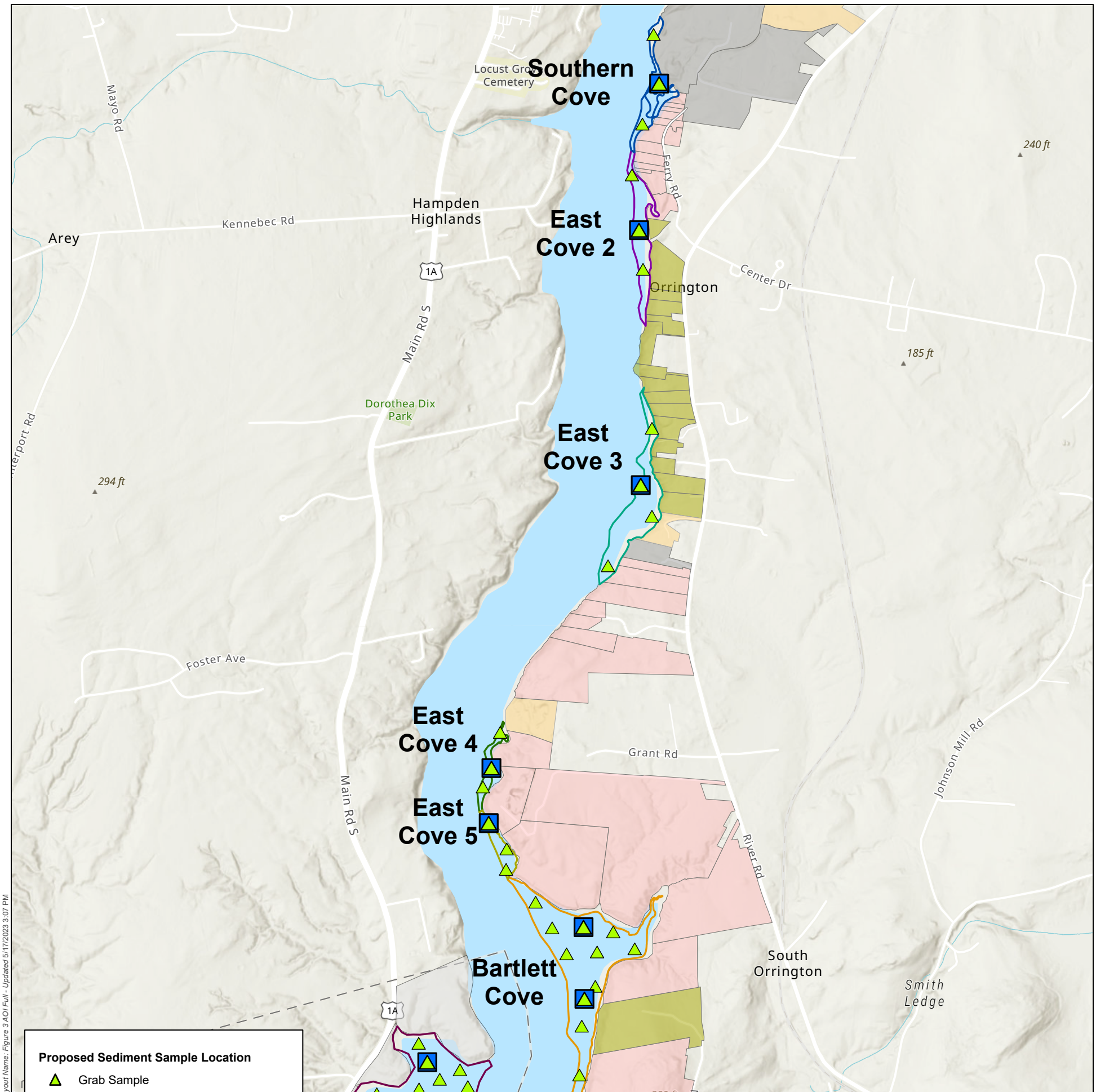
Prepared for: Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared by: integral consulting inc.

Figure 2.
Orrington Reach Existing Sediment Mercury Sample Locations
Sediment Pre-Design Investigation Work Plan
August 2023

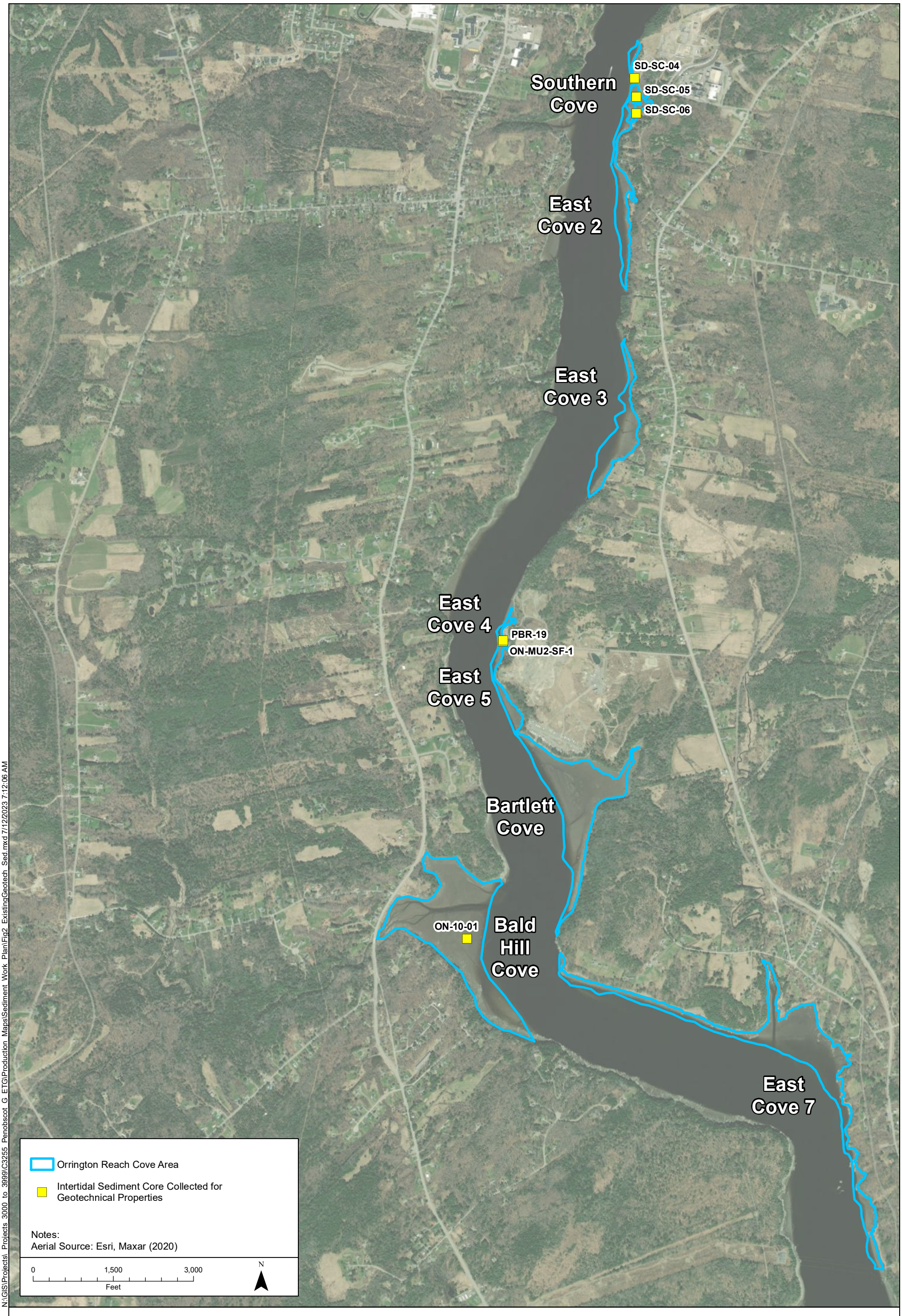


Cove Name	Proposed Grab Sample Locations	Proposed Box Core Sample Locations
Southern Cove	3	1
East Cove 2	3	1
East Cove 3	4	1
East Cove 4	3	1
East Cove 5	3	1
Bald Hill Cove	16	2
Bartlett Cove	11	2
East Cove 7	14	2

Prepared for: Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared by: integral consulting inc.

Figure 3.
Overview of Proposed Orrington Reach Sediment PDI Sample Locations
Sediment Pre-Design Investigation Work Plan
August 2023



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Prepared for: Greenfield Penobscot Estuary Remediation Trust LLC
Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared by: integral consulting inc.

Figure 4.
Orrington Reach Existing Sediment Geotechnical Sample Locations
Sediment Pre-Design Investigation Work Plan
August 2023

Tables

Table 1. Statement of Work Compliance

Statement of Work Requirement		Work Plan Section
¶ 6(a)(i) An evaluation and summary of existing data and a description of the data gaps that require further investigation in order to complete the Work Design	✓	Section 2
¶ 6(a)(ii) A description of the required technical and/or regulatory decisions to be made or questions to be answered with the Investigation results, along with a summary of the type, quantity, and quality of data needed to reach those decisions ("Data Quality Objectives" or "DQOs")	✓	Section 3
¶ 6(a)(iii) A sampling plan including media to be sampled, contaminants or parameters for which sampling will be conducted, location (areal extent and depths), and number of samples	✓	Section 4
¶ 6(a)(iv) A schedule for the Investigation	✓	Section 8
¶ 6(a)(v) Cross references to quality assurance/quality control ("QA/QC") requirements set forth in the QAPP as described in Paragraph 31(d)	✓	Section 5

Notes:
QAPP = quality assurance project plan

Table 2. Orrington Reach Mercury Concentration Data in Preliminary TLC Capping Areas and Bald Hill Cove

			All (1995–2021) Sediment Samples Collected at any Interval within 0-0.5 ft bss						Recent (2016–2021) Sediment Samples Collected at any Interval within 0-0.5 ft bss					
			Counts		Total Mercury Concentration (ng/g)				Counts		Total Mercury Concentration (ng/g)			
Cove Name	Acres[a]	Most Recent Year Sampled	# of Sample Locations	# of Sample Results	Minimum	Median	Maximum	Average	# of Sample Locations	# of Sample Results	Minimum	Median	Maximum	Average
Eastern Bank of Orrington Reach														
Southern Cove	6.3	2017	44	87	50	1,200	6,400	1,396	9	9	595	1,321	2,223	1,283
East Cove 2	10	2000	1	3	570	1,200	1,300	1,023	--	--	--	--	--	--
East Cove 3	18	2011	4	4	1,100	1,330	1,500	1,315	--	--	--	--	--	--
East Cove 4	2.9	2017	5	56	643	1,527	3,050	1,665	3	23	962	1,280	2,189	1,431
East Cove 5	3.8	2017	3	75	63	1,169	2,072	1,170	1	8	550	767	1,080	820
Bartlett Cove	44	2007	7	21	690	1,200	1,580	1,160	--	--	--	--	--	--
East Cove 7	59	2007	6	7	569	1,000	1,270	1,023	--	--	--	--	--	--
Western Bank of Orrington Reach														
Bald Hill Cove	72	2017	9	77	82	721	2,110	682	4	21	82	688	2,110	722

Notes:
The data set includes samples from varying depth intervals, and at many locations, multiple depth intervals were sampled between 0 and 0.5 ft bss. This table includes data for any sample depth interval that is between 0 and 0.5 ft bss, resulting in a higher sample count than sample locations.
-- = no data from 2016 to 2021
bss = below sediment surface
TLC = thin layer cap

[a] As estimated in ArcGIS using cove areas presented in Figures 2 through 9. Acreages to be revised following bathymetric/LiDAR data analysis.

Table 3. Orrington Reach Sediment PDI Data Quality Objectives

Problem Statement and Goals	Information	Additional Data Collection and Analysis Needs	Scope of Additional Data Collection and Analysis
Sediment Chemistry			
Refine the area to be capped with a more complete data set. Identify areas with highest mercury concentrations.	Capping of the preliminary remediation area (130 acres) is estimated to achieve a reduction of the SWAC for mercury in surface sediment within Orrington Reach. Data within Orrington Reach are limited or old (collected prior to 2016).	Sediment sample collection for chemical concentration analysis is needed to supplement the existing mercury data set, refine the SWAC calculation, and support the identification of the final area to be capped.	Conduct surface sediment sampling for chemical concentration analysis in intertidal sediment on east and west side of Orrington Reach.
Identify nature of mercury contamination in areas on western side of river should access be denied for a portion of the eastern bank intertidal zone sediment or if capping in those areas is determined to be otherwise infeasible.	Bald Hill Cove, located on the western side of river within Orrington Reach, is an area with expansive intertidal flats and elevatd mercury concentrations in surface sediment.	Supplement the existing sediment chemistry data set with samples in Bald Hill Cove.	Conduct surface sediment sampling for chemical concentration analysis in intertidal sediment in Bald Hill Cove.
Establish the mercury concentration in native sediment that will underlie the cap to support the evaluation of the impact of mixing and the required minimum cap thickness.	Modeling will be performed to estimate minimum cap thickness requirements and will incorporate underlying sediment concentrations, physical transport mechanisms that impact mixing of underlying sediment, such as bioturbation, along with chemical processes such as methylation.	Sediment sampling is needed to estimate mercury concentrations in native sediment that can impact the cap through mixing processes to support identification of a minimum design thickness for the cap.	Conduct sediment sampling for chemical concentration analysis in intertidal sediment on east and west side of Orrington Reach.
Geotechnical Data			
Estimate sediment strength and stability to select the appropriate placement and implementation methods.	Selection of appropriate placement and implementation methods, such as the use of hydraulic or mechanical methods and placement under dry or wet conditions with barges or floating docks, will consider the sediment strength to limit disturbance and mobilization of sediment.	Geotechnical characterization of the native sediment is needed to support selection of implementation methods based on strength properties.	Conduct surface sediment sampling for geotechnical analysis of index properties to understand variability within Orrington Reach intertidal surface sediment and identify additional geotechnical data needs.
Design for cap stability by evaluating geotechnical characteristics of underlying sediment to minimize intermixing with cap material during placement.	Limited available grain size data indicate that the native sediment is fine grained (predominantly silt).	Geotechnical characterization of the native sediment is needed.	Conduct surface sediment sampling for geotechnical analysis of index properties to understand variability within Orrington Reach intertidal surface sediment and identify additional geotechnical data needs.
Additional Considerations			
Define the minimum protective cap thickness to limit mixing and mercury methylation by evaluating redox conditions and the extent of bioturbation.	There is limited site-specific information on the extent of redox conditions and bioturbation. These parameters support the cap design thickness to limit mixing and mercury methylation.	Quantification of the redox potential depth (RPD) is needed to estimate the depth of bioturbation within native sediments.	Record visual observations on the depth of redox conditions and bioturbation.
Identify the absence or presence of wood waste on and/or within Orrington Reach intertidal flat surface sediment.	There is limited information regarding the presence and extent of wood waste on and/or within Orrington Reach intertidal sediment.	Information regarding the vertical and horizontal extents of wood waste is needed to understand the potential impact of wood waste to serve as an ongoing source of mercury to Orrington Reach intertidal sediment.	Record visual observations of wood waste during Orrington Reach Sediment PDI chemistry and geotechnical sample collection, and if a discrete layer of sufficient volume of wood waste is present, collect wood waste sample for chemistry analysis.

Notes:
SWAC = surface weighted average concentration

Table 4. Orrington Reach Sediment PDI Sample Locations

		Coordinates[a]		Collection Method	
Cove Name	Station ID	Easting (ft)	Northing (ft)	Ponar Dredge (0-0.5 ft)	Box Core[b]
Southern Cove	OR-PDI-01	898735.25	391387.28	X	
Southern Cove	OR-PDI-02	898815.04	390636.84	X	X
Southern Cove	OR-PDI-03	898559.14	390042.33	X	
East Cove 2	OR-PDI-04	898397.79	389278.61	X	
East Cove 2	OR-PDI-05	898498.82	388435.60	X	X
East Cove 2	OR-PDI-06	898554.56	387859.58	X	
East Cove 3	OR-PDI-07	898674.55	385470.13	X	
East Cove 3	OR-PDI-08	898501.59	384604.68	X	X
East Cove 3	OR-PDI-09	898665.76	384149.42	X	
East Cove 3	OR-PDI-10	898001.54	383408.31	X	
East Cove 4	OR-PDI-11	896366.19	380915.11	X	
East Cove 4	OR-PDI-12	896232.18	380367.76	X	X
East Cove 4	OR-PDI-13	896101.91	380097.04	X	
East Cove 5	OR-PDI-14	896186.11	379540.99	X	X
East Cove 5	OR-PDI-15	896453.32	379162.45	X	
East Cove 5	OR-PDI-16	896441.99	378855.83	X	
Bartlett Cove	OR-PDI-17	896882.65	378361.62	X	
Bartlett Cove	OR-PDI-18	897129.19	377974.03	X	
Bartlett Cove	OR-PDI-19	897600.95	377968.96	X	X
Bartlett Cove	OR-PDI-20	898046.38	377907.58	X	
Bartlett Cove	OR-PDI-21	897343.22	377581.96	X	
Bartlett Cove	OR-PDI-22	897801.91	377607.32	X	
Bartlett Cove	OR-PDI-23	898367.30	377651.15	X	
Bartlett Cove	OR-PDI-24	897771.83	377091.69	X	
Bartlett Cove	OR-PDI-25	897608.34	376890.26	X	X
Bartlett Cove	OR-PDI-26	897564.37	376494.48	X	
Bartlett Cove	OR-PDI-27	897525.46	375760.28	X	
East Cove 7	OR-PDI-28	897739.94	374053.60	X	
East Cove 7	OR-PDI-29	899114.36	373593.88	X	
East Cove 7	OR-PDI-30	900656.27	373036.64	X	
East Cove 7	OR-PDI-31	901459.08	373146.12	X	
East Cove 7	OR-PDI-32	901785.04	373394.61	X	
East Cove 7	OR-PDI-33	901917.05	373072.37	X	
East Cove 7	OR-PDI-34	901722.75	372943.65	X	X
East Cove 7	OR-PDI-35	901483.42	372794.80	X	
East Cove 7	OR-PDI-36	902005.64	372690.60	X	
East Cove 7	OR-PDI-37	902401.06	372641.87	X	
East Cove 7	OR-PDI-38	902316.82	372228.54	X	
East Cove 7	OR-PDI-39	902586.12	371610.14	X	
East Cove 7	OR-PDI-40	902815.22	370360.59	X	
East Cove 7	OR-PDI-41	903030.92	369586.29	X	X

Table 4. Orrington Reach Sediment PDI Sample Locations

		Coordinates[a]		Collection Method	
Cove Name	Station ID	Easting (ft)	Northing (ft)	Ponar Dredge (0-0.5 ft)	Box Core[b]
Bald Hill Cove	OR-PDI-42	895113.35	376251.43	X	
Bald Hill Cove	OR-PDI-43	895241.30	375954.64	X	X
Bald Hill Cove	OR-PDI-44	895731.08	375849.21	X	
Bald Hill Cove	OR-PDI-45	895847.18	375596.43	X	
Bald Hill Cove	OR-PDI-46	895425.98	375709.08	X	
Bald Hill Cove	OR-PDI-47	895113.96	375566.51	X	
Bald Hill Cove	OR-PDI-48	894478.96	375496.68	X	
Bald Hill Cove	OR-PDI-49	894484.28	375288.55	X	
Bald Hill Cove	OR-PDI-50	894761.89	375037.44	X	
Bald Hill Cove	OR-PDI-51	895070.39	375177.48	X	
Bald Hill Cove	OR-PDI-52	895385.61	375184.48	X	X
Bald Hill Cove	OR-PDI-53	895774.77	375093.13	X	
Bald Hill Cove	OR-PDI-54	895735.71	374129.98	X	
Bald Hill Cove	OR-PDI-55	895623.29	374664.72	X	
Bald Hill Cove	OR-PDI-56	895189.43	374851.94	X	
Bald Hill Cove	OR-PDI-57	896100.54	373610.65	X	
Count of Locations:				57	11

Notes:

PDI = pre-design investigation

[a] Coordinates provided in Maine State Plane, ft.

[b] Box core samples will be colocated with ponar samples, and sample depth intervals will be identified based on changes in lithology observed in the field.

Table 5. Orrington Reach Sediment PDI Analytical Method and QA/QC Summary

Collection Method	Sample Depth Interval (ft bss)	Analyte/Parameter	Analytical Method	Number of Locations[a]	Number of Samples per Location	Total Number of Samples to Analyze	Field Duplicates[b]	Equipment Blanks[c]	MS[d]	MSD[d]	Total Number Samples, with QA/QC	Notes
Grab Sample via Ponar Dredge	0–0.5 ft	Total Mercury	EPA 1631E	57	1	57	6	3	3	3	72	
		Total Organic Carbon	Lloyd Kahn	57	1	57	6	0	3	3	69	
		Atterberg Limits	ASTM D4318	57	1	20	NA	NA	NA	NA	20	Geotechnical index property samples will be collected at all grab sample locations. A subset of the geotechnical index property samples will be submitted for analysis; this sample subset will be identified based on lithology observations collected in the field.
		Sediment Grain Size	ASTM D6913-sieve and D7928-hydrometer	57	1	20	NA	NA	NA	NA	20	
		Moisture Content	ASTM D2216	57	1	20	NA	NA	NA	NA	20	
		Bulk Density	ASTM 7263	57	1	20	NA	NA	NA	NA	20	
Box Core	Total depth of 1.5 ft. Sample intervals between 0–0.5 ft (up to 3) will be identified based on field observations.	Atterberg Limits	ASTM D4318	11	Up to 3	11 to 33	NA	NA	NA	NA	11 to 33	If a distinct layer of wood waste is identified in the Ponar dredge grab sample, the box core may be deployed to assess the thickness of wood waste, and additional chemistry samples may be collected.
		Sediment Grain Size	ASTM D6913-sieve and D7928-hydrometer	11	Up to 3	11 to 33	NA	NA	NA	NA	11 to 33	
		Moisture Content	ASTM D2216	11	Up to 3	11 to 33	NA	NA	NA	NA	11 to 33	
		Bulk Density	ASTM 7263	11	Up to 3	11 to 33	NA	NA	NA	NA	11 to 33	

Notes:

bss = below sediment surface
MS = matrix spike
MSD = matrix spike duplicate
NA = not applicable
PDI = pre-design investigation
QA/QC = quality assurance and quality control

[a] Box cores will be performed at a subset of grab sample locations.
[b] Field duplicates will be collected at a frequency of 1 per 10 samples for sediment chemistry. Geotechnical sample duplicates are not required for QA/QC, but may be collected based on field observations to assess variability in sediment conditions.
[c] Equipment blanks will be collected at a frequency of 1 per 20 chemistry samples per piece of equipment.
[d] MS/MSDs will be analyzed at a frequency of 1 per 20 samples per sample type and analyte.

Appendix A

Orrington Reach Sediment PDI
Sample Matrix Summary

Table A-1. Orrington Reach Sediment PDI Sample Matrix Summary

										Analyte:	Total Mercury	TOC	Atterberg Limits [c]	Moisture Content [c]	Grain Size [c]	Bulk Density [c]
										Method:	EPA 1631E	Lloyd Kahn	ASTM D4318	ASTM D2216	ASTM D6913-sieve and D7928-hydrometer	ASTM 7263
										Container:	1 x 4 oz. Trace Clean PETG	4 oz WMG	8 oz WMG	4 oz WMG	16 oz WMG	16 oz WMG
					Target Coordinates[a]		Target Sample Depth (ft)	Actual Sample Depth (ft)		Preservation:	--	Cool to ≤ 6°C	--	Cool to ≤ 6°C	--	--
Cove Name	Station ID	Sample ID [b]	Sample Date	Sample Time	Easting (ft)	Northing (ft)			Matrix	Sample Type						
Ponar Dredge Samples																
Southern Cove	OR-PDI-01	OR-PDI-01_MMDDYY_SED_00-05_C			898735.25	391387.28	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Southern Cove	OR-PDI-02	OR-PDI-02_MMDDYY_SED_00-05_C			898815.04	390636.84	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Southern Cove	OR-PDI-03	OR-PDI-03_MMDDYY_SED_00-05_C			898559.14	390042.33	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 2	OR-PDI-04	OR-PDI-04_MMDDYY_SED_00-05_C			898397.79	389278.61	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 2	OR-PDI-05	OR-PDI-05_MMDDYY_SED_00-05_C			898498.82	388435.60	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 2	OR-PDI-06	OR-PDI-06_MMDDYY_SED_00-05_C			898554.56	387859.58	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 3	OR-PDI-07	OR-PDI-07_MMDDYY_SED_00-05_C			898674.55	385470.13	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 3	OR-PDI-08	OR-PDI-08_MMDDYY_SED_00-05_C			898501.59	384604.68	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 3	OR-PDI-09	OR-PDI-09_MMDDYY_SED_00-05_C			898665.76	384149.42	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 3	OR-PDI-10	OR-PDI-10_MMDDYY_SED_00-05_C			898001.54	383408.31	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 4	OR-PDI-11	OR-PDI-11_MMDDYY_SED_00-05_C			896366.19	380915.11	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 4	OR-PDI-12	OR-PDI-12_MMDDYY_SED_00-05_C			896232.18	380367.76	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 4	OR-PDI-13	OR-PDI-13_MMDDYY_SED_00-05_C			896101.91	380097.04	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 5	OR-PDI-14	OR-PDI-14_MMDDYY_SED_00-05_C			896186.11	379540.99	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 5	OR-PDI-15	OR-PDI-15_MMDDYY_SED_00-05_C			896453.32	379162.45	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 5	OR-PDI-16	OR-PDI-16_MMDDYY_SED_00-05_C			896441.99	378855.83	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-17	OR-PDI-17_MMDDYY_SED_00-05_C			896882.65	378361.62	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-18	OR-PDI-18_MMDDYY_SED_00-05_C			897129.19	377974.03	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-19	OR-PDI-19_MMDDYY_SED_00-05_C			897600.95	377968.96	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-20	OR-PDI-20_MMDDYY_SED_00-05_C			898046.38	377907.58	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-21	OR-PDI-21_MMDDYY_SED_00-05_C			897343.22	377581.96	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-22	OR-PDI-22_MMDDYY_SED_00-05_C			897801.91	377607.32	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-23	OR-PDI-23_MMDDYY_SED_00-05_C			898367.30	377651.15	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-24	OR-PDI-24_MMDDYY_SED_00-05_C			897771.83	377091.69	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-25	OR-PDI-25_MMDDYY_SED_00-05_C			897608.34	376890.26	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-26	OR-PDI-26_MMDDYY_SED_00-05_C			897564.37	376494.48	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bartlett Cove	OR-PDI-27	OR-PDI-27_MMDDYY_SED_00-05_C			897525.46	375760.28	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]

Table A-1. Orrington Reach Sediment PDI Sample Matrix Summary

										Analyte:	Total Mercury	TOC	Atterberg Limits [c]	Moisture Content [c]	Grain Size [c]	Bulk Density [c]
										Method:	EPA 1631E	Lloyd Kahn	ASTM D4318	ASTM D2216	ASTM D6913-sieve and D7928-hydrometer	ASTM 7263
										Container:	1 x 4 oz. Trace Clean PETG	4 oz WMG	8 oz WMG	4 oz WMG	16 oz WMG	16 oz WMG
					Target Coordinates[a]		Target Sample Depth (ft)	Actual Sample Depth (ft)		Preservation:	--	Cool to ≤ 6°C	--	Cool to ≤ 6°C	--	--
Cove Name	Station ID	Sample ID [b]	Sample Date	Sample Time	Easting (ft)	Northing (ft)			Matrix	Sample Type						
Ponar Dredge Samples																
East Cove 7	OR-PDI-28	OR-PDI-28_MMDDYY_SED_00-05_C			897739.94	374053.60	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-29	OR-PDI-29_MMDDYY_SED_00-05_C			899114.36	373593.88	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-30	OR-PDI-30_MMDDYY_SED_00-05_C			900656.27	373036.64	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-31	OR-PDI-31_MMDDYY_SED_00-05_C			901459.08	373146.12	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-32	OR-PDI-32_MMDDYY_SED_00-05_C			901785.04	373394.61	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-33	OR-PDI-33_MMDDYY_SED_00-05_C			901917.05	373072.37	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-34	OR-PDI-34_MMDDYY_SED_00-05_C			901722.75	372943.65	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-35	OR-PDI-35_MMDDYY_SED_00-05_C			901483.42	372794.80	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-36	OR-PDI-36_MMDDYY_SED_00-05_C			902005.64	372690.60	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-37	OR-PDI-37_MMDDYY_SED_00-05_C			902401.06	372641.87	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-38	OR-PDI-38_MMDDYY_SED_00-05_C			902316.82	372228.54	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-39	OR-PDI-39_MMDDYY_SED_00-05_C			902586.12	371610.14	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-40	OR-PDI-40_MMDDYY_SED_00-05_C			902815.22	370360.59	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
East Cove 7	OR-PDI-41	OR-PDI-41_MMDDYY_SED_00-05_C			903030.92	369586.29	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-42	OR-PDI-42_MMDDYY_SED_00-05_C			895113.35	376251.43	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-43	OR-PDI-43_MMDDYY_SED_00-05_C			895241.30	375954.64	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-44	OR-PDI-44_MMDDYY_SED_00-05_C			895731.08	375849.21	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-45	OR-PDI-45_MMDDYY_SED_00-05_C			895847.18	375596.43	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-46	OR-PDI-46_MMDDYY_SED_00-05_C			895425.98	375709.08	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-47	OR-PDI-47_MMDDYY_SED_00-05_C			895113.96	375566.51	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-48	OR-PDI-48_MMDDYY_SED_00-05_C			894478.96	375496.68	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-49	OR-PDI-49_MMDDYY_SED_00-05_C			894484.28	375288.55	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-50	OR-PDI-50_MMDDYY_SED_00-05_C			894761.89	375037.44	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-51	OR-PDI-51_MMDDYY_SED_00-05_C			895070.39	375177.48	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-52	OR-PDI-52_MMDDYY_SED_00-05_C			895385.61	375184.48	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-53	OR-PDI-53_MMDDYY_SED_00-05_C			895774.77	375093.13	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-54	OR-PDI-54_MMDDYY_SED_00-05_C			895735.71	374129.98	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-55	OR-PDI-55_MMDDYY_SED_00-05_C			895623.29	374664.72	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-56	OR-PDI-56_MMDDYY_SED_00-05_C			895189.43	374851.94	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]
Bald Hill Cove	OR-PDI-57	OR-PDI-57_MMDDYY_SED_00-05_C			896100.54	373610.65	0-0.5		Sediment	Normal	X	X	X [c]	X [c]	X [c]	X [c]

Table A-1. Orrington Reach Sediment PDI Sample Matrix Summary

										Analyte:	Total Mercury	TOC	Atterberg Limits [c]	Moisture Content [c]	Grain Size [c]	Bulk Density [c]
										Method:	EPA 1631E	Lloyd Kahn	ASTM D4318	ASTM D2216	ASTM D6913-sieve and D7928-hydrometer	ASTM 7263
										Container:	1 x 4 oz. Trace Clean PETG	4 oz WMG	8 oz WMG	4 oz WMG	16 oz WMG	16 oz WMG
					Target Coordinates[a]		Target Sample Depth (ft)	Actual Sample Depth (ft)		Preservation:	--	Cool to ≤ 6°C	--	Cool to ≤ 6°C	--	--
Cove Name	Station ID	Sample ID [b]	Sample Date	Sample Time	Easting (ft)	Northing (ft)			Matrix	Sample Type						
Box Core Samples [d]																
Southern Cove	OR-PDI-02	OR-PDI-02_MMDDYY_SED_Depth_G			898815.04	390636.84	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-02_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-02_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
East Cove 2	OR-PDI-05	OR-PDI-05_MMDDYY_SED_Depth_G			898498.82	388435.60	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-05_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-05_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
East Cove 3	OR-PDI-08	OR-PDI-08_MMDDYY_SED_Depth_G			898501.59	384604.68	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-08_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-08_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
East Cove 4	OR-PDI-12	OR-PDI-12_MMDDYY_SED_Depth_G			896232.18	380367.76	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-12_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-12_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
East Cove 5	OR-PDI-14	OR-PDI-14_MMDDYY_SED_Depth_G			896186.11	379540.99	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-14_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
Bartlett Cove	OR-PDI-19	OR-PDI-19_MMDDYY_SED_Depth_G			897600.95	377968.96	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-19_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-19_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
Bartlett Cove	OR-PDI-25	OR-PDI-25_MMDDYY_SED_Depth_G			897608.34	376890.26	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-25_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-25_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
East Cove 7	OR-PDI-34	OR-PDI-34_MMDDYY_SED_Depth_G			901722.75	372943.65	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-34_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-34_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
East Cove 7	OR-PDI-41	OR-PDI-41_MMDDYY_SED_Depth_G			903030.92	369586.29	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-41_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-41_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
Bald Hill Cove	OR-PDI-43	OR-PDI-43_MMDDYY_SED_Depth_G			895241.30	375954.64	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-43_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-43_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
Bald Hill Cove	OR-PDI-52	OR-PDI-52_MMDDYY_SED_Depth_G			895385.61	375184.48	NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-52_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	
		OR-PDI-52_MMDDYY_SED_Depth_G					NA		Sediment	Normal		X [c]	X [c]	X [c]	X [c]	

Table A-1. Orrington Reach Sediment PDI Sample Matrix Summary

Cove Name	Station ID	Sample ID [b]	Sample Date	Sample Time	Target Coordinates[a] Easting (ft)	Target Coordinates[a] Northing (ft)	Target Sample Depth (ft)	Actual Sample Depth (ft)	Matrix	Sample Type	Total Mercury	TOC	Atterberg Limits [c]	Moisture Content [c]	Grain Size [c]	Bulk Density [c]
										Method:	EPA 1631E	Lloyd Kahn	ASTM D4318	ASTM D2216	ASTM D6913-sieve and D7928-hydrometer	ASTM 7263
										Container:	1 x 4 oz. Trace Clean PETG	4 oz WMG	8 oz WMG	4 oz WMG	16 oz WMG	16 oz WMG
										Preservation:	--	Cool to ≤ 6°C	--	Cool to ≤ 6°C	--	--
QA/QC																
		EB-Ponar_MMDDYY_SED_QC					NA	NA	Water	QA/QC	X	X				
		EB-Ponar_MMDDYY_SED_QC					NA	NA	Water	QA/QC	X	X				
		EB-Ponar_MMDDYY_SED_QC					NA	NA	Water	QA/QC	X	X				
		EB-Ponar_MMDDYY_SED_QC					NA	NA	Water	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_DUP					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_DUP					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_DUP					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_DUP					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_DUP					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_DUP					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_MS					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_MSD					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_MS					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_MSD					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_MS					NA		Sediment	QA/QC	X	X				
		OR-PDI-XX_MMDDYY_SED_Depth_C_MSD					NA		Sediment	QA/QC	X	X				

Notes:
PETG = polyethylene terephthalate glycol
QA/QC = quality assurance and quality control
TOC = total organic carbon
WMG = wide-mouth glass
[a] Coordinates provided in Maine State Plane, ft.
[b] Sample ID Format (FSP Section 12; WSP 2023a) –
Sample ID – Station ID_MMDDYY_Media Type_Depth_X
Date Format – MMDDYY
Media Type – SED or WCH (Sediment or Wood Chips)
Depth – 2-digit depth below sediment surface in tenths of feet (0.05 ft = 05)
X = G or C (indicating grab or composite)
[c] Samples for Atterberg Limits, Grain Size, Moisure Content, and Bulk Density will be collected at all ponar sample locations and held for pending analyses determined by review of field observations on lithology.
[d] Wood waste may be collected as a separate sample from box core sediment where discrete layers of wood waste are observed, and will be assigned a separate sample ID.