

Coastal Wetland Assessment Plan

Orrington Reach Capping Remedy

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



Prepared by:



WSP USA Environment & Infrastructure Inc.

511 Congress Street, Suite 200

Portland, ME 04101

July 2023

SIGNATURES

PREPARED BY



Todd Coffin
Environmental Specialist

APPROVED BY (*must be reviewed for technical accuracy prior to approval*):



Rod Pendleton, PG
Vice-President, Project Manager

I certify that this document and all appendices were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I have no personal knowledge that the information submitted is other than true, accurate, and complete.

CONTENTS

ACRONYMS AND ABBREVIATIONS	V
1 INTRODUCTION.....	1-1
2 SUMMARY OF EXISTING DATA AND DATA NEEDS	2-1
2.1 Background Data, Penobscot Estuary	2-1
2.2 Natural Resource Data for Orrington Reach	2-1
2.3 Penobscot Estuary Remediation Data Needs	2-2
3 DATA QUALITY OBJECTIVES	3-1
4 METHODOLOGY.....	4-1
4.1 Roles and Responsibilities	4-1
4.2 Points of Contact	4-2
4.3 Target Wetland Areas with Orrington Reach.....	4-2
4.4 Assessment Methods	4-3
4.4.1 Desktop Survey	4-3
4.4.2 LiDAR, Bathymetry and Hydrodynamic Modeling.....	4-3
4.4.3 Initial Wetlands Reconnaissance.....	4-3
4.4.4 Wetland Zone Delineation	4-4
4.4.5 Sampling Plots.....	4-4
4.4.6 Function and Value Assessment	4-5
4.4.7 NRPA Field Assessment Forms	4-5
4.5 Health and Safety	4-5
4.6 Deliverables.....	4-5
5 QUALITY CONTROL AND QUALITY ASSURANCE	5-1
6 ACCESS AND PERMIT REQUIREMENTS.....	6-1
7 SCHEDULE	7-1
8 SUPPORTING DELIVERABLES	8-1
9 REFERENCES.....	9-1

FIGURES

FIGURE 1-1	PENOBSCOT RIVER REACHES
FIGURE 1-2	COVES PRELIMINARILY IDENTIFIED AS REMEDIATION AREA
FIGURE 2-1	SURFACE WATER AND WETLANDS
FIGURE 2-2	WILDLIFE, PLANT AND AQUATIC SPECIES HABITAT
FIGURE 4-1	WETLAND ASSESSMENT - SOUTHERN COVE
FIGURE 4-2	WETLAND ASSESSMENT- EAST COVE 2
FIGURE 4-3	WETLAND ASSESSMENT- EAST COVE 3
FIGURE 4-4	WETLAND ASSESSMENT- EAST COVE 4
FIGURE 4-5	WETLAND ASSESSMENT- EAST COVE 5
FIGURE 4-6	WETLAND ASSESSMENT- BARTLETT COVE
FIGURE 4-7	WETLAND ASSESSMENT- EAST COVE 7
FIGURE 4-8	WETLAND ASSESSMENT- BALD HILL COVE

TABLES

TABLE 1-1	STATEMENT OF WORK COMPLIANCE
TABLE 3-1	DATA QUALITY OBJECTIVES

APPENDICES

APPENDIX A	USACE WETLAND DETERMINATION DATA FORM
APPENDIX B	USACE HIGHWAY METHODOLOGY WORKBOOK SUPPLEMENT
APPENDIX C	DEP FIELD SURVEY AND COASTAL WETLAND SURVEY CHECKLISTS

ACRONYMS AND ABBREVIATIONS

BwH	Beginning with Habitat
CWAP	Coastal Wetland Assessment Plan
ERP	Emergency Response Plan
Estuary	Penobscot River Estuary
Greenfield	Greenfield Penobscot Estuary Remediation Trust LLC, Trustee of the Penobscot Estuary Mercury Remediation Trust
GPS	Global Positioning System
HASP	Health and Safety Plan
LIDAR	Light Detection and Ranging
DEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MLLW	Mean Lower Low Water
NOAA	National Oceanic and Atmospheric Administration
NRPA	Natural Resources Protection Act
QAPP	Quality Assurance Project Plan
Remediation Trust	Penobscot Estuary Mercury Remediation Trust
TLC	Thin-Layer Cap
USACE	United States Army Corps of Engineers
USFWS	United State Fisheries and Wildlife Service
WSP	WSP USA Environment & Infrastructure, Inc.

1 INTRODUCTION

This Coastal Wetland Assessment Plan (CWAP) was prepared by WSP USA Environment & Infrastructure, Inc. (WSP) 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 (Estuary) located in Hancock, Penobscot, and Waldo counties, Maine (the Site). Capping of intertidal sediments in Orrington Reach is one of the remedies required by the Consent Decree¹ and appendices as approved and entered by the Maine District Court in October of 2022. The CWAP describes the scope and assessment methodology necessary to characterize the current condition, function, and value of wetlands affected by the capping remedy and provides information to support the Natural Resource Protection Act (NRPA) permit process. The NRPA permit process includes consultation with state and federal environmental agencies, and applicable state and federal requirements will be addressed as part of the overall program. This document meets the requirements of Paragraph 6(a) of the Statement of Work (Appendix A to the Consent Decree) as shown in **Table 1-1**.

The Remediation Trust is proposing a Thin Layer Cap (TLC) for Orrington Reach to satisfy the requirements of the Consent Decree (refer to Figure 1-1 and Figure 1-2 for maps of the Estuary reaches and wetlands within Orrington Reach, respectively). A TLC will immediately reduce concentrations of mercury in surface sediment and accelerate the natural recovery of the Estuary. TLCs are often referred to as an “enhanced natural recovery” remedy and have been shown to minimize negative impacts to wetlands flora and fauna when compared to other sediment remedies such as dredging or construction of isolation caps. Potential effects to wetlands from placement of a TLC are temporary and wetlands should begin recovery to normal function and value after construction is complete.

Data obtained through this assessment will be considered along with data collected from the Long-Term Monitoring (LTM) of the Penobscot Estuary also being performed by the Remediation Trust. These combined data will be used to evaluate the TLC’s benefits and potential impacts to habitat, biota and protected and endangered species. If necessary, the Remediation Trust may propose additional, focused investigations to further characterize specific wetlands functions and value.

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).

2 SUMMARY OF EXISTING DATA AND DATA NEEDS

2.1 Background Data, Penobscot Estuary

Existing information on the nature and extent of mercury contamination in Estuary sediment, impacts on biota and alternatives for remediation are presented in the following three documents:

- Phase I Study: Penobscot River Mercury Study, Update to the Phase I Report (Bodaly et al., 2009). A two-year investigation of industrial mercury contamination in the “lower Penobscot River and Bay,” including analysis of concentrations in sediment and biota and evaluation of food chain implications.
- Phase II Study: Final Report, Mercury Contamination of the Penobscot River Estuary: Current Situation, Remediation Targets and Possible Remediation Procedures (Bodaly et al., 2013). Further investigation of mercury in the Estuary to determine (a) if natural attenuation could reduce concentrations of mercury in the “contaminated area of the Penobscot system” to acceptable levels in a reasonable timeframe; and (b) if active remediation measures, such as clean particulate layering, controlled flooding, and dredging, were feasible. The study considered mercury loading and transport mechanisms in the river, among others.
- Phase III Engineering Study: Phase III Engineering Study Report, Penobscot River Estuary, Maine (Amec Foster Wheeler Environment & Infrastructure, Inc., 2018). The engineering study included the identification and evaluation of “feasible, effective and cost-effective measures” to remediate mercury at the Site. The study was based on the findings of the Phase I and Phase II studies, supplemental reports on mercury in river sediments and biota, and hydrodynamic modelling, among other studies. The Phase II study evaluated the feasibility of TLC, dredging, long-term monitoring, and adaptive management options such as enhanced monitored natural recovery and targeted supplemental dredging.

Additional information on wetlands in Orrington Reach was developed during RCRA Corrective Action work performed at the former HoltraChem Facility from July through November 2017. The Corrective Measures Implementation Plan for Southern Cove (Anchor and CDM, 2017) included an intertidal vegetation survey within the wetlands of the cove. The assessment identified three wetland communities covering 2.1 acres, as described below.

- A high marsh community of beaked spikerush growing near the shoreline on a thick base of peat.
- Multiple, sparse beds of common three-square growing in soft, unconsolidated mud.
- A small bed of densely growing hardstem bulrush embedded within the sparse common three-square, which appeared to be growing partly on a small chunk of peat mat, as well as soft mud.

The wetlands assessment will also include review of other readily available publications, such as wildlife surveys conducted along the Estuary by the National Oceanic and Atmospheric Administration (NOAA) and others in response to the removal of dams upstream of Orrington Reach.

2.2 Natural Resource Data for Orrington Reach

Existing natural resource mapping data for Orrington Reach is shown on **Figure 2-1** and **Figure 2-2**. Figure 2-1 presents wetland boundaries and types updated in 2023 by the United States Fish and Wildlife Service (USFWS). The estuarine and marine wetlands mapped by USFWS are not as extensive as the approximate wetland boundaries shown in Figure 2-1. Figure 2-1 was prepared originally as Figure 6 in the Remediation Trust’s Thin Layer Cap (TLC) Design Work Plan (Integral, 2023) and based on current intertidal zone limits published by the National Oceanic and Atmospheric Administration (NOAA, 2023).

Figure 2-2 reproduces the map of wildlife, plant and species habitat published by the Maine Department of Inland Fisheries & Wildlife (MDIFW) Beginning with Habitat (BwH) program. As shown, Orrington Reach includes several notable resources:

- Seven rare plant species;
- Unspecified endangered, threatened and species of special concern wildlife;
- Habitat for Great Blue Heron;
- Habitat for wild eastern brook trout, alewife, and sea-run rainbow smelt;
- Critical habitat for Atlantic salmon US-listed endangered species); and
- Tidal waterfowl and wading bird habitat.

In addition, the Estuary is habitat for the shortnose sturgeon, an endangered species under the United States Endangered Species Act (ESA), and the Atlantic sturgeon, a threatened species under the ESA.

2.3 Penobscot Estuary Remediation Data Needs

Assessment of wetlands in the potential TLC areas is required to obtain information for the NRPA permit application and provides a baseline that will allow evaluation of wetland functions and values restoration post-construction. The primary wetland data needs for fulfilling NRPA permit requirements are anticipated to include:

- Delineation of the coastal wetland zones within the TLC remedy areas (e.g., intertidal, marsh and subtidal zone boundaries);
- Inventory of flora and fauna within the wetland zones, including species and relative abundance;
- Identification of shorebirds that may feed on or near the wetlands, particularly during migration; and
- Description of the function and value of the wetlands (e.g., habitat, water quality and recreation).

Section 4 describes the techniques and applicable references proposed for the wetland assessment and associated data collection requirements.

3 DATA QUALITY OBJECTIVES

The primary objective for data collected during the coastal wetland assessment for the potential TLC remedy areas is to satisfy relevant requirements of the NRPA permitting process. In addition to the core requirements of the NRPA permit as detailed in Section 2.3 herein, the wetland assessment will provide data to inform, among others:

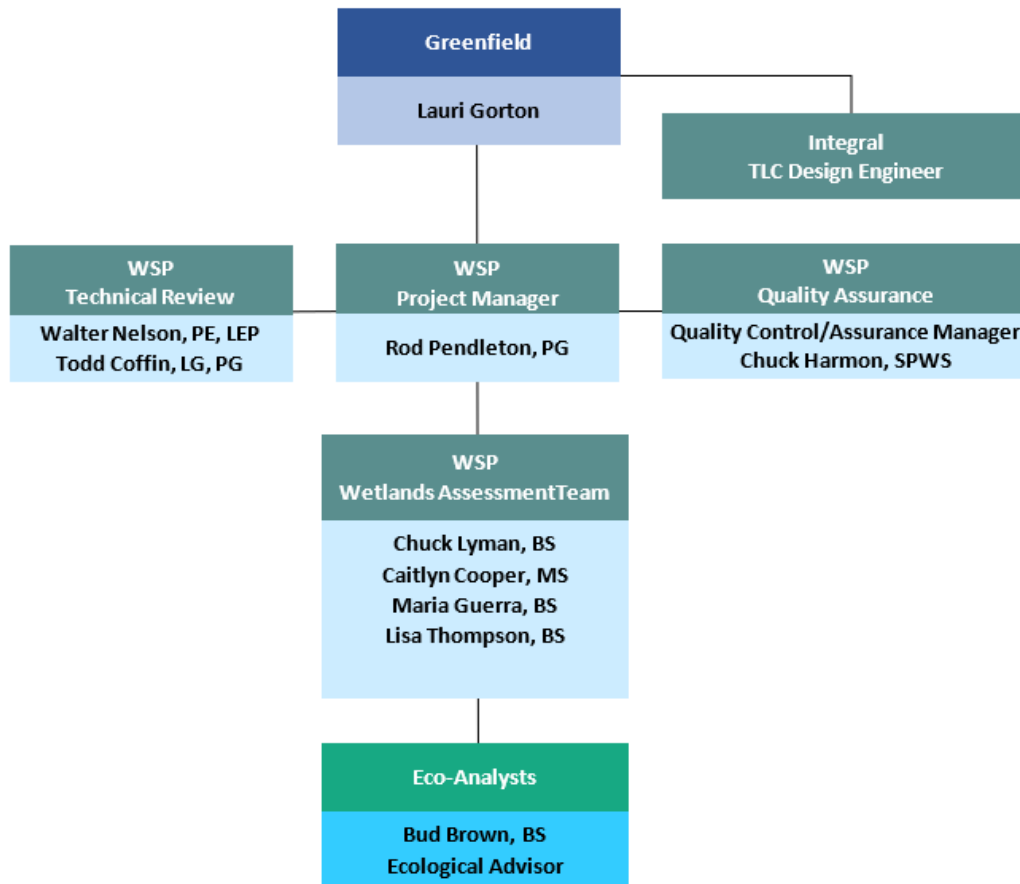
- Potential impacts to wetlands and associated biota from implementation of the TLC;
- Requirements for possible regulatory approval of an expanded work window for implementation of the TLC;
- Discussion with regulatory agencies on the appropriateness of wetland mitigation;
- The objectives and methodology of a TLC performance monitoring program;
- Wetland characteristics in Southern Cove subsequent to mercury-contaminated sediment removal and backfilling in 2017 (e.g., potential sediment redeposition and biota recovery);
- Evaluation of intertidal depositional areas, including presence of wood chips/fragments in the surface sediment (up to 1 foot deep); and
- The potential need for and scope of monitoring mercury concentrations in select biota within impacted wetlands before and after TLC placement.

Specific data quality objectives are presented in Table 3-1. Table 3-1 also includes details on the information needed to meet the data quality objectives, and the associated data collection approach. Reference is made to checklists and forms required to complete the NRPA permit, as provided in guidance published by the DEP and USACE.

4 METHODOLOGY

4.1 Roles and Responsibilities

An organization chart for wetland assessment in support of the Orrington Reach TLC remedy is provided below. The chart illustrates the roles and lines of communication and is followed by a table describing the responsibilities of Greenfield, WSP, and Integral Consulting, Inc. (Integral) for their respective role(s) in the primary coastal wetland assessment tasks.



The roles, responsibilities, and authorities of Greenfield and WSP are presented below. Integral, as the TLC Design Engineer, is responsible for providing information on the TLC scope and implementation and advising Greenfield on the integration of wetlands data with the preliminary design.

Task	Greenfield Role	WSP Role
Communication with Regulatory Agencies and Beneficiaries	Lead	Technical Support
Wetland Survey	Oversight, deliverable review, and project management	Lead. Responsible for securing contractor and implementation of CWAP.
Data Integration	Oversight, deliverable review, and project management	Lead. Responsible for data QA/QC, interpretation, and integration with requirements of the NRPA permit application.
Wetland Characterization Report	Oversight, deliverable review, and project management	Lead. Responsible for draft report preparation and final report following review and comment by stakeholders.

4.2 Points of Contact

Communications with regulatory agencies will be led and managed by Greenfield. The list below references Greenfield key contact information and the WSP wetland assessment team.

Permitting Team	Organization	Role	Email & phone
Greenfield Penobscot Estuary Remediation Trust LLC			
Lauri Gorton	Greenfield	Program Manager	lg@g-etg.com 414-732-4514
WSP Wetland Assessment Team			
Rod Pendleton	WSP	Project Manager	rod.pendleton@wsp.com 207-229-0891
Todd Coffin	WSP	Environmental Specialist	todd.coffin@wsp.com 207-939-4150
Charles Lyman	WSP	Wetland Biologist	charles.lyman@wsp.com 207-461-0001
Bud Brown	Eco-Analysts	Ecological Specialist/Wetland Biologist	raptor@gwi.net 207-837-2442

4.3 Target Wetland Areas within Orrington Reach

The intertidal flats currently being evaluated for the TLC remedy are located within Orrington Reach of the Estuary, which extends 5.3 miles from Orrington, Maine downstream to the Winterport Reach. Potential TLC areas include coves and fringing intertidal areas as shown on Figure 2-1b. Typical of a coastal plain estuary, flow in the Estuary is relatively small. Because of a lack of wave activity in Orrington Reach, tidal currents in the system result in a tide-dominated estuary (Dalrymple et al., 1992), as opposed to a flow-dominated estuary. Wetlands consisting of salt marshes and intertidal mudflats are common features of the tide-dominated Estuary.

The Consent Decree requires capping 130 acres of intertidal sediments, primarily on the east side of Orrington Reach but does not preclude consideration of areas on the west side of Orrington Reach that may contribute to the overall objective of accelerating the natural recovery of the Estuary. Conceptual TLC design plans are currently evaluating the coves and areas shown in Figure 2-1b, as well as Bald Hill Cove on the west side of the Estuary.

Figures 4-1 through 4-8 present aerial photographs of the wetland areas proposed for characterization under this CWAP. These areas include eight relatively flat intertidal coves and fringing intertidal zones listed below:

- Southern Cove
- East Cove 2
- East Cove 3
- East Cove 4
- East Cove 5
- Bartlett Cove
- East Cove 7
- Bald Hill Cove

Figures 4-1 through 4-8 include preliminary wetland characterization stations coded with the following general wetland zones:

- X Mudflats
- Y Low Marsh
- Z High Marsh

The wetland zones were identified based on review of aerial photographs and a preliminary reconnaissance of the wetland areas in December 2022. The zones will be evaluated and delineated as described in Section 4.4.

4.4 Assessment Methods

The CWAP is designed to characterize the physical and biological features of the coves and fringing intertidal zones identified for capping. The assessment methods are described in the following subsections.

4.4.1 Desktop Survey

A desktop survey will be conducted prior to the initiation of the field survey. This preliminary assessment will review the following resources, at a minimum, to gain a better understanding of the physical and natural resources at and around the Site:

- Aerial photographs (current and historical);
- United States Geological Survey (USGS) topographic maps;
- United States Fish and Wildlife Service (USFWS), National Wetland Inventory (NWI) maps;
- Maine BwH natural resource maps;
- Federal Emergency Management Agency (FEMA) flood maps; and
- Project maps, reports, and photographs.

4.4.2 LiDAR, Bathymetry and Hydrodynamic Modeling

As described in the Thin Layer Cap (TLC) Design Work Plan for the Orrington Reach (Integral 2023) and the Bathymetric Survey Work Plan (WSP, Integral 2023), a thorough understanding of Penobscot River bathymetry and specifically of the intertidal regions of Orrington Reach is required to delineate the extent of intertidal sediment for potential capping. A comprehensive bathymetric map is required for Orrington Reach to refine the delineation of key morphologic features, such as surface drainages on the flats, areas of rapid slope change as the geomorphology transitions from intertidal to subtidal sediment, and the geometry of the subtidal channel. Quantifying these bathymetric and morphologic features is essential to delineating the extent of intertidal flats. Existing light detection and ranging (LiDAR) topographic data obtained by USGS between May 12, 2021, and May 10, 2022, will be combined with the 2023 bathymetric data to support the development of a hydrodynamic model of the Estuary. The hydrodynamic model will simulate river flow velocities and associated bed shear stresses to identify areas most conducive to capping (i.e., where shear stresses are lowest); determine cap materials, grain size, and need for armoring; evaluate the potential to impact the habitat in intertidal flats and marshes; and assess the potential for the cap to increase flood risk.

Because vegetation zones in coastal wetlands are elevation dependent, the LiDAR data in conjunction with the results from the Bathymetry Survey will also be used to interpret wetlands field assessment data.

4.4.3 Initial Wetlands Reconnaissance

Initial reconnaissance of the coves and fringing intertidal zones targeted for capping is scheduled for June-July 2023. Reconnaissance by boat and on foot (if access permission from adjacent landowners is granted) will inform access needed to complete the wetland assessment. The reconnaissance will also refine the boundaries of mudflats, low marsh areas and high marsh areas observed conditions and suitability for representing wetland zones. Observations during the reconnaissance will include, but are not limited to:

- Sediment Types
- Habitat Types
- Ledge Outcrops and associated biota (e.g., mussels, crabs)

- Stream Outlets
- Riverbank and floodplain characteristics (including evidence of erosion)
- Groundwater discharge sites
- Pools
- Panns
- Launch Ramps
- Docks
- Upland Access Points

The reconnaissance will also include the presence and relative abundance of shore birds within the potential TLC areas. Observations are expected to be made by boat using binoculars to minimize disturbance and flight of the shore birds.

4.4.4 Wetland Zone Delineation

Wetland zone delineation will be conducted following guidance provided in the “Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region” (USACE 2011). A Trimble (or equivalent) Global Positioning System (GPS) device with line functions will be used to delineate the boundaries between tidal flats, low marsh, high marsh, and other zones, if observed. If tidal flat sediments are too soft for access on foot, the downslope edge of the tidal flats will be mapped using bathymetric survey data referenced to Mean Lower Low Water (MLLW).

4.4.5 Sampling Plots

Figures 4-1 through 4-8 show preliminary wetland sampling plot locations based on review of aerial photographs and prior WSP team knowledge of the Estuary. At each observation point, a tape measure will be used to assist the field crew with marking an approximate 15-foot radius plot. In accordance with the USACE Regional Supplement, the information below will be gathered at each plot, at a minimum:

- Plant species
- Vegetation characteristics (appearance, height, cover, zonation, etc.)
- Wetland type per Cowardin classification (Cowardin et al., 1979)
- Wildlife and wildlife signs (e.g., tracks, scat, feathers, remains, etc.)
- Sediment texture (general description)
- Relative abundance of sediment-dwelling macroinvertebrates:

Abundant > 50 individuals or > 50% cover

Common ≥ 5 but < 50 individuals or ≥ 10 but < 50% cover

Present < 5 individuals or <10% cover

The relative abundance of sediment-dwelling macroinvertebrates will be determined with examination of the substrate. The assessment will be performed by examining the sediment collected with hand tools from five (5) random locations at each observation point. The collected sediment will be examined in place and the presence of any macroinvertebrates will be recorded. Taxonomic identification will be performed as feasible.

The coordinates of each of the observation points will be recorded with a survey-grade GPS. A minimum of four (4) photographs will be taken at each of these GPS locations (i.e., facing north, south, east, and west). Additional photographs will be taken of notable landscape features, specimens, etc. The Wetland Determination Data Form from the USACE Regional Supplement (**Appendix B**) will be completed for each wetland area (i.e., each wetland cove and fringing intertidal zones).

4.4.6 Function and Value Assessment

In accordance with requirements of the DEP NRPA permit application (38 MRSA §§ 480-A to 480-BB), wetland functions and values will be assessed following the USACE's "The Highway Methodology Workbook Supplement" (**Appendix C**). The field survey will include the wetland function and value features listed below.

Function

- Groundwater Recharge/Discharge
- Flood flow Alteration
- Fish and Shellfish Habitat
- Sediment/Toxicant Retention
- Nutrient Removal
- Production Export
- Sediment/Shoreline Stabilization
- Wildlife Habitat

Value

- Recreation
- Education and Scientific Value
- Uniqueness/Heritage
- Visual Quality/Aesthetics
- Endangered Species Habitat

4.4.7 NRPA Field Assessment Forms

As required for the NRPA permit application, the following two forms will be completed for each of eight coves and associated fringing intertidal zones based on the field data collected (refer to **Appendix D**).

1. DEP Visual Evaluation Field Survey Checklist
2. DEP Coastal Wetland Characterization Guidelines and Intertidal & Shallow Subtidal Field Survey Checklist.

4.5 Health and Safety

The site-wide Health and Safety Plan (HASP, WSP 2023) will be reviewed prior to any fieldwork being conducted. A pre-task health and safety tailgate meeting will be held at the start of each field day and additional meetings will be held as necessary should site conditions or scope of work conditions change during the field effort.

4.6 Deliverables

A draft Site Condition Report (also referred to as a Wetland Assessment Report by USACE) will be prepared as required for completion of the DEP NRPA permit application. The report will document the program objectives, methodology, and findings. Data will be presented on summary tables and figures, where appropriate, and supplemented with appendices containing supporting field data.

Documentation for each wetland area will include:

- Location plan with topographic contours (contour interval based on relief and accuracy of LiDAR data);
- Wetland zone delineation and classification;
- Description of existing resource characteristics including water depths, vegetation, and fauna;
- Description of riverbank stability and floodplain;

- DEP Visual Evaluation Field Survey Checklist;
- DEP Coastal Wetland Intertidal & Shallow Subtidal Field Survey Checklist;
- Function and Value Worksheets; and
- Photographic Log.

5 QUALITY CONTROL AND QUALITY ASSURANCE

Quality assurance and quality control (QA/QC) for field data collection will be maintained through:

- Strict adherence to the CWAP or documentation of deviations from the plan and associated rationale.
- Calibration of field assessment objectives and techniques with team instruction, including field team training on location.
- Use of pre-populated field checklists to assure collection of data required per the NRPA permit and other applicable permits.
- Daily QA/QC review of field data and checklists to assure complete, thorough collection of the data.
- Peer review of deliverables relative to overall project objectives, consistency with the wetland assessment guidance specified herein, and requirements of the TLC permitting plan.

6 ACCESS AND PERMIT REQUIREMENTS

The Remediation Trust is seeking written permission from landowners to access areas needed to perform wetlands assessment work described in this CWAP. If access is not granted to the proposed sampling locations, alternate locations will be identified and modifications to this CWAP will be described in the final report.

No other permit requirements have been identified to complete the planned coastal wetland assessment.

7 SCHEDULE

The schedule for the CWAP fieldwork falls within May to November timeframe recommended by the DEP for performing coastal wetland assessments. Reconnaissance of the proposed TCL remedy area is scheduled late June to mid-July, with the wetland assessment described herein scheduled for the week of July 17, 2023. The wetland assessment is anticipated to require approximately three weeks to be conducted during the growing season. This schedule is dependent on weather and the receipt of property access agreements.

The draft CWAP Report will be provided to the Remediation Trust for review and comment within thirty working days of completion of the field work. Completion of a final wetland assessment report is anticipated by the end of December 2023 in order to support completion of the NRPA permit application during the first half of 2024.

8 SUPPORTING DELIVERABLES

The Supporting Deliverables for this CWAP include the Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), Health and Safety Plan (HASP), and Emergency Response Plan (ERP). The components of the Supporting Deliverables pertinent to the wetland assessment are:

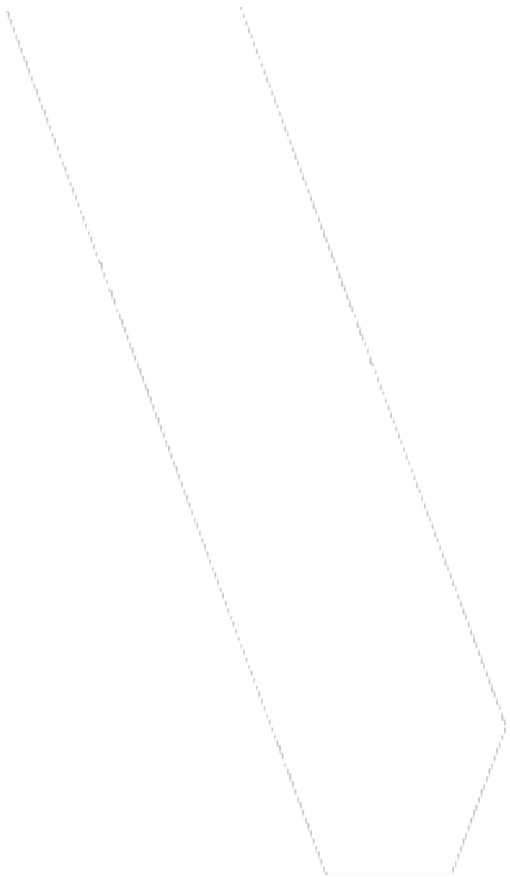
- FSP: Section 2.0 Logistics, 14.0 Survey, and 15.0 Record Keeping, and associated Standard Operating Procedures and Field Data Records in Appendices A and B
- QAPP: Worksheets #2 through #10
- HASP: entire content
- ERP: entire content

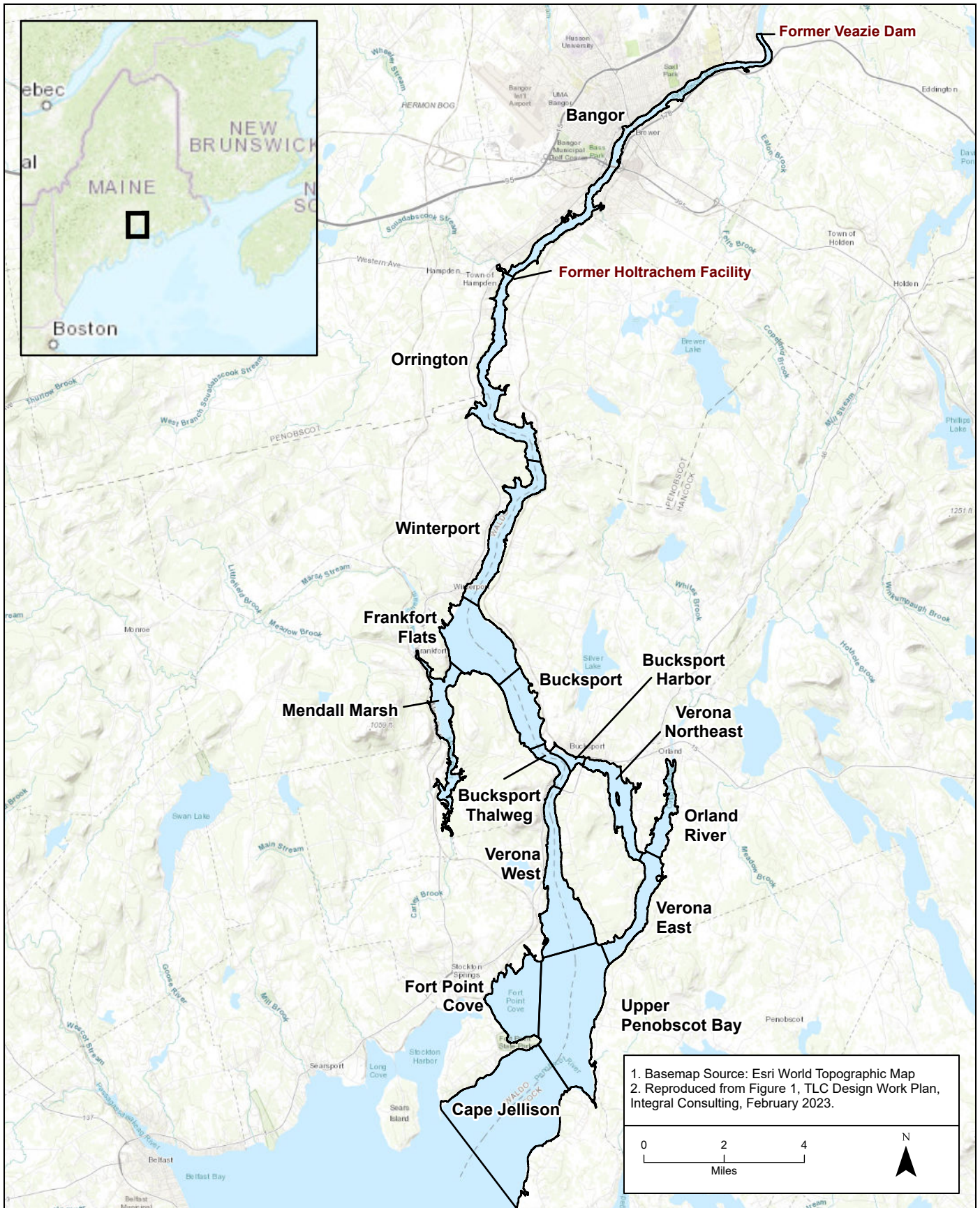
These documents will be consulted and followed as appropriate for the CWAP .

9 REFERENCES


- Amec Foster Wheeler. 2018. Phase III Engineering Study Report, Penobscot River Estuary, Maine. September.
- Anchor and CDM. 2017. Corrective Measures Implementation Plan. Southern Cove, Orrington Remediation Site, Orrington, Maine. Prepared for Mallinckrodt US LLC by Anchor QEA LLC and CDM Smith, Inc.
- Dalrymple, R.W., B.A. Zaitlin, and R. Boyd. 1992. Estuaries facies models; conceptual basis and stratigraphic implications. *Journal of Sedimentary Research* 62(6):1130-1146.
- Integral Consulting, Inc. 2023. Thin Layer Cap Design Work Plan, Orrington Reach Capping Remedy (Draft). Prepared for Greenfield Penobscot Estuary Trust LLC. April.
- NOAA. 2016. Penobscot River Habitat Focus Area 2016 Annual Report. Available at: Penobscot-HFA-2016-Annual-Report.pdf (noaa.gov)
- NOAA. 2023. Office of East Coast Survey, NOAA ENC Viewer. Retrieved from <https://www.nauticalcharts.noaa.gov/enonline/enonline.html>. May 3.
- United States District Court, District of Maine. 2022. Consent Decree. Maine People’s Alliance and Natural Resources Defense Council, Inc., Plaintiffs, v. Holtrachem Manufacturing Company, LLC, and Mallinckrodt US LLC, Defendants. Case 1:00-cv-00069-JAW, filed October 11.
- United States District Court, District of Maine. 2022. Order on Consent Decree and Proposed Bar Order. Maine People’s Alliance and Natural Resources Defense Council, Inc., Plaintiffs, v. Holtrachem Manufacturing Company, LLC, and Mallinckrodt US LLC, Defendants. Case 1:00-cv-00069-JAW, filed August 4.
- USACE. 2011. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region. Version 2.0, ed. J.S. Wakeley, R.W. Lichvar, C.V. Noble, and J.F. Berkowitz. ERDC/EL TR-12-1. Vicksburg, MS: U.S. Army Engineer Research and Development Center.
- USACE. 1999. The Highway Methodology Workbook Supplement. Wetland Functions and Values, A Descriptive Approach. United States Army Corps of Engineers, New England District. 32pp. September.
- WSP, 2023. TLC Permitting Plan, Orrington Reach, Penobscot Estuary Remediation, Maine. WSP USA Environment & Infrastructure, Inc. February.

FIGURES





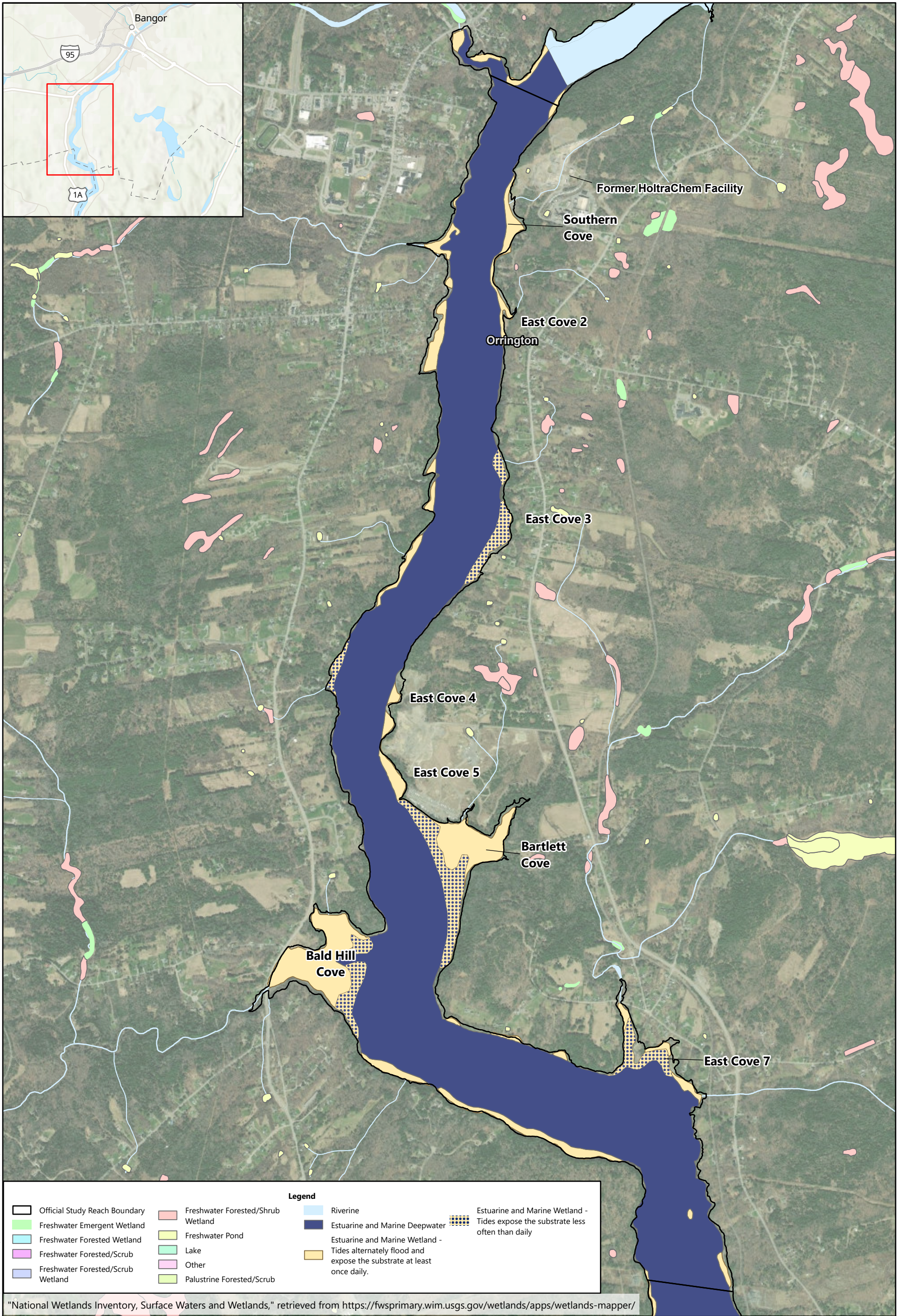
1. Basemap Source: Esri World Topographic Map
 2. Reproduced from Figure 1, TLC Design Work Plan, Integral Consulting, February 2023.

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


Prepared by: 

Figure 1-1
 Estuary Reaches

Coastal Wetlands Assessment Plan
 RT02 Orrington Reach TLC
 Penobscot Estuary Remediation



"National Wetlands Inventory, Surface Waters and Wetlands," retrieved from <https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/>

Prepared For:  Greenfield Penobscot Estuary Remediation Trust LCC
Trustee of the Penobscot Estuary Mercury Remediation Trust


Prepared By:  WSP USA Environment & Infrastructure, Inc.

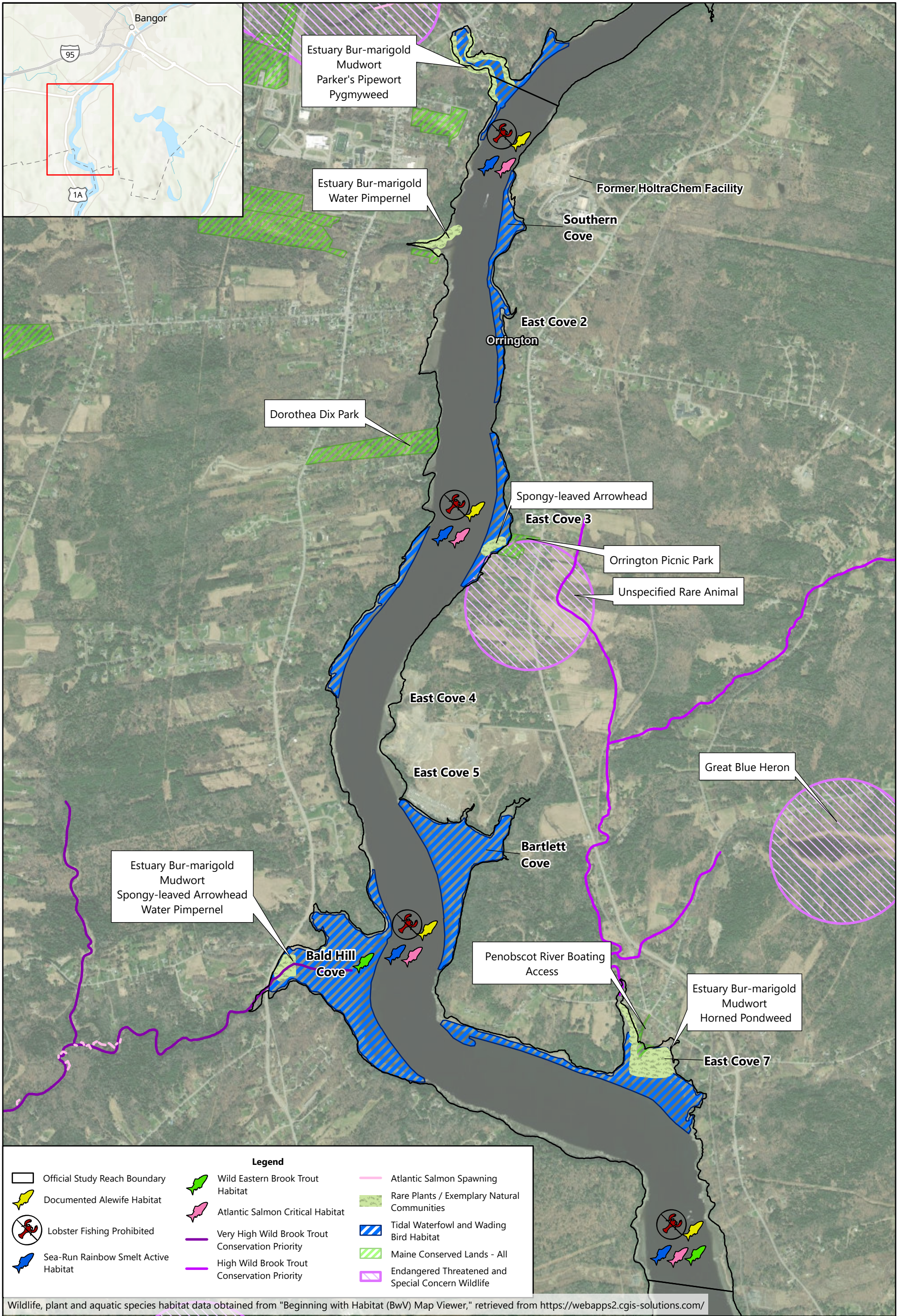


Figure 2-1
Surface Water and Wetlands
National Wetlands Inventory


Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation

Prepared/Date: LCB 5/5/2023 Checked/Date: DTC 5/5/2023

Document:\Y:\Penobscot Estuary\PenobscotEcoFig\PenobscotEcoFig.aprx P:\PLD2-FS\1\Project\Projects\USDC - Penobscot River\4.0_Deliverables\4.1_Reports\2018_Engineering_Report\Figures\Figure 8-5_OrringtonRem.pdf 5/5/2023 8:42 AM lindsay.belliveau



Wildlife, plant and aquatic species habitat data obtained from "Beginning with Habitat (BwV) Map Viewer," retrieved from <https://webapps2.cgis-solutions.com/>

Prepared For:  Greenfield Penobscot Estuary Remediation Trust LCC
Trustee of the Penobscot Estuary Mercury Remediation Trust

Prepared By:  WSP USA Environment & Infrastructure, Inc.



Prepared/Date: LCB 5/5/2023 | Checked/Date: DTC 5/5/2023

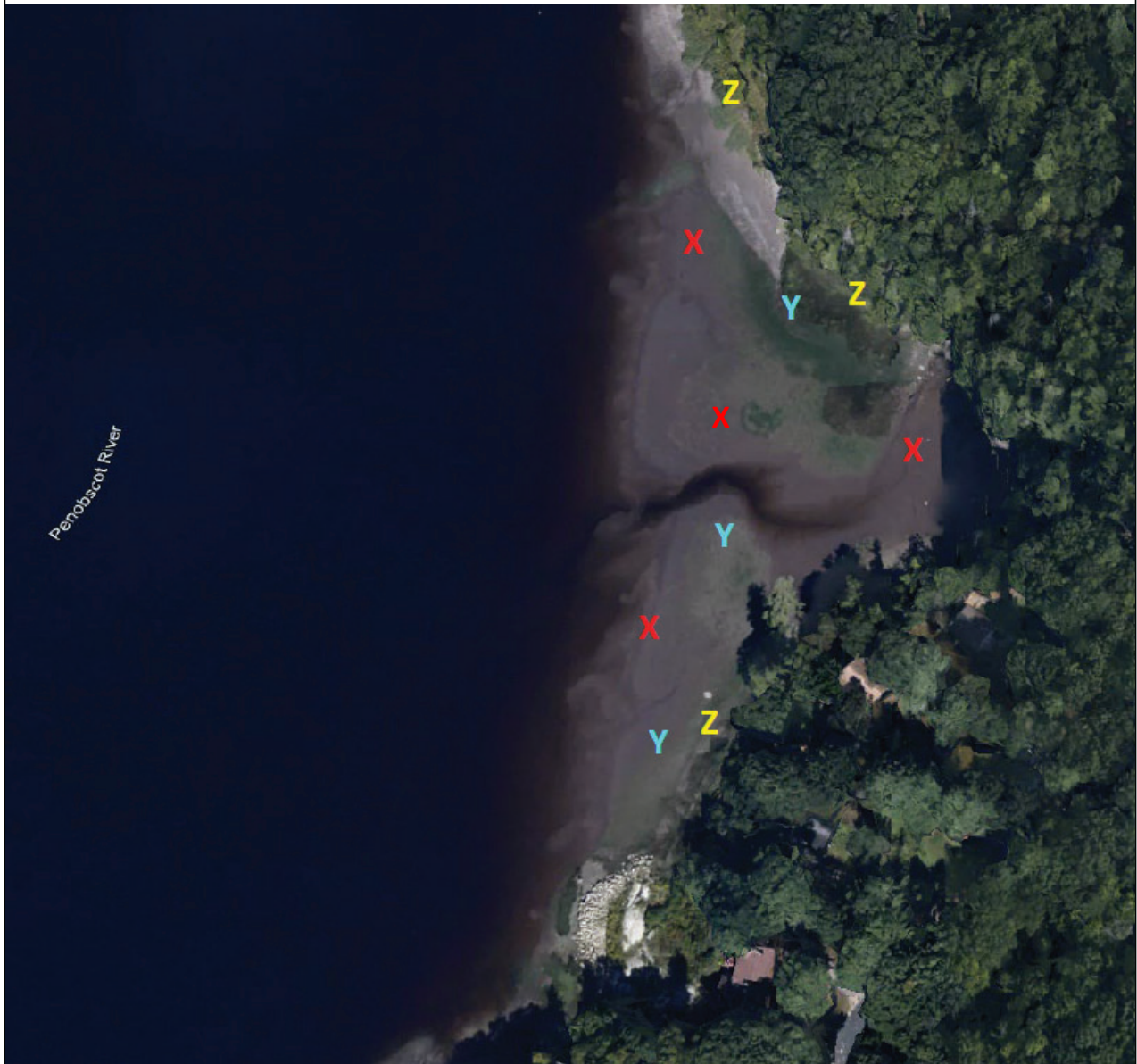
Figure 2-2
Wildlife, Plant and Aquatic Species Habitat

Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation

Document:\Y:\Penobscot Estuary\PenobscotEcoFig\Penobscot River\4.0_Deliverables\4.1_Reports\2018 Engineering Report\Figures\Figure 8-5 OrringtonRem.pdf 5/5/2023 8:42 AM lindsay.belleau



Aerial source: GoogleEarth Pro.

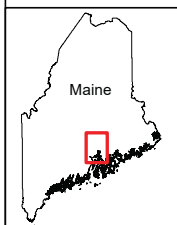


Penobscot River

Legend


- X Mudflats
- Y Low Marsh
- Z High Marsh

Note: Wetland types are preliminary and subject to field verification.




NOT TO SCALE

Figure 4-1

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

Wetland Assessment - Southern Cove

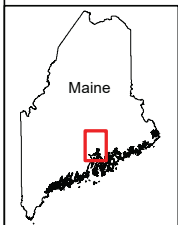
Prepared by:  WSP USA Environment & Infrastructure, Inc.

Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation

Project: 3617237573 | Prepared: DTC 3/12/2023 | Checked: RP 5/9/2023



Aerial source: GoogleEarth Pro.




Maine


NOT TO SCALE

Legend

- X Mudflats
- Y Low Marsh
- Z High Marsh

Note: Wetland types are preliminary and subject to field verification.

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

Prepared by:  WSP USA Environment & Infrastructure, Inc.

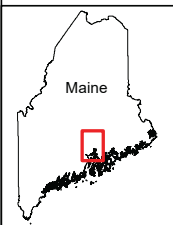
Project: 3616237573 | Prepared: DTC 3/12/2023 | Checked: RP 05/09/2023

Figure 4-2
Wetland Assessment - East Cove 2

Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation



Aerial source: GoogleEarth Pro.




Maine


Legend

- X Mudflats
- Y Low Marsh
- Z High Marsh

Note: Wetland types are preliminary and subject to field verification.

NOT TO SCALE

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

Prepared by:  WSP USA Environment & Infrastructure, Inc.

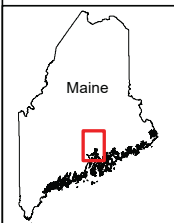
Project: 3617237573 | Prepared: DTC 3/12/2023 | Checked: RP 05/09/2023

Figure 4-3
Wetland Assessment - East Cove 3

Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation



Aerial source: GoogleEarth Pro.




Maine


NOT TO SCALE

Legend

- X Mudflats
- Y Low Marsh
- Z High Marsh

Note: Wetland types are preliminary and subject to field verification.

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

Prepared by:  WSP USA Environment & Infrastructure, Inc.

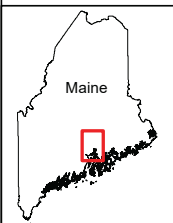
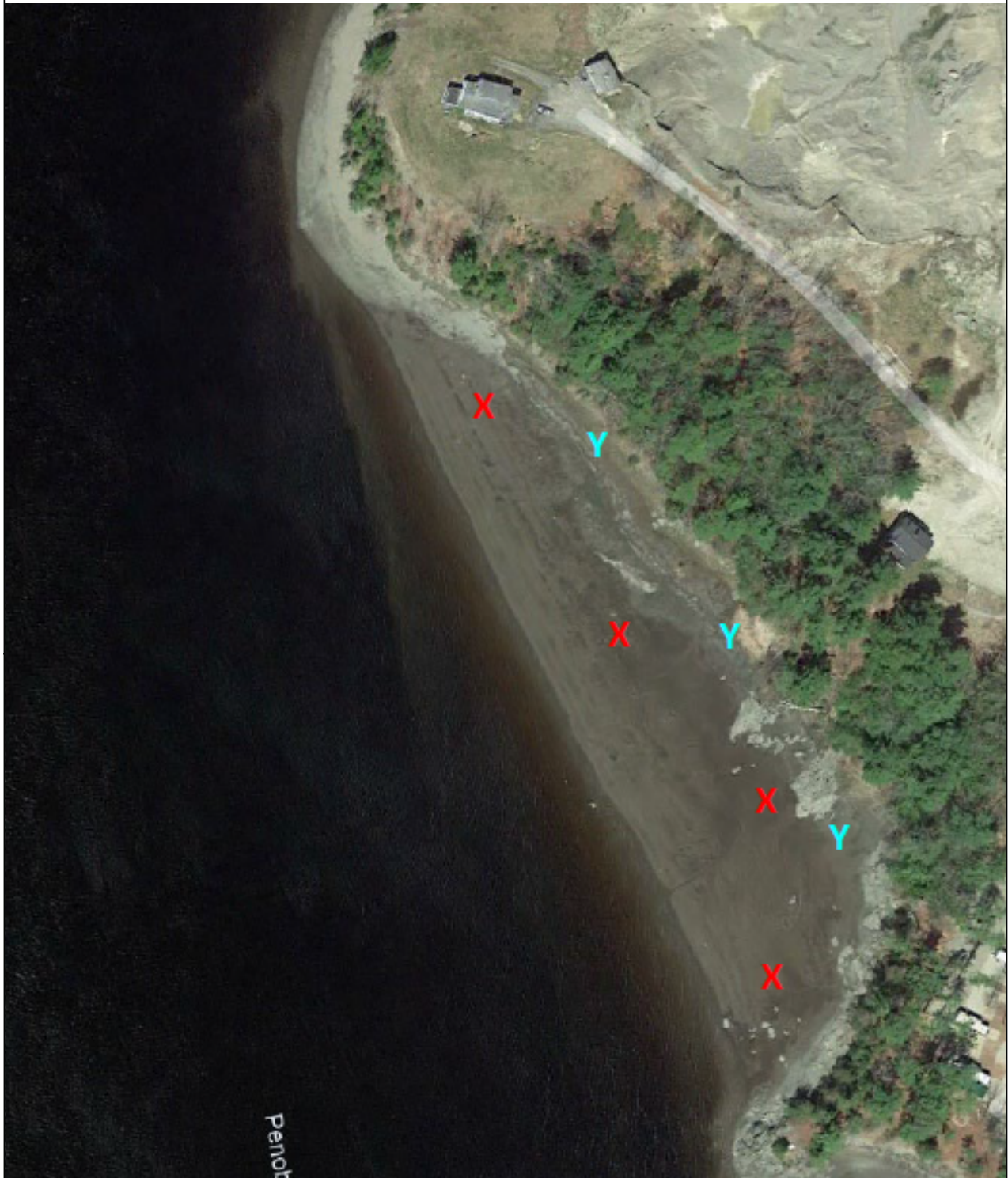
Project: 3617237573 | Prepared: DTC 3/12/2023 | Checked: RP 5/09/2023

Figure 4-4
Wetland Assessment - East Cove 4

Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation



Aerial source: GoogleEarth Pro.




Maine


NOT TO SCALE

Legend

- X Mudflats
- Y Low Marsh
- Z High Marsh

Note: Wetland types are preliminary and subject to field verification.

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

Prepared by:  WSP USA Environment & Infrastructure, Inc.

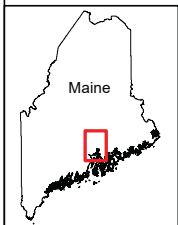
Project: 3617237573 | Prepared: DTC 3/12/2023 | Checked: RP 5/09/2023

Figure 4-5
Wetland Assessment - East Cove 5

Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation



Aerial source: GoogleEarth Pro.





NOT TO SCALE

Legend

- X Mudflats
- Y Low Marsh
- Z High Marsh

Note: Wetland types are preliminary and subject to field verification.

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

Prepared by:  WSP USA Environment & Infrastructure, Inc.

Project: 3617237573 | Prepared: DTC 3/12/2023 | Checked: RP 5/09/2023

Figure 4-6
Wetland Assessment - Bartlett Cove

Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation



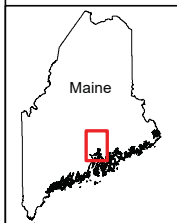
Aerial source: GoogleEarth Pro.




Legend


- X Mudflats
- Y Low Marsh
- Z High Marsh

Note: Wetland types are preliminary and subject to field verification.



NOT TO SCALE

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

Prepared by:  WSP USA Environment & Infrastructure, Inc.

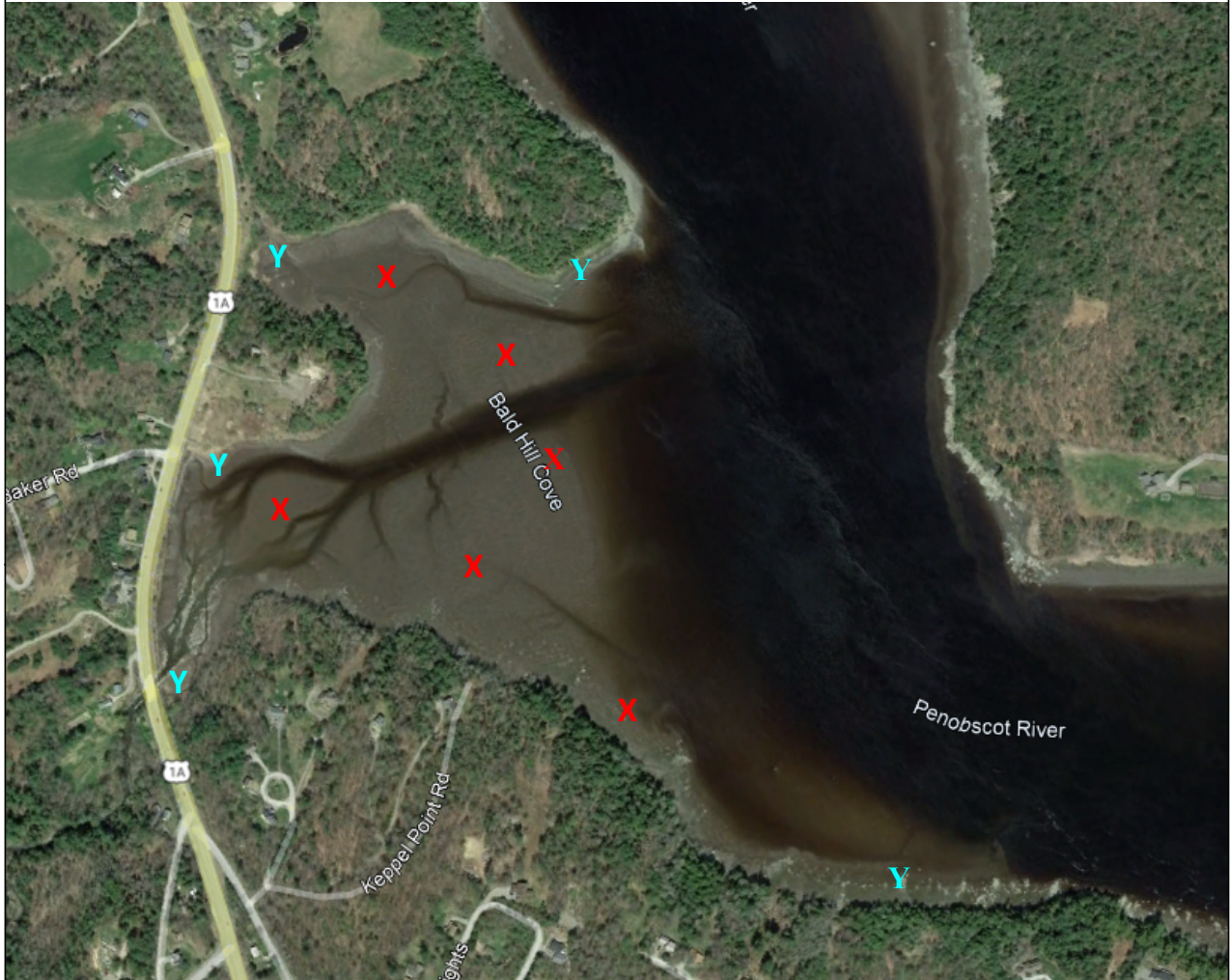
Project: 3617237573 | Prepared: DTC 3/12/2023 | Checked: RP 5/09/2023

Figure 4-7
Wetland Assessment - East Cove 7

Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation



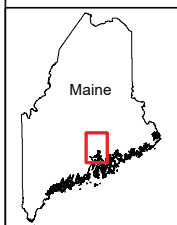
Aerial source: GoogleEarth Pro.




Legend

- X Mudflats
- Y Low Marsh
- Z High Marsh

Note: Wetland types are preliminary and subject to field verification.



NOT TO SCALE

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

Prepared by:  WSP USA Environment & Infrastructure, Inc.

Project: 3617237573 | Prepared: DTC 3/12/2023 | Checked: RP 5/09/2023

Figure 4-8
Wetland Assessment - Bald Hill Cove

Coastal Wetlands Assessment Plan
RT02 Orrington Reach TLC
Penobscot Estuary Remediation

TABLES

Table 1-1. Statement of Work Compliance	
Statement of Work (SOW) 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	✓ 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”)	✓ 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	✓ 4.4.6 and 4.4.7
¶ 6(a)(iv) A schedule for the Investigation	✓ 7
¶ 6(a)(v) Cross references to quality assurance/quality control (“QA/QC”) requirements set forth in the QAPP as described in Paragraph 31(d)	Not Applicable

Table 3-1. Data Quality Objectives for Coastal Wetlands Assessment		
Problem Statement and Goals	Information/Data Needed	Data Collection Approach
<p>Wetlands Assessment for the Orrington Reach is a required component of the Natural Resources Protection Act (NRPA) and US Army Corps of Engineers (USACE) permitting process. Wetlands assessment provides data necessary for natural resource agencies and other stakeholders to evaluate:</p> <ol style="list-style-type: none"> 1. Impacts to wetlands and associated biota from TLC placement; 2. Proposed methods to minimize impacts to wetlands; 3. Whether impacts trigger the need for wetlands mitigation; and 4. Rationale for approving an expanded work window and associated measures to protect habitat. <p>Refer to "Information/Data Needed" for a listing of specific data needs to fulfill the above data quality objectives.</p>	<ol style="list-style-type: none"> 1. Wetland zone boundaries (e.g., subtidal, intertidal and marsh). 2. Biological inventory to include flora and fauna within proposed TLC placement areas and adjacent wetland habitat (e.g., coastal marsh); data to include species type and relative abundance. 3. Functions and values evaluation of wetlands targeted for TLC placement; scope to include intertidal flats within Orrington Reach and fringing coastal marshes. 4. Field observations for completion of: <ul style="list-style-type: none"> - "MDEP Visual Evaluation Field Survey Checklist." - "MDEP Coastal Wetland Characterization: Intertidal & Shallow Subtidal Field Survey Checklist." - "USACE Wetland Determination Data Form - Northcentral and Northeast Region (Version 2.0)." 	<p>Wetland access and associated observations by boat and on foot pending tides and observation location.</p> <p>Delineation of wetland zones using guidance and checklists from MEDEP and USACE; trimble GPS to document zone boundaries, sample areas and features of interest.</p> <p>A minimum of three 30-foot diameter observation "plots" within each wetland zone of each cove and fringing intertidal zone (e.g., marsh, upper tidal flats and lower tidal flats) where inventory of biota is obtained; observations will be made at five randomly selected locations within each plot.</p> <p>Wetland Function and value assessment using guidance from the USACE Highway Methodology Workbook.</p>

APPENDIX A
USACE Wetland Determination Data Form

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: _____ City/County: _____ Sampling Date: _____

Applicant/Owner: _____ State: _____ Sampling Point: _____

Investigator(s): _____ Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No _____ Hydric Soil Present? Yes _____ No _____ Wetland Hydrology Present? Yes _____ No _____	Is the Sampled Area within a Wetland? Yes _____ No _____ If yes, optional Wetland Site ID: _____
Remarks: (Explain alternative procedures here or in a separate report.)	

HYDROLOGY

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)	Secondary Indicators (minimum of two required)
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Marl Deposits (B15) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No _____ Depth (inches): _____ Water Table Present? Yes _____ No _____ Depth (inches): _____ Saturation Present? Yes _____ No _____ Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes _____ No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	

VEGETATION – Use scientific names of plants.

Sampling Point: _____

<u>Tree Stratum</u> (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status	
1. _____	_____	_____	_____	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A) Total Number of Dominant Species Across All Strata: _____ (B) Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
	_____ = Total Cover			Prevalence Index worksheet: _____ Total % Cover of: _____ Multiply by: OBL species _____ x 1 = _____ FACW species _____ x 2 = _____ FAC species _____ x 3 = _____ FACU species _____ x 4 = _____ UPL species _____ x 5 = _____ Column Totals: _____ (A) _____ (B) Prevalence Index = B/A = _____
<u>Sapling/Shrub Stratum</u> (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
	_____ = Total Cover			Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 - Rapid Test for Hydrophytic Vegetation <input type="checkbox"/> 2 - Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.
<u>Herb Stratum</u> (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
5. _____	_____	_____	_____	
6. _____	_____	_____	_____	
7. _____	_____	_____	_____	
8. _____	_____	_____	_____	
9. _____	_____	_____	_____	
10. _____	_____	_____	_____	
11. _____	_____	_____	_____	
12. _____	_____	_____	_____	
	_____ = Total Cover			Definitions of Vegetation Strata: Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height. Sapling/shrub – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall. Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall. Woody vines – All woody vines greater than 3.28 ft in height.
<u>Woody Vine Stratum</u> (Plot size: _____)				
1. _____	_____	_____	_____	
2. _____	_____	_____	_____	
3. _____	_____	_____	_____	
4. _____	_____	_____	_____	
	_____ = Total Cover			Hydrophytic Vegetation Present? Yes _____ No _____
Remarks: (Include photo numbers here or on a separate sheet.)				

APPENDIX B

USACE Highway Methodology Workbook Supplement












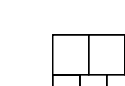

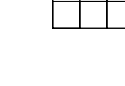




The
Highway
Methodology
Workbook
Supplement















**US Army Corps
of Engineers®**
New England District

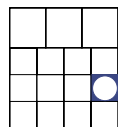
Wetland Functions and Values
A Descriptive Approach

Graphical Representation of Wetland Functions and Values

Wetland I.D.		Total Acres		Impacted Acres	
					
					
					

Symbols Key

-  Groundwater Recharge/Discharge
-  Floodflow Alteration (Storage & Desynchronization)
-  Fish and Shellfish Habitat
-  Sediment/Toxicant Retention
-  Nutrient Removal/Retention/Transformation
-  Production Export (Nutrient)
-  Sediment/Shoreline Stabilization
-  Wildlife Habitat
-  Recreation (Consumptive & Non-Consumptive)
-  Educational/Scientific Value
-  Uniqueness/Heritage
-  Visual Quality/Aesthetics



Indicates Principal Function or Value

ES Endangered Species

This graphical summary of wetland characteristics was developed as a tool to help construct an annotated map of functions and values for project analysis. Based on the findings reported on a data collection form, an icon box is prepared for each wetland investigated during Phase II of the Highway Methodology. The Endangered Species value may be added when present.



Contents

- Preface
- Introduction
- What are wetland functions and values?
- What wetland functions and values are considered by the Corps in its Section 404 permit process?
- How are wetland functions and values applied to the Regulatory Program?
- What wetland evaluation method does the Corps accept?
- Does the Corps have a prescribed format for wetland evaluation?
- How are the phases of the Highway Methodology incorporated?
- Are there good examples to follow?
- How are resources other than wetlands considered in the Corps permit decision?
- Appendix A
- Bibliography

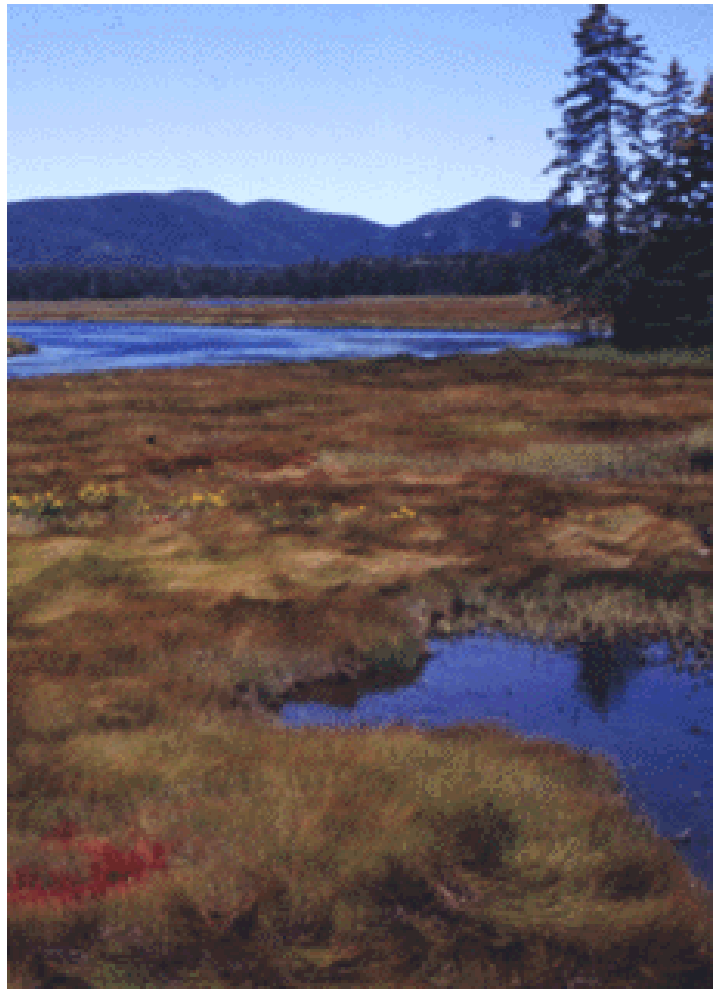
We wish to acknowledge both the Connecticut and New Hampshire Department of Transportation for the opportunities they provided to develop ideas and acquire experience reflected in this booklet. Detailed questions regarding information contained in this booklet may be directed to Regulatory Branch, at the Corps, New England District at 1-800-362-4367 (within Massachusetts) or 1-800-343-4789 (outside Massachusetts).



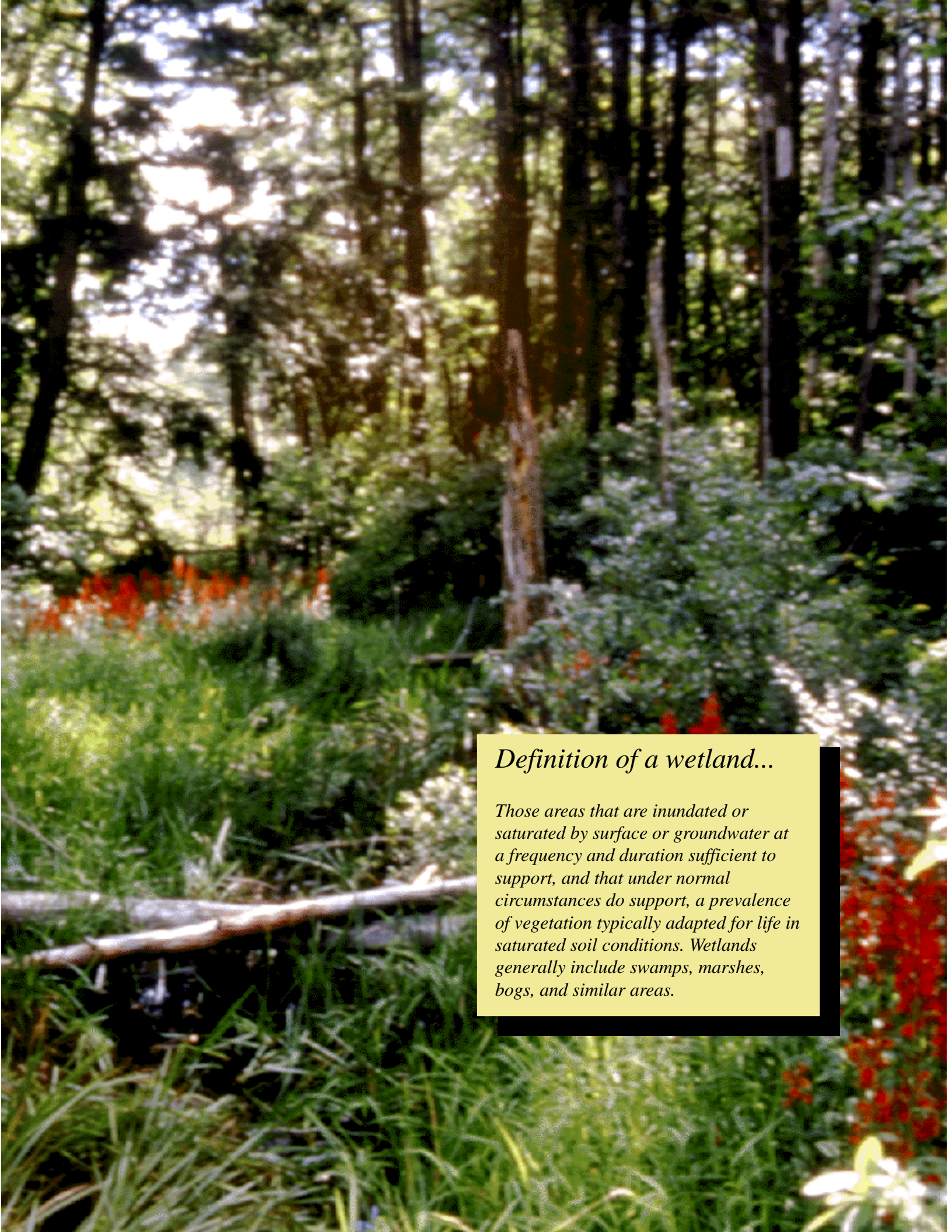
A New England forested wetland.

Preface

This booklet provides guidance to permit applicants, consultants, and U.S. Army Corps of Engineers project managers on how to identify and display wetland functions and values acceptable for the Corps New England District Regulatory Program. It is a supplement to the Highway Methodology Workbook published by the Regulatory Branch in 1993, which defines procedures to integrate Section 404 permit requirements with highway planning and engineering and the National Environmental Policy Act (NEPA). The evaluation of wetland functions and values is an integral part of the overall phased approach of the Highway Methodology. Use of this booklet for highway projects, and other projects with an integrated planning process, should be preceded by review of the Highway Methodology Workbook. The wetland functions and values "Descriptive Approach" presented in this booklet, however, can be used for any project where the characterization of wetland resources is necessary for Section 404 permit requirements. It is important to note that, although wetland evaluations form the base from which impact assessments are made, they are two distinct processes. Impact assessment is only briefly addressed in this booklet.



Wetlands add diversity and beauty to the landscape.



Definition of a wetland...

Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Introduction

For some years now, the Regulatory Branch has recognized the limitations of wetland assessment methodologies that generate numerical weightings, rankings, and/or averaging of dissimilar wetland functions, which unnecessarily bias a project reviewer. For many of these regional or national methods, the base data is not reported and it is difficult for the reviewer to reconstruct the indicators that were considered to predict the functions and values of a wetland. As a result, we advocate an approach that includes a qualitative description of the physical characteristics of the wetlands, identifies the functions and values exhibited, and most importantly, the bases for the conclusions using "best professional judgement." All readily available data are used by an interdisciplinary team for evaluation and subsequent consensus recommendations to the Corps decisionmaker.

There was an initial concern by applicants and consultants that a descriptive approach to evaluate wetlands would be unorganized, unpredictable, not legally defensible, and difficult to document. In response, we developed a format to collect and display this information which is described in this booklet.



Evaluating a wetland

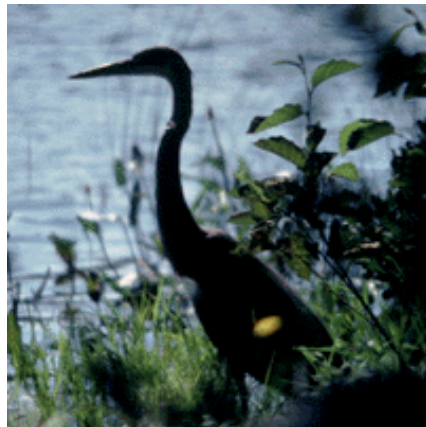
In addition, and in the context of the Highway Methodology, this booklet takes the approach one step further and describes ways to graphically represent the functions and values of wetlands separately, as well as in relationship to other constraints or resources.

Visualizing geographical relationships between dissimilar resources is key to making permit decisions that are sensitive to all natural and human resources including, but not limited to, the protection of wetlands. As a consequence, study areas are depicted using multiple constraint graphics. These tools build on the McHarg (1969) overlay techniques of the 1960s. They are facilitated by the use of Computer Aided Drafting and Design (CADD) and Geographic Information Systems (GIS). Neither of these computer methods is necessary, however, they can save time and add flexibility to the planning process.

What are wetland functions and values?

Wetland functions and values form a very important part of Section 404 permit decisions by the Corps. **Functions** are self-sustaining properties of a wetland ecosystem that exist in the absence of society. Functions result from both living and non-living components of a specific wetland. These include all processes necessary for the self-maintenance of the wetland ecosystem such as primary production and nutrient cycling. Therefore, functions relate to the ecological significance of wetland properties without regard to subjective human values.

For example, a wetland that has slowly moving water performs the function of retaining sediments and toxicants. That is, the physical characteristic of a wetland that causes surface water to move slowly serves to let suspended particulates settle out of that water. This function traps sediments carried to it in runoff from uplands or upstream areas and clarifies the water. Identification of that function helps the Corps evaluate (1) whether the impacts of a project may impair that function and (2) whether such impacts are permissible.



Great Blue Heron


Values are benefits that derive from either one or more functions and the physical characteristics associated with a wetland. Most wetlands have corresponding societal value. This is recognized in various federal, state, and local wetland legislation that was enacted to protect these resources. The value of a particular wetland function, or combination thereof, is based on human judgment of the worth, merit, quality, or importance attributed to those functions. For example, a particular wetland might be

considered valuable because it is known to store flood waters upgradient or adjacent to a developed area. That function is valuable to society because it attenuates flood waters which lessens the destructive severity of flood events. Another wetland might be valued because its combination of diverse wildlife habitat and picturesque setting offers various recreational and educational opportunities. The judgment of value is based on the opinion of recognized experts whose views are ultimately weighed and considered by the Corps in its permit process.



The proximity of development may alter wetland functions and values. Therefore, evaluation of the resource must consider not only the wetland, but also adjacent land use and associated interrelationships.

The "Descriptive Approach" to wetland functions and values presented in this booklet is twofold and incorporates both wetland science and human judgment of values. Intermixing science with value judgments in this way, while difficult, has proven to be both effective and acceptable. The evaluator first determines if a wetland is suitable for particular functions and values and why, followed by a determination of what functions and values are principal and why. (The purpose of designating a principal function and value category is discussed later in this booklet.) Functions and values can be principal if they are an important physical component of a wetland ecosystem (function only) and/or are considered of special value to society, from a local, regional, and/or national perspective.



What wetland functions and values are considered by the Corps in its Section 404 permit process?

The 13 functions and values that are considered by the Regulatory Branch for any Section 404 wetland permit are listed below. The list includes eight functions and five values. Values are grouped together at the end of the list.

These are not necessarily the only wetland functions and values possible, nor are they so precisely defined as to be unalterable. However, they do represent the best working "palette" of descriptors which can be used to paint an objective representation of the wetland resources associated with a proposed project.



GROUNDWATER RECHARGE/DISCHARGE — This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. Recharge should relate to the potential for the wetland to contribute water to an aquifer. Discharge should relate to the potential for the wetland to serve as an area where groundwater can be discharged to the surface.



FLOODFLOW ALTERATION (Storage & Desynchronization) — This function considers the effectiveness of the wetland in reducing flood damage by attenuation of floodwaters for prolonged periods following precipitation events.



FISH AND SHELLFISH HABITAT — This function considers the effectiveness of seasonal or permanent waterbodies associated with the wetland in question for fish and shellfish habitat.

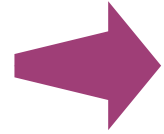


SEDIMENT/TOXICANT/PATHOGEN RETENTION — This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants, or pathogens.



NUTRIENT REMOVAL/RETENTION/TRANSFORMATION — This function relates to the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries.

PRODUCTION EXPORT (Nutrient) — This function relates to the effectiveness of the wetland to produce food or usable products for humans or other living organisms.



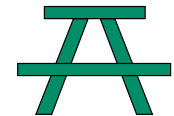
SEDIMENT/ShORELINE STABILIZATION — This function relates to the effectiveness of a wetland to stabilize streambanks and shorelines against erosion.



WILDLIFE HABITAT — This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species must be considered. Species lists of observed and potential animals should be included in the wetland assessment report.



RECREATION (Consumptive and Non-Consumptive) — This value considers the effectiveness of the wetland and associated water-courses to provide recreational opportunities such as canoeing, boating, fishing, hunting, and other active or passive recreational activities. Consumptive activities consume or diminish the plants, animals, or other resources that are intrinsic to the wetland, whereas non-consumptive activities do not.



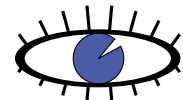
EDUCATIONAL/SCIENTIFIC VALUE — This value considers the effectiveness of the wetland as a site for an “outdoor classroom” or as a location for scientific study or research.



UNIQUENESS/HERITAGE — This value relates to the effectiveness of the wetland or its associated waterbodies to produce certain special values. Special values may include such things as archaeological sites, unusual aesthetic quality, historical events, or unique plants, animals, or geologic features.




VISUAL QUALITY/AESTHETICS — This value relates to the visual and aesthetic qualities of the wetland.



THREATENED or ENDANGERED SPECIES HABITAT — This value relates to the effectiveness of the wetland or associated waterbodies to support threatened or endangered species.

ES



How are wetland functions and values applied to the Regulatory Program?

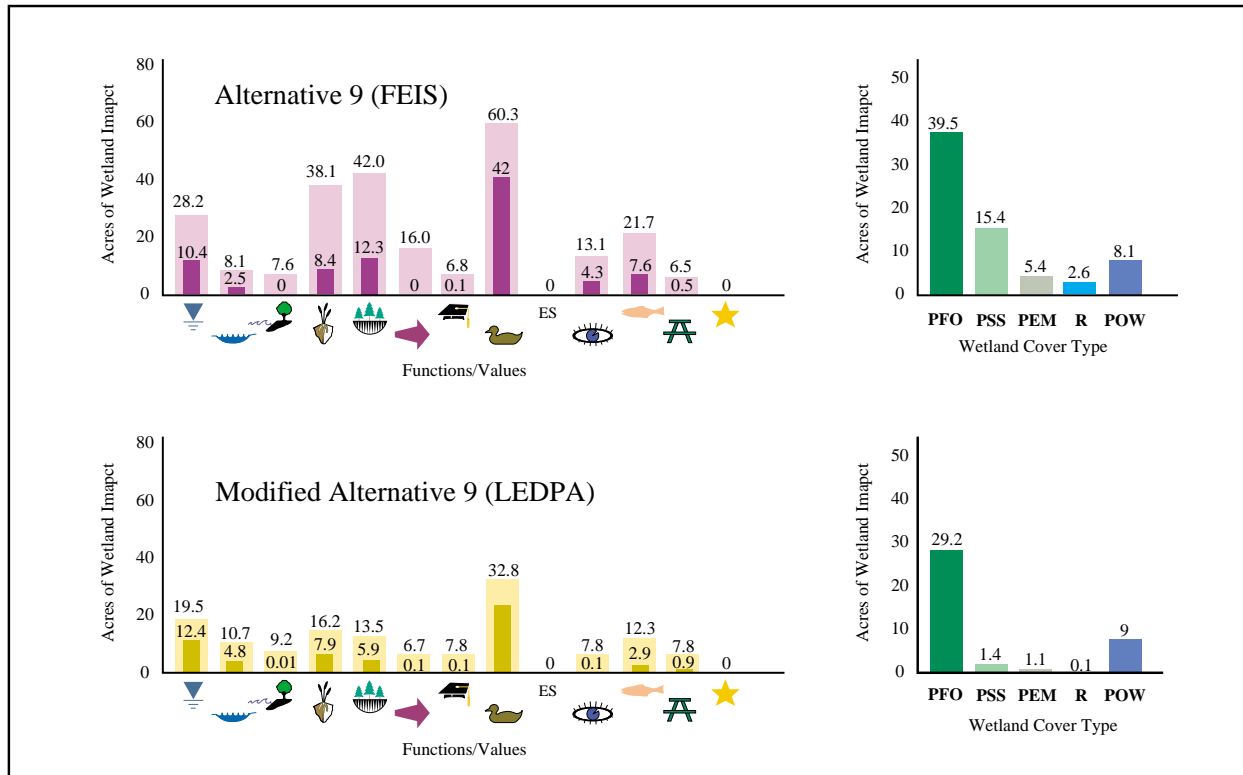
Wetland functions and values are used by the Corps in a variety of ways including to:

- describe site characteristics
- compare project alternatives
- avoid and minimize project impacts
- determine significance of impacts
- weigh environmental impacts against project benefits
- design and monitor compensatory mitigation

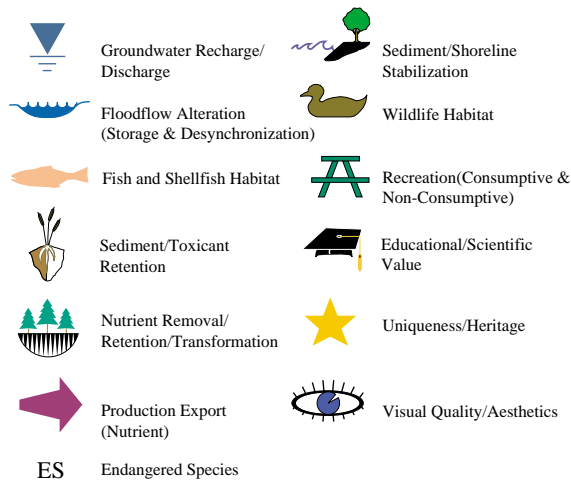
These required uses come from various statutes, regulations, and policies including:

- Corps permit regulations, Title 33 Code of Federal Regulations (CFR) Parts 320 through 330
 - public notice and other permit decision documents including special conditions for compensatory mitigation.
- National Environmental Policy Act, 40 CFR, Parts 1500 - 1508 and Corps Appendix B implementing regulations.
 - environmental assessment or environmental impact statement.
- Clean Water Act Section 404(b)(1) Guidelines, 40 CFR, Part 230.
 - compliance determination including selection of the **least environmentally damaging practicable alternative (LEDPA)**, significance of impacts and appropriate mitigation.
- Environmental Protection Agency / Department of the Army Memorandum of Agreement on Mitigation.
 - sequencing process to avoid, minimize, and only as a last resort, compensate for aquatic resource values impacted.
 - strive for no overall net loss of wetland functions and values.

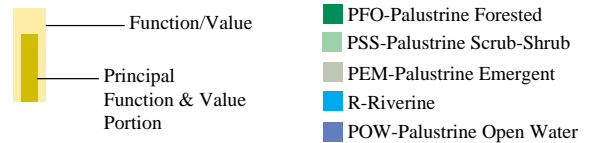
Direct Impact Quantification for Wetland Functions/Values and Cover Types



Symbols Key



Legend



The above graphics display wetland cover types, functions/values, and principal functions and values portions quantified for acreage of direct impacts under the footprint of the fill. Other information, including impacts beyond the footprint, may be quantified as data exists, but dissimilar factors should not be combined or weighted. Also illustrated is a comparison of Alternative 9 with a modified alignment.

What wetland evaluation method does the Corps accept?

The Regulatory Branch advocates a qualitative, descriptive approach to wetland assessment based on consensus of an interdisciplinary team of professionals.

The team is normally comprised of the applicant's consultant, Corps staff, and state and Federal agency staff. The consultant should first seek guidance from the Corps, then evaluate the wetlands. The team could either be party to this effort directly or could review the consultant's work product and offer comments. Typically the end result is a consensus of the professionals involved; however, the Corps will make the final determination. This approach has proven to be practical, cost effective, and acceptable for the purpose intended.

The evaluation should be a qualitative description of the physical characteristics of the wetlands, including a determination of the principal functions and values exhibited, and the bases for the conclusions. Generally, readily available information from site visits and existing literature is used. On some occasions the Corps may require more extensive studies.



Consensus among professionals may be reached in the field during wetland investigations

The Wetland Evaluation Technique (WET II) is not an acceptable method. It is not regionally sensitive and does not consider wildlife habitat corresponding to the concerns of the Corps, particularly as expressed by the US Fish and Wildlife Service. WET II analyses typically include high, moderate, and low rankings, which can imply a more quantifiable data base than actually exists, thereby biasing the reviewing agencies.

Numerical methods in general are to be avoided unless the data is readily available to support the analysis. In no case, however, should arbitrary weighting be applied to wetland functions, nor should dissimilar functions be ranked.

Note: Where project conditions warrant, the Corps may require a more detailed method than described in this booklet.

Summary of Evaluation Results for Wetlands

Ground Water Recharge	M		*
Ground Water Discharge	L	M	*
Floodflow Alteration	L	H	H
Sediment Stabilization	L	M	*
Sediment/Toxicant Retention	H	L	M
Nutrient Removal/Transformation		M	L
Production Export		M	*
Wildlife Diversity/Abundance	L	*	*
Wildlife D/A Breeding	*	H	L
Wildlife D/A Migration	*	H	*
Wildlife D/A Wintering	*	L	*
Aquatic Diversity/Abundance	L	L	*
Uniqueness/Heritage	L	*	*
Recreation	L	*	*

Note: "H"=High, "M"=Moderate, "L"=Low, "U"=Uncertain, and "*"s identify areas where functions and values are not evaluated.

Methods using subjective weightings are not acceptable.

Does the Corps have a prescribed format for wetland evaluation?

Any appropriate format may be used. As a guide we developed a wetland evaluation form that can be used by the evaluator to organize various information consistent with wetland evaluation requirements discussed in the previous section. The form shown on the next page is structured such that it directs the evaluator to include all pertinent wetland information and draw the necessary conclusions about the presence or absence of functions and values, as well as principal function and value determinations. The form allows additional space for backup rationale and best professional judgement. Refer to Appendix A for a blank reproducible form.

To begin with, the area or extent of each wetland to be evaluated should be determined. For large projects with multiple wetlands, the Corps will typically coordinate this determination with the interdisciplinary team.



Interdisciplinary Team Coordination













Descriptive wetland information is recorded on the form either in the office or in the field. The top portion of the form allows space for a general description of the wetland with respect to the surrounding landscape and hydrologic systems. Information regarding potential impacts is also documented here.

The procedure then requires each wetland that is potentially impacted by a project alternative to be visited. Each is evaluated considering the presence or absence of the 13 wetland functions and values defined earlier. A simple yes or no column is checked and documentation supporting the presence or absence of a function and/or value is recorded. A standard, but flexible, list of rationale factors for each function and value, numbered for easy reference, will facilitate this documentation. A sample list is shown in Appendix A.

Wetland Function-Value Evaluation Form

Total area of wetland _____ Human made? _____ Is wetland part of a wildlife corridor? _____ or a "habitat island"? _____
 Adjacent land use _____ Distance to nearest roadway or other development _____
 Dominant wetland systems present _____ Contiguous undeveloped buffer zone present _____
 Is the wetland a separate hydraulic system? _____ If not, where does the wetland lie in the drainage basin? _____
 How many tributaries contribute to the wetland? _____ Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. _____
 Latitude _____ Longitude _____
 Prepared by: _____ Date _____
 Wetland Impact:
 Type _____ Area _____
 Evaluation based on:
 Office _____ Field _____
 Corps manual wetland delineation completed? Y _____ N _____

Function/Value	Suitability Y N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
 Groundwater Recharge/Discharge				
 Floodflow Alteration				
 Fish and Shellfish Habitat				
 Sediment/Toxicant Retention				
 Nutrient Removal				
 Production Export				
 Sediment/Shoreline Stabilization				
 Wildlife Habitat				
 Recreation				
 Educational/Scientific Value				
 Uniqueness/Heritage				
 Visual Quality/Aesthetics				
ES Endangered Species Habitat				
Other				

Notes:

*Refer to backup list of numbered considerations.

Wetland Evaluation Form - When completed, the above wetland evaluation form with backup information provides the permit reviewer with sufficient information regarding the wetland's overall characteristics.

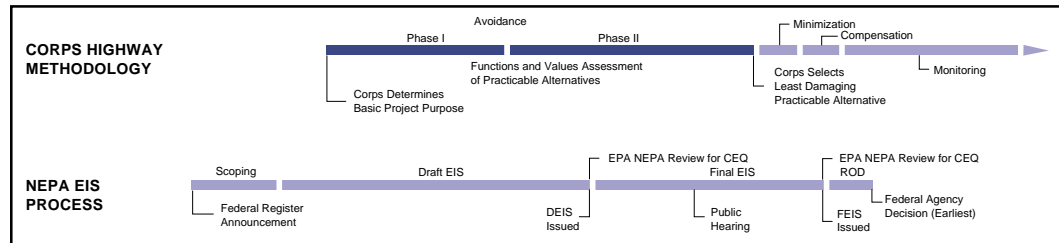
Next, the format requires the evaluator to check the column regarding the principal functions and values designation (Refer to page 4 for definition). Since wetlands are apt to contain most functions and values to some degree, it is helpful to identify those few that are most important.

Focusing on the principal functions and values helps the reviewer more easily assimilate information for large projects with multiple wetlands. The next column provides space for the evaluator to substantiate the principal function and value designation and/or to record other notes.

With the exception of reporting principal function and/or value, the forms do not report weighted or biased data. Therefore, each can be interpreted from the perspective and independent judgment of each reviewer. The bottom of the form provides space for additional narrative descriptions, including unusual or noteworthy conditions. The objective of the form is to document an unbiased record of the wetland, including its location, function, appearance and relationship to its adjacent land use.

Attachments to each form are recommended and should include a sketch of the wetland in relation to the impact area and surrounding landscapes, an inventory of vegetation and potential wildlife species, and a photo of the wetland. This additional information facilitates understanding functions and the subjective analysis of values.

How are the phases of the Highway Methodology incorporated?



Wetland resources are evaluated in both Phase I and Phase II of the Highway Methodology using different levels of information, commensurate with the project planning stage. They are evaluated further when the least environmentally damaging practicable alternative (LEDPA) is selected and when mitigation is considered.

For Phase I, a large number of alternatives may be under consideration and only limited field observations are made in order to screen out those which are obviously either not practicable or not a potential LEDPA. It is not necessary to complete the wetland evaluation forms at this stage because existing information is typically very general. Wetland boundaries are defined as a composite of National Wetland Inventory and Natural Resource Conservation Service maps. Cover types according to the Cowardin et. al. (1979) system (See Appendix A) and key wetland functions and values can be derived from the literature, limited field investigations, or public input. These should be noted on the wetland resource map.

For Phase II, additional field work is typically warranted but it is still of a limited nature sufficient to satisfy the selection of the LEDPA. The wetland evaluation forms should be completed for Phase II.

The LEDPA is then subjected to a three parameter delineation of the affected wetlands using the required Corps method and the New England District's field worksheets. At the same time, additional observations of wetland functions and values may be added to the Phase II field evaluation worksheets. The figure opposite illustrates the progression of wetland information from Phase II (black) to the LEDPA Phase (red).

The wetland evaluation should be complete for use in the Corps permit decision documents, including the determination of mitigation requirements.

A critical part of the Highway Methodology is the graphical display of project constraints, including wetland resources. Examples of ways to display wetland functions and values are shown in the next section.

Wetland Function-Value Evaluation Form

Total area of wetland 11.3 ac. Human made? No Is wetland part of a wildlife corridor? Yes or a "habitat island"? No

Adjacent land use Forest, Residential Distance to nearest roadway or other development 0'

Dominant wetland systems present POWH, PFO 1E Contiguous undeveloped buffer zone present Yes

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Mid

How many tributaries contribute to the wetland? 1 Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. WD1-1

Latitude N41°44'54.86 Longitude W71°44'54.86

Prepared by: LDC, JCL Date 12-7-92

Wetland Impact:
Type Fill Area 4.9 AC

Evaluation based on:
Office Field

Corps manual wetland delineation completed? Y N

Function/Value	Suitability		Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
	Y	N			
Groundwater Recharge/Discharge	X		2,6,7,9,10,11,12,13		A layer of organic soil blankets the thin glacial till overburden in this area, this wetland is an expression of groundwater discharge.
Floodflow Alteration	X	X	2,5,6,7,8,9,11,13,14		Water flow constricted by culvert, some detention occurring in this ponded, well-saturated area. Portion of wetland at impact area does not store floodwater.
Fish and Shellfish Habitat		X	1,5,(6),9,10,14,15,16,17		Culvert restricts access, wetland is relatively small, fisheries site #15.
Sediment/Toxicant Retention	X		3,4,5,6,7,8,9,10,12		Sediments can drop out in the ponded section.
Nutrient Removal	X		2,3,5-15		Potential for sediment and nutrient removal exists, logging activities have occurred adjacent to wetland.
Production Export		X	1,2,4,5,6,7,9,10,12,14		Outflow is constricted, little transport occurs via wildlife, wetland is predominantly attenuating nutrients.
Sediment/Shoreline Stabilization		X	4,6,9,10,12,13,14,15		Low flow velocities.
Wildlife Habitat	X		1,2,4,5,6,7,8,(13),16,17,18,19,21	X	Except for minor road, this wetland is well buffered, and directly connected to the Hop River. Good amphibian habitat.
Recreation	X		2,4,5,6,8,9,10		Wetland is easily accessible, and has some potential to function as educational and recreational area.
Educational/Scientific Value	X		2,3,5,8,9,10,11,12,13		Potential for pond study to occur. No known educational use.
Uniqueness/Heritage	X	X	7,(14),17,18,20,22,29	X	Prehistoric archeologic sensitive sites adjacent to wetlands. Archeologic artifacts found adjacent to wetland by local archaeologist.
Visual Quality/Aesthetics	X		1,2,3,4,5,6,7,8,9,10,11,12		Direct view of wetland exists from roadway. Open water contrasts with surrounding forest land.
ES Endangered Species Habitat		X	None		None found or known to occur here.
Other					

Notes: *Additional vegetative species noted at 3/24/93 Wetland Delineation field visit (Refer to Wetland Delineation Form). Phase II wetland assessment is relatively indicative of functions and values present at impact area.*

* Refer to backup list of considerations.

Are there good examples to follow?

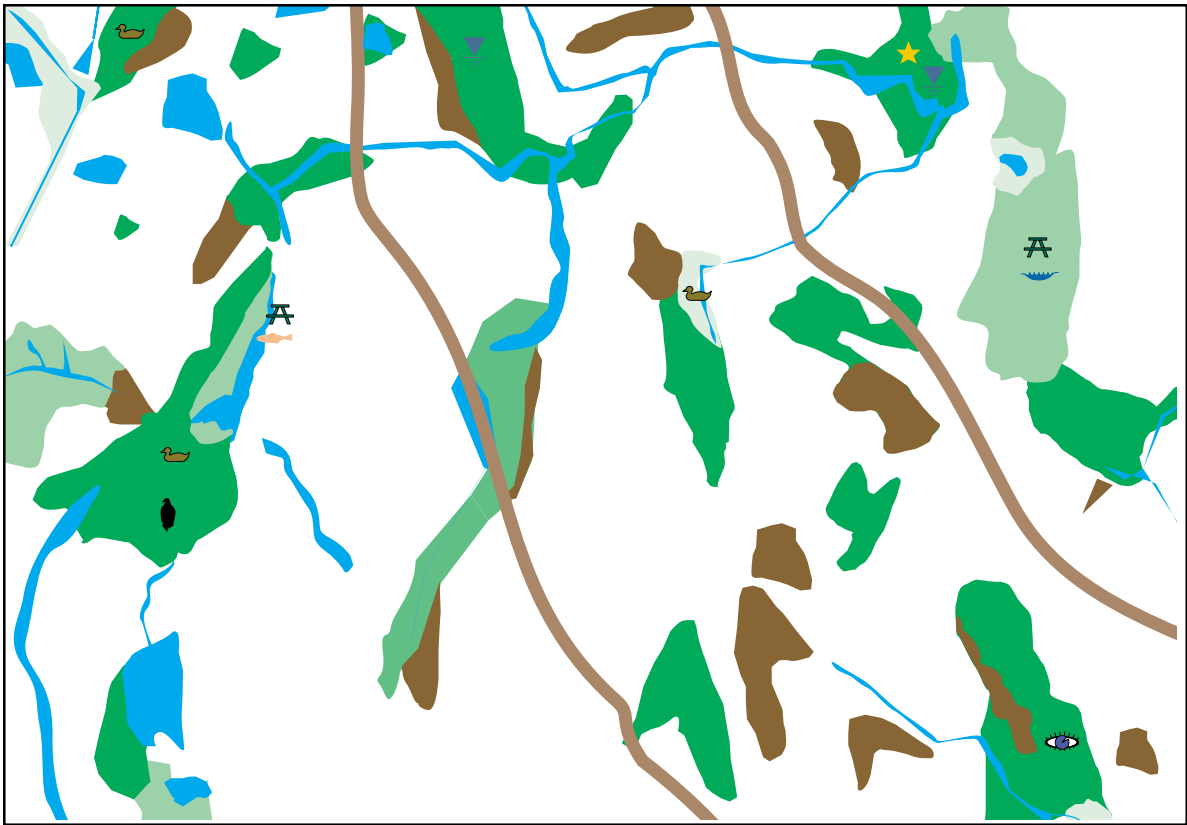
Good examples describe the wetland system and its individual components clearly with factual supporting data at an appropriate scale and level of detail commensurate with the project development stage. The objective is to graphically display complex wetland information in a format that facilitates assimilation by reviewers and expedites regulatory decisions. The figures in this section represent some good examples of wetland evaluation graphics at various phases in the process.

The figure on the next page defines a portion of an 80 square mile Phase I study area and illustrates the general distribution and configuration of wetlands based on data from National Wetland Inventory and Natural Resource Conservation Service (formerly Soil Conservation Service) maps augmented with approximately two person weeks of field investigations. Principal functions and values that can be identified using existing literature or limited field investigations are shown.

The figure on the following page illustrates the various aspects of the wetland evaluation process, including the completed wetland evaluation form with corresponding backup information and an entire study area graphic that includes information on the functions and values for all wetlands evaluated. This graphic is an example of what is used in Phase II of the Highway Methodology to facilitate the LEDPA decision.














From this graphic, a reviewer can analyze such things as wetland position in the landscape, configuration, cover type, and corresponding functions and values. Potential impacts to each system can be implied by the relative location of the highway with respect to each wetland, considering typical impacts associated with highways (e.g., runoff, noise, habitat fragmentation).

To make a complete, informed decision regarding other project impacts and the practicability of an alternative, multiple constraints must also be shown and evaluated.









A typical Phase I wetlands constraint graphic.

Symbols Key

- | | | | |
|---|---|---|--|
|  | Groundwater Recharge/
Discharge |  | Sediment/Shoreline
Stabilization |
|  | Floodflow Alteration
(Storage & Desynchronization) |  | Wildlife Habitat |
|  | Fish and Shellfish Habitat |  | Recreation(Consumptive &
Non-Consumptive) |
|  | Sediment/Toxicant
Retention |  | Educational/Scientific
Value |
|  | Nutrient Removal/
Retention/Transformation |  | Uniqueness/Heritage |
|  | Production Export
(Nutrient) |  | Visual Quality/Aesthetics |
| | | ES | Endangered Species  |

Legend

- | | |
|---|----------------------------|
|  | H.S.-Hydric Soil |
|  | PEM-Palustrine Emergent |
|  | PSS-Palustrine Scrub-Shrub |
|  | PFO-Palustrine Forested |
|  | L-Lacustrine |
|  | R-Riverine |



**US Army Corps
of Engineers®**
New England District

Graphical Approach to Wetland Evaluation

Wetland Function-Value Evaluation Form

Total area of wetland 11.5 ac Human made? No Is wetland part of a wildlife corridor? Yes or a "habitat island"? No

Adjacent land use Forest, Residential Distance to nearest roadway or other development 0'

Dominant wetland systems present POWH, PPO1E Contiguous undeveloped buffer zone present Yes

Is the wetland a separate hydraulic system? No If not, where does the wetland lie in the drainage basin? Mid

How many tributaries contribute to the wetland? 1 Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. WD1-1
 Latitude N 41° 44' 54.00" Longitude W 71° 44' 40.00"
 Prepared by: LDC, JCL Date 1-27-92
 Wetland Impact: Type FW Area 4.9 AC

Evaluation based on:
 Office Field
 Corps manual wetland delineation completed? Y N

Function/Value	Suitability Y N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
Groundwater Recharge/Discharge	X	2,6,7,9,10,11,12,13		A layer of organic soil blankets the thin glacial fill overburden in this area, this wetland is an expression of groundwater discharge.
Floodflow Alteration	X	2,3,6,7,9,11,13,14		Water flow constricted by culvert, some detention occurring in this ponded, well-aerated area. Portion of wetland at impact area does not store floodwater.
Fish and Shellfish Habitat	X	1,5,(6),9,10,14,15,16,17		Culvert restricts access, wetland is relatively small, fisheries site #15.
Sediment/Toxicant Retention	X	3,4,5,6,7,9,10,12		Sediments can drop out in the ponded section.
Nutrient Removal	X	2,3,5-13		Potential for sediment and nutrient removal exists, logging activities have occurred adjacent to wetland.
Production Export	X	1,2,4,5,6,7,9,10,12,14		Outflow is constricted, little transport occurs via wildlife, wetland is predominantly attenuating nutrients.
Sediment/Shoreline Stabilization	X	4,6,9,10,12,13,14,15		Low flow velocities.
Wildlife Habitat	X	1,2,4,5,6,7,9,10,11,12,17,18,19,21	X	Except for minor road, this wetland is well buffered, and directly connected to the top River. Good amphibian habitat.
Recreation	X	2,4,5,6,9,10		Wetland is easily accessible, and has some potential to function as educational and recreational area.
Educational/Scientific Value	X	2,3,3,9,10,11,12,13		Potential for pond study to occur. No known educational use.
Uniqueness/Heritage	X	X 7,(14),17,18,20,22,29	X	Prehistoric archeologic sensitive sites adjacent to wetlands. Archeologic artifacts found adjacent to wetland by local archeologist.
Visual Quality/Aesthetics	X	1,2,3,4,5,6,7,9,10,11,12		Direct view of wetland exists from roadway. Open water contrasts with surrounding forest land.
Endangered Species Habitat	X	None		None found or known to occur here.
Other				

Notes: Additional vegetative species noted at 5/24/93 Wetland Delineation field visit (Refer to Wetland Delineation Form). Phase II wetland assessment is relatively indicative of functions and values present at impact area. * Refer to backup list of considerations.

Completed Wetlands Functions and Values Evaluation Field Observation Form

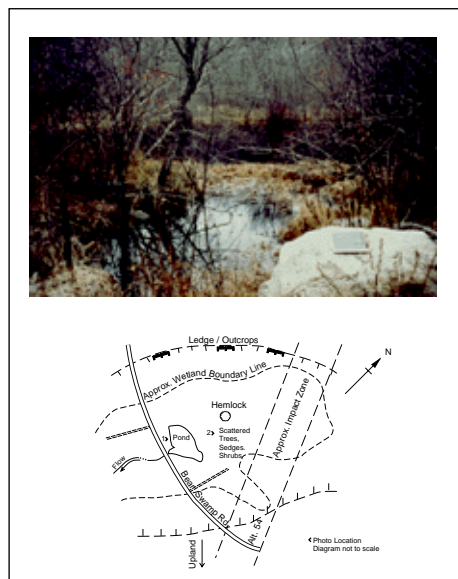
Species List WD1-1
Vegetative

Common Name	Scientific Name
Slippery Elm	<i>Ulmus rubra</i>
Yellow Birch	<i>Betula lutea</i>
Poplar	<i>Populus sp.</i>
White Oak	<i>Quercus alba</i>
Shagbark Hickory	<i>Carya ovata</i>
Grey Birch	<i>Betula populifolia</i>
Ash	<i>Fraxinus sp.</i>
Speckled Alder	<i>Alnus rugos</i>
American Hornbeam	<i>Carpinus caroliniana</i>
American Hop Hornbeam	<i>Ostrya virginiana</i>
Winterberry	<i>Ilex verticillata</i>
Maleberry	<i>Lyonia ligustrina</i>
Hazelnut	<i>Corylus americana</i>
Highbush Blueberry	<i>Vaccinium corymbosum</i>
Sweet Pepperbush	<i>Clethra alnifolia</i>
Azalea	<i>Rhododendron sp.</i>
Dogwood	<i>Cornus sp.</i>
Sensitive Fern	<i>Onoclea sensibilis</i>
Cattail	<i>Typha latifolia</i>
Meadowsweet	<i>Spiraea latifolia</i>
Sphagnum Moss	<i>Sphagnum sp.</i>
Skunk Cabbage	<i>Symplocarpus foetidus</i>

Wildlife

Common Name	Scientific Name
Blue Jay	<i>Cyanocitta cristata</i>
White-tailed Deer	<i>Odocoileus virginianus</i>
Muskrat	<i>Ondatra zibethicus</i>
Raccoon	<i>Procyon lotor</i>
Black-capped Chickadee	<i>Parus atricapillus</i>
Tufted Titmouse	<i>Parus bicolor</i>
American Goldfinch	<i>Carduelis tristis</i>

WD1-1 Vegetation and wildlife species list



Photographs of WD1-1 wetland

The above information constitutes a complete wetland function/value package. It can easily be converted into descriptive text for environmental documents or graphical display as shown on the right.

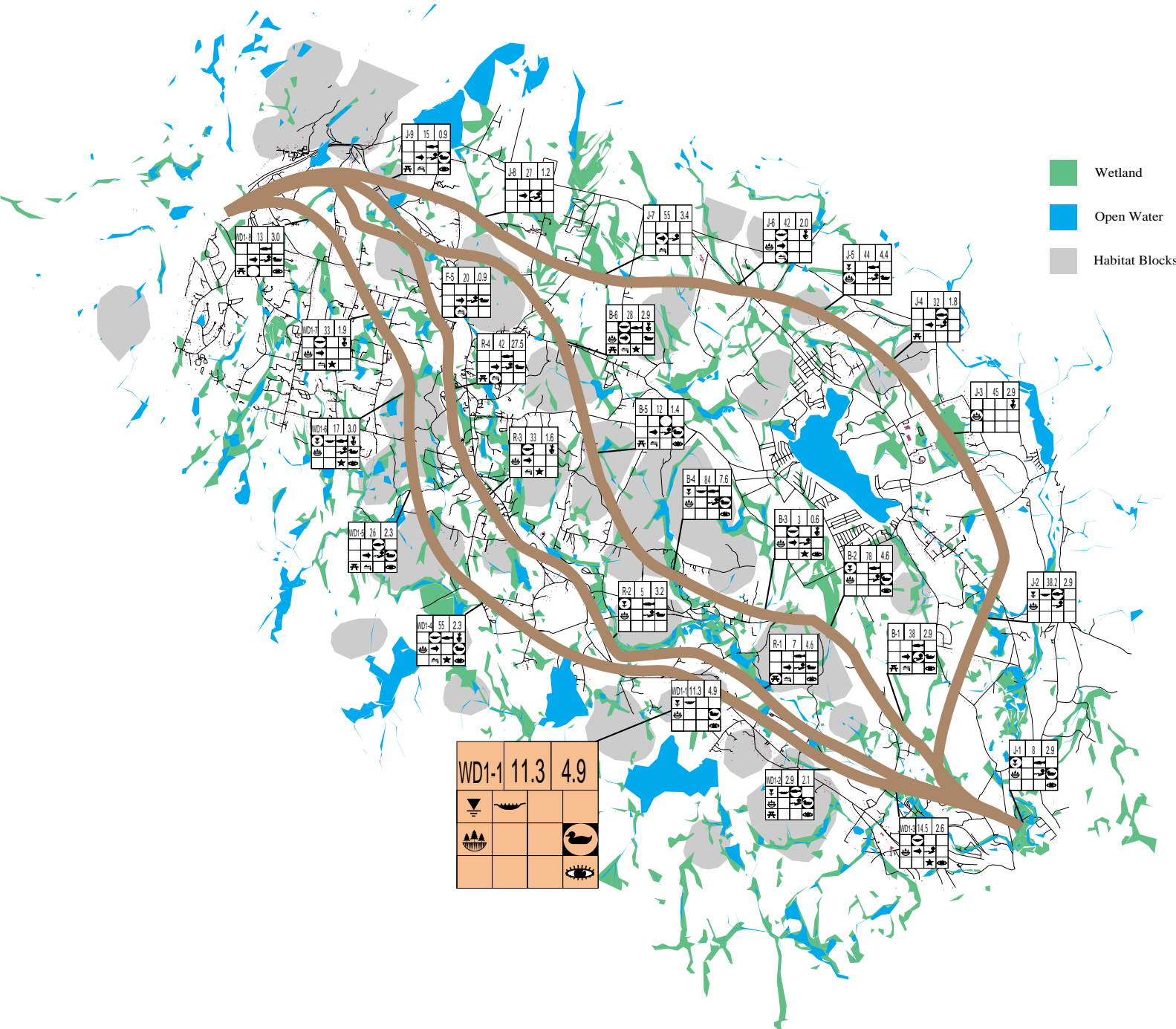
Wetland I.D.	Total Acres	Impacted Acres	



Symbols Key

- Groundwater Recharge/Discharge
- Floodflow Alteration (Storage & Desynchronization)
- Fish and Shellfish Habitat
- Sediment/Toxicant Retention
- Nutrient Removal/Retention/Transformation
- Production Export (Nutrient)
- Sediment/Shoreline Stabilization
- Wildlife Habitat
- Recreation/Consumptive & Non-Consumptive
- Educational/Scientific Value
- Uniqueness/Heritage
- Visual Quality/Aesthetics
- Endangered Species

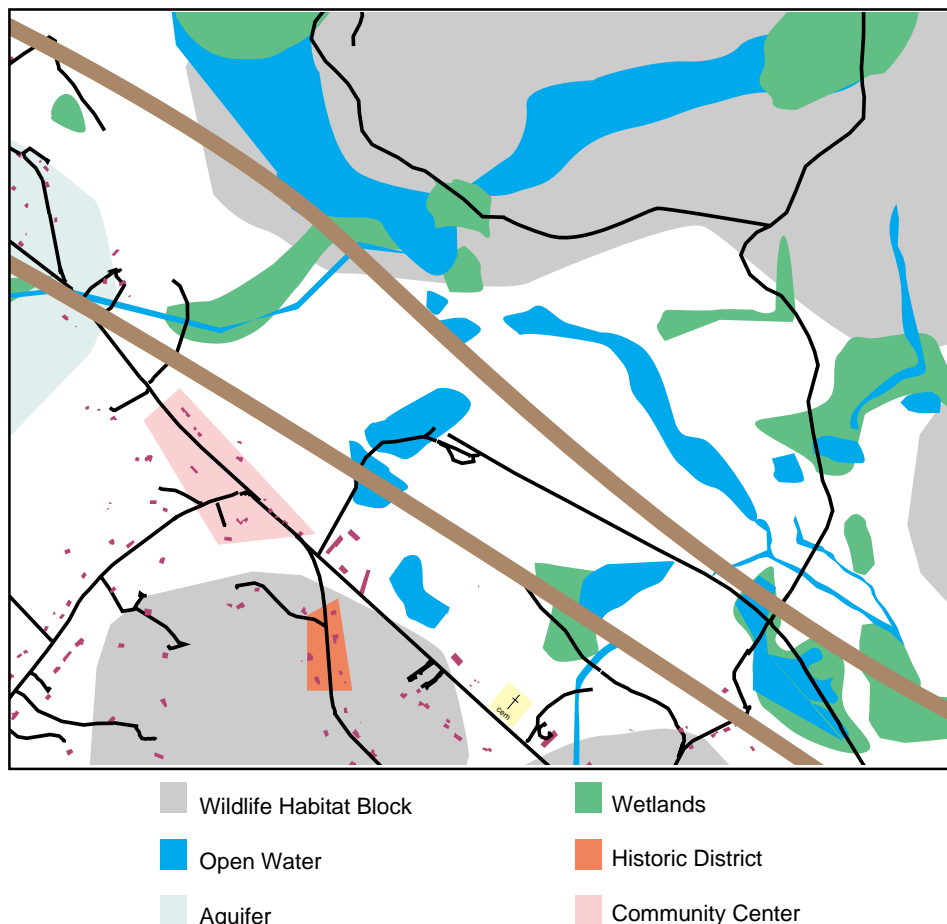
- Wetland
- Open Water
- Habitat Blocks



How are resources other than wetlands considered in the Corps permit decision?

Wetlands may appear to receive disproportionate attention in the Corps permit process because the Section 404(b)(1) Guidelines require the Corps to permit the practicable alternative that has the least adverse impact on the aquatic ecosystem, provided there are no other significant adverse environmental consequences (among other tests). Impacts on other resources of concern, including such things as aquifers, wildlife habitat blocks, and socio-economic constraints must therefore be considered before a LEDPA can be determined.

It is important that these other resources be displayed along with the wetland functions and values in order to give the decisionmaker a complete picture when evaluating alternatives. A typical multi-constraint map overlay is shown in the figure below.



Natural resources and community factors must all be considered in light of the multi-constraints that define the study area.





Appendix A

Wetland evaluation supporting documentation; Reproducible forms.

Below is an example list of considerations that was used for a New Hampshire highway project. Considerations are flexible, based on best professional judgment and interdisciplinary team consensus. This example provides a comprehensive base, however, and may only need slight modifications for use in other projects.



GROUNDWATER RECHARGE/DISCHARGE— This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. It refers to the fundamental interaction between wetlands and aquifers, regardless of the size or importance of either.

CONSIDERATIONS/QUALIFIERS

1. Public or private wells occur downstream of the wetland.
2. Potential exists for public or private wells downstream of the wetland.
3. Wetland is underlain by stratified drift.
4. Gravel or sandy soils present in or adjacent to the wetland.
5. Fragipan does not occur in the wetland.
6. Fragipan, impervious soils, or bedrock does occur in the wetland.
7. Wetland is associated with a perennial or intermittent watercourse.
8. Signs of groundwater recharge are present or piezometer data demonstrates recharge.
9. Wetland is associated with a watercourse but lacks a defined outlet or contains a constricted outlet.
10. Wetland contains only an outlet, no inlet.
11. Groundwater quality of stratified drift aquifer within or downstream of wetland meets drinking water standards.
12. Quality of water associated with the wetland is high.
13. Signs of groundwater discharge are present (e.g., springs).
14. Water temperature suggests it is a discharge site.
15. Wetland shows signs of variable water levels.
16. Piezometer data demonstrates discharge.
17. Other



FLOODFLOW ALTERATION (Storage & Desynchronization) — This function considers the effectiveness of the wetland in reducing flood damage by water retention for prolonged periods following precipitation events and the gradual release of floodwaters. It adds to the stability of the wetland ecological system or its buffering characteristics and provides social or economic value relative to erosion and/or flood prone areas.

CONSIDERATIONS/QUALIFIERS

1. Area of this wetland is large relative to its watershed.
2. Wetland occurs in the upper portions of its watershed.
3. Effective flood storage is small or non-existent upslope of or above the wetland.
4. Wetland watershed contains a high percent of impervious surfaces.
5. Wetland contains hydric soils which are able to absorb and detain water.
6. Wetland exists in a relatively flat area that has flood storage potential.
7. Wetland has an intermittent outlet, ponded water, or signs are present of variable water level.
8. During flood events, this wetland can retain higher volumes of water than under normal or average rainfall conditions.
9. Wetland receives and retains overland or sheet flow runoff from surrounding uplands.
10. In the event of a large storm, this wetland may receive and detain excessive flood water from a nearby watercourse.
11. Valuable properties, structures, or resources are located in or near the floodplain downstream from the wetland.
12. The watershed has a history of economic loss due to flooding.
13. This wetland is associated with one or more watercourses.
14. This wetland watercourse is sinuous or diffuse.
15. This wetland outlet is constricted.
16. Channel flow velocity is affected by this wetland.
17. Land uses downstream are protected by this wetland.
18. This wetland contains a high density of vegetation.
19. Other

FISH AND SHELLFISH HABITAT (FRESHWATER) — This function considers the effectiveness of seasonal or permanent watercourses associated with the wetland in question for fish and shellfish habitat.



CONSIDERATIONS/QUALIFIERS

1. Forest land dominant in the watershed above this wetland.
2. Abundance of cover objects present.

STOP HERE IF THIS WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE

3. Size of this wetland is able to support large fish/shellfish populations.
4. Wetland is part of a larger, contiguous watercourse.
5. Wetland has sufficient size and depth in open water areas so as not to freeze solid and retain some open water during winter.
6. Stream width (bank to bank) is more than 50 feet.
7. Quality of the watercourse associated with this wetland is able to support healthy fish/shellfish populations.
8. Streamside vegetation provides shade for the watercourse.
9. Spawning areas are present (submerged vegetation or gravel beds).
10. Food is available to fish/shellfish populations within this wetland.
11. Barrier(s) to anadromous fish (such as dams, including beaver dams, waterfalls, road crossing) are absent from the stream reach associated with this wetland.
12. Evidence of fish is present.
13. Wetland is stocked with fish.
14. The watercourse is persistent.
15. Man-made streams are absent.
16. Water velocities are not too excessive for fish usage.
17. Defined stream channel is present.
18. Other

Although the above example refers to freshwater wetlands, it can also be adapted for marine ecosystems. The following is an example provided by the National Marine Fisheries Service (NMFS) of an adaptation for the fish and shellfish function.

FISH AND SHELLFISH HABITAT (MARINE) — This function considers the effectiveness of wetlands, embayments, tidal flats, vegetated shallows, and other environments in supporting marine resources such as fish, shellfish, marine mammals, and sea turtles.

CONSIDERATIONS/QUALIFIERS

1. Special aquatic sites (tidal marsh, mud flats, eelgrass beds) are present.
2. Suitable spawning habitat is present at the site or in the area.
3. Commercially or recreationally important species are present or suitable habitat exists.
4. The wetland/waterway supports prey for higher trophic level marine organisms.
5. The waterway provides migratory habitat for anadromous fish.
6. Essential fish habitat, as defined by the 1996 amendments to the Magnuson-Stevens Fishery & Conservation Act, is present (consultation with NMFS may be necessary).
7. Other



SEDIMENT/TOXICANT/PATHOGEN RETENTION — This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants, or pathogens in runoff water from surrounding uplands or upstream eroding wetland areas.

CONSIDERATIONS/QUALIFIERS

1. Potential sources of excess sediment are in the watershed above the wetland.
2. Potential or known sources of toxicants are in the watershed above the wetland.
3. Opportunity for sediment trapping by slow moving water or deepwater habitat are present in this wetland.
4. Fine grained mineral or organic soils are present.
5. Long duration water retention time is present in this wetland.
6. Public or private water sources occur downstream.
7. The wetland edge is broad and intermittently aerobic.
8. The wetland is known to have existed for more than 50 years.
9. Drainage ditches have not been constructed in the wetland.

STOP HERE IF WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE.

10. Wetland is associated with an intermittent or perennial stream or a lake.
11. Channelized flows have visible velocity decreases in the wetland.
12. Effective floodwater storage in wetland is occurring. Areas of impounded open water are present.
13. No indicators of erosive forces are present. No high water velocities are present.
14. Diffuse water flows are present in the wetland.
15. Wetland has a high degree of water and vegetation interspersion.
16. Dense vegetation provides opportunity for sediment trapping and/or signs of sediment accumulation by dense vegetation is present.
17. Other



NUTRIENT REMOVAL/RETENTION/TRANSFORMATION — This function considers the effectiveness of the wetland as a trap for nutrients in runoff water from surrounding uplands or contiguous wetlands and the ability of the wetland to process these nutrients into other forms or trophic levels. One aspect of this function is to prevent ill effects of nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers, or estuaries.

CONSIDERATIONS/QUALIFIERS

1. Wetland is large relative to the size of its watershed.
2. Deep water or open water habitat exists.
3. Overall potential for sediment trapping exists in the wetland.

4. Potential sources of excess nutrients are present in the watershed above the wetland.
5. Wetland saturated for most of the season. Pondered water is present in the wetland.
6. Deep organic/sediment deposits are present.
7. Slowly drained fine grained mineral or organic soils are present.
8. Dense vegetation is present.
9. Emergent vegetation and/or dense woody stems are dominant.
10. Opportunity for nutrient attenuation exists.
11. Vegetation diversity/abundance sufficient to utilize nutrients.

STOP HERE IF WETLAND IS NOT ASSOCIATED WITH A WATERCOURSE.

12. Waterflow through this wetland is diffuse.
13. Water retention/detention time in this wetland is increased by constricted outlet or thick vegetation.
14. Water moves slowly through this wetland.
15. Other

PRODUCTION EXPORT (Nutrient) — This function evaluates the effectiveness of the wetland to produce food or usable products for humans or other living organisms.



CONSIDERATIONS/QUALIFIERS

1. Wildlife food sources grow within this wetland.
2. Detritus development is present within this wetland.
3. Economically or commercially used products found in this wetland.
4. Evidence of wildlife use found within this wetland.
5. Higher trophic level consumers are utilizing this wetland.
6. Fish or shellfish develop or occur in this wetland.
7. High vegetation density is present.
8. Wetland exhibits high degree of plant community structure/species diversity.
9. High aquatic vegetative diversity/abundance is present.
10. Nutrients exported in wetland watercourses (permanent outlet present).
11. “Flushing” of relatively large amounts of organic plant material occurs from this wetland.
12. Wetland contains flowering plants that are used by nectar-gathering insects.
13. Indications of export are present.
14. High production levels occurring, however, no visible signs of export (assumes export is attenuated).
15. Other

SEDIMENT/ShORELINE STABILIZATION — This function considers the effectiveness of a wetland to stabilize streambanks and shorelines against erosion.



CONSIDERATIONS/QUALIFIERS

1. Indications of erosion or siltation are present.
2. Topographical gradient is present in wetland.
3. Potential sediment sources are present up-slope.
4. Potential sediment sources are present upstream.
5. No distinct shoreline or bank is evident between the waterbody and the wetland or upland.
6. A distinct step between the open waterbody or stream and the adjacent land exists (i.e., sharp bank) with dense roots throughout.
7. Wide wetland (>10') borders watercourse, lake, or pond.
8. High flow velocities in the wetland.
9. The watershed is of sufficient size to produce channelized flow.
10. Open water fetch is present.
11. Boating activity is present.
12. Dense vegetation is bordering watercourse, lake, or pond.
13. High percentage of energy-absorbing emergents and/or shrubs border a watercourse, lake, or pond.
14. Vegetation is comprised of large trees and shrubs that withstand major flood events or erosive incidents and stabilize the shoreline on a large scale (feet).
15. Vegetation is comprised of a dense resilient herbaceous layer that stabilizes sediments and the shoreline on a small scale (inches) during minor flood events or potentially erosive events.
16. Other



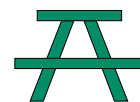
WILDLIFE HABITAT — This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species must be considered. Species lists of observed and potential animals should be included in the wetland assessment report.¹

CONSIDERATIONS/QUALIFIERS

1. Wetland is not degraded by human activity.
2. Water quality of the watercourse, pond, or lake associated with this wetland meets or exceeds Class A or B standards.
3. Wetland is not fragmented by development.
4. Upland surrounding this wetland is undeveloped.
5. More than 40% of this wetland edge is bordered by upland wildlife habitat (e.g., brushland, woodland, active farmland, or idle land) at least 500 feet in width.
6. Wetland is contiguous with other wetland systems connected by a watercourse or lake.
7. Wildlife overland access to other wetlands is present.
8. Wildlife food sources are within this wetland or are nearby.
9. Wetland exhibits a high degree of interspersed vegetation classes and/or open water.
10. Two or more islands or inclusions of upland within the wetland are present.
11. Dominant wetland class includes deep or shallow marsh or wooded swamp.
12. More than three acres of shallow permanent open water (less than 6.6 feet deep), including streams in or adjacent to wetland, are present.
13. Density of the wetland vegetation is high.
14. Wetland exhibits a high degree of plant species diversity.
15. Wetland exhibits a high degree of diversity in plant community structure (e.g., tree/shrub/vine/grasses/mosses)
16. Plant/animal indicator species are present. (List species for project)
17. Animal signs observed (tracks, scats, nesting areas, etc.)
18. Seasonal uses vary for wildlife and wetland appears to support varied population diversity/abundance during different seasons.
19. Wetland contains or has potential to contain a high population of insects.
20. Wetland contains or has potential to contain large amphibian populations.
21. Wetland has a high avian utilization or its potential.
22. Indications of less disturbance-tolerant species are present.
23. Signs of wildlife habitat enhancement are present (birdhouses, nesting boxes, food sources, etc.).
24. Other

¹In March 1995, a rapid wildlife habitat assessment method was completed by a University of Massachusetts research team with funding and oversight provided by the New England Transportation Consortium. The method is called WEThings (wetland habitat indicators for non-game species). It produces a list of potential wetland-dependent mammal, reptile, and amphibian species that may be present in the wetland. The output is based on observable habitat characteristics documented on the field data form. This method may be used to generate the wildlife species list recommended as backup information to the wetland evaluation form and to augment the considerations. Use of this method should first be coordinated with the Corps project manager. A computer program is also available to expedite this process.

RECREATION (Consumptive and Non-Consumptive) — This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting, and other active or passive recreational activities. Consumptive opportunities consume or diminish the plants, animals, or other resources that are intrinsic to the wetland. Non-consumptive opportunities do not consume or diminish these resources of the wetland.



CONSIDERATIONS/QUALIFIERS

1. Wetland is part of a recreation area, park, forest, or refuge.
2. Fishing is available within or from the wetland.
3. Hunting is permitted in the wetland.
4. Hiking occurs or has potential to occur within the wetland.
5. Wetland is a valuable wildlife habitat.
6. The watercourse, pond, or lake associated with the wetland is unpolluted.
7. High visual/aesthetic quality of this potential recreation site.
8. Access to water is available at this potential recreation site for boating, canoeing, or fishing.
9. The watercourse associated with this wetland is wide and deep enough to accommodate canoeing and/or non-powered boating.
10. Off-road public parking available at the potential recreation site.
11. Accessibility and travel ease is present at this site.
12. The wetland is within a short drive or safe walk from highly populated public and private areas.
13. Other

EDUCATIONAL/SCIENTIFIC VALUE — This value considers the suitability of the wetland as a site for an “outdoor classroom” or as a location for scientific study or research.



CONSIDERATIONS/QUALIFIERS

1. Wetland contains or is known to contain threatened, rare, or endangered species.
2. Little or no disturbance is occurring in this wetland.
3. Potential educational site contains a diversity of wetland classes which are accessible or potentially accessible.
4. Potential educational site is undisturbed and natural.
5. Wetland is considered to be a valuable wildlife habitat.
6. Wetland is located within a nature preserve or wildlife management area.
7. Signs of wildlife habitat enhancement present (bird houses, nesting boxes, food sources, etc.).
8. Off-road parking at potential educational site suitable for school bus access in or near wetland.
9. Potential educational site is within safe walking distance or a short drive to schools.
10. Potential educational site is within safe walking distance to other plant communities.
11. Direct access to perennial stream at potential educational site is available.
12. Direct access to pond or lake at potential educational site is available.
13. No known safety hazards exist within the potential educational site.
14. Public access to the potential educational site is controlled.
15. Handicap accessibility is available.
16. Site is currently used for educational or scientific purposes.
17. Other

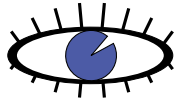


UNIQUENESS/HERITAGE — This value considers the effectiveness of the wetland or its associated waterbodies to provide certain special values. These may include archaeological sites, critical habitat for endangered species, its overall health and appearance, its role in the ecological system of the area, its relative importance as a typical wetland class for this geographic location. These functions are clearly valuable wetland attributes relative to aspects of public health, recreation, and habitat diversity.

CONSIDERATIONS/QUALIFIERS

1. Upland surrounding wetland is primarily urban.
2. Upland surrounding wetland is developing rapidly.
3. More than 3 acres of shallow permanent open water (less than 6.6 feet deep), including streams, occur in wetlands.
4. Three or more wetland classes are present.
5. Deep and/or shallow marsh or wooded swamp dominate.
6. High degree of interspersion of vegetation and/or open water occur in this wetland.
7. Well-vegetated stream corridor (15 feet on each side of the stream) occurs in this wetland.
8. Potential educational site is within a short drive or a safe walk from schools.
9. Off-road parking at potential educational site is suitable for school buses.
10. No known safety hazards exist within this potential educational site.
11. Direct access to perennial stream or lake exists at potential educational site.
12. Two or more wetland classes are visible from primary viewing locations.
13. Low-growing wetlands (marshes, scrub-shrub, bogs, open water) are visible from primary viewing locations.
14. Half an acre of open water or 200 feet of stream is visible from the primary viewing locations.
15. Large area of wetland is dominated by flowering plants or plants that turn vibrant colors in different seasons.
16. General appearance of the wetland visible from primary viewing locations is unpolluted and/or undisturbed.
17. Overall view of the wetland is available from the surrounding upland.
18. Quality of the water associated with the wetland is high.
19. Opportunities for wildlife observations are available.
20. Historical buildings are found within the wetland.
21. Presence of pond or pond site and remains of a dam occur within the wetland.
22. Wetland is within 50 yards of the nearest perennial watercourse.
23. Visible stone or earthen foundations, berms, dams, standing structures, or associated features occur within the wetland.
24. Wetland contains critical habitat for a state- or federally-listed threatened or endangered species.
25. Wetland is known to be a study site for scientific research.
26. Wetland is a natural landmark or recognized by the state natural heritage inventory authority as an exemplary natural community.
27. Wetland has local significance because it serves several functional values.
28. Wetland has local significance because it has biological, geological, or other features that are locally rare or unique.
29. Wetland is known to contain an important archaeological site.
30. Wetland is hydrologically connected to a state or federally designated scenic river.
31. Wetland is located in an area experiencing a high wetland loss rate.
32. Other

VISUAL QUALITY/AESTHETICS — This value considers the visual and aesthetic quality or usefulness of the wetland.



CONSIDERATIONS/QUALIFIERS

1. Multiple wetland classes are visible from primary viewing locations.
2. Emergent marsh and/or open water are visible from primary viewing locations.
3. A diversity of vegetative species is visible from primary viewing locations.
4. Wetland is dominated by flowering plants or plants that turn vibrant colors in different seasons.
5. Land use surrounding the wetland is undeveloped as seen from primary viewing locations.
6. Visible surrounding land use form contrasts with wetland.
7. Wetland views absent of trash, debris, and signs of disturbance.
8. Wetland is considered to be a valuable wildlife habitat.
9. Wetland is easily accessed.
10. Low noise level at primary viewing locations.
11. Unpleasant odors absent at primary viewing locations.
12. Relatively unobstructed sight line exists through wetland.
13. Other

ENDANGERED SPECIES HABITAT — This value considers the suitability of the wetland to support threatened or endangered species.

ES

CONSIDERATIONS/QUALIFIERS

1. Wetland contains or is known to contain threatened or endangered species.
2. Wetland contains critical habitat for a state or federally listed threatened or endangered species.









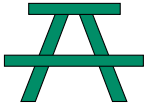


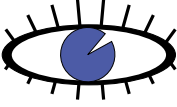
System

Subsystem













Class

Wetlands
and
Deep
Water
Habitats

System	Subsystem	Class
Marine	Subtidal	<ul style="list-style-type: none"> • Rocky Bottom • Unconsolidated Bottom • Aquatic Bed • Reef
	Intertidal	<ul style="list-style-type: none"> • Aquatic Bed • Reef • Rocky Shore • Unconsolidated Shore
Estuarine	Subtidal	<ul style="list-style-type: none"> • Rocky Bottom • Unconsolidated Bottom • Aquatic Bed • Reef
	Intertidal	<ul style="list-style-type: none"> • Aquatic Bed • Reef • Streambed • Rocky Shore • Unconsolidated Shore • Emergent Wetland • Scrub-Shrub Wetland • Forested Wetland
Riverine	Tidal	<ul style="list-style-type: none"> • Rock Bottom • Unconsolidated Bottom • Aquatic Bed • Rocky Shore • Unconsolidated Shore • Emergent Wetland
	Lower Perennial	<ul style="list-style-type: none"> • Rock Bottom • Unconsolidated Bottom • Aquatic Bed • Rocky Shore • Unconsolidated Shore • Emergent Wetland
	Upper Perennial	<ul style="list-style-type: none"> • Rock Bottom • Unconsolidated Bottom • Aquatic Bed • Rocky Shore • Unconsolidated Shore
	Intermittent	<ul style="list-style-type: none"> • Streambed
Lacustrine	Limnetic	<ul style="list-style-type: none"> • Rock Bottom • Unconsolidated Bottom • Aquatic Bed
	Littoral	<ul style="list-style-type: none"> • Rocky Bottom • Unconsolidated Bottom • Aquatic Bed • Rocky Shore • Unconsolidated Shore • Emergent Wetland
Palustrine		<ul style="list-style-type: none"> • Rock Bottom • Unconsolidated Bottom • Aquatic Bed • Unconsolidated Shore • Moss-Lichen Wetland • Emergent Wetland • Scrub-Shrub Wetland • Forested Wetland

Wetland I.D.	Total Acres	Impacted Acres	
			
			
			

Symbols Key

- | | | | |
|---|---|---|--|
|  | Groundwater Recharge/
Discharge |  | Sediment/Shoreline
Stabilization |
|  | Floodflow Alteration
(Storage & Desynchronization) |  | Wildlife Habitat |
|  | Fish and Shellfish Habitat |  | Recreation(Consumptive &
Non-Consumptive) |
|  | Sediment/Toxicant
Retention |  | Educational/Scientific
Value |
|  | Nutrient Removal/
Retention/Transformation |  | Uniqueness/Heritage |
|  | Production Export
(Nutrient) |  | Visual Quality/Aesthetics |
| | | ES | Endangered Species |

Wetland Function-Value Evaluation Form

Total area of wetland _____ Human made? _____ Is wetland part of a wildlife corridor? _____ or a "habitat island"? _____

Adjacent land use _____ Distance to nearest roadway or other development _____

Dominant wetland systems present _____ Contiguous undeveloped buffer zone present _____

Is the wetland a separate hydraulic system? _____ If not, where does the wetland lie in the drainage basin? _____

How many tributaries contribute to the wetland? _____ Wildlife & vegetation diversity/abundance (see attached list)

Wetland I.D. _____

Latitude _____ Longitude _____

Prepared by: _____ Date _____

Wetland Impact:
Type _____ Area _____

Evaluation based on:
Office _____ Field _____

Corps manual wetland delineation completed? Y _____ N _____

Function/Value	Suitability Y / N	Rationale (Reference #)*	Principal Function(s)/Value(s)	Comments
 Groundwater Recharge/Discharge				
 Floodflow Alteration				
 Fish and Shellfish Habitat				
 Sediment/Toxicant Retention				
 Nutrient Removal				
 Production Export				
 Sediment/Shoreline Stabilization				
 Wildlife Habitat				
 Recreation				
 Educational/Scientific Value				
 Uniqueness/Heritage				
 Visual Quality/Aesthetics				
ES Endangered Species Habitat				
Other				

Notes:

* Refer to backup list of numbered considerations.

Bibliography

- Adamus, P.R., E.J. Clairain, Jr., R.O. Smith, and R.E. Young. 1987. Wetland Evaluation Technique (WET); Volume II: Methodology. Operational Draft Technical Report FHWA-IP-88-029. US Army Engineer Waterways Experiment Station. Vicksburg, MI. 279 pp.
- Ammann, A.P. and A.L. Stone. 1991. Method for the comparative evaluation of nontidal wetlands in New Hampshire. New Hampshire Department of Environmental Services. NHDES-WRD-1991-3.
- Ammann, A.P., R.W. Franzen, and J.L. Johnson. 1986. Method for the evaluation of inland wetlands in Connecticut. Connecticut Department of Environmental Protection. Bulletin No. 9.
- Barkman, J.J., H. Doing, and S. Segal. 1964. Kritische Bemerkungen und Vorschläge zur quantitativen Vegetationsanalyse. *Acta Botanica Neerlandica*. 13:394-419.
- Brinson, M.M (1993). "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Council on Environmental Quality. 1978. National Environmental Policy Act. Implementation of Procedural Provisions. 40 CFR 1500.
- Cowardin, L.M., V. Carter, F.C. Golet, E.T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. US Government Printing Office. Washington D.C. GPO 024-010-00524-6.103 pp.
- FHWA. 1988. Applying The Section 404 Permit Process to Federal-Aid Highway Projects. Washington, D.C. Publication No. FHWA-RE-88-028.
- Golet, F.C., J.S. Larson. 1974. Classification of freshwater wetlands in the glaciated Northeast. U.S. Fish Wildl. Serv., Resour. Publ. 116. 56 pp.
- Larson, J.S. 1976. Models for Assessment of Freshwater Wetlands. Water Resources Research Center. University of Massachusetts at Amherst. Publication 32, 91 pp.
- Larson, J.S., P.R. Adamus, and E.J. Clairain. 1989. Functional Assessment of Freshwater Wetlands: A Manual and Training Outline. Publication No. 89-6. University of Massachusetts. Amherst, Massachusetts. 62 p.
- McHarg, I. 1969. Design with Nature. Natural History Press. 198 pp. (Reprinted in 1992 by John Wiley & Sons, Inc. New York.)
- Mitsch, W.J. and J.G. Gosselink. 1993. Wetlands, 2nd edition. Van Nostrand Reinhold Company Inc., New York, N.Y.
- Richardson, C.J. 1994. Ecological functions and human values in wetlands: A framework for assessing forestry impacts. *Wetlands*. 14(1). 1-9 pp.

- The National Wetlands Policy Forum. 1988. Protecting America's Wetlands: an action agenda. The Conservation Foundation, Washington, DC. 69 pp.
- Tufte, E.R. 1983. The Visual Display of Quantitative Information. Graphics Press. Cheshire, Connecticut. 197 pp.
- Tufte, E.R. 1990, Envisioning Information. Graphics Press. Cheshire, Connecticut. 126 pp.
- USACOE. 1986. Regulatory Programs of the Corps of Engineers. 33 CFR Parts 320 through 330. Fed. Reg. 52(7):1182. 51(219):41206-41260.
- USACOE. 1990. Memorandum—Section 404 Mitigation Memorandum of Agreement. CECW-OR. Washington, D.C. 8 pp.
- USACOE. 1991. Memorandum for Regulatory Staff—WET II Assessment Methodology. CENED-OD-R (1145-2-303b) Waltham, Massachusetts
- USACOE. 1991. Nationwide Permit Program Regulations and Issue, Reissue, and Modify Nationwide Permits. 33 CFR Part 330. Fed. Reg. 56(226):59110-59147.
- USACOE. 1993. The Highway Methodology Workbook. US Army Corps of Engineers New England Division. 28 pp. NEDEP-360-1-30.
- USACOE. 1993. Clean Water Act Regulatory Programs. 33 CFR Parts 323 and 328. Fed. Reg. 58(163):45008-45038.
- Wigley, T.B. and T.H. Roberts. 1994. Wildlife changes in southern bottomland hardwoods due to forest management practices. Wetlands 14:(in press).

Photo Credits:

- *US Army Corps of Engineers*
- *William Lawless*
- *Richard Roach*
- *Ruth Ladd*

SEPTEMBER 1999

NAEEP-360-1-30a

This brochure supercedes NEDEP-360-1-30a
NOVEMBER 1995

APPENDIX C

DEP FIELD SURVEY AND COASTAL WETLAND SURVEY CHECKLISTS

**APPENDIX A: MDEP VISUAL EVALUATION
FIELD SURVEY CHECKLIST**
(Natural Resources Protection Act, 38 M.R.S. §§ 480 A - Z)

Name of applicant: _____ Phone: _____

Application Type: _____

Activity Type: (brief activity description) _____

Activity Location: Town: _____ County: _____

GIS Coordinates, if known: _____

Date of Survey: _____ Observer: _____ Phone: _____

**Distance Between the Proposed Visibility
Activity and Resource (in Miles)**

1. Would the activity be visible from:	0-¼	¼-1	1+
A. <i>A National Natural Landmark or other outstanding natural feature?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. <i>A State or National Wildlife Refuge, Sanctuary, or Preserve or a State Game Refuge?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. <i>A state or federal trail?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
D. <i>A public site or structure listed on the National Register of Historic Places?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
E. <i>A National or State Park?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
F. 1) <i>A municipal park or public open space?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2) <i>A publicly owned land visited, in part, for the use, observation, enjoyment and appreciation of natural or man-made visual qualities?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3) <i>A public resource, such as the Atlantic Ocean, a great pond or a navigable river?</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. What is the closest estimated distance to a similar activity?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. What is the closest distance to a public facility intended for a similar use?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Is the visibility of the activity seasonal? (i.e., screened by summer foliage, but visible during other seasons)		<input type="checkbox"/> Yes	<input type="checkbox"/> No
5. Are any of the resources checked in question 1 used by the public during the time of year during which the activity will be visible?		<input type="checkbox"/> Yes	<input type="checkbox"/> No

A listing of National Natural Landmarks and other outstanding natural features in the State of Maine can be found at: www.nature.nps.gov/nnl/Registry/USA_map/states/Maine/maine.htm. In addition, unique natural areas are listed in the Maine Atlas and Gazetteer published by DeLorme.

(pink)

Most Maine State and National Wildlife Refuges, Sanctuaries, and Preserves and State Game Refuges are listed in the Maine Atlas and Gazetteer published by DeLorme.

Most State and federal trails are listed in the Maine Atlas and Gazetteer published by DeLorme. In addition, the Maine Department of Conservation maintains a list of state parks with trails that can be searched by county at: www.state.me.us/doc/parks/programs/db_search/index.html

Maine sites and structures listed on the National Register of Historic Places pursuant to the National Historic Preservation Act of 1966, as amended, can be searched by town at: www.cr.nps.gov/nr/research/nris.htm

In addition, State historic sites can be found at: www.state.me.us/doc/parks/programs/db_search/index.html A partial listing of historic sites in Maine can be found in the Maine Atlas and Gazetteer published by DeLorme.

A listing of Maine State Parks can be found at: www.state.me.us/doc/parks/programs/db_search/index.html or in the Maine Atlas and Gazetteer published by DeLorme. Acadia National Park on Mount Desert Island is Maine's only National Park.

For guidance on completing this field survey checklist, please contact Licensing staff in the Division of Land Resource Regulation at the following offices:

(Headquarters)
Central Maine Regional Office
17 State House Station
Ray Building, Hospital Street
Augusta, Maine 04333
(207) 287-7688 or
toll free at **1-800-452-1942**

Eastern Maine Regional Office
106 Hogan Road
Bangor, Maine 04401
(207) 941-4570 or
toll free at **1-888-769-1137**

Northern Maine Regional Office
1235 Central Drive
Presque Isle, Maine 04769
(207) 764-0477 or
toll free at **1-888-769-1053**

Southern Maine Regional Office
312 Canco Road
Portland, Maine 04103
(207) 822-6300 or
toll free at **1-888-769-1036**

(pink)

APPENDIX B

MAINE'S COASTAL WETLANDS: COASTAL WETLAND CHARACTERIZATION GUIDELINES

(Partly derived from Maine's Coastal Wetlands: Volume II)

Guidelines for the sampling and assessment of coastal wetlands have been developed by the Department of Environmental Protection to standardize habitat characterizations and functional assessments of coastal wetlands as required by the Natural Resources Protection Act (NRPA). The NRPA requires all applicants to characterize coastal wetland areas occurring in the location or vicinity of a proposed activity. Intertidal and/or subtidal characterizations are required for the following activities: fill, crib-supported or subtidal piers, lobster pounds, shoreline stabilization, or dredging. Activities impacting over 500 square feet of coastal wetland require a functional assessment performed by a professional wetland scientist unless the Department determines that the activity will have minimal adverse impact on the functions and values of the wetland.

This checklist satisfies the requirement for Attachment 12, Wetland Delineation Report, described in Part II of the NRPA application for coastal wetlands located only in intertidal areas and subtidal areas less than one foot in depth. The checklist is required for all activities impacting coastal wetlands to provide information describing coastal habitats and assess their most critical functions and values with the least amount of sampling effort possible, providing DEP licensing staff and biologists with information. The information provided will be used to determine whether the Department will require further sampling and assessment. This checklist does not substitute for any other NRPA application requirements.

SURVEY METHODS:

Following the methods below, survey and photograph the activity area on an ebb tide.

1. Walk throughout the activity area and note the location and measurements of all dominant habitat types. If not part of an application, complete an overhead drawing of the activity area. The overhead drawing should include the location and types of vegetation, boundaries of habitat types, sample locations, the location of spring high tide, mean high water and mean low water, and contours, if possible.
2. Take photographs of activity area and habitat types. (Include date, time, tide cycle and location of each photograph).
3. Search throughout the entire activity site, turning over rocks, wood, and algal mats, and look for any identifiable organisms present on the surface of the habitat, list the organisms found if known, and estimate their relative abundance. Complete the Checklist.
4. Using a clam rake or shovel, turn over sediments at random locations throughout the intertidal zone (at least one per zone, high, mid and low). Look for any identifiable organisms present in the sediments and estimate their relative abundance. Mark location on overhead drawing. Complete the Checklist.

PLEASE NOTE: Some activities may require quantitative benthic analysis of the sediments. Examples of such activities include dredges, lobster pounds, and fill activities consisting of over 500 square feet. Determination of sampling requirements may be made through consultation with DEP licensing staff and biologists. Guidelines for quantitative benthic sampling can be provided on request.

DEFINITIONS:

Area of Impact:

Direct Impact: The footprint of a proposed activity; e.g. area of dredge, area covered by cribs, base of riprap.

Indirect Impact: The area surrounding a proposed activity that will potentially be affected by the activity; e.g. shoreline adjacent to riprap, salt marsh areas, shaded areas. NOTE: The area of indirect impact will vary from site to site and should be determined on a case by case basis by the consultant, the applicant, and DEP staff.

(pink)

Timing of Survey Work: The date, time of day, and tidal height of sampling. Ideally, surveys should be conducted between May 1 and November 30 on an ebb or flood tide. Surveys may be conducted at other times of year, if necessary. Include the timing of low tide on the survey date. If the activity will extend into the low intertidal and/or shallow subtidal, the survey should be conducted on a negative or zero tide.

Energy Levels:

Exposed/High energy: Area exposed to oceanic swell and wind waves. Wind fetch (i.e. direction of origin) unlimited. Water velocity exceeds 2 meters/second.

Partially exposed/Moderate energy: Oceanic swell attenuated by offshore reefs, islands, or headlands, but shoreline is substantially exposed to wind waves. Typical of cobble or gravel fields. Water velocity between 1 and 2 meters/second.

Semi-protected/Low energy: Shoreline protected from sea swell, but it may receive waves generated by moderate fetch. Typical of gravel or unconsolidated muddy sediments. Water velocity less than 1 meter/second.

Protected/Low energy: No sea swell, little or no current, and restricted wind. Typical of unconsolidated muddy sediments. Water velocity less than 1 meter/second.

Drainage on Intertidal Flats: The amount of water left on intertidal area after ebb tide.

Habitats: description of activity site and adjacent areas

Sand Beach: exposed environments containing at least 75% sand.

Boulder/cobble Beach: exposed environments dominated by boulders and/or loose rounded rocks.

Sand Flat: protected and semi-protected environment dominated by sandy sediment.

Mixed Coarse & Fines: semi-protected environment consisting of a mixture of rocks, boulders, gravel, sand, cobbles, and mud.

Rocky Shore: semi-protected to moderate consisting of rocks, boulders, or ledge.

Salt Marsh: persistent near shore emergent grass habitats.

Ledge: stable bedrock

Mud Flat: protected environments containing at least 75% mud

Eelgrass: intertidal and subtidal grass habitat.

Relative Abundance: the frequency of an organism at or adjacent to the activity site

Absent: Organism is physically absent from the specific area.

Scattered or occasional: A limited number of a specific organism found only after a thorough investigation of the habitat *or* organisms occurring in small (<1/2 square foot) patches or small clumps throughout the zone.

Common: Specific organism found readily with little investigation, but not visually obvious; found repeatedly and/or occurring in numerous patches throughout habitat.

Abundant: Specific organism is visually obvious throughout area with limited or no habitat disturbance.

(pink)

**APPENDIX B: MDEP COASTAL WETLAND CHARACTERIZATION:
INTERTIDAL & SHALLOW SUBTIDAL FIELD SURVEY CHECKLIST**

NAME OF APPLICANT: _____ PHONE: _____

APPLICATION TYPE: _____

ACTIVITY LOCATION: TOWN: _____ COUNTY: _____

ACTIVITY DESCRIPTION: fill pier lobster pound shoreline stabilization
 dredge other: _____

DATE OF SURVEY: _____ OBSERVER: _____

TIME OF SURVEY: _____ TIDE AT SURVEY: _____

SIZE OF DIRECT IMPACT OR FOOTPRINT (square feet):
Intertidal area: _____ Subtidal area: _____

SIZE OF INDIRECT IMPACT, if known (square feet): _____
Intertidal area: _____ Subtidal area: _____

HABITAT TYPES PRESENT (check all that apply):
 sand beach boulder/cobble beach sand flat mixed coarse & fines salt marsh
 ledge rocky shore mudflat (sediment depth, if known: _____)

ENERGY: protected semi-protected partially exposed exposed

DRAINAGE: drains completely standing water pools stream or channel

SLOPE: >20% 10-20% 5-10% 0-5% variable

SHORELINE CHARACTER:
 bluff/bank (height from spring high tide: _____) beach rocky vegetated

FRESHWATER SOURCES: stream river wetland stormwater

MARINE ORGANISMS PRESENT:

	absent	occasional	common	abundant
mussels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
clams	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
marine worms	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
rockweed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
eelgrass	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
lobsters	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SIGNS OF SHORELINE OR INTERTIDAL EROSION? yes no

PREVIOUS ALTERATIONS? yes no

CURRENT USE OF SITE AND ADJACENT UPLAND:
 undeveloped residential commercial degraded recreational

PLEASE SUBMIT THE FOLLOWING:
 Photographs Overhead drawing (pink)