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Via Electronic Mail

December 22, 2021

Mr. Dean Tagliaferro
EPA Project Coordinator
U.S. Environmental Protection Agency
c/o HDR, Inc.
10 Lyman Street, Suite 2
Pittsfield, MA 01201

Re: GE-Pittsfield/Housatonic River Site
Rest of River (GECD850)
Baseline Restoration Assessment Work Plan

Dear Mr. Tagliaferro:

In accordance with the approved Final Revised Rest of River Statement of Work for the Rest of River, enclosed for EPA's review and approval is GE's *Baseline Restoration Assessment Work Plan*, prepared for GE by AECOM.

Please let me know if you have any questions about this Work Plan.

Very truly yours,

Kevin G. Mooney
Senior Project Manager – Environmental Remediation

Enclosure

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December 2021
Housatonic River – Rest of River



Baseline Restoration Assessment Work Plan

Prepared for General Electric Company
Pittsfield, Massachusetts

December 2021
Housatonic River – Rest of River

Baseline Restoration Assessment Work Plan

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FIGURE

Figure 1 Wetland Functional Units in the PSA

APPENDIX

A. MNHESP Vernal Pool Field Observation Form

ABBREVIATIONS

BEHI	Bank Erosion Hazard Index
BRA	Baseline Restoration Assessment
CD	Consent Decree
CMS	Corrective Measures Study
EFDC	Environmental Fluid Dynamics Code
EPA	U.S. Environmental Protection Agency
FEMA FIS	Federal Emergency Management Agency Flood Insurance Study
Final Accessibility Report	<i>Final Morphology and Accessibility Survey Report</i>
Final Revised SOW	<i>Final Revised Rest of River Statement of Work</i>
GE	General Electric Company
GPS	global positioning system
HEC-RAS	Hydrologic Engineering Center River Analysis Center (USACE)
IPaC	Information, Planning, and Consultation System (of the USFWS)
LiDAR	Light Detection and Ranging
MIPAG	Massachusetts Invasive Plant Advisory Group
mg/kg	milligram per kilogram
MNHESP	Massachusetts Natural Heritage and Endangered Species Program
MassDFW	Massachusetts Division of Fisheries and Wildlife
MIPAG	Massachusetts Invasive Plant Advisory Group
NBS	Near Bank Stress
PCBs	polychlorinated biphenyls
PDI	pre-design investigation
PSA	Primary Study Area
RBP	EPA Rapid Bioassessment Protocol
RCRA	Resource Conservation and Recovery Act
RCMS	Revised Corrective Measures Study for Housatonic Rest of River
RD/RA	Remedial Design/Remedial Action
Revised Permit	Revised Final RCRA Permit Modification
ROR	Rest of River
SOP	Standard Operating Procedure
SOW	Statement of Work
UDF	Upland Disposal Facility
USACE	U.S. Army Corps of Engineers
USDA NRCS	U.S. Department of Agriculture Natural Resource Conservation Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Woodlot	Woodlot Alternatives, Inc (now Stantec)

1 Introduction

1.1 Background

Pursuant to Section II.B.1.c.(2)(a) of the Revised Final Resource Conservation and Recovery Act (RCRA) Permit Modification (Revised Permit; EPA 2020), issued by the U.S. Environmental Protection Agency (EPA) to the General Electric Company (GE) on December 16, 2020, for the Rest of River (ROR) portion of the GE-Pittsfield/Housatonic River Site, GE is required to prepare a work plan to conduct a Baseline Restoration Assessment (BRA) of areas that will be affected by the Rest of River Remedial Action selected by EPA in the Revised Permit. The requirements for that work plan were described further in Section 4.2.1.4 of GE's *Final Revised Rest of River Statement of Work* (Final Revised SOW; Anchor QEA et al., 2021), submitted on September 14, 2021 and approved by EPA on September 18, 2021. In accordance with those requirements, this document provides GE's BRA Work Plan.¹

This BRA Work Plan describes the process and activities that GE will conduct to identify and document the existing ecological conditions and functions in the areas that will be subject to remediation activities and associated support areas. As discussed herein, the BRA will include a general assessment of such conditions and functions in the overall areas within the ROR that could potentially be affected by remediation activities (but not portions where no remediation or impacts will occur), referred to herein as a "site-wide" assessment. It will also include an assessment of such conditions and functions in the specific units where such activities could occur, referred to in the Final Revised SOW as "Remediation Areas," but referred to herein as "Remediation Units" or "RUs."² This approach is described further in Section 1.5. As also noted there, the initial BRA activities for both the site-wide assessment and for individual RUs will be conducted in the near term and will rely on existing information, supplemented by some additional reconnaissance-level investigations and by survey work being otherwise conducted as part of pre-design investigation (PDI) activities. Once the specific areas that will require remediation and the associated support areas (access roads and staging areas) have been identified during conceptual design, more specific and detailed BRA activities will be conducted for each RU and will be reported in Supplemental BRA Reports for those RUs.

¹ Although the Revised Permit is currently being appealed by other parties to the EPA Environmental Appeals Board, GE agreed in a February 10, 2020 Settlement Agreement to submit the SOW and, subject to approval by EPA, to perform the investigation and design work specified in the SOW as contractual obligations under that agreement, unless and until EPA issues a further revised permit that is not substantially similar to the current Revised Permit. This includes the submission and implementation of this BRA Work Plan.

² In accordance with the Final Revised SOW, the Upland Disposal Facility (UDF) site and UDF support area to be used in the Remedial Action will be subject to a separate baseline habitat assessment, which is described in the Pre-Design Investigation Work Plan for the UDF, submitted to EPA on November 24, 2021.

1.2 Restoration Performance Standards

As summarized in Section 2.1.3 of the Final Revised SOW, the Performance Standards for restoration of disturbed areas, provided in Section II.B.1.c.(1) of the Revised Permit, are to: (1) implement a comprehensive program of restoration measures to address the impacts of the Corrective Measures on affected ecological resources, species, and habitats, including, but not limited to, riverbanks, riverbed, floodplain, wetland habitat, and the occurrence of threatened, endangered, or other state-listed species and their habitats; and (2) return areas disturbed by remediation activities to pre-remediation conditions (e.g., the functions, values, characteristics, vegetation, habitat, species use, and other attributes) to the extent feasible and consistent with the remediation requirements. Under Section II.B.1.c.(2) of the Revised Permit, these Performance Standards will be achieved through a program designed to address the potential impacts of remediation, which will be specified in the following series of documents: (1) a BRA Work Plan; (2) a Restoration Performance Objectives and Evaluation Criteria report; (3) Restoration Corrective Measures Coordination Plans; and (4) Restoration Plans. Each of those documents is discussed further in the Final Revised SOW.

1.3 Baseline Restoration Assessment Objectives

The BRA is intended to provide a detailed baseline ecological inventory and assessment of pre-remediation conditions and functions of the affected habitats and thus to serve as the foundation for meeting the restoration Performance Standards set forth in Section II.B.1.c.(1) of the Revised Permit.

1.4 BRA Work Plan Requirements

As provided in Section II.B.1.c.(2)(a) of the Revised Permit and Section 4.2.1.4 of the Final Revised SOW, the BRA Work Plan is required to describe the procedures to be implemented to perform a baseline assessment of pre-remediation conditions, functions, and values of river bottom, riverbank, backwater, floodplain, impoundment, and vernal pool habitats, as well as the occurrence of federal or state-listed threatened or endangered species or other state-listed rare species present in the RUs. Specifically, the BRA Work Plan must propose the following for each RU:

- Identification of the presence and location of specific habitat types, including delineation of existing wetlands;
- Identification of the presence, location, abundance, and condition of federal or state-listed threatened or endangered species or other state-listed species and their habitats, as well as other representative species;
- Identification of the presence, location, abundance, and condition of invasive species;
- Evaluation of vernal pool locations, hydrology, and species use; and

- Characterization of physical/biological attributes of affected habitats (e.g., substrate characteristics, water depth, velocity, temperature, elevation/bathymetry, species composition, density, percent cover, and structural components).

1.5 Site-Wide and Remediation Unit Coverages

As noted above, the BRA will include a general assessment of the existing ecological conditions and functions in the overall areas within the ROR that could potentially be affected by remediation activities. These will include the riverine habitats in Reach 5, the riverbanks in Reaches 5A and 5B, the floodplain in Reach 5, all of the impoundments in Reaches 6, 7, and 8 (but excluding the flowing portions of Reach 7), and the designated Exposure Areas (EAs) and vernal pools (if any) in the Reach 7 floodplain – collectively referred to herein as “site-wide.”³ As also noted above, the BRA will also include an assessment of the baseline ecological conditions and functions in the individual RUs (called “Remediation Areas” in the Final Revised SOW). The RUs that will be assessed individually will be identified in the forthcoming Overall Strategy and Schedule document; they are anticipated to be Reach 5A, Reach 5B, Reaches 5C/6, Reach 7 (impoundments, EAs, and vernal pools), and Reach 8.

For both the site-wide assessment and the assessment of individual RUs, the initial BRA activities that will be conducted in the near term and will be reported in an initial BRA Report will necessarily be fairly general and will rely on existing information, supplemented by some additional reconnaissance-level investigations and investigations that are being otherwise conducted as part of PDI activities. In that regard, the assessments of the individual RUs will largely build on the site-wide information as it applies to those specific RUs. The reason is that, at that time, much information relevant to assessment of the specific RUs will not be known. This includes the specific locations to be remediated within the RUs, as well as the location of access roads and staging areas. For this reason, following submittal and approval of the Conceptual Remedial Design/Remedial Action (RD/RA) Work Plan for each RU, it will be necessary to conduct additional BRA activities that take into account the specific areas to be remediated and associated support areas. The plans for these additional BRA activities in each RU will be included as part of or in an addendum to the Conceptual RD/RA Work Plan for that RU, and the results will be presented in a Supplemental BRA Report for that RU, which will be submitted after the additional BRA data collection and before development of the Final RD/RA Work Plan for the subject RU.

1.6 Work Plan Organization

The remainder of this BRA Work Plan is organized into the following sections:

- Section 2 provides a summary of previous ecological inventories and assessments in the ROR.

³ The river and floodplain reaches referenced herein are those identified in the Revised Permit.

- Section 3 contains a description of the proposed procedures to document and assess baseline ecological conditions and functions, both on a site-wide basis and for the individual RUs, in the ROR riverine, riverbank, backwater, impoundment, and floodplain habitats (including vernal pools) which could potentially be affected by the Remedial Action.
- Section 4 presents the anticipated schedule for BRA activities.

2 Summary of Prior ROR Ecological Inventories and Assessments

This section identifies and summarizes a number of prior reports that have included characterization of the habitats and ecological conditions of the Housatonic ROR area. Where appropriate, the information within these documents will be used in the BRA, particularly in developing the site-wide BRA.

2.1 Pre-CMS Ecological Characterizations

Numerous investigations involving characterizations and assessments of ecological conditions in the ROR area were conducted in the late 1990s and early 2000s. The *Ecological Characterization of the Housatonic River* (Ecological Characterization; Woodlot 2002a) prepared by Woodlot Alternatives, Inc. (now Stantec) for EPA summarized detailed field investigations performed over a three-year period (1998-2000) and associated research compiling the results of previous investigations of the ecological resources of the Primary Study Area (PSA) – the stretch of river and floodplain extending from the confluence of the East and West Branches of the Housatonic River in Pittsfield (the Confluence) south to Woods Pond Dam (Reaches 5 and 6). Woodlot also prepared a similar report covering the portions of the river and floodplain downstream of the PSA – the *Ecological Characterization of The Housatonic River Downstream of Woods Pond* (Woodlot 2002b). The 2002 Woodlot reports constitute a compilation of reported landscape/biophysical settings, natural community types, and biota (including macroinvertebrates, fish, amphibians, reptiles, birds, and mammals), including rare species information. That characterization work was conducted by experienced wildlife biologists and botanists during thousands of field survey hours from 1998 through 2000 to evaluate ecological resources within the ROR, particularly in the PSA.

In addition, GE's 2003 RCRA Facility Investigation Report (RFI Report; BBL and QEA 2003) provides substantial information characterizing ecological resources in the ROR area.

Finally, EPA's modeling efforts for the ROR, notably its EFDC (Environmental Fluid Dynamics Code) hydrodynamic, sediment transport, and contaminant fate modeling (EPA 2006), provide information on specific functions, such as riverine hydrodynamics, that can be used in characterizing ecological functions.

2.2 CMS Report (2007)

In 2007, GE issued a Corrective Measures Study (CMS) Report, which provided detailed evaluations of remedial alternatives for the ROR (Arcadis and QEA 2007). The CMS evaluated eight options for addressing sediments, seven options for addressing floodplain soils, and five options for handling sediments and soils that would be removed from the River and floodplain. In the course of those

evaluations, the CMS Report presented substantial information on ecological baseline conditions in the ROR.

2.3 Stantec Bank Erosion Evaluation (2009)

On EPA's behalf, its consultants at Stantec Consulting Services, Inc (Stantec) conducted an evaluation of erosion from the ROR riverbanks, using the Bank Erosion Hazard Index (BEHI) and Near Bank Stress (NBS) ratings. This evaluation was presented in a report entitled *A Study of Bank Erosion Rates within Selected Reaches of the Housatonic River* (Stantec 2009). In Reaches 5A and 5B, data were collected in May of 2009 from approximately 41,000 linear feet of stream channel and 82,000 feet of streambank (both banks were surveyed). Field surveys of bank erosion were stopped near the end of Reach 5B.

2.4 Example Area Evaluations (February 2010)

In February 2010, GE submitted a Supplement to Interim Response presenting detailed evaluations of six Example Areas within Reaches 5A to 5C (AECOM 2010). Those evaluations contain considerable information on the existing ecological conditions and functions in the six Example Areas selected by EPA (which, as noted above, are representative of the river and floodplain ecology in the PSA), as well as the impacts of remedial alternatives on those conditions and functions.

2.5 RCMS Report (October 2010)

In October 2010, GE issued a Revised Corrective Measures Study (RCMS) Report, which included additional remedial alternatives, provided an updated evaluation of the remedial alternatives, and responded to comments on the 2007 CMS Report (Arcadis et al. 2010). The RCMS Report included a substantially expanded description of the affected habitats in the ROR and the ecological impacts and potential for restoration associated with the remedial alternatives.

2.6 MNHESP Investigations

Investigations, data, mapping, and reports from the Massachusetts Natural Heritage and Endangered Species Program (MNHESP) of the Massachusetts Division of Fisheries and Wildlife (Mass DFW) have been ongoing for at least the last two decades. These efforts included designation of Priority Habitats of Rare Species and Estimated Habitats of Rare Wildlife, as well as Biomaps of Core Habitats and Supporting Natural Landscapes within the PSA. These sources described habitat conditions of state-wide significance and detailed the state-listed rare species (i.e., threatened, endangered, and special concern species) that were documented within the Priority Habitat limits delineated. In 2008-2009, MNHESP conducted rare species field surveys over thousands of hours to identify populations of state-listed rare species within the Upper Housatonic River Valley (MNHESP, 2010). The results of those surveys included the identification of over 100 state-listed species within the areas surveyed. As of 2010, this research confirmed the presence of at least 49 state-listed species in the Housatonic River Valley between the Confluence and Rising Pond Dam (32 between the Confluence and Woods

Pond Dam and 30 between Woods Pond and Rising Pond Dams, with many of these species found in both stretches), and resulted in the preparation of updated Priority Habitat mapping for each of these species, presented in the 2010 RCMS Report. These maps showed Priority Habitat for 40 state-listed species within the lateral boundaries of the Rest of River (28 in the PSA and 23 between Woods Pond and Rising Pond Dams, with numerous species in both stretches).

Further, in July of 2012, the Mass DFW issued a letter to EPA which reported on its designation of Core Habitat Areas within the ROR that was based upon the MNHESP state-listed species data and analyses (Mass DFW 2012). This letter, which was attached to the Revised Permit, included maps which depicted the locations of the different types of Core Habitat areas and presented the criteria for the designations.

2.7 Reach 5A Vernal Pool Investigations (2018-2020)

With EPA approval, GE conducted an identification and evaluation of vernal pools in the Reach 5A floodplain in 2018 and 2019 in accordance with a protocol approved by EPA (EPA 2018). Those identifications and evaluations were described in reports submitted to EPA on November 18, 2019, and July 16, 2020 (AECOM 2020), and February 4, 2021 (GE 2021), which were conditionally approved by EPA on June 16, 2020, August 10, 2020, and March 9, 2021, respectively. These reports included the identification of pools in Reach 5A that met the MNHESP biological and physical criteria for vernal pools, as well as providing information on the hydrology of the pools and the faunal species observed in those pools.⁴ During the course of those investigations, information was also obtained, but not included in the reports, on other aspects of the vernal pools in Reach 5A, including flora, topography, bottom sediment/soil composition, in-pool physical structure, surrounding land use, and relationship/proximity to other vernal pools. That existing information will be compiled and used in the BRA, as discussed in Section 3.6.

2.8 Final Morphology and Accessibility Surveys (2018-2020)

In response to a directive from EPA, in 2018 and 2019, GE conducted a desktop review and evaluation of available information on Reach 5A of the ROR floodplain to identify any non-riverbank areas of the floodplain with the potential for soil erosion into the river and any visually apparent changes in morphology that occurred since the Woodlot (2002) survey and that could affect property boundaries, super habitat boundaries, application of accessibility factors, and selection of data for use in developing Floodplain Exposure Point Concentrations (EPCs). In addition, GE performed a visual field reconnaissance to check the areas identified from the desktop review and record observations of any of the above-mentioned conditions. The results of these activities were presented in a number of reports to EPA, the final of which, entitled *Final Morphology and Accessibility Survey Report*, was submitted to EPA on July 16, 2020 (Final Accessibility Report; AECOM

⁴ That information was also submitted to MNHESP, which certified the vernal pools that met its criteria.,

and Anchor QEA 2020). That report presented the results of the field surveys to assess appreciable changes in morphology and/or the accessibility categories previously assigned by EPA, as well as the results of an evaluation of the presence of any non-riverbank areas with the potential for soil erosion into the river. It also included super habitat mapping for the Reach 5A floodplain, a proposal for how all waterbodies in the Reach 5A floodplain should be characterized, and a proposed delineation of the Frequently Used Subareas (as defined in the Revised Permit) in the Reach 5A floodplain.

3 Procedures to Document and Assess Baseline Ecological Conditions and Functions

This section describes the process and methods proposed for the identification and documentation of existing conditions of the habitats that will potentially be affected by remediation activities and for the assessment of the functions and values of those habitats. The process and methods proposed will first be applied generally to the site-wide limits of potential remedial activities within Reaches 5-8. This site-wide assessment will largely rely on the consolidation of existing information, but with some additional reconnaissance-level investigations or mapping/classification to supplement existing information if needed, and also, where possible, incorporation of survey and other data collected in accordance with GE's *Pre-Design Investigation Work Plan for Reach 5A Sediment and Riverbanks* (Reach 5A Sediment/Bank PDI Work Plan; Anchor QEA and AECOM 2021), as approved and/or revised in response to EPA conditions. For example, reliance on existing information for rare species locations is especially warranted on a site-wide basis, given the past investigations at this site that have been factored into the evaluation of remedial alternatives in the RCMS Report and that the occurrence or distribution of rare species is not necessarily related to reach/RU divisions. Accordingly, the site-wide BRA will provide an overview of the range of ecological conditions and functions for the riverine, riverbank, backwater, impoundment, and floodplain (including vernal pool) habitats within the ROR.

In conducting the general (or site-wide) BRA, consideration will be given to the extent of potential remedial activities throughout the ROR. For example, all of the riverine habitats in Reach 5 and all of the impoundments in Reaches 6, 7, and 8 will be included in that site-wide BRA since those areas could potentially be affected by remedial activities. However, the flowing subreaches of Reach 7, which are designated for MNR in the Revised Permit, will not be covered in the BRA. For the Reach 5 floodplain, the site-wide BRA will present a general characterization of existing ecological conditions throughout the floodplain, since remediation could occur in various locations in the floodplain; whereas for the Reach 7 floodplain, the site-wide BRA will focus on a general characterization of the designated EAs and identified potential vernal pools in that reach, since those are the portions that could be affected by remedial activities.

As described in Section 1.5, the initial BRA will also include a specific assessment of each RU, which will provide greater detail on that RU but still be limited in the evaluation of affected resources because the limits of remedial activities and associated support areas (access roads and staging areas) will not have been determined yet. Each initial RU-specific BRA will still largely rely on the consolidation of existing information that applies to conditions within the respective RU, but will be more focused on the conditions within each RU and will incorporate applicable survey and other data collected during previous investigations as well as other PDI activities as available at the time of initial BRA. For example, four of the Example Area assessments (AECOM 2010) included more

detailed information on habitats in Reach 5A, and that specific information will be reviewed for potential incorporation into the initial BRA for Reach 5A. The initial RU BRA sections will provide a framework for the results of more detailed assessments to be added when the limits of remedial activity and associated support areas are determined.

After the Conceptual RD/RA Work Plan is submitted and approved for each RU, the BRA process for that RU will continue with the collection of additional, focused information, as necessary, to supplement the existing information and/or to cover specific areas of remedial actions and support areas such as access roads and staging areas. Thus, for each RU, the initial BRA Report will provide general RU-specific information, but additional, more detailed BRA activities will need to be conducted after submittal and approval of the Conceptual RD/RA Work Plan for the subject RU. Those additional activities will focus on the specific areas to be remediated and the specific locations of the support areas (to the extent identified in the Conceptual RD/RA Work Plan).

The following sections describe the baseline inventory and function assessment process for both the site-wide and initial RU BRAs in each of the ROR habitats: riverine, riverbank, backwater, impoundment, floodplain wetland, floodplain upland, vernal pool, and rare species habitats. The more detailed inventory and assessment process for the areas of each RU where remedial and support activities will result in direct effects to those habitats, including the specific activities to be performed and the forms to be used for the detailed BRAs in those areas, will be described in, or in addenda to, the Conceptual RD/RA Work Plans for the individual RUs; and the results will be reported in Supplemental BRA Reports for those RUs.

3.1 Riverine Habitats

Numerous protocols have been developed pertaining to the collection of field data for evaluating the ecological conditions, functions, and values of rivers and streams. From a site-wide perspective, investigations of the ROR over the past 20-25 years have encompassed many of the parameters incorporated into such protocols. Accordingly, consolidating existing information on the relevant riverine habitats to develop the site-wide BRA is an appropriate initial step in the restoration assessment process. As discussed below, the site-wide assessment will incorporate information on key parameters which collectively provide a comprehensive description of the riverine characteristics in the ROR. This approach recognizes the link between parameters which encompass physical, hydrologic, and structural characteristics of the riverine system and ecological functions and values. Physical processes form habitat in a stream channel. For example, importation of woody debris, movement of sediment over a range of flows, formation of scour and depositional features due to channel morphology and flow variability, and changes on dynamic riverbanks all establish important habitat features. Combined with chemical constituents and biological interactions, physical habitat determines biological productivity and diversity, and drives the aquatic ecosystem.

Both the site-wide BRA of riverine habitat and the RU-specific assessments of such habitat will focus on the river channel in Reaches 5A, 5B, and 5C, which are the only parts of the ROR where remediation within the flowing river channel will be performed.

3.1.1 *Riverine Habitat Inventory Procedure*

Table 3.1.1 provides a summary of the parameters that will be incorporated into the site-wide assessment of riverine habitat conditions in the ROR as well as the initial RU BRAs for Reaches 5A, 5B, and 5C. As noted in the table, some of these parameters will be based on information that will be consolidated from the sources cited previously in Section 2 of this Work Plan, in some instances supplemented by site reconnaissance to verify, add to, or update that existing information. In other cases, the parameters will be based on information drawn from other tasks or steps in the remedial investigation process. These include physical descriptions and measurements from the topographic and bathymetric surveys of the PSA, as described in the Reach 5A Sediment/Bank PDI Work Plan, as partially approved by EPA on November 24, 2021, including the Light Detection and Ranging (LiDAR) survey of the PSA.⁵ Still other information, such as hydrologic/hydraulic data, will be obtained from sources such as the U.S. Geological Survey (USGS) gauging stations and previous or anticipated hydrologic modeling, if applicable and available (e.g., EFDC and potential updated hydraulic modeling).

As noted in Table 3.1.1, an initial step in the site-wide riverine habitat process is the generation of updated base mapping and classification of riverine conditions. The riverine classification system to be employed will follow that used in the 2002 Ecological Characterization. For that effort, community type mapping was produced for the PSA, including riverine habitats, and that work will be incorporated into updated mapping for this portion of the ROR, including the LiDAR mapping and/or sonar scanning (if conducted).

In addition to the mapping and classification process, the site-wide riverine inventory characterization will consolidate and incorporate a broad range of riverine characteristics related to riverine geomorphology, hydrology, floodplain connectivity, riverbank conditions, instream habitat, aquatic biota, and bordering vegetative conditions, as listed in Table 3.1.1. As described below, each parameter will be considered in assessing the ecological functions of the riverine habitat on a site-wide basis, and will also form the basis of each initial RU BRA prior to the determination of areas to be affected by remedial activities.

⁵ Although that Work Plan was submitted for Reach 5A, it proposed the performance of topographic and bathymetric surveys for the entire PSA because topographic and bathymetric data are needed to develop the hydraulic model that will be used as a design tool for Reach 5A; and that model is planned to extend from the Confluence to Woods Pond Dam, given that the latter serves as a hydraulic control point for much of the PSA. The LiDAR survey work that is part of these surveys was conducted on December 6-7, 2021.

The riverine habitat inventory process for each subject RU with such habitat will start with incorporating information consolidated for the site-wide riverine habitat characterization where it is applicable to the specific RU. Information on the parameters listed in Table 3.1.1 specific to each RU will be used to generally characterize riverine habitat conditions within that RU. Where applicable, this may include reference to specific conditions within each RU known to provide ecological habitats important to document in the BRA; an example of this might include documented site-specific occurrences of state-listed species such as triangle floater or wood turtle within the Reach 5A riverine habitat.

Following submission and approval of the Conceptual RD/RA Work Plans for the subject RUs, more detailed habitat characterization activities for those RUs will be conducted. Those additional habitat characterization activities will include RU-specific inventories and data collection for that RU focusing on the areas to be remediated. Characterization of the structural parameters of the baseline riverine habitat conditions in each RU with riverine habitat is anticipated to be based on RU-specific collection of the parameters in Table 3.1.1, as well as the physical characterization and habitat assessment protocols of EPA's Rapid Bioassessment Protocols (RBP; Barbour et al. 1999). The RBP provide for an integrated assessment, comparing habitat (e.g., physical structure, flow regime), water quality, and biological measures. They include standard measures for documenting a variety of watershed, riparian, and in-stream features, such as in-stream physical measures, aquatic vegetation, large woody debris, basic water quality parameters, sediment/substrate conditions, epifaunal habitat, embeddedness, flow regime, channel conditions, bank stability, and vegetative cover. Incorporation of the RBP elements would provide for a systematic documentation of baseline conditions which could serve as a reference for post-remediation restoration assessment. However, for Reach 5C, given the deeper, quiescent conditions of the river in that reach, the option of using side-scan sonar for habitat characterization and mapping will be considered instead of the RBP, based upon the extent of remedial activities.

Consistent with the approach described at the beginning of Section 3, the specific techniques to be used for the detailed riverine assessments, including the assessment forms to be used and the evaluation segments of the given reach for which the forms will be completed, will be described in, or in addenda to, the Conceptual RD/RA Work Plans for the RUs with riverine habitats; and the results will be reported in the Supplemental Reports for those RUs.

3.1.2 Riverine Habitat Functional Assessment

This task will involve the process to assess the ecological functions and services of the riverine conditions based upon the information consolidated in the inventory described above. As stated above, assessment of the existing functions will be based primarily upon the collection of data on measurable and observable structural parameters that are known to give rise to the functions of the relevant habitats.

Assessment of riverine functions requires the integration of various disciplines, including fluvial geomorphology, geology, hydrology, aquatic and riparian ecology, sedimentation engineering, and hydraulic and geotechnical engineering. The Stream Functions Pyramid, developed by Harman (2009, 2011), provides an approach that organizes stream functions in a pyramid form to illustrate goal setting for restoration assessments. Table 3.1.2 is adapted from this approach, where the functional categories have been modified from Fischenich (2006) to more closely match functions with parameters that are commonly used in the fields of hydrology, hydraulics, geomorphology, physicochemistry, and ecology. The intent of the assessment process is to use the inventoried structural parameters to describe the overall function of each category. Table 3.1.2 shows, for each function, the parameters from Table 3.1.1 that will be used to describe and assess that function. These parameters are primarily observable structural or physical measures, although some are actual functions (e.g., flood storage). Through the inventory and data collection process before and after restoration, these parameters can be used to determine the overall status of the stream restoration by comparing the baseline conditions to the post-restoration conditions.

On a site-wide basis, the riverine functions listed in Table 3.1.2 will be qualitatively described considering the broad range of riverine conditions indicated by the consolidation of existing source information. For the initial RU-specific BRA, the existing information will be applied to each subject RU. As an example, specific rare species habitat conditions within each RU will be assessed based upon the existing Priority Habitat designations within each RU and the available information for that RU that determine the habitat suitability for the applicable species. When the more detailed RU-specific is conducted, more detailed site-specific data collected on the habitat suitability for that species in the specific areas of interest can be incorporated into the assessment. As with all function assessments, the intent is to base the assessment on the data collected on measurable and observable structural parameters that are known to give rise to the functions of the riverine habitat.

3.2 Riverbank Habitats

Riverbank conditions in the ROR have been included in numerous investigations over the past 20+ years along with other work, particularly in the PSA. As with the riverine BRA approach, the baseline restoration assessment of riverbanks on a site-wide basis will draw, in large part, from these previous investigations. As with the riverine inventory and assessment, information on riverbank structural parameters will be consolidated for areas in the ROR that could be subject to remedial activities. Thus, the BRA of riverbanks, including both the site-wide assessment and the RU-specific assessments, will

focus on the banks in Reaches 5A and 5B, which are the only parts of the ROR where the Revised Permit requires riverbank remediation.⁶

3.2.1 *Riverbank Habitat Inventory Procedure*

Table 3.2.1 provides a summary of the parameters that will be incorporated into the site-wide assessment of riverbank habitat conditions in Reaches 5A and 5B, as well as the initial RU-specific assessments of those reaches. Again, some of these parameters will be based on prior studies, such as the BEHI/NBS evaluations reported by Stantec in 2009 for the banks in Reaches 5A and 5B and other sources described in Section 2 insofar as they contain information about these riverbanks. For example, the Example Area evaluations (AECOM 2010) provided site-specific information on riverbanks within Reaches 5A and 5B (five of the six Example Areas were within Reaches 5A and 5B). In other cases, the parameters will be based on information drawn from other tasks or steps in the remedial investigation process. These will include physical descriptions and measurements from the proposed topographic surveys of the PSA and the assessments of the Reach 5A riverbanks using the BEHI and NBS ratings, as described in the Reach 5A Sediment/Bank PDI Work Plan (with any revisions), assuming those surveys and assessments have been completed in time for incorporation into the initial BRA. The inventoried bank characteristics will include parameters that collectively contribute to the formation of habitat functions, including hydrologic conditions, floodplain connectivity, stability/erosional status, and specific habitat features such as large woody debris, cut banks, and vegetative cover, as listed in Table 3.2.1

The detailed RU-specific assessment of riverbank habitats will likewise focus only on Reaches 5A and 5B. For the initial BRA, the riverbank characterization in those reaches will provide a more detailed description (than the site-wide) of the banks in those individual RUs based upon the information available at the time, including information from the existing sources listed in Table 3.2.1 and any additional information generated from PDI investigations up to the time of preparation of the initial BRA.

However, a detailed RU-specific assessment of riverbanks in these reaches cannot be completed until the remedial design process has advanced through conceptual design (including EPA approval) to determine which riverbanks will require remediation. That additional habitat characterization will include consideration of the BEHI/NBS data collected for both Reach 5A and Reach 5B under the PDIs for those reaches. It will also involve more detailed field investigations to document the

⁶ The BRA will use the same definition of riverbanks as presented in GE's Reach 5A Sediment/Bank PDI Work Plan. As stated in that Work Plan, the Massachusetts Wetlands Protection Act regulations (310 CMR 10.54(2)(c)) define the toe and top-of-bank as follows: Toe is "the mean annual low flow level"; and top is "the first observable break in the slope or the mean annual flood level, whichever is lower." The Work Plan stated that GE will generally adopt these definitions with the modification that the elevation of the top-of-bank will be no higher than the elevation of the adjacent 1 mg/kg PCB isopleth.

physical/structural conditions of the particular riverbank areas in Reaches 5A and 5B that will be affected by remedial activities. Those investigations will include the identification, at least in general, of special habitat features on the affected Reach 5A and 5B banks – e.g., cut banks, turtle hibernacula or nesting sites, kingfisher or bank swallow nest sites (which consist of vertical sandy banks), otter slides, rock basking sites, beaver bank dens, burrows, and tree cavities. The details of this additional habitat characterization, including the form to be used and the evaluation segments for the completion of that form, will be identified after the extent and areas of riverbank remediation have been determined and will be described in, or in addenda to, the Conceptual RD/RA Work Plans for Reaches 5A and 5B. This additional data collection will be conducted as part of the supplemental BRA activities for those RUs and will be reported in the Supplemental BRA Reports for those RUs.

3.2.2 Riverbank Habitat Functional Assessment

Assessment of the existing riverbank functions will be based primarily upon the consolidated information discussed in Section 3.2.1, which describe the observable structural parameters that are known to give rise to the functions of the riverbank habitats. Table 3.2.2 presents the applicable functional categories for this assessment, summarizes the primary bank functions that will be assessed, and lists, for each, the inventoried parameters from Table 3.2.1 that will contribute to developing the functional assessment. While the functional categories of riverbanks are those also assessed for riverine functions, the specific functions and parameters considered in assessing the functions vary between riverbank and riverine habitats. In addition to the hydrologic and geomorphologic functions, a primary objective of the bank assessment will focus on the ecological and wildlife habitat functions that have been recognized in past investigations and that are related to specific habitat features such as vertical sandy banks and cut banks.

At the site-wide level, the riverbank function assessment will consist of a general review of the overall functions (as listed in Table 3.2.2) provided by the riverbanks along Reaches 5A and 5B, without a focus on specific locations along these reaches where certain riverbank conditions may in particular contribute to the designated functions. The initial BRA for the applicable RUs (Reaches 5A and 5B) will provide more focus on specific riverbank conditions within these RUs as may be possible from the source information described in Table 3.2.1. Following determination of the specific riverbank areas that will be directly affected by remedial activities in Reaches 5A and 5B, the assessment of riverbank functions in each RU will draw from the information obtained from the site-specific field investigations of each of the areas to be affected, as documented on the applicable forms. The inventoried data on those forms will then be utilized to assess the functions presented in Table 3.2.2 to qualitatively relate the physical/structural conditions of the affected riverbank areas to the listed functions.

3.3 Backwater Habitats

The Revised Permit defines “backwaters” as “areas that are typically inundated or open water adjacent to the main channel of the river in Reaches 5, 6, and 7” (page 1). EPA’s earlier *Final Supplemental Investigation Work Plan* (EPA 2000) provided a more refined definition: “Backwater areas are quiescent areas adjacent to the main river channel that maintain a hydraulic connection to the river channel.” Similarly, *GE’s Supplement to Response to EPA’s Interim Comments on CMS Report* (GE 2010) noted that, “[f]or remediation purposes, . . . backwaters are generally addressed by the sediment (rather than floodplain) remedial alternatives, reflecting the fact that they generally have a direct surface water connection to the river.”

Backwaters refer more to a hydrologic condition than a distinct habitat type, encompass both riverine and floodplain natural community types, and generally have a direct surface water connection to the river. However, from the perspective of habitat, backwaters are predominantly deep marshes with either shallow (i.e, less than six feet deep) open water and/or floating and/or submerged aquatic vegetation. These areas have open surface water connections to the Housatonic River that allow unimpeded backwater flow from the river into them annually, and that backwater flow is the primary hydrologic input (versus other surface water inputs). Each backwater area is typically accessible to fish annually, which can occur much of the year. Backwaters were not a mapped community type in the 2002 Ecological Characterization.

A preliminary identification of backwaters in Reaches 5-7 was depicted on Figure 3-17 of the RCMS Report. In addition, backwaters in Reach 5A have been subject to further survey and identification in the 2018-2019 morphology and vernal pool investigations, and those changes will be carried forward into this backwaters assessment process. This assessment of backwaters will be continued through the rest of Reach 5 and in Reaches 6 and 7. Reach 5C contains by far the largest area of backwaters based on the mapping previously prepared.

3.3.1 Backwater Habitat Inventory Procedure

Table 3.3.1 provides a summary of the parameters that will be incorporated into the site-wide assessment of backwater habitat in the ROR, as well as the initial RU-specific assessments of backwaters. Given the above interpretational considerations in backwater designation, an important first step in the inventory and site-wide characterization of backwaters is that of mapping and classification. While the designation and delineation of backwaters in Reaches 5-6 will start with the mapping previously conducted for the RCMS, as amended in Reach 5A by the 2018-2019 morphology surveys, it will be advanced with the updated LiDAR topography and bathymetry (with potential sonar scanning) obtained for the PSA under the Reach 5A Sediment/Bank PDI Work Plan. Application of the backwaters criteria described above will be conducted with the aid of these updated mapping sources, along with additional field reconnaissance as needed. Many of the other

parameters listed in Table 3.3.1 will be incorporated into the backwater determination process, including hydrology and connectivity to the river, sediment, and aquatic plant composition, and accessibility to fish. Based on this information, as part of the site-wide BRA, the waterbodies in Reaches 5 and 6 that meet the applicable criteria for backwaters (other than the backwaters already identified in Reach 5A) will be identified and their limits determined (and mapped to the extent practicable on the available base maps and aerial photographs).

While the updated LiDAR mapping will be used for the site-wide backwater assessment in Reaches 5-6, such mapping will not be available downstream of Woods Pond. Therefore, potential backwater conditions in Reach 7 will be assessed using GIS-based mapping with aerial photograph interpretation, supplemented by field reconnaissance as needed, to determine whether they meet the criteria for backwaters.

In addition to the mapping and classification process, the site-wide backwater inventory and characterization will consolidate and incorporate a broad range of characteristics related to backwater hydrology, river connectivity, sediment composition, water quality, aquatic biota, rare species, invasive species, special habitat features, and bordering habitat conditions, as listed in Table 3.3.1, based on the sources specified in that table. To the extent possible (based upon the extent of existing information, which may be limited for potential backwaters in Reach 7 in particular), this will be intended to describe the range of backwater conditions for each parameter on a site-wide basis to provide an overall site-wide baseline ecological characterization of these habitats.

The habitat inventory process for backwaters in each RU will start with incorporating information consolidated for the site-wide backwater habitat characterization where it is applicable to the specific RU being addressed. In Reaches 5 and 6, information on physical conditions within each identified backwater will first be generated from the updated LiDAR mapping and/or sonar scanning (if conducted) of the PSA. Identified backwaters in Reach 7 will also be subject to more detailed determination and mapping. The initial BRA for the backwaters in each RU will include a habitat characterization of those backwaters based on the information available.

Subsequently, when the specific limits of remediation within the backwaters in each RU have been determined in the conceptual design, more detailed characterization of the habitat within those specific limits will be conducted, including documentation of physical connectivity with the river, sediment composition, aquatic biota, rare species habitat, and invasive species presence. The details of this additional habitat characterization, including the form to be used, will be described in, or in addenda to, the Conceptual RD/RA Work Plans for the relevant RUs. The results of these additional characterization activities will be presented in the Supplemental BRA Reports for the subject RUs.

3.3.2 *Backwater Habitat Functional Assessment*

The inventoried backwater parameters described above collectively contribute to the formation of habitat functions. The intent of the functional assessment process is to use the inventoried structural parameters to qualitatively describe the overall function of the backwater habitat, initially on a site-wide basis and on a general basis for each RU with backwater habitats that may be affected by remedial activities. The applicable functional categories and key functions of backwater areas that will be generally assessed on a site-wide basis and for the initial RU BRAs are presented in Table 3.3.2. For the purposes of the BRA, the assessment will focus on readily observable biological functions, chiefly fish and wildlife habitat. However, hydrologic support (e.g., flood storage) and water quality functions will also be assessed. These functions will be described qualitatively within the BRA with a focus on describing key characteristics and parameters to be considered in restoration plans for the affected backwaters.

For the specific backwater areas that are subsequently determined to be directly affected by remedial activities in each RU, the location-specific information collected for each backwater as described above and as documented on the applicable form will be used in the functional assessment, considering the physical and hydrologic characteristics, substrate conditions, specific habitat features, connectivity with surrounding habitats, and the presence of both rare and invasive species habitats.

3.4 Impoundment Habitats

This section addresses the six impoundments in the ROR in Massachusetts: Woods Pond in Reach 6; Columbia Mill Dam impoundment, the former Eagle Mill Dam impoundment, Willow Mill Dam impoundment, and Glendale Dam impoundment in Reach 7; and Rising Pond in Reach 8. The primary habitat type associated with these impoundments is characterized as moderately alkaline pond (Woodlot, 2002), although, as impoundments, they are influenced by riverine flows to a greater extent than many moderately alkaline ponds in this region that are not on the mainstem of the Housatonic River. Other moderately alkaline ponds within the floodplain of the Housatonic River are considered as a floodplain habitat for the purposes of this BRA Work Plan.

3.4.1 *Impoundment Habitat Inventory Procedure*

The six impoundments addressed here (Woods Pond, Columbia Mill Dam impoundment, former Eagle Mill Dam impoundment, Willow Mill Dam impoundment, Glendale Dam impoundment, and Rising Pond) have approximate areas of 60 acres, 10 acres, 8 acres, 8 acres, 10 acres, and 41 acres, respectively. The four impoundments in Reach 7 are more linear than Woods Pond and Rising Pond. Table 3.4.1 provides a listing of the parameters that will be incorporated into the baseline assessment of impoundment habitat conditions, for both the general site-wide BRA and the initial RU assessments, and the sources for such information. Again, some of these parameters consist of

information drawn from other tasks or steps in the remedial investigation process; these include physical descriptions and measurements from the proposed updated topographic and bathymetric surveys of the PSA (per the Reach 5A Sediment/Bank PDI Work Plan) as they relate to Woods Pond. Other information will be obtained from existing sources such as the various reports on the dams associated with the impoundments (including the numerous reports submitted on Woods Pond Dam and Rising Pond Dam under the Revised Permit), the topographic and bathymetric surveys conducted at Woods Pond Dam and Rising Pond Dam in 2020, the 2002 Ecological Characterization, and the RCMS Report. The compilation of parameters that affect the ecological functions of the impoundments and will be included in the general site-wide and initial RU-specific BRAs include hydrologic conditions, sediment/benthic habitat, aquatic biota (vegetation, fish and wildlife, including benthic organisms), rare species habitat, and invasive species occurrence, as listed in Table 3.4.1.

After the specific portions of the impoundments to be affected by remediation activities, including dam removal activities, have been determined, more detailed surveys and documentation of the relevant parameters will be performed for each impoundment, focusing on the areas to be affected and using the procedures and a form to be provided in, or in addenda to, the relevant Conceptual RD/RA Work Plans.⁷ The results will be presented in the Supplemental BRA Reports for the subject RUs.

3.4.2 Impoundment Habitat Functional Assessment

The inventoried parameters of impoundments described above collectively contribute to the formation of habitat functions. The intent of the assessment process is to use the inventoried structural parameters to qualitatively describe the overall functions of the impoundment habitat. The applicable functional categories and key functions of impoundments that will be generally assessed on both a site-wide basis and for the initial RU BRAs are presented in Table 3.4.2, along with the inventoried factors from Table 3.4.1 considered in assessing the functions. The assessment will focus on readily observable biological functions, chiefly fish and wildlife habitat. However, hydrologic support (e.g., flood storage), geomorphology functions (e.g., sediment dynamics) and water quality functions will also be qualitatively assessed considering impoundment characteristics on a site-wide basis and for the separate impoundment RUs. The site-wide BRA will provide an overall assessment of impoundment functions, while the initial RU-specific BRAs will generally assess the conditions within each of the six impoundments that may affect the functional performance of each area, as indicated by the available existing information.

⁷ The option of using side-scan sonar for habitat characterization and mapping in the Reach 7 impoundments will be considered based upon the extent of remedial activities in each of those impoundments.

In the subsequent RU-specific detailed assessments, the more detailed information collected for each impoundment, as documented on the applicable form, will be used in the functional assessment, considering the physical and hydrologic characteristics, substrate conditions, specific habitat features, connectivity with surrounding habitats, and the presence of both rare and invasive species habitats. The assessed functions will be described qualitatively with a focus on describing the key characteristics and parameters that contribute to restoration of impoundment functions, where applicable (i.e., excluding areas where dam removal activities are expected to remove impoundment habitat).

3.5 Floodplain Habitats (excluding Vernal Pools)

As with other habitat types described above, an initial step in the site-wide floodplain habitat inventory and assessment process is the generation of updated base mapping and classification of floodplain habitats (except for vernal pools, which are discussed in Section 3.6). This process will vary between the PSA and Reach 7 due to differences in existing source information and proposed procedures. The floodplain classification to be employed will follow that used in the 2002 Ecological Characterization. For that effort, ecological community type mapping was produced for the PSA, including all floodplain habitats, and that work will be incorporated into updated mapping for this portion of the ROR, including the current LiDAR mapping, supplemented with sonar scanning if conducted. Updated floodplain community cover mapping conducted in Reach 5A during the 2018-2019 morphology surveys will also be incorporated into the site-wide classification and mapping process. As documented in GE's 2020 Final Accessibility Report for Reach 5A, portions of the floodplain within that reach showed significant changes in habitat boundaries since the 2002 Woodlot survey (resulting from hydrologic changes). Similar updates to the habitat types in other portions of the floodplain in Reaches 5 and 6 will be made using methods similar to those employed in Reach 5A. For the floodplain in Reach 7, floodplain habitat classification and mapping was not conducted previously. For the site-wide BRA, a GIS-based map of habitats in the relevant portions of the Reach 7 floodplain – namely, the EAs designated in the Revised Permit – will be generated using on-line data sources supported by general site reconnaissance. The site-wide floodplain mapping updates will also be carried forward into the initial RU BRAs, providing a consistent base mapping reflecting current conditions, although that mapping may be further updated as the site-specific RU inventories proceed during and after the conceptual remedial design process. All delineations of both upland and wetland habitats will be conducted using site base mapping and aerial photographs with field checking.

The initial BRA for floodplain habitats in each RU will draw from the information consolidated in the site-wide BRA, considering both wetland and upland habitats in the floodplain. Since the specific areas of the floodplain that will require remediation and the locations of support areas (access roads and staging areas) will not have been determined, the initial BRA will address the overall floodplain

habitat conditions specific to the RU being considered based upon the information compiled in the site-wide BRA but with specific attention to conditions in that RU. Some additional field reconnaissance may be warranted at this stage to contribute to the accuracy of information within the areas of the floodplain that may be affected; this would be coordinated with other preliminary field surveys, such as those proposed to add to the understanding of invasive species occurrence in the RUs. However, detailed inventories and field data collection on ecological conditions within the floodplain in each RU will not be conducted until the limits of remedial activities are determined. Further, full assessment of all potentially affected areas will need to be conducted after determination of the necessary support areas, such as access roads and staging areas.

As described below, floodplain habitats for the purposes of the BRA will be separated into either wetland or upland categories (vernal pools will be treated separately). Wetland habitats were referred to in the 2002 Ecological Characterization as “palustrine communities,” while upland habitats were referred to a “terrestrial communities.” Moderately alkaline ponds in the floodplain, which were classified in the Ecological Characterization as a lacustrine community, will be considered within the wetland habitat assessment for the BRA, while several palustrine habitats (mud flats, point bar/beach, calcareous seepage marsh, and woodland vernal pool) will not be included as wetland classes, as they either do not occur within the PSA or are encompassed in other habitat assessments. Upland habitats include several forest types as well as “cultural grasslands,” but will not include residential lawns. The distinction between wetlands and uplands using this classification considers the criteria for wetlands under the Massachusetts Wetlands Protection Act regulations.

3.5.1 Floodplain Wetland Inventory and Characterization Procedure

As described above, the initial step in the floodplain wetland habitat assessment is the mapping and classification process on a site-wide basis but with applicability to each RU as well. Wetland community types that will be incorporated into this process include wet meadow, shallow emergent marsh, deep emergent marsh, shrub swamp, and several wetland forest communities (red maple swamp, transitional floodplain forest, high-terrace floodplain forest, and black ash-red maple-tamarack calcareous seepage swamp), as shown in Table 3.5.1.

In addition to the mapping and classification process, the floodplain habitat inventory characterization will consolidate and incorporate information on a broad range of floodplain wetland parameters that collectively contribute to wetland functional capacity; these will be implemented on a site-wide basis and also specific to each RU for the initial BRA. These parameters include wetland hydrology, vegetative conditions, soils, rare species habitat, invasive species, surrounding habitats, and juxtaposition with other wetland and surface water systems. The intent of the site-wide inventory of wetlands is to describe each floodplain wetland community type within the PSA and the Reach 7 EAs in terms of its identified location, extent, and characteristics. Table 3.5.2 summarizes the floodplain wetland parameters that will be included in this site-wide characterization, and the

primary sources from which information will be obtained on those parameters. These sources will include the existing sources described in Section 2, supplemented with aerial photograph interpretation and updated LiDAR mapping in Reaches 5-6 and GIS-based mapping and site reconnaissance in the Reach 7 EAs, as well as other pertinent existing information such as the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) soil surveys for Berkshire County (USDA NRCS 1988), the USGS surficial geology mapping for Massachusetts (USGS 2018), and the Federal Emergency Management Agency (FEMA) Flood Insurance Studies (FIS) for Pittsfield, Lenox, and Lee (FEMA 1982).

In addition to this characterization of wetlands by community type, the site-wide BRA will summarize the wetland systems in various sections of the PSA to provide context of the network of wetlands as part of the surface water and floodplain system. This grouping will also facilitate the functional assessment described below by considering functional wetland units. The selected floodplain wetland functional units in the PSA are depicted on Figure 1 and consist of the following:

- Wetlands in Reach 5A from the Confluence to Holmes Road;
- Wetlands of Canoe Meadows (including the association with Sackett Brook/Sykes Brook and other surface waters);
- Wetlands in the remainder of Reach 5A;
- Wetlands in Reach 5B to New Lenox Road;
- Wetlands in Reach 5B downstream of New Lenox Road; and
- Wetlands in Reach 5C to Woods Pond.

Wetlands identified in the Reach 7 EAs will be characterized separately from those in the PSA functional units. Groupings of floodplain wetlands in Reach 7 for functional assessment will be considered based upon the mapping of these resources and their geographic/hydrologic relationships.

The initial floodplain wetland habitat inventory process for each RU will start with incorporating information consolidated for the site-wide wetland habitat characterization, as listed in Table 3.5.2, where it is applicable to the specific RU being addressed. This will be supplemented by review of other available information on the specific ecological conditions on wetlands within the subject RU. The initial RU BRAs will also use the wetland evaluation units shown in Figure 1, which coincide with reach/RU limits (with some subdivisions).

Once the limits of remediation in the floodplain wetland habitats in each RU have been defined and the locations of support areas in each RU have been identified through the conceptual design, more detailed field inventories will be conducted within each wetland community type to be affected by

remedial activities or support activities. The conditions observed during those additional field inventories will be documented on a form to be developed for that purpose. In addition, it is anticipated that the U.S. Army Corps of Engineers (USACE) Wetland Determination Data Form for the Northeast Region will be completed for each delineated wetland cover type to be affected by remedial activities. Together, these forms will provide site-specific information on wetland hydrology, soils, vegetation, and specific wildlife habitat features (e.g., wolf trees, tree cavities, standing dead trees, large woody debris, mammal burrows, connectivity/juxtaposition with other habitat, signs of degradation, etc.), and provide data confirming the status of each area in terms of meeting applicable federal and state wetland criteria. In this assessment, it will be particularly important to identify the presence of Core Area 1, Core Area 2, and Core Area 3 habitats in the affected wetland areas. The details of this additional habitat characterization, including the forms to be used and the wetland evaluation segments for which those forms will be completed, will be finalized after the extent of floodplain remediation, as well as other floodplain areas to be affected by support activities, have been determined, and will be presented in, or in addenda to, the Conceptual RD/RA Work Plans for the pertinent RUs. It is anticipated that the evaluation segments will be defined consistent with the wetland functional units specified above and depicted on Figure 1. This additional BRA information will be reported in the Supplemental BRA Reports for the subject RUs. It will contribute to the wetland functional assessment, and will also be important to document features to consider for incorporation into the restoration design.

3.5.2 Floodplain Wetland Functional Assessment

This task will involve the process to assess the ecological functions and services of the floodplain wetland conditions based upon the information consolidated in the inventory described above. As described previously, assessment of the existing functions will be based primarily upon the collection of data on measurable and observable structural parameters that are known to give rise to the functions of the relevant habitats. Using this information, a qualitative assessment of wetland functions will be provided on a site-wide basis, considering the wetland functional units described above, as well as for the specific RUs. Since the site-wide and initial RU-specific assessments will draw primarily from existing information, the parameters selected for the characterization as well as the functional assessment are those which have been addressed in existing documentation.

The floodplain wetland functional assessment will draw upon the criteria and functions described in the USACE New England District's *The Highway Methodology Workbook Supplement, Wetland Functions and Values, A Descriptive Approach* (USACE Wetland Workbook Supplement; USACE New England District 1995). This approach is a multi-disciplinary assessment of wetland functions, including the following: groundwater recharge/discharge; floodflow alteration; fish and shellfish habitat; sediment, toxicant, and pathogen retention; nutrient removal, retention, and transformation; production export; sediment and shoreline stabilization; wildlife habitat; recreation; education and

scientific value; uniqueness and heritage; visual quality and aesthetics; and threatened or endangered species habitat. The assessment is a qualitative description of the physical characteristics of the wetlands, including a determination of the principal functions exhibited. This method is not based on quantitative metrics, but rather provides criteria for assessing whether a wetland's characteristics could contribute to providing the functions listed above. For the site-wide BRA, the wetland functional assessment will be conducted for the functional wetland units described above. Again, floodplain wetlands in Reach 7 EAs may be grouped separately for functional assessments based upon geographic/hydrologic relationships subsequent to mapping.

The wetland functions to be included in the site-wide, as well as the initial RU-specific, assessments of wetland functions are listed in Table 3.5.3, which has been developed and adapted from the USACE Wetland Workbook Supplement cited above. In addition to a description of each function, that table lists the characteristics or criteria from Table 3.5.2 to be used in assessing the function. At the site-wide level and for the initial RU BRAs, these characteristics and criteria will be considered generally, based primarily on the available information from the sources listed in Table 3.5.2.

Once the limits of remediation in the floodplain wetland habitats in each RU have been defined and the locations of support areas for each RU have been identified through the conceptual design, a more detailed functional assessment will be conducted within each wetland community type to be affected by remedial activities or support activities. The functional assessment will be documented on a form to be developed for that purpose. The forms to be used and the wetland evaluation segments for which those forms will be completed will be finalized after the extent of floodplain remediation and identification of support area locations (at least provisionally) have been determined, and they will be presented in, or in addenda to, the Conceptual RD/RA Work Plans for the pertinent RUs. It is anticipated that the floodplain wetland functional assessment for the affected portions of each RU will also draw upon the criteria and functions described in the 1995 USACE Wetland Workbook Supplement (cited above). The results of this additional functional assessment will be presented in the Supplemental BRA Reports for the subject RUs.

3.5.3 Floodplain Upland Habitat Inventory and Characterization Procedure

As noted in the 2002 Ecological Characterization: "[V]ery little terrestrial or upland habitat is found in the PSA. Red oak–sugar maple transition forests are located in a few widely scattered locations. Cultural grasslands, which are open, upland habitats periodically disturbed by mowing or grazing, do occur near New Lenox Road. A few upland inclusions of northern hardwoods–hemlock–white pine forest also occur north of Yokum Brook. Most of the upland habitats occur adjacent to the PSA as cultural grassland, northern hardwoods–hemlock–white pine forest, and rich mesic forest." Agricultural fields may be considered a subset of cultural grasslands, and developed/disturbed parts of the floodplain may also be distinguished in the mapping and classification. These floodplain upland community types in Reaches 5 and 6 will be subject to updated delineation and classification

as part of the LiDAR mapping process for the PSA, as described previously. In the Reach 7 EAs, identified floodplain upland habitats will be included in the GIS-based mapping generated from on-line data bases.

Once the upland floodplain habitats have been delineated, information will be obtained on the parameters specified in Table 3.5.4 in those habitats, based on the information sources listed in that table. This will include information on flood frequency and depth, soil composition, vegetation, wildlife habitat features, identified rare species habitat, invasive species, and juxtaposition with surrounding habitats.

The floodplain upland habitat inventory process for each RU will start with incorporating information consolidated for the site-wide floodplain habitat characterization where it is applicable to the specific RU being addressed. It will also include incorporation of other existing information on the specific ecological conditions of upland habitats within the subject RU.

Once the limits of remediation in the floodplain upland habitats in each RU have been defined and the locations of support areas in such areas have been identified through the conceptual design, more detailed site-specific habitat characterization activities for those affected upland habitat areas will be conducted. As with the floodplain wetland inventory, the specifics of those activities, including the form to be used (which may be the same as the habitat assessment form used for floodplain wetland habitats) and the upland evaluation segments for which that form will be completed, will be determined after the conceptual design advances to depict the extent of remediation and support activities. These specifics will be described in, or in addenda to, the Conceptual RD/RA Work Plans for the subject RUs, and the results will be presented in the Supplemental BRA Reports.

3.5.4 Floodplain Upland Functional Assessment

The information consolidated for the inventory and characterization of floodplain upland habitats will be incorporated into a qualitative assessment of the site-wide ecological functions that these habitats contribute to. Functions which will be assessed in both the site-wide and initial RU assessments include groundwater recharge, flood storage, general wildlife habitat, rare species habitat, buffer capacity, and corridor connectivity, as listed in Table 3.5.5. The impact of invasive species in the floodplain upland habitats will also be considered.

For the subsequent RU-specific assessments, the site-specific information collected for each floodplain upland to be affected by remedial activities, as documented on the applicable form, will be used in the functional assessment, again considering the physical and hydrologic characteristics, substrate conditions, specific habitat features, connectivity with surrounding habitats, and the presence of both rare and invasive species habitats.

3.5.5 *Survey of Exposure Area 10*

In accordance with Section 4.2.1.4 of the Final Revised SOW, the BRA assessment of Reach 5A will include a survey of the trails, signage, boardwalk, and accessway in the expanded EA 10, owned by the Massachusetts Audubon Society (Mass Audubon). This will consist of a survey of existing conditions using global positioning system (GPS) instrumentation, with documentation of the location and photographs of trails, signs, boardwalk, and access areas located on an aerial photographic base. This information will also be imported onto the updated LiDAR topographic base map when that is available.

3.6 Vernal Pool Habitats

For vernal pool habitats, the site-wide BRA will consist of the identification of vernal pools throughout the ROR floodplain and a general characterization of the ecological conditions of those vernal pools at a site-wide scale. The RU-specific assessments will consist of a more detailed characterization of the conditions within the individual vernal pools in the subject RUs.

As discussed in Section 2.7, GE has already completed an identification and evaluation of vernal pools in the Reach 5A floodplain in 2018 and 2019 and presented the results to EPA in reports in 2020 and 2021. Those reports included the identification of pools in Reach 5A that met the MNHESP biological and physical criteria for vernal pools, as well as providing information on the hydrology of the pools and the faunal species observed in those pools (specifically, invertebrates, amphibians, reptiles, and fish).⁸ As also noted in Section 2.7, during the course of the 2018-2019 investigations, information was also obtained, but not reported, on other aspects of the vernal pools in Reach 5A, including flora, topography, bottom sediment/soil composition, in-pool physical structure, surrounding land use, and relationship/proximity to other vernal pools. The BRA will use and build upon this existing information for both the site-wide vernal pool characterization and the initial BRA for Reach 5A, as discussed further in Section 3.6.1.

For the floodplain reaches downstream of Reach 5A (i.e., the floodplain in Reaches 5B through 8), the site-wide assessment will include the implementation of a similar approach to that already implemented for Reach 5A by evaluating potential vernal pools to identify those that meet the MNHESP criteria for vernal pools. This assessment will include: (a) the identification of potential vernal pools in those reaches; (b) the performance of field surveys to collect the information to determine whether those pools meet the MNHESP criteria for vernal pool certification and thus constitute vernal pools for the purposes of remedial activities; and (c) a general characterization of the ecological conditions of those vernal pools. These activities are also described in Section 3.6.1.

⁸ As previously noted, that information was also presented to the MNHESP, which certified the vernal pools that met its criteria, although the Revised Permit does not require such certification for pools to be considered as vernal pools, only that they meet the MNHESP criteria for vernal pools.

As further discussed there, the RU-specific assessments will involve the collection of more detailed baseline data on the pertinent characteristics of the individual vernal pools within the subject RUs.

3.6.1 Vernal Pool Inventory and Characterization Procedure

As discussed above, the site-wide BRA for vernal pool habitat will include the identification of vernal pools throughout the ROR floodplain and a general assessment of the characteristics of those pools. As also noted above, this step has already been completed for Reach 5A, where the vernal pools have been identified and assessed with EPA approval. For the downstream ROR reaches (i.e., Reaches 5B through 8), the identification of potential vernal pools will begin by compiling information on areas that may constitute vernal pools in those reaches, followed by implementing the field surveys for vernal pool classification and mapping as already conducted in Reach 5A.

The first step in this process to identify areas that could potentially constitute vernal pools. As part of EPA's Housatonic River Ecological Characterization efforts that occurred primarily between 1998 and 2002, detailed surveys were conducted to document the occurrence of potential vernal pools (i.e., spring breeding habitats by various herptiles) in the PSA (TechLaw 1998; presented in Appendix A.18 to EPA's *Supplemental Investigation Work Plan for the Lower Housatonic River* [EPA 2000]; Woodlot 2002). Those surveys identified 33 potential vernal pools in the floodplain in Reaches 5B and 5C. Those pools will be subject to further assessment in the initial BRA. In addition, remote sensing data (e.g., aerial photographs from various dates over the past 20+ years) and the results of previous or current field surveys (e.g., the Example Area surveys in 2009, the PDI topographic survey of the PSA) will be reviewed to determine if there are other potential amphibian breeding/vernal pool habitat areas in Reaches 5B, 5C, or 6 that could potentially constitute vernal pools.

For the Reach 7 floodplain, review of the MassGIS database on vernal pools indicates that there are three certified vernal pools and 16 potential vernal pools within the limits of the 100-year floodplain in that reach. Those vernal pools and potential vernal pools will also be identified as part of the initial BRA, and an evaluation will be made as to whether they could contain PCBs from the GE Pittsfield facility such that they would be encompassed within the definition of the ROR. In addition, aerial photographs will be reviewed to identify whether there are other potential amphibian breeding habitat areas in the floodplain of Reaches 7 or 8 that could potentially constitute vernal pools containing PCBs.

For the potential vernal pools identified in reaches downstream of Reach 5A that could potentially contain PCBs, the process for evaluating and characterizing those pools will follow the procedures previously implemented in Reach 5A in 2018-2019 as approved by EPA. During the vernal pool breeding season, generally between late March and early June (but most likely between April and May), all potential vernal pools identified in the site-wide inventory process for ROR reaches downstream of Reach 5A will be visited in the field, and detailed investigations will be conducted to

document the biological and physical criteria described above for the MNHESP certification criteria. It is anticipated that each area will be surveyed at least twice during the primary vernal pool breeding period, consistent with the seasonal conditions observed for that particular year. The current version of the MNHESP Vernal Pool Field Observation Form (provided in Appendix A) will be completed for each discrete area identified and surveyed.

While these surveys are intended to address the biological criteria encompassed in the MNHESP guidelines, additional field visits will be required to assess the physical criteria (e.g., whether there is a “permanently flowing outlet” and/or reproducing fish population) for pools that meet the biological criteria. This assessment will require monitoring the hydrology in each such pool, assessing the presence or absence of fish, and establishing the hydrologic connectivity with the Housatonic River or tributary streams, primarily in terms of the annual duration of a surface water connection. In general, the critical time period for assessing this hydrologic connection is during the months of July through September. In performing this assessment for pools that meet the biological criteria, the relative meteorologic/hydrologic conditions during the monitoring period versus the long-term average conditions will be considered (i.e., whether conditions are relatively dry or wet).

Based on the data obtained through these surveys, a determination will be made as to whether each potential vernal pool surveyed outside of Reach 5A meets the biological and physical criteria in the MNHESP guidelines for certification as a vernal pool and by which criteria/method. As was the case for the potential vernal pools in Reach 5A, for any such area that does not meet the applicable criteria for vernal pool certification based on the initial survey year, GE will repeat the surveys in a second year to make a final determination of whether the area meets the applicable criteria.⁹

In addition to identifying the vernal pools in the reaches downstream of Reach 5A, the site-wide assessment will include a general characterization of the ecology of the vernal pools in the overall ROR floodplain, based on available information, including the information obtained during the surveys of potential vernal pools.

For the RU-specific assessments, additional characterization activities will be conducted for the vernal pools in the individual RUs as part of the initial BRA. For the identified vernal pools in Reach 5A, those additional characterization activities will consist of: (1) compiling the existing information collected during the 2018-2019 surveys on other relevant attributes of those vernal pools – namely, flora, topography, bottom sediment/soil composition, in-pool physical structure, surrounding land use, and relationship/proximity to other vernal pools; and (2) collecting additional information on the relevant attributes that do not have existing data. The latter will include collecting data on the

⁹ For areas that do not meet the criteria for certification as a vernal pool after two years, an assessment will be provided as to whether each such area should be classified as backwater or floodplain habitat based upon the observed conditions.

general water and soil chemistry of the vernal pools, other than PCB concentrations, which will be determined separately.¹⁰ The collection of those general water and soil chemistry data will involve the measurement of pH, temperature, conductivity, and dissolved oxygen in the water, using a field meter to the extent possible, and the collection and analysis of soil samples for pH and organic carbon (or organic matter) content.¹¹ These parameters will be measured in a stratified random selection of the Reach 5A vernal pools to obtain data from 25% of these pools. If the data from those selected pools show significant spatial variability in one or more of these parameters, water quality measurements will be made and/or soil samples will be collected in additional vernal pools, selected in consultation with EPA, for determination of those parameters

For Reaches 5B through 8, during the course of the surveys described above, information will be collected on the other key attributes of the potential vernal pools, including species composition (flora and fauna), topography, hydrologic regime, bottom sediment/soil composition, in-pool physical structure, surrounding land uses, and relationship/proximity to other vernal pools. In the RU-specific assessments for those downstream RUs, that information will be compiled for the pools that meet the criteria for vernal pool certification. In addition, as with Reach 5A, for pools that meet the vernal pool criteria, data will be collected on general water quality and soil chemistry (other than PCB concentrations). The collection of those general water and soil chemistry data will follow the same procedures described above for the Reach 5A vernal pools, including the same frequency of measurement/sampling (starting with a stratified random selection of 25% of the vernal pools in each reach) and with measurement or analysis of the same parameters.

3.6.2 *Vernal Pool Functional Assessment*

The functional assessment of vernal pools will be based primarily on their status as vernal pools that meet the applicable MNHESP criteria. This determination has already been made for the vernal pools in Reach 5A. The functional assessment will also consider the vernal pools in terms of the network they present within the context of the overall floodplain system. For potential vernal pools in downstream floodplain reaches, the information generated for each such pool will be presented in spreadsheet format to summarize current conditions; and as noted above, a determination will be made, based upon that information, as to whether each area meets the MNHESP criteria for certification as a vernal pool and by which criteria/method. The resulting information from the first survey year, including the spreadsheet and the completed MNHESP Vernal Pool Field Observation Forms for all downstream potential vernal pools evaluated through that year, will be included in the

¹⁰ Specifically, the PCB concentrations in the Reach 5A vernal pools will be determined through sampling conducted under the *Second Revised Pre-Design Investigation Work Plan for Reach 5A Non-Residential Floodplain Exposure Areas* (Anchor QEA 2021), submitted on November 19, 2021 and approved by EPA on December 13, 2021.

¹¹ For this purpose, soil samples will be collected using the procedures in GE's current Field Sampling Plan/Quality Assurance Project Plan (Arcadis 2013).

initial BRA Report. The final information on vernal pool certification for the downstream pools, based on data collected through the second survey year, will be provided in appropriate subsequent reports on the subject RUs, such as the PDI Summary Reports on those RUs. This process will constitute the functional assessment of vernal pools downstream of Reach 5A. As provided in the Revised Permit, EPA will make the final determination as to which areas constitute vernal pools.

3.7 Assessment of Threatened, Endangered, and Other Listed Rare Species

The occurrence of any federally listed threatened or endangered species or their habitat in the ROR project area will be identified based on the U.S. Fish and Wildlife Service (USFWS) on-line Information, Planning, and Consultation System (IPaC) (USFWS 2021). The occurrence of state-listed threatened, endangered, or special concern species and their Priority Habitats will be based on established records and documentation available from the MNHESP. (These federal and state-listed species are referred to collectively as rare species.) These sources will be used to provide an overview on a site-wide basis of potential rare species habitats and rare species occurrences in Reaches 5-8 of the ROR.

As with the site-wide BRA for rare species, the occurrence of any federally listed threatened or endangered species or their habitat in each individual RU will be identified based on the USFWS on-line IPaC; and the occurrence of state-listed species and their Priority Habitats within each RU will be based on established records and documentation available from MNHESP, as they may be updated based upon ongoing communications with MNHESP. This work will include the identification of threatened, endangered, and other state-listed species in the vernal pools in the ROR area, as required by Section II.B.3.b.(2)(b) of the Revised Permit, and will also include the identification of rare species habitat within the Reach 7 impoundments and EAs.

3.7.1 Federally Listed Species

The USFWS IPaC online mapping tool will be consulted to document the potential presence of federally listed species under the Endangered Species Act on a site-wide basis. Federally listed species indicated by the IPaC process will then be evaluated in terms of their habitat requirements and the potential for these habitat requirements to be present on a site-wide basis in Reaches 5-8 of the ROR. For the RU-specific BRAs, that information will be applied to the various RUs, and the habitat requirements and the potential effects on that habitat from remedial activities within each RU will be described. The initial BRA for each RU will likely be limited in terms of assessment of potential effects on identified habitat for federally listed species, since the extent of remediation and support areas in many portions of the ROR (e.g., riverbanks, floodplain) will not be known until the conceptual design stage. Accordingly, after the limits of areas affected by remedial activities have

been determined for each RU, updates to the assessment of affected habitat for federally listed species in that RU will be provided in the Supplemental BRA Report for that RU.

3.7.2 State-Listed Species

As discussed in Section 2.6, MNHESP has been conducting surveys of state-listed species and their habitats in the ROR area for at least 20 years, including consolidating information obtained during the ecological characterization work between 1998 and 2002 and conducting rare species field surveys in 2008-2009, resulting in the development of detailed assessments and Priority Habitat mapping for those species, as presented in the RCMS Report. In addition, MNHESP has defined the limits of Core Area habitats based upon these surveys and studies. Building upon this existing information, GE will conduct further coordination with MNHESP to determine if additional updated information on state-listed species is available from MNHESP which could be incorporated into the site-wide understanding of either species occurrence or habitat. This will include consultation with MNHESP to determine if the Priority Habitat maps included in the RCMS Report remain applicable for each species or if changes are warranted. Any changes to state-listed species names or state-listed status will also be noted. In the absence of additional or updated information, the previous designations and mapping will be presumed to be applicable. The BRA will include the species-specific mapping and habitat assessment of each state-listed species on a site-wide basis.

The BRAs for the individual RUs will apply that information to the various RUs and will include species-specific mapping and a habitat assessment of each state-listed species for each RU. Again, the initial BRA for each RU will be limited in terms of assessment of potential effects on identified habitat for state-listed species, since the extent of remediation and/or support areas in many portions of the ROR will not be known until the conceptual design stage. Accordingly, after the limits of areas affected by remedial activities have been determined, a more detailed assessment will be made of the effects of the remediation and support activities on each of the identified state-listed species and their Priority Habitats in the subject RUs.

3.8 Site-Wide Invasive Species

The site-wide assessment will include a discussion of invasive species in the ROR area. This task will start with establishing a definition of "invasive species," including the biological species that will be included (plant and animal). It is anticipated that the focus will be on the plant community and will refer to established listings by recognized organizations – notably, the USACE New England District and the Massachusetts Invasive Plant Advisory Group (MIPAG). As with the habitat inventories described above, it is anticipated that identification and location of invasive species will be conducted using site base mapping and aerial photographs in combination with field verification. The site-wide assessment of invasive species will be based upon the consolidation and review of existing information, and will not include updated field surveys. Available information on the general

occurrence of each invasive species within Reaches 5-8 will be presented, along with a summary of information on the ecology of each identified species.

For the RU-specific BRAs, that site-wide information will be first tailored to be applicable to each RU, generating available information for each overall RU in terms of known invasive species occurrence. For each RU, an aerial photograph overlay will be generated which will provide an initial depiction of known areas of invasive species based on the available information and aerial photographic interpretation.

When the limits of remedial activities have been developed for each RU and support areas have been identified, the aerial photographic base from field surveys conducted will be used to document the location and extent of invasive species, in addition to the limits of known occurrences, in the areas that will be subject to remedial activities and support activities. For the purposes of this documentation, an invasive species occurrence will be ranked by relative abundance of foliage cover on a scale of 0-5%, 5-25%, 25-50%, 50-75%, or >75%. For instances of invasive species exceeding 25% cover within an area subject to remedial or support activities, GPS instrumentation will be used to document the location.

4 Schedule and Reporting

The data collection for the site-wide BRA and the initial RU-specific BRAs will be initiated within 30 days after the later of EPA approval of this BRA Work Plan or full EPA approval of the Reach 5A Sediment/Bank PDI Work Plan (which will provide for the collection of important data for use in the BRA), provided that weather conditions are suitable for conducting such data collection. This is anticipated to occur in approximately March 2022 (assuming timely EPA approval). That data collection will proceed for approximately seven months. The initial BRA Report will then be developed and submitted within three months after completion of the data collection. As discussed above, that report will present the results of the site-wide assessment, but will also include, for each RU, a general baseline assessment of the conditions in that RU, building on the site-wide information, to the extent that the relevant information for such an assessment is known.

As also discussed above, some key information will not be known at the time of that initial BRA Report. For example, the final information on vernal pools in RUs downstream of Reach 5A will require a second year of vernal pool surveys and thus will be provided in subsequent deliverables for those RUs. More significantly, other critical information will not be known until the PDI data are evaluated and conceptual design plans have been developed. These will include the specific locations to be remediated within most RUs and the location of access roads and staging areas. To address these areas, additional BRA activities for each RU will be conducted after submittal and approval of the Conceptual RD/RA Work Plan for that RU. Those additional activities will be described in, or in an addendum to, the Conceptual RD/RA Work Plan for each RU, and the results will be presented in a Supplemental BRA Report for that RU. That Supplemental BRA Report will be submitted after the additional BRA data collection and before development of the Final RD/RA Work Plan for the subject RU.

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Tables

Table 3.1.1: Riverine Habitat Characterization		
Parameter	Description of Parameter	Site-Wide and Initial RU-Specific Inventory Approach*
Mapping and classification	Mapping of physical location and limits; High gradient/mid-gradient/low gradient	Updated LiDAR and (if conducted) sonar scanning in Reaches 5-6; consolidate existing information (from sources below); site reconnaissance
Hydrology	Flooding and flow characteristics (volume/velocity from peak to base flow, bankfull discharge); hydrologic indicators (mean low water, mean high water, bankfull stage)	Consolidate existing information from prior hydrologic modeling, USGS gauge data, and other relevant sources below; discharge volume of 1.5-2 yr flood flow in channel cross-section; field indicators via site reconnaissance
Geomorphology	Channel form (type)/sinuosity; channel-forming flow; physical dimensions (length, area, depth, width, thalweg); floodplain connectivity (entrenchment status; side channel connections); stream bedform variability (riffle/pool/run)	Sinuosity = stream length/valley length (to be measured from mapping by Reach); LiDAR and (if conducted) sonar scanning in Reaches 5-6; consolidate existing information (from sources below); site reconnaissance
Bank characteristics	Range in observed bank heights relative to mean low water, mean high water, and bankfull stages; substrate composition; vegetative cover; stability/erosiveness	BEHI/NBS information from Stantec 2009 evaluation, 2010 Example Area evaluations, and PDI of Reach 5A banks; consolidate other bank-related information (from sources below); site reconnaissance
In-stream habitat characteristics	Sediment/substrate composition (% clay/silt/sand, gravel/cobble; boulder/bedrock; organic matter); sediment depositional/erosion features (bars, benches, fans, cut banks); riffle/pool/run presence; large woody debris	Consolidate existing information (from sources below)
Water quality	Temperature, pH, TSS, turbidity, clarity, dissolved oxygen, nutrients (nitrogen and phosphorus)	Consolidate existing information (from sources below)
Habitat for aquatic and other water-using biota	Species composition and relative abundance of aquatic macrophytes, fish, benthic habitat/organisms, and other water-using biota; presence/abundance of invasive species	Consolidate existing information (from sources below); site reconnaissance; review of invasive species data from ACOE New England District and MIPAG
Rare species habitat	Priority Habitat/Core Area Habitat mapping; IPaC results from USFWS on-line data base	MNHESP investigations and designations; IPaC results
Riparian zone conditions	Riparian vegetative cover; overhanging vegetation; rare species habitat; invasive species	Consolidate existing information (from sources below); aerial photography; site reconnaissance
<p>* The existing information to be used for the site-wide and initial RU-specific riverine habitat characterization will be consolidated from the following sources: the 2002 Woodlot Ecological Characterization reports, the 2003 RFI Report, the 2010 Example Area evaluations and RCMS Report, the MNHESP investigations of state-listed species through 2012, and the Final Accessibility Report – all described and referenced in Section 2 of this BRA Work Plan – as well as USGS gauge data and previous hydrologic modeling (e.g., EFDC model) referenced in Section 3.1.1 of this BRA Work Plan.</p>		

Table 3.1.2: Riverine Function Assessment Factors		
Functional Category	Description of Functions	Parameters Considered in Assessing Function (see Table 3.1.1)
Hydrologic Support	Water conveyance and transport; watershed connectivity; floodwater dynamics (flood flow amelioration, flood storage and desynchronization, peak rate control); base flow maintenance (groundwater discharge); migration and dispersal corridor	Hydrology; geomorphology; bank characteristics
Geomorphology	Channel formation and maintenance; floodplain connectivity; transport of organic and mineral sediment material; transport of woody debris; transport of nutrients and food sources	Hydrology; geomorphology; bank characteristics; in-stream habitat features
Physicochemical	Water quality maintenance; temperature and oxygen regulation; processing of organic matter and nutrients	Hydrology; in-stream habitat features; water quality; aquatic biota habitat
Biological	Biodiversity and sustaining life stages of aquatic and riparian life; habitat for aquatic and other water-using biota; rare species habitat	Hydrology; geomorphology; bank characteristics; in-stream habitat features; water quality; habitat for aquatic and other water-using biota; riparian zone conditions; rare species habitat (mapped Priority Habitat and Core Area habitat and IPaC results); connectivity; invasive species

Table 3.2.1: Riverbank Habitat Characterization¹		
Parameter	Description of Parameter	Site-Wide and Initial RU-Specific Inventory Approach²
Mapping and physical measures	Mapping of physical location and limits; length, depth, slope	LIDAR and (if conducted) sonar scanning in Reaches 5A and 5B
Bank height (relative to water stage); bankfull stage/discharge	Range in observed bank heights relative to mean low water, mean high water, and bankfull stages.	Consolidate existing information (from sources below); site reconnaissance; discharge volume of 1.5-2 yr flood flow in channel cross-section; bankfull indicators
Floodplain connectivity	Hydrologic connection between the river and floodplain; degree of river incisement/entrenchment along with breaks in the bank or conduits for floodwater dispersment into the floodplain	Consolidate existing information (from sources below); site reconnaissance
Soil/substrate composition	Relative % clay/silt/sand and gravel/cobble; boulder/bedrock presence; organic matter	Consolidate existing information (from sources below)
Bank stability and migration	Observed erosional conditions; documentation of river channel/bank migration	BEHI/NBS information from Stantec 2009 evaluation, 2010 Example Area evaluations, and PDI of Reach 5A banks; consolidate other bank-related information (from sources below)
Large woody debris (LWD)	Density of LWD; woody debris on the bank	Consolidate existing information (from sources below)
Vegetation, including on-bank, overhanging, and riparian vegetation	Species composition and relative abundance; percent cover presence/abundance of invasive species	Consolidate existing information (from sources below); aerial photography; site reconnaissance; review of invasive species data from ACOE New England District and MIPAG
General wildlife habitat	Species composition and relative abundance of riverbank and riparian wildlife	Consolidate existing information (from sources below)
Rare species habitat	Priority Habitat/Core Area Habitat mapping; IPaC results from USFWS on-line data base	MNHESP investigations and designations; IPaC results
Unique habitat features	Cut banks; turtle hibernacula or nesting sites, kingfisher or bank swallow nest sites (vertical sandy banks); otter slides; rock basking sites; beaver bank dens; burrows; tree cavities; bars and benches	Consolidate existing information (from sources below); site reconnaissance

¹ Applies only to Reaches 5A and 5B, since no riverbank remediation will be conducted in Reaches 5C-8.

² The existing information to be used for the site-wide and initial RU-specific riverbank habitat characterization will be consolidated from the following sources: the 2002 Woodlot Ecological Characterization, the Stantec 2009 bank erosion evaluation, the 2003 RFI Report, the 2010 Example Area evaluations and RCMS Report, the MNHESP investigations of state-listed species through 2012, the Final Accessibility Report – all described and referenced in Section 2 of this BRA Work Plan.

Table 3.2.2: Riverbank Function Assessment Factors*		
Functional Category	Description of Functions	Parameters/Factors Considered in Assessing Function (see Table 3.2.1)
Hydrology/hydraulic	Water conveyance and transport; floodwater dynamics (flood flow distribution, flood storage and desynchronization, peak rate control)	Bank height; bank vegetation; bank stability/migration; floodplain connectivity
Geomorphology	Supply of organic and mineral sediment material; supply/processing of woody debris; effects on flow and role in determining stream planform and geomorphic diversity	Bank stability; substrate composition; large woody debris supply; bank stability/migration; bank vegetation
Physicochemical	Water quality maintenance; temperature and oxygen regulation for in-stream habitat	Vegetation (bank, overhanging, riparian); bank stability/migration
Biological	Biodiversity and sustaining aquatic and riparian life; migration and dispersal corridor; river access; rare species habitat	Bank stability/migration; vegetation (on-bank, overhanging, and riparian); large woody debris; general wildlife habitat; presence of unique habitat features; rare species habitat (mapped Priority Habitat and Core Area habitat and IPaC results); floodplain connectivity; invasive species

* Applies only to riverbanks in Reaches 5A and 5B, since no riverbank remediation will occur in Reaches 5C-8.

Table 3.3.1: Backwater Habitat Characterization		
Parameter	Description of Parameter	Site-Wide and Initial RU-Specific Inventory Approach*
Mapping and classification	Mapping of physical location and limits	Updated LiDAR mapping and (if conducted) sonar scan data for Reaches 5-6; GIS-compiled mapped base for Reach 7 with site reconnaissance.
Physical dimensions	Length, width, area, depth, and volume	Updated LiDAR mapping and (if conducted) sonar scanning; cross-sections; GIS mapping
Hydrology and connectivity to river	Flow dynamics; depth; water level fluctuation; mean low water; mean high water; hydrologic connection with river; other surface water inputs	Consolidate existing information (from sources below); site reconnaissance
Sediment composition	Relative % clay/silt/sand/gravel/cobble; boulder/bedrock; organic matter	Consolidate existing information (from sources below)
Aquatic plant community	Species composition and relative abundance; rare species habitat; invasive species	Consolidate existing information (from sources below)
Bordering habitat types	Species composition and relative abundance; rare species habitat; standing dead timber	Species composition and relative abundance; rare species habitat from MNHESP investigations and designations and IPaC results
Large woody debris (LWD)	Size, relative abundance and density of LWD above and below water	Consolidate existing information (from sources below)
Water quality	Temperature, pH, TSS, turbidity, clarity, dissolved oxygen, nutrients (nitrogen and phosphorus)	Consolidate existing information (from sources below)
Habitat for aquatic and other water-using biota	Species composition and relative abundance of aquatic macrophytes, fish, benthic habitat/organisms, and other water-using biota	Consolidate existing information (from sources below); site reconnaissance
Rare species habitat	Priority Habitat/Core Area Habitat mapping; IPaC results from USFWS on-line data base	MNHESP investigations and designations; IPaC results
Invasive species	Presence/relative abundance of designated invasive species	Consolidate existing information (from sources below); site reconnaissance; review of invasive species data from ACOE New England District and MIPAG
Presence of special habitat features	Tree cavities; beaver/muskrat dens; otter slides	Consolidate existing information (from sources below)
<p>* The existing information to be used for the site-wide and initial RU-specific backwater habitat characterization will be consolidated from the following sources: the 2002 Woodlot Ecological Characterization, the 2003 RFI Report, the 2010 Example Area evaluations and RCMS Report, the MNHESP investigations of state-listed species through 2012, and the Final Accessibility Report – all described and referenced in Section 2 of this BRA Work Plan.</p>		

Table 3.3.2: Backwater Function Assessment Factors		
Functional Category	Description of Functions	Parameters/Factors Considered in Assessing Function (see Table 3.3.1)
Hydrology/hydraulic	Floodwater dynamics (flood flow amelioration, flood storage and desynchronization, peak rate control)	Physical dimensions; hydrology and connectivity to river
Geomorphology	Deposition and storage of organic and mineral sediment material	Hydrology and connectivity to river; sediment composition; aquatic plant community; large woody debris; aquatic biota
Physicochemical	Water quality maintenance; temperature and oxygen regulation; processing of organic matter and nutrients	Hydrology and connectivity to river; water quality; aquatic plant community; aquatic biota habitat
Biological	Biodiversity and sustaining life stages of fish and other aquatic biota; habitat for aquatic and other water-using biota; rare species habitat	Hydrology and connectivity to river; aquatic plant community; bordering habitat types; large woody debris; water quality; habitat for aquatic and other water-using biota; rare species habitat (mapped Priority Habitat and Core Area habitat and IPaC results); invasive species; presence of special habitat features

Table 3.4.1: Impoundment Habitat Characterization		
Parameter	Description of Parameter	Site-Wide and Initial RU-Specific Inventory Approach*
Mapping and classification	Mapping of physical location and limits	Updated LiDAR mapping and (if collected) sonar scan data for Reach 6; GIS-compiled mapped base for Reaches 7-8 with site reconnaissance.
Physical dimensions	Length, width, area, depth, and volume	LiDAR; sonar scan (if conducted); cross-sections; GIS mapping; existing dam reports and mapping
Hydrology	Water regime (depth, water level fluctuation; exchange rate).	Consolidate existing information (from sources below); site reconnaissance
Sediment composition	Relative % clay/silt/sand/gravel/cobble; boulder/bedrock; organic matter	Consolidate existing information (from sources below)
Aquatic plant community	Species composition and relative abundance; rare species habitat; invasive species	Consolidate existing information (from sources below)
Bordering habitat types	Species composition and relative abundance; rare species habitat; standing dead timber; surrounding habitat connectivity	Species composition and relative abundance; rare species habitat from MNHESP investigations and designations and IPaC results
Large woody debris (LWD)	Size, relative abundance and density of LWD above and below water	Consolidate existing information (from sources below)
Water quality	Temperature, pH, TSS, turbidity, clarity, dissolved oxygen, nutrients (nitrogen and phosphorus)	Consolidate existing information (from sources below)
Habitat for aquatic and other water-using biota	Species composition and relative abundance of aquatic macrophytes, fish, benthic habitat/organisms, and other water-using biota	Consolidate existing information (from sources below); site reconnaissance
Rare species habitat	Priority Habitat/Core Area Habitat mapping; IPaC results from USFWS on-line data base	MNHESP investigations and designations; IPaC results
Invasive species	Presence/relative abundance of designated invasive species	Consolidate existing information (from sources below); site reconnaissance; review of invasive species data from ACOE New England District and MIPAG
Special habitat features	Beaver/muskrat dens; otter slides	Consolidate existing information (from sources below)
<p>* The existing information to be used for the site-wide and initial RU-specific impoundment habitat characterization will be consolidated from the following sources: the 2002 Woodlot Ecological Characterization, the 2003 RFI Report, the 2010 RCMS Report, and the MNHESP investigations of state-listed species through 2012 – all described and referenced in Section 2 of this BRA Work Plan – as well as individual reports on, and mapping of, Woods Pond Dam, Rising Pond Dam, and dams in Reach 7.</p>		

Table 3.4.2: Impoundment Function Assessment Factors		
Functional Category	Description of Functions	Parameters/Factors Considered in Assessing Function (see Table 3.4.1)
Hydrology/hydraulic	Floodwater dynamics (flood flow amelioration, flood storage and desynchronization, peak rate control)	Physical dimensions; hydrology (flood storage volume; inlet/outlet conditions; flow dynamics)
Geomorphology	Sediment dynamics (deposition/accretion/transport)	Hydrology (flow dynamics); sediment composition; aquatic plant community
Physicochemical	Water quality maintenance; temperature and oxygen regulation; processing of sediment, organic matter and nutrients	Water quality; hydrology (flow dynamics; water regime); aquatic biota (aquatic vegetation, including algae); sediment composition
Biological	Biodiversity and sustaining life stages of fish and other aquatic biota; habitat for aquatic and other water-using biota; rare species habitat	Habitat for aquatic biota (macrophyte, benthic macroinvertebrate, and; fish communities) and other water-using biota; rare species habitat (mapped Priority Habitat and Core Area habitat and IPaC results); special habitat features (including large woody debris); invasive species

Table 3.5.1: Wetland Community Types*	
Community Type	Description
Wet Meadow	Herbaceous emergent wetlands that are periodically disturbed by mowing or grazing or possibly sustained by hydrologic factors.
Shallow Emergent Marsh	Herb-dominated wetland community with saturated soils or inundated at some locations. Vegetation diverse, but lacking robust, grass-like herbs characteristic of deep emergent marshes.
Deep Emergent Marsh	Herb-dominated wetland community that often remains inundated with water through the growing season. Dominated by robust graminoids grass-like plants or aquatic, broad-leaved herbs.
Shrub Swamp	Hydric shrublands lacking a closed canopy.
Red Maple Swamp	Hydric forests dominated by red maple.
Transitional Floodplain Forest	Riparian forests dominated by silver maple, box-elder, and American elm.
High-terrace Floodplain Forest	Riparian forests with a mixture of trees from wetter sites (e.g., silver maple, American elm) and trees from rich, upland sites (e.g., sugar maple, white ash, basswood). Herb layer with characteristic species of high-nutrient forests.
Black ash-red maple-tamarack calcareous seepage swamp	Hydric forests dominated by red maple, black ash, and bur oak. Occur in high pH groundwater discharge areas.
Moderately alkaline lake/pond	Ponds located in the central valley region with calcareous bedrock underneath.
* From Woodlot (2002a) Ecological Characterization	

Table 3.5.2: Floodplain Wetland Habitat Characterization		
Parameter	Description of Parameter	Site-Wide and Initial RU-Specific Inventory Approach*
Mapping and classification; watershed setting/factors	Mapping of physical location and limits; natural community cover type classification and delineation; wetland-watershed relationships (position in watershed; size of wetland relative to watershed; watershed factors)	Ecological Characterization mapping and classification (updated in Reach 5A during 2018-2019 morphology surveys); aerial photograph interpretation and updated LiDAR mapping in Reaches 5-6; GIS-based mapping in Reach 7 Exposure Areas using on-line data sources to identify potential wetlands.
Hydrogeologic setting	Surficial geology	USGS surficial geology information; U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) soil survey mapping
Hydrology	Degree of surface flooding; connectivity to river or other surface water flow; water regime (mean water level, fluctuation/maximum water depth to lowest water level). Evidence of groundwater discharge (springs/seeps, etc)	Field indicators; consolidate existing information (from sources below); Federal Emergency Management Agency Flood (FEMA) Flood Insurance Study (FIS); site reconnaissance
Soil composition and characteristics	Soil profile description; soils series as mapped by the USDA NRCS	Consolidate existing information (from sources below)
Plant community	Plant species by community type.	Consolidate existing information (from sources below)
Overall wildlife habitat/use	Wildlife use; habitat suitability; surrounding land uses; corridor connectivity	Consolidate existing information (from sources below)
Special habitat features	Wolf trees; standing dead timber; tree cavities; large woody debris; turtle hibernacula or nesting sites	Consolidate existing information (from sources below)
Rare species habitat	Priority Habitat/Core Area Habitat mapping; IPaC results from USFWS on-line data base	MNHESP investigations and designations; IPaC results
Invasive species	Invasive species as designated by ACOE New England District or MIPAG	Consolidate existing information (from sources below); site reconnaissance; review of invasive species data from ACOE New England District and MIPAG
<p>* The existing information to be used for the site-wide and initial RU-specific floodplain wetland habitat characterization will be consolidated from the following sources: the 2002 Woodlot Ecological Characterization reports, the 2003 RFI Report, the 2010 example area evaluations and RCMS Report, the MNHESP investigations of state-listed species through 2012, the Reach 5A vernal pool investigations; and the Final Accessibility Report – all described and referenced in Section 2 of this BRA Work Plan – as well as the USDA NRCS soil surveys, USGS surficial geology mapping, and FEMA FIS – all referenced in Section 3.5.1.</p>		

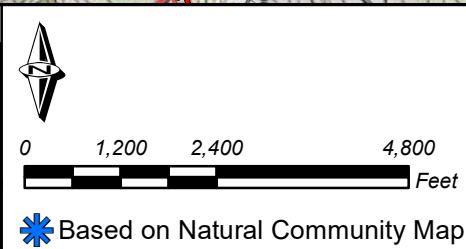
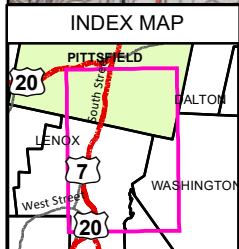
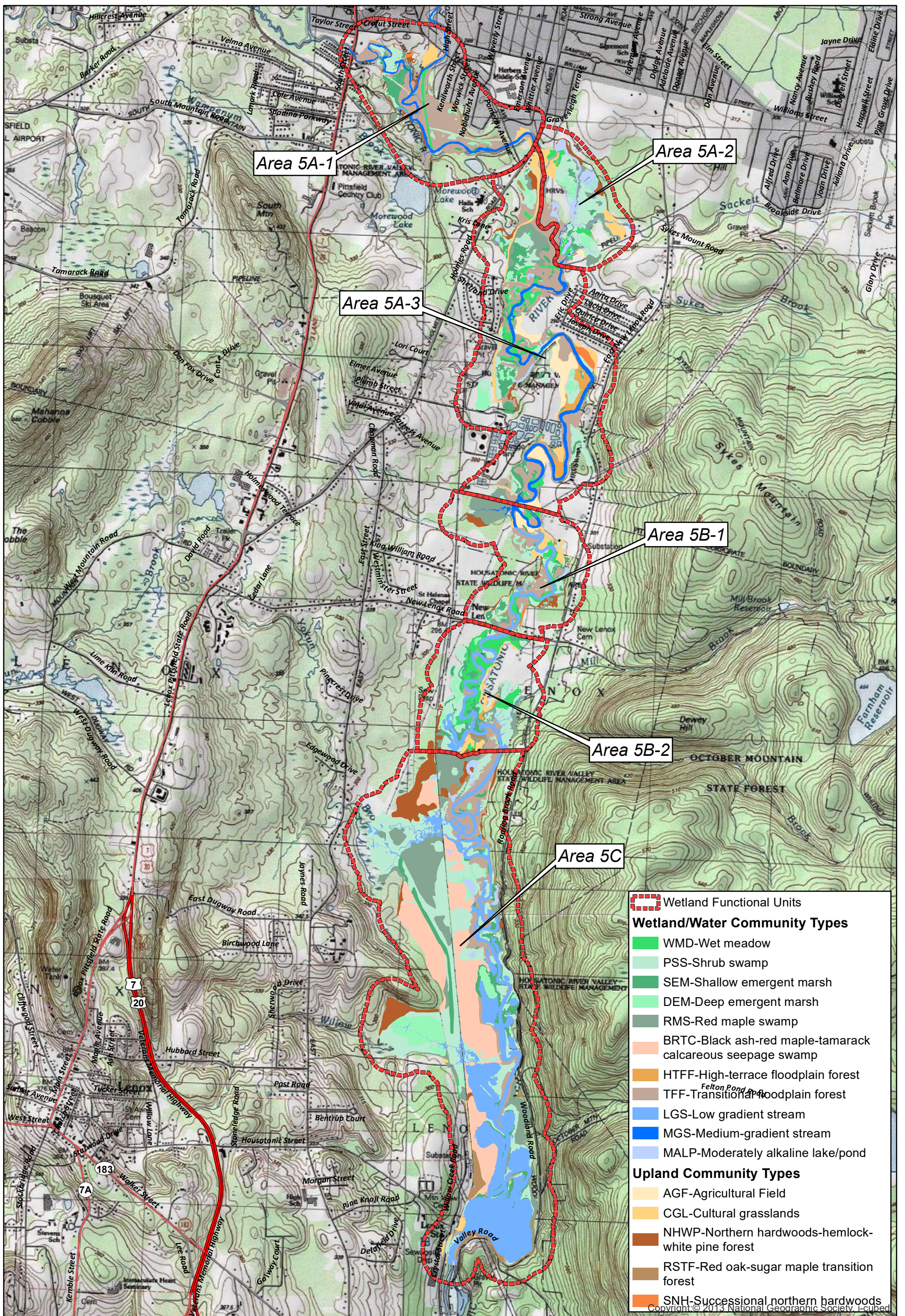
Table 3.5.3: Floodplain Wetland Function Assessment Factors*		
Function	Description of Function	Parameters Considered in Assessing Function (see Table 3.5.2)
Groundwater recharge/discharge	This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. Recharge relates to the potential for the wetland to contribute water to an aquifer. Discharge relates to the potential for the wetland to serve as an area where groundwater can be discharged to the surface.	Hydrogeologic setting; soil composition and characteristics
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.	Watershed setting/factors; hydrology; soil composition and characteristics; plant community
Sediment, toxicant, and 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	Watershed setting/factors; hydrology; soil composition and characteristics; plant community
Nutrient removal, retention, and 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.	Watershed setting/factors; hydrology; soil composition and characteristics; plant community
Production export (nutrient)	This function relates to the effectiveness of the wetland to produce food or usable products for humans or other living organisms.	Watershed setting/factors; hydrology; soil composition and characteristics; plant community; overall wildlife habitat/use
Sediment/shoreline stabilization	This function relates to the effectiveness of a wetland to stabilize streambanks and shorelines against erosion.	Watershed setting/factors; hydrology; soil composition and characteristics; plant community
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	Watershed setting/factors; hydrology; soil composition and characteristics; plant community; special habitat features; overall wildlife habitat/use; rare species habitat; invasive species
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.	Watershed setting/factors; hydrology; soil composition and characteristics; plant community; special habitat features; overall wildlife habitat; rare species habitat; invasive species
Rare species habitat	This value relates to the effectiveness of the wetland or associated waterbodies to support threatened, endangered, or other rare species	Rare species habitat (mapped Priority Habitat and Core Area habitat and IPaC results)

* Generally adapted from USACE New England District, 1995: *The Highway Methodology Workbook Supplement, Wetland Functions and Values, A Descriptive Approach*, NEDEP-360-1-30a.

Table 3.5.4: Floodplain Upland Habitat Characterization		
Parameter	Description of Parameter	Site-Wide and Initial RU-Specific Inventory Approach*
Mapping and classification	Mapping of physical location and limits; natural community cover type classification and delineation.	Ecological Characterization mapping and classification; aerial photograph interpretation and updated LiDAR mapping in Reaches 5-6; GIS-based map in Reach 7 Exposure Areas using on-line data sources to identify floodplain upland community cover types.
Hydrogeologic setting	Surficial geology	USGS surficial geology information; U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) soil survey mapping.
Hydrology/drainage characteristics	Degree of surface flooding; connectivity to adjacent wetlands, river or other surface water flow.	Consolidate existing information (from sources below); Federal Emergency Management Agency Flood (FEMA) Flood Insurance Study (FIS); site reconnaissance
Soil composition and characteristics	Soil profile description; soils series as mapped by the USDA NRCS.	USDA NRCS soil survey mapping; consolidate other existing information (from sources below)
Plant community	Plant species by community type; density/diversity and interspersions of plant community cover types.	Consolidate existing information (from sources below)
Overall wildlife habitat/use	Wildlife use; habitat suitability	Consolidate existing information (from sources below)
Special habitat features	Wolf trees; standing dead timber; tree cavities; large woody debris; turtle hibernacula or nesting sites	Consolidate existing information (from sources below)
Rare species habitat	Priority Habitat/Core Area Habitat mapping; IPaC results from USFWS on-line data base.	MNHESP investigations and designations; IPaC results
Invasive species	Invasive species as designated by ACOE New England District or MIPAG	Consolidate existing information (from sources below); site reconnaissance; review of invasive species data from ACOE New England District and MIPAG
<p>* The existing information to be used for the site-wide and initial RU-specific floodplain upland habitat characterization will be consolidated from the following sources: the 2002 Woodlot Ecological Characterization reports, the 2003 RFI Report, the 2010 example area evaluations and RCMS Report, the MNHESP investigations of state-listed species through 2012, the Reach 5A vernal pool investigations; and the Final Accessibility Report – all described and referenced in Section 2 of this BRA Work Plan – as well as the USDA NRCS soil surveys, USGS surficial geology mapping, and; FEMA FIS – all referenced in Section 3.5.1.</p>		

Table 3.5.5: Floodplain Upland Function Assessment Factors		
Function	Description of Functions	Parameters/Factors Considered in Assessing Function (see Table 3.5.4)
Groundwater recharge	Infiltration/recharge of surface water to groundwater, especially during flood or high runoff events	Hydrogeologic setting; soil composition and characteristics; hydrology/drainage characteristics; plant community
Flood storage and desynchronization	Floodwater dynamics (flood flow amelioration, flood storage and desynchronization, peak rate control)	Hydrology/drainage characteristics; plant community
Corridor ecological connectivity	Capacity to contribute to ecological corridor connectivity along the riparian zone	Mapping and classification; plant community; overall wildlife habitat/use; rare species habitat
Buffer capacity	Capacity to buffer adjacent wetland and water habitats from nearby development	Soil composition and characteristics; plant community
Overall wildlife habitat	Habitat suitability for diverse wildlife at various trophic levels and all life stages	Plant community; presence of special habitat features; overall wildlife habitat/use; rare species habitat; invasive species
Rare species habitat	Designated rare species habitat per MNHESP and USFWS	Rare species habitat (mapped Priority Habitat and Core Area habitat and IPaC results)

Figure



Wetland Functional Units in the PSA

Housatonic River - Pittsfield, MA

Figure 1
12/2/2021

AECOM

Appendix A

NHESP Vernal Pool Field Observation
Form

Instructions (continued)
 4. Certification by the Facultative Amphibian Method - provide photo, video, or audio (chorusing) of the required breeding evidence and photo(s) or video of the pool holding water **AND** dry.
 6. Provide information to help distinguish the pool & assess its features.
 7. All required biological & physical evidence must be documented by good quality photos, video, or audio.
 8. Indicate the 3 required maps submitted.

4. Biological Evidence: *Facultative Amphibians*

Breeding evidence¹ of ≥ 2 species must be documented by photos, video, or audio.

Spring peeper		
Gray treefrog		
American toad		
Fowler's toad		

Breeding evidence¹ includes: full breeding choruses (call constant & overlapping), ≥ 5 adults in amplexus, any # of egg masses, tadpoles, and/or transforming juveniles in pool.

5. Rare Wetland Species

Were MESA-listed species observed using this pool?

Yes No

If yes, please submit a Rare Animal Observation Form with photo & map to the NHESP (available at www.nhesp.org).

6. Description of Pool and Surroundings ~ Please describe to the best of your ability and knowledge.

Dimensions (please include measurements or estimates):

Approx. Length: _____ Approx. Width: _____ Approx. Maximum Depth: _____

Describe distinctive features (roads, structures, boulders, foot trails, vegetation types, etc.) which are visible from or near the pool that would help someone recognize it.

Origin of the pool (check): Natural depression Human-made pool/ditch Created wetland/pool Other or Unknown (describe) _____

The pool's hydroperiod is most likely: Seasonal (drying out in most years) Semi-permanent (drying partially in most years) Permanent

Describe any inlet or outlets to/from the pool and their permanence (e.g., streams, culverts, etc).

Land use in vicinity of pool (approx. 100 ft from pool edge – check all that apply): upland forest forested wetlands emergent marsh/scrub-shrub wetland agricultural/grassland/meadow residential/commercial other _____

7. Documentation Submitted – Label with pool name or tracking #, town, date taken, observer's name.

- Photo(s) Video Audio
 Obligate Species Facultative Species Pool Holding Water Dry Pool

9. Property Owner Information - Landowner information is optional & is available from local tax assessor's offices.

Name _____

Address _____

Town _____ State _____ Zip _____ Assessors Map/Pcl# _____ (if known)

10. Observer Information & Signature – Must be filled out & signed.

Name _____

Address _____

Town _____ State _____ Zip _____

Telephone _____ E-mail _____

I hereby certify under the pains and penalties of perjury that the information contained in this report is true and complete to the best of my knowledge.

Signature _____ Date _____

Signature of Adult, if Observer is under 18 years of age _____

All submissions and supporting documents will be retained by the NHESP and, with the exception of information for MESA-listed species and the identity of minors, are available to interested parties under the Public Records Law.

8. Maps Submitted

Pool locus must be delineated & identified with your pool name or tracking #.

3 REQUIRED MAPS:

- USGS Topographic Map - 1:24,000 or 1:25,000 or better
 Color orthophoto - 1:12,000 or better

and ≥1 of the following:

- Assessor's map (Map and Plot #)
 Professional survey
 Sketch map - with directions and distances from permanent landmarks
 GPS longitude/latitude coordinates:
 Latitude = _____
 Longitude = _____

SEND COMPLETED, SIGNED FORM & SUPPORTING DOCUMENTATION TO:

**NHESP - Vernal Pool Certification
 MA Division of
 Fisheries & Wildlife
 1 Rabbit Hill Rd.
 Westborough, MA 01581**

For questions call 508-389-6360