Kevin Mooney
Senior Project Manager
Global Operations - Environment, Health & Safety

General Electric Company
1 Plastics Ave.
Pittsfield, MA 01201

T (413) 553-6610
kevin.mooney@ge.com

Via Electronic Mail

September 16, 2022

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)
Sustainability and Climate Adaptation Plan

Dear Mr. Tagliaferro:

In accordance with Section II.H.14 of the Revised Final RCRA Permit issued by EPA and Section 4.5.4 of the Final Revised Rest of River Statement of Work, enclosed is GE's Sustainability and Climate Adaptation Plan for the Rest of River Remedial Action.

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

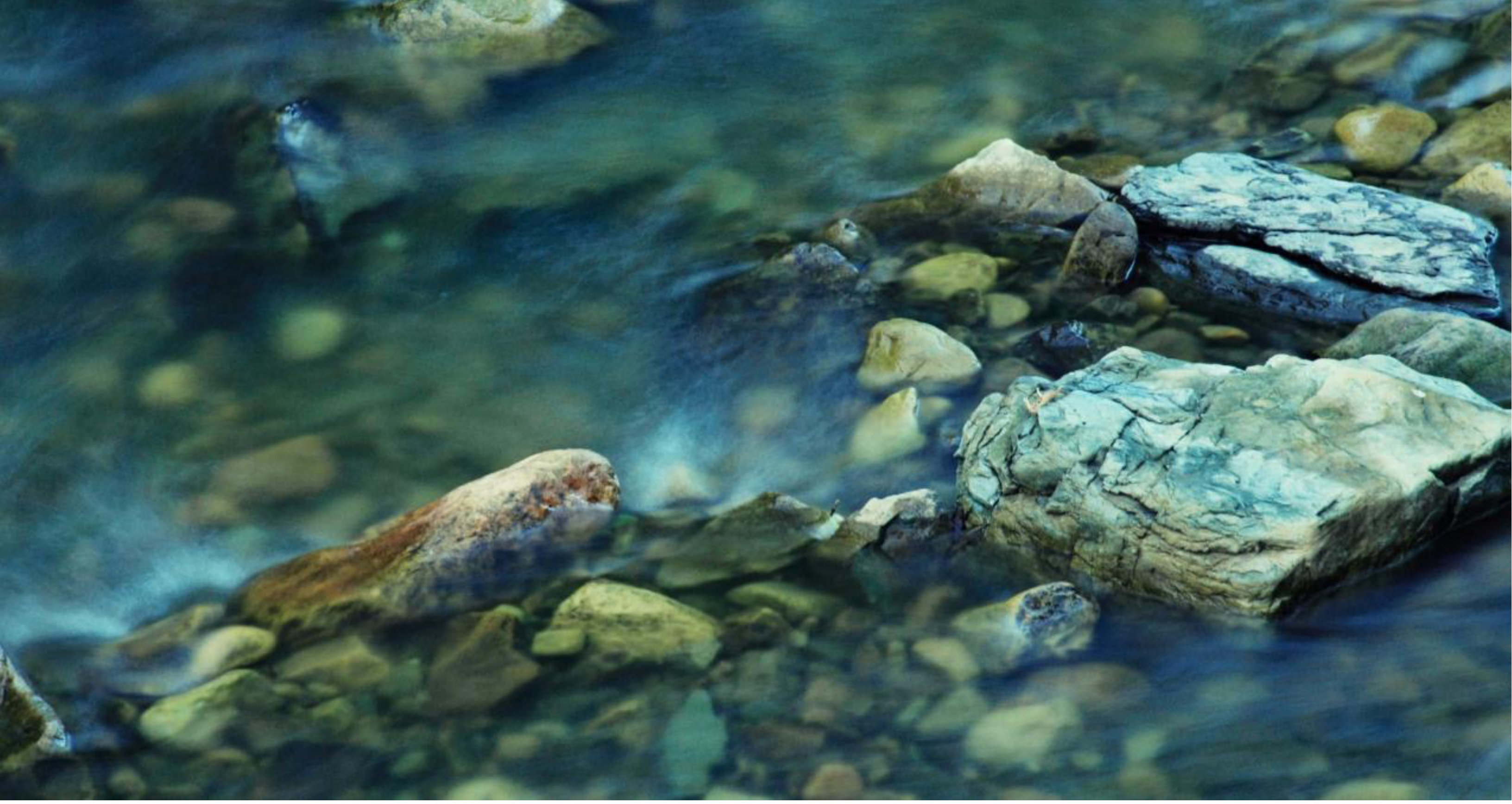
Very truly yours,

Kevin G. Mooney
Senior Project Manager – Environmental Remediation

Enclosure

Cc: (via electronic mail)
Tim Conway, EPA
John Kilborn, EPA
Richard Fisher, EPA
Joshua Fontaine, EPA
Christopher Smith, EPA
Anni Loughlin, EPA
Christopher Ferry, ASRC Primus
Thomas Czelusniak, HDR Inc.
Scott Campbell, Taconic Ridge Environmental

Izabella Zapisek, Taconic Ridge Environmental
Michael Gorski, MassDEP
Elizabeth Stinehart, MassDEP
John Ziegler, MassDEP
Ben Guidi, MassDEP
Michelle Craddock, MassDEP
Jeffrey Mickelson, MassDEP
Mark Tisa, MassDFW
Jonathan Regosin, MassDFW
Betsy Harper, MA AG
Traci Iott, CT DEEP
Susan Peterson, CT DEEP
Graham Stevens, CT DEEP
Lori DiBella, CT AG
Molly Sperduto, USFWS
Mark Barash, US DOI
Ken Finkelstein, NOAA
James McGrath, City of Pittsfield
Andrew Cambi, City of Pittsfield
Michael Coakley, PEDA
Melissa Provencher, BRPC
Christopher Ketchen, Town of Lenox
Town Administrator, Lee
Town Manager, Great Barrington
Town Administrator, Stockbridge
Town Administrator, Sheffield
Andrew Silfer, GE
Andrew Thomas, GE
Matthew Calacone, GE
Michael Werth and Charles Guest, Anchor QEA
Mark Gravelding and Philip Batten, Arcadis
Dennis Lowry, AECOM
James Bieke, Sidley Austin
Public Information Repository at David M. Hunt Library in Falls Village, CT
GE Internal Repository



September 2022
GE-Pittsfield/Housatonic River Site

ANCHOR QEA

Sustainability and Climate Adaptation Plan

September 2022
GE-Pittsfield/Housatonic River Site

Sustainability and Climate Adaptation Plan

Prepared for
General Electric Company
1 Plastics Avenue
Pittsfield, Massachusetts 01201

Prepared by
Anchor QEA, LLC
290 Elwood Davis Road
Liverpool, New York 13088

Project Number: 210469-12.01

TABLE OF CONTENTS

FIGURES

ABBREVIATIONS

°C	Degrees Centigrade
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CH_4	methane
CMR	Code of Massachusetts Regulations
CO_2	carbon dioxide
EPA	U.S. Environmental Protection Agency
°F	Degrees Fahrenheit
Final Revised OSS	*Final Revised Overall Strategy and Schedule for Implementation of Corrective Measures*
Final Revised SOW	*Final Revised Rest of River Statement of Work*
GE	General Electric Company
GHG	greenhouse gas
IPCC	Intergovernmental Panel on Climate Change
MassDEP	Massachusetts Department of Environmental Protection
N_2O	nitrous oxide
NOAA	National Oceanographic and Atmospheric Administration
PCB	polychlorinated biphenyl
RCP	Representative Concentration Pathway
PDI	pre-design investigation
RD/RA	Remedial Design/Remedial Action
ROR	Rest of River
SOW	Statement of Work
UDF	Upland Disposal Facility

1 Introduction

1.1 Background

On December 16, 2020, pursuant to the 2000 Consent Decree (CD) for the GE-Pittsfield/ Housatonic River Site (EPA/GE 2000), the U.S. Environmental Protection Agency (EPA) issued to the General Electric Company (GE) a final revised modification of GE's Resource Conservation and Recovery Act Corrective Action Permit (Revised Final Permit) for the Housatonic Rest of River (ROR; EPA 2020). The ROR is defined as that portion of the Housatonic River and its backwaters and floodplain (excluding Actual/Potential Lawns as defined in the CD) located downstream of the confluence of the East and West Branches of the Housatonic River (the Confluence). The Revised Final Permit set forth a Remedial Action selected by EPA to address polychlorinated biphenyls (PCBs) in the ROR.

The Revised Final Permit required GE to develop and submit a Statement of Work (SOW) specifying the deliverables and activities GE will conduct to design and implement the ROR Remedial Action. In accordance with that requirement, after receipt of EPA's comments on an earlier version, GE submitted a *Final Revised Rest of River Statement of Work* (Final Revised SOW) on September 14, 2021 (Anchor QEA et al. 2021), and EPA approved it on September 16, 2021 (EPA 2021a).

Section II.H.14 of the Revised Final Permit and Section 4.5.4 of the Final Revised SOW require GE to prepare a Sustainability and Climate Adaptation Plan that includes measures to ensure that the Corrective Measures (i.e., remediation activities) to be conducted in the ROR are designed and constructed to be resilient to potential changes due to climate change and to incorporate, where practicable and appropriate, methods to minimize greenhouse gas (GHG) emissions. This document constitutes that Plan.

On May 26, 2021, EPA issued a conditional approval letter for an earlier version of GE's ROR SOW (EPA 2021b). That conditional approval letter included an attachment containing sustainability-related comments and references that EPA directed GE to address and consider in the Sustainability and Climate Adaptation Plan. This Plan considers those comments and also considers EPA's Superfund Climate Resilience webtool (EPA 2022a) and *Climate Resilience Technical Fact Sheet: Contaminated Sediment Sites* (EPA 2019).

Several other federal and state guidance documents have been prepared to provide guidelines on sustainability and "green" practices for consideration during planning and implementation of remediation projects. In February 2012, EPA Region 1 issued a policy document to promote strategies and practices that reduce the environmental footprint during cleanup and restoration activities (EPA 2012). In August 2016, EPA issued a guidance memorandum (EPA 2016) recommending approaches for regional Superfund programs to consider when evaluating greener cleanup activities through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). That guidance covers a broad range of approaches, including GHG emissions reduction, for relevant parts of the CERCLA process, including site characterization, remedial investigation and feasibility study or engineering evaluation/cost analysis, development of decision documents, and enforcement mechanisms. The Massachusetts Department of Environmental Protection (MassDEP) also promotes the incorporation of sustainability considerations into remedy selection, implementation, and optimization of remediation projects and has developed principles and opportunities for sustainable remediation (MassDEP 2017). These and other guidance have been considered in the development of this Plan.

1.2 Project Setting and Remedial Action Overview

The Housatonic River is approximately 149 miles long. Its headwaters begin in northwestern Massachusetts. The river flows southeast through western Connecticut and into the Long Island Sound. The ROR area consists of the portion of the Housatonic River and its backwaters and floodplain (excluding portions of certain residential properties) downstream of the Confluence (located approximately two miles downstream from the GE facility in Pittsfield, Massachusetts). The ROR area subject to the Revised Final Permit is shown in Figure 1-1 and identified according to river reach designations established by EPA.

In accordance with the Revised Final Permit, remediation activities are planned in Reaches 5 through 8, which are shown on Figure 1-2. These reaches are located between the City of Pittsfield to the north and Town of Great Barrington to the south. The ROR Remedial Action includes remediation, as necessary, of sediments (including in backwaters), riverbank soils, and floodplain soils (including vernal pools) over an area covering approximately 30 river miles. Specifically, it includes active remediation of: (1) sediments in the river (including backwaters) within Reaches 5 through 8, with the exception of the flowing subreaches in Reach 7 (i.e., Reaches 7A, 7D, 7F, and 7H); (2) riverbank soils in Reaches 5A and 5B; and (3) floodplain soils (including vernal pools) in portions of Reaches 5 through 8 where necessary to meet certain Performance Standards.

The type of active remediation varies for the river sub-reaches and includes excavation of sediment, riverbank soils, and floodplain soils; capping of river sediments; post-excavation backfill placement; placement of sediment amendments; construction of an on-site upland disposal facility; and disposal of excavated soil and sediment in the on-site upland disposal facility and in an off-site disposal facility. Based on the scale of the required remediation activities, the Remedial Design/Remedial Action (RD/RA) process is anticipated to take a number of years to complete, as described in the *Final Revised Overall Strategy and Schedule for Implementation of Corrective Measures* (Final Revised OSS; Anchor QEA 2022), approved by EPA on July 6, 2022.

1.3 Plan Objective and Scope

In accordance with Section II.H.14 of the Revised Final Permit and Section 4.5.4 of the Final Revised SOW, this Plan describes the process for designing and constructing the remediation and restoration activities for the ROR to be resilient to potential impacts due to climate change to the extent practicable, and to minimize GHG emissions where practicable and appropriate.

While the effects of climate change on the remedy are uncertain, there are several Performance Standards and associated Corrective Measures specified in the Revised Final Permit on whose implementation climate change could potentially have some impact. These include the Performance Standards and Corrective Measures relating to sediment removal, engineered caps, riverbank soil remediation, floodplain and vernal pool soil remediation, restoration of areas disturbed by remediation, the Upland Disposal Facility (UDF), and dam maintenance and inspections. This Plan conceptually describes how resiliency to climate change will be factored into the remedial design, construction, and monitoring and maintenance relating to those activities.

Construction, through the use of equipment and materials, will generate GHG emissions. This Plan also describes the process for identifying potential methods to minimize those emissions (where practicable and appropriate), considering both direct measures (e.g., use of lower-emissions equipment) and indirect measures (e.g., use of construction materials produced with a lower carbon footprint).

Design details and specific measures to promote resiliency to the potential effects of climate change and to reduce GHG emissions will be presented in the Conceptual and Final RD/RA Work Plans to be prepared for each Remediation Unit.[1] In addition, other project plans will consider potential climate, resiliency, and GHG emissions implications, including the Adaptive Management Plan; Supplemental Information Packages; Model Reevaluation Plan (if that plan is deemed necessary by EPA after consultation with GE); and inspection, monitoring, and maintenance plans.

1.4 Plan Organization

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

- Section 2 summarizes regional and local climate change projections and describes anticipated measures to be implemented during the remedial design and construction to promote the resiliency of the Remedial Action to potential effects of climate change.
- Section 3 identifies the anticipated sources of GHG emissions during the Remedial Action and identifies potential methods to minimize GHG emissions (as practicable and appropriate).

As noted in the Final Revised SOW, GE will update this Plan in the future, upon notification by EPA, as relevant guidance evolves, including both federal and state guidance documents.

[1] As described in Section 3.2 of GE's Final Revised OSS, the ROR has been segmented into separate Remediation Units to manage workflow and schedule for the ROR Remedial Action.

2 Climate Change Resiliency

While some of the general effects of climate change are universal, regions will experience different levels of effects based on geography and land development patterns. Climate resilience planning for remedial projects generally involves assessing the vulnerability of the remedy's elements, including the site's infrastructure, and evaluating the design and measures that could potentially increase the remedy's resilience to change (EPA 2019). EPA recommends using a place-based strategy to determine how climate change may affect a remediation project. A place-based approach considers the varying geophysical characteristics of contaminated sites, the nature of remedial actions at those sites, and local or regional climate and weather regimes (EPA 2022b). Data indicate that, in general, climate-induced warming is happening faster in New England than in the rest of the United States, and accepted climate models predict increases in annual temperatures and precipitation intensity in New England through the end of the century (Young and Young 2021). Between 1900 and 2020, New England warmed 1.83ºC (3.29ºF) on average, while worldwide temperature rose an average of 1.14ºC. Winters are predicted to become dominated by rain instead of snow, which will decrease spring-generated snow melts, and rainfall is predicted to increase in intensity with longer periods of drought (NOAA/NESDIS 2022).

This section first describes localized projections of climate change for consideration during remedial design (Section 2.1). Section 2.2 then presents an assessment of potential localized effects of climate change on the ROR Remedial Action based on generally accepted climate projections from Massachusetts. Section 2.3 then describes specific elements of the remedy for which resiliency to the potential impacts of climate change will need to be evaluated during remedial design.

2.1 Climate Projections

The Intergovernmental Panel on Climate Change (IPCC) and National Oceanographic and Atmospheric Administration (NOAA) have developed regional guidance that States can use and refine based on state-specific parameters. The IPCC prepares comprehensive reports for governments and policymakers about the state of scientific, technical, and socioeconomic knowledge on climate change and its impacts and future risks. IPCC projections are widely used as a basis for regional and local projections and risk assessments. NOAA *State Climate Summaries* (NOAA/NESDIS 2022) were originally produced in response to a growing demand for state-level information in the context of the National Climate Assessments (USGCRP 2018). States use this information to help inform regional assessments.

Massachusetts has developed the *Massachusetts Climate Change Projections - Statewide and for Major Drainage Basins: Temperature, Precipitation, and Sea Level Rise Projections* (NE CASC 2018). That report details projections for changes in temperature, precipitation, and sea level rise and is supported by the Massachusetts Executive Office of Energy and Environmental Affairs to enable municipalities, industry, organizations, state government, and others to utilize a standard, peer-reviewed set of climate change projections that show how the climate is likely to change in Massachusetts through the end of this century. The report summarizes localized temperature and precipitation projections based on simulations from the latest generation of climate models from the IPCC and scenarios of future GHG emissions. The models were selected because they provide reliable climate information for the Northeastern U.S., but predictions were based on ranges to account for the uncertainty in modeling climate variables. Specifically, the projections were based on two Representative Concentration Pathway (RCP) emissions scenarios[2]—the medium (RCP 4.5) and high (RCP 8.5) scenarios. Both annual and seasonal projections are available at statewide and major drainage basin geographic scales. The projections summarized below are specific to the Housatonic River Basin.

2.1.1 Temperature Projections

While the focus of global climate change is often on warmer summers, higher winter temperatures are the most dramatic shift seen thus far in the northeast (Mufson et al. 2019). Winters are predicted to be warmer with more periods of freeze and thaw and a greater percentage of precipitation falling as rain instead of snow. The Housatonic River Basin is predicted to experience increased average temperatures, with both maximum and minimum temperature expected to increase. For example, the NE CASC (2018) predicts the annual average temperature in the Housatonic River Basin is expected to rise from the 1971 to 2000 average (44.3°F) by approximately 3.1°F to 6.7°F by the middle of the 21st century and by 4.3°F to 11.3°F by the end of this century.

Due to projected increases in average and maximum temperatures throughout the end of the century, the Housatonic River Basin is also expected to experience an increase in days with daily maximum temperatures over 90°F, 95°F, and 100°F. The NE CASC (2018) estimates that, annually, up to 20 more days will see daily maximum temperatures over 90°F by mid-century, with up to 57 more days by the end of the century. The Housatonic River Basin is also expected to experience a decrease in days with daily minimum temperatures below 32°F. The NE CASC (2018) estimates winter will see up to nine fewer days below 32°F by mid-century and up to 20 fewer days below 32°F by the end of the century.

2.1.2 Precipitation Projections

Precipitation is normally variable from year to year, with periods of short-term droughts interspersed among normal precipitation years. Climate change is predicted to further increase this variability; drought years will be drier than average and wet years wetter. Rainfall will likely increase in spring

[2] RCPs are GHG concentration trajectories adopted by the IPCC. They represent four pathways: a low-emissions pathway that limits warming to 1.5°C, a medium pathway, a high pathway, and an uncontrolled pathway. The pathways describe different climate futures, all of which are considered possible depending on the volume of GHGs emitted and mitigation strategies employed globally.

and winter months in the Housatonic River Basin, with increasing consecutive dry days in summer and fall. As an example, the NE CASC (2018) predicts the annual average precipitation in the Housatonic River Basin is expected to rise from the 1971 to 2000 average (47.4 inches) by approximately 1.1 to 6.4 inches by the middle of the 21st century and by approximately 1.6 to 7.7 inches by the end of this century.

Winter is anticipated to experience the greatest increase in precipitation. Projections for the summer and fall seasons are more variable; those seasons could experience either a drop or an increase in total precipitation throughout the 21st century, depending on natural cycles of drought. Fall and summer will likely experience the highest number of consecutive dry days. More precipitation will occur over shorter periods of time during intense storms (NOAA/NESDIS 2022). The 100-year flood event (a flood of a magnitude that occurs on average once every 100 years) has been estimated to now occur every 60 years on average; by 2050, 100-year flood events are projected to occur every 10 to 20 years (USGCRP 2018).

2.1.3 Massachusetts Design Guidelines

Massachusetts has developed a web-based Climate Resilience Design Standards Tool, which provides design-level guidance for state agencies to promote the incorporation of climate resilience into capital projects (Resilient MA 2022). While the tool is meant for capital planning purposes, it includes infrastructure design standards for streams and rivers, as well as for infrastructure related to hazardous waste. Specifically, the guidelines recommend designing for a 100-year flood with a 1% annual exceedance probability.

2.2 Assessment of Potential Localized Effects of Climate Change on ROR Remedial Action

Assessing the vulnerability of a site remedy to the effects of climate change involves evaluating the remedy's exposure to climate or weather hazards of concern and evaluating the remedy's sensitivity to those hazards (i.e., likelihood for the hazards to reduce remedy effectiveness). As a general matter, EPA identifies the following climate change-related hazards that may affect remediation projects (EPA 2022b):

- Climate events, such as intense storms;
- Sustained changes, such as drought;
- Localized project parameters, such as increased stormwater; and
- Technological problems arising in the system or site infrastructure, such as impacts to electrical supply.

Based on projections discussed in Section 2.1, the localized climate effects that could potentially affect the ROR Remedial Action include the following:

- Increased storms and changing weather patterns could result in higher river flows and more frequent flooding.
- Changing seasonal patterns could result in changes to peak river flow amounts, both in terms of quantity and timing, with higher flows in winter and early spring and lower flows in summer and fall. For example, frozen ground conditions can contribute to low rainfall infiltration and higher runoff events that may result in riverine flooding (EOEEA et al. 2018). Warming spring seasons that reduce the number of days where the ground is frozen may slightly decrease this effect in early spring floods.
- Changes in seasonal patterns could lead to less snowpack, and higher temperatures in summer and fall could increase evaporation rates; both would result in less groundwater recharge.
- A decrease in summer water availability (with greater evapotranspiration) would increase the potential risk of drought, which could affect local habitats.
- More frequent droughts could exacerbate the impacts of flood events by damaging vegetation that could otherwise help mitigate flooding impacts.
- More frequent and intense storms may also lead to damages to regional infrastructure such as bridges and roadways, as well as utility transmission, and hotter conditions could lead to strains on the local electrical grid due to an increased need for air conditioning.

2.3 Resiliency Considerations for Remedial Design

Remedial designs will consider the potential effects identified in Section 2.2 to provide resiliency to climate change. The following subsections describe the design aspects that provide resiliency to protect the integrity of the remedy during and after construction. This Plan does not provide specific design details and measures that may be implemented to provide resiliency to the potential effects of climate change; those details will be presented in future Conceptual and Final RD/RA Work Plans for the various RUs.

2.3.1 Sediment Removal and Backfilling

The ROR Remedial Action will include sediment removal and engineered capping or backfilling in certain portions of Reaches 5 through 8. The sediment removal activities will be designed in accordance with the Revised Final Permit to reduce future exposure to and bioavailability of PCBs. As described in Sections 2.1 and 2.2, climate change has the potential to result in storms with increased intensity that would result in higher river flows (i.e., a higher volume of flow) and more frequent flooding. The increased flows have the potential to cause erosion of the riverbed and riverbanks and may affect the natural river conditions independent of the Remedial Action. The sediment removal activities, in conjunction with other components of the Remedial Action (e.g., engineered caps, restoration), will be designed to be resilient to the potential effects of climate change to the extent practicable.

Engineered capping, where required, is discussed in Section 2.3.2. In lieu of capping, in certain portions of the river required to be remediated to a spatially weighted average PCB concentration of 1 milligram per kilogram, backfill material will be placed within the excavated riverbed after sediment removal is complete. These river sections will include Reach 5C and some of the Reach 7 impoundments (including Reaches 7B and 7C, where sediment will be removed from the impoundments prior to removal of the downstream dams). Under the Revised Final Permit, the final elevations of backfill placement will be required to show no net loss of flood storage capacity and no increase in water surface elevation. These requirements will ensure the backfill placement does not exacerbate the potential effects of increased flows due to climate change. During the design, a hydraulic model will be developed using the most up-to-date river flow data available to meet these conditions.

Where placed, backfill material types and gradations will be specified to be similar to the existing riverbed to provide channel stability and functions and values equivalent to those of the pre-removal surficial sediment substrate. The backfill material will not be designed to be resistant to erosive forces from extreme storm and flow events. Instead, over the long term, the backfill material is expected to serve a similar role as existing sediment within the river system, given that sediment transport is a natural function of river systems. Material type and geotechnical testing data collected during the pre-design investigation (PDI) for each applicable reach of the river will be evaluated to support development of the backfill material specifications.

For Reach 6 (Woods Pond), the Revised Final Permit requires that sediment be removed and that an engineered cap be placed over residual PCBs to provide a minimum post-cap water depth of six feet based on the crest elevation of the downstream dam (Woods Pond Dam).[3] Nearshore areas of Woods Pond will be excavated to provide a stable slope that is not subject to erosion or sloughing, while also being as steep as possible. The remedial design will evaluate geotechnical data collected during the PDI to determine the stable slope requirements and take into consideration that the engineered cap will be placed within Wood Pond several years after the sediment removal work is completed so as to allow for the upstream remediation to be completed (as described in GE's Final Revised OSS). This evaluation will also consider potential slope stability impacts associated with future water levels due to extreme flow or drought events.

[3] As noted above, engineered caps are discussed in Section 2.3.2.

2.3.2 *Engineered Caps*

Increased intensity of storms and changing weather patterns are anticipated to result in higher river flows and more frequent flooding. The engineered caps will need to be designed to withstand the projected river flows under extreme storm and flood events.

In accordance with the Revised Final Permit, the engineered caps will be constructed such that they will result in no loss of flood storage capacity and no increase in water surface elevations in any of the reaches where the cap installed. These requirements will ensure the cap placement does not exacerbate the potential effects of increased flows due to climate change. This will be accomplished by removing sediment to depth necessary to accommodate construction of the engineered caps that will meet the functions outlined in the Revised Final Permit, including a mixing layer, a chemical isolation layer, a geotechnical filter layer (where appropriate), an erosion protection layer, a bioturbation layer, and a habitat layer.[4] The final grade of the cap will be consistent with the preconstruction grade or with modifications, considering the principles of Natural Channel Design. During design analysis for each reach where engineered caps will be placed, modeling will be performed to verify that the design will not result in a loss of flood storage capacity or an increase in water surface elevations.

The erosion protection component of the engineered caps will stabilize the underlying cap layers and provide physical stability to protect against potential erosion from the forces of river currents, considering the potential impacts of climate change. Because the Housatonic River is not a navigable river, the river currents and flood flows are the dominant factors contributing to potential erosion. The bed shear stresses associated with water velocity will be determined based on a specified design flow event (which will be selected in consideration of the impacts of climate change on flood flow return frequency) using a hydraulic model. Stable particle sizes for the erosion protection layer will be determined in consideration of relevant EPA and U.S. Army Corps of Engineers guidance to provide resistance to the calculated bed erosive forces.[5]

As described in the EPA-approved Final Revised OSS, the remedial design and remedial action process for the ROR is anticipated to take a number of years to complete, with some time between the remedial design for Reach 5A and the remedial designs for other downstream reaches where capping will be required. In this situation, the remedial designs for the engineered cap in each downstream RU where a cap will be installed will be based on the most up-to-date river flow data applicable to that RU, along with site-specific modeling.

[4] Section II.B.2.i.(2) of the Revised Final Permit provides details related to design and construction requirements for each of the cap layers described above, including that, under some circumstances, a single layer of material may serve more than one of the functions listed.

[5] Such guidance includes EPA's *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites* (EPA 2005) and the U.S. Army Corps of Engineers' *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments* (Palermo et al 1998).

Long-term monitoring and maintenance will be conducted to verify that the engineered caps continue to function as designed and are resilient to climate change impacts to the extent practicable. The long-term monitoring and maintenance program will include routine monitoring and event-based monitoring triggered after river flow events with a certain recurrence interval(s).

2.3.3 Riverbank Soil Removal and Reconstruction

The Revised Final Permit requires remediation of "contaminated eroding" riverbanks (as defined in the Revised Final Permit), as well as potentially other riverbanks (depending on certain conditions), in Reaches 5A and 5B. This remediation will include removal of riverbank soil followed by reconstruction of the riverbanks. As with sediment removal, riverbank soil removal activities will be designed in accordance with the Revised Final Permit to reduce future exposure to and bioavailability of PCBs and, in conjunction with other components of the Remedial Action, will be designed to be resilient to the potential effects of climate change to the extent practicable.

As required by the Revised Final Permit, the affected riverbanks will be reconstructed/stabilized to minimize erosion considering the principles of Natural Channel Design and to result in a channel that is in dynamic equilibrium, balances flow and sediment loads, and reduces the impact of erosive forces. The goal of Natural Channel Design is not to create a river fixed in place by hardening of the entire riverbed or riverbanks. In addition, armor stone (i.e., riprap) will likely be placed on the residual surface of banks where needed for protection of adjacent infrastructure and properties. In other areas, bioengineering methods will be used to restore excavated or disturbed riverbanks. These measures will be constructed to mitigate potential erosion of reconstructed riverbanks, including potential effects associated with climate change.

2.3.4 Floodplain Areas and Vernal Pools, Including Restoration

The ROR Remedial Action will include excavation of soil from floodplain areas (including potentially vernal pools) as necessary to achieve the Performance Standards listed in the Final Revised Permit. The locations and depths of floodplain soil excavations will be determined during the design phase based on the requirements of the Final Revised Permit.

Upon completion of the remedial activities, the excavated areas will be backfilled and restored to provide a stable surface and a similar pre-excavation grade. The backfill material will provide a substrate suitable to establish a vegetated cover over the excavated areas to mitigate erosion during future storm and runoff events, including increases in the frequency of such events (if any) resulting from climate change. The disturbed areas will be restored using vegetation (e.g., grasses, shrubs, trees), where necessary, to stabilize and restore the disturbed soils. Functional erosion and sedimentation control measures will be used and maintained until the vegetation is established.

The remedial design will also include an evaluation, as needed, of remaining PCB concentrations in floodplain soil for erosion potential and the likelihood of future downstream transport at concentrations that could result in an exceedance of the General Performance Standards specified in Sections II.B.1.a and II.B.1.b of the Revised Final Permit (i.e., the Downstream Transport and Biota Performance Standards). This evaluation would consider several factors to evaluate erosion potential from water and wind, including topography, land use, soil type and structure, vegetative cover, and rainfall. Variations in rainfall and flood frequency resulting from climate change would be considered as part of this evaluation, including variations in rainfall intensity, duration, and time of year, as well as potential periods of drought.

Vernal pools located within the floodplain will also be remediated as required (either by traditional excavation methods or by application of activated carbon) to achieve the Performance Standards specified in the Revised Final Permit for vernal pools. The Revised Final Permit also requires that, in cases where excavation of vernal pool soils is conducted, the vernal pools are to be restored to pre-remediation conditions to the extent feasible. Vernal pools typically fill with water in the spring and are dry in the summer months. The potential effects of climate change could affect the vernal pools, regardless of any Remedial Action. Climate change may affect or alter current habitat, even if the vernal pool restoration results in conditions identical to current conditions; this will be noted as a consideration in future operation, monitoring, and maintenance plans covering vernal pools. Changing weather patterns could lead to increasing droughts, and shifts in precipitation timing may mean some pools dry earlier in the year. These potential effects associated with climate change may add to the complexities of restoring the vernal pools.

The following will likely be considered during the remedial design phase to help reduce vulnerabilities to climate change in vernal pools:

- Disturbance will be limited to areas necessary to meet the Performance Standards, while minimizing the impacts to other existing vernal pools.
- Restoration designs will evaluate several factors intended to maximize restoration success in vernal pools that require remediation (e.g., focusing on hydrology and soil types first and then vegetation, maintaining the forested "envelope" surrounding the vernal pool to the extent practicable and using uncompacted soils with high levels of organic material).
- Routine monitoring will be implemented to measure restoration success over an ecologically relevant time scale.

2.3.5 Upland Disposal Facility

GE will design and construct a UDF at the location identified in the Revised Final Permit. The UDF will be used to contain excavated sediment and soil that meets specific concentration and other criteria described in the Revised Final Permit.

Climate change could cause variations in groundwater levels due to increased rainfall, flooding, or drought. As described in Section 2.2, regional projections indicate changes in seasonal patterns could lead to less snowpack in winter and higher temperatures in summer and fall with a consequent increase in evaporation rates, both which would result in less groundwater recharge. In accordance with the Revised Final Permit, the bottom liner of the UDF will be designed to be a minimum of 15 feet above a conservative estimate of the seasonally high groundwater elevation. Site-specific groundwater elevation data, along with historical groundwater level fluctuations at similarly sited off-site long-term monitoring wells in Massachusetts, will be used during design of the UDF to evaluate the seasonally high groundwater elevation. This evaluation of the seasonally high groundwater elevation will also consider the potential effects of climate change.

The design for the UDF will also include a stormwater management system to control and manage surface runoff and minimize surface erosion. Stormwater runoff from the UDF (following capping) will be managed by a system of features including drainage channels, culverts, and basins. Both water infiltration and detention will be considered during the UDF design to manage stormwater to the extent practicable. Stormwater design calculations will use the most recent precipitation-frequency atlas issued by NOAA, including any updates related to climate change considerations. Stormwater controls for the UDF will be designed in accordance with 310 Code of Massachusetts Regulations (CMR) 19.115(2), which requires that stormwater runoff calculations include specific storm event scenarios, including a 24-hour, 100-year storm.

Inspection, monitoring, and maintenance activities will be conducted during operation of the UDF, and post-closure monitoring will continue in perpetuity following closure of the UDF to ensure it functions as designed.

2.3.6 Dam Maintenance and Inspections

GE has previously submitted, and EPA has approved, Operation, Monitoring, and Maintenance (OM&M) Plans for Woods Pond Dam and Rising Pond Dam, and GE is currently implementing those plans. In accordance with the Final Revised Permit, GE is also required to submit monitoring and maintenance plans for the non-GE-owned dams on the ROR in Massachusetts—namely, the Columbia Mill Dam, Willow Mill Dam, and Glendale Dam.

Woods Pond Dam and Rising Pond Dam will continue to be operated, monitored, and maintained in accordance with the requirements of their EPA-approved OM&M Plans, as well as the applicable provisions of the Massachusetts dam safety regulations in 302 CMR 10.00. Those dams, which are classified as intermediate- and large-sized dams, respectively, with Significant Hazard potential, are compliant with the Spillway Design Flood criteria that are based on applicable 100- and 500-year flood return periods. In addition, after the monitoring and maintenance plans for the non-GE-owned dams on the ROR in Massachusetts have been submitted and approved, GE will comply with the provisions of those plans applicable to GE.

The operation, monitoring, and maintenance of all these dams in accordance with the applicable plans will take into account the impacts of high-flow and flood events. Further, in cases in which GE is evaluating maintenance and repair activities for the dams, the potential future impacts due to climate change will be considered as appropriate. Finally, all these dams have (or will have) Emergency Action Plans to address the impacts of dam failure or other conditions that result in an impending or actual sudden, uncontrolled release of water, including releases associated with events caused or exacerbated by climate change impacts.

3 Greenhouse Gas Emissions Reductions

GHGs are gases the trap heat in the atmosphere. The most prominent GHGs contributing to this process are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Fluorinated gases, such as chlorofluorocarbons, hydrochlorofluorocarbons, and hydrofluorocarbons, are synthetic GHGs that also contribute to climate change. CO_2 is the primary GHG emitted through human activities. (Approximately 80% of GHGs emissions consist of CO_2.) Although CO_2 is naturally present in the atmosphere, emissions from human activities have significantly increased the levels of CO_2 (and other GHGs) in the atmosphere since the Industrial Revolution through fossil fuel combustion, deforestation, and land use changes.

This section summarizes the potential sources of GHG emissions anticipated during the construction and operations associated with the ROR Remedial Action. This section also describes measures that will be considered during remedial design and construction to minimize GHG emissions.

3.1 Potential Greenhouse Gas Emissions Sources

3.1.1 Direct Emissions

Construction activities will result in direct GHG emissions, primarily through use of fossil fuels, during site preparation, remedial construction, construction of the UDF, transportation of materials (including transport of construction materials to the site and transport of excavated materials to the UDF and off-site landfills), and restoration activities. Construction will likely involve the use of medium- and heavy-duty diesel-powered equipment such as haul trucks, excavators, and backhoes, as well as smaller gas-powered equipment such as field trucks, handheld tools, generators, and landscaping equipment. Direct GHG emissions will primarily be generated through mobile source combustion of fossil fuels (i.e., tailpipe emissions from on-road vehicles and off-road equipment).

3.1.2 Indirect Emissions

Construction and operation will also result in indirect and off-site GHG emissions. Indirect emissions include emissions associated with purchased electricity used for field trailers, lighting, pump operations, water treatment system operations, etc., as well as off-site emissions from production of construction materials (such as quarrying and excavation of backfill and cap materials) and off-site landfill operations.

3.2 Methods to Minimize Greenhouse Gas Emissions

Design and construction of the ROR Remedial Action will consider potential sustainability practices and methods as they pertain to reducing or minimizing GHG emissions to the extent practicable and applicable. Green and sustainable methods and practices will be considered through each stage of the remedial design and construction planning. Green and sustainable opportunities identified as practicable and appropriate to the remedial implementation project will be incorporated into the design specifications for the remediation contractor. Because construction will be phased over time, and design plans, including equipment lists and schedules, are not yet finalized, most measures are adaptive in nature to allow for flexibility and changes to equipment/material availability.

3.2.1 Minimizing Direct Greenhouse Gas Emissions

During the ROR remediation activities, direct GHG emissions will be generated primarily through mobile-source combustion of fossil fuels from on-road vehicles and off-road equipment. These will include heavy-duty and lighter-duty construction equipment, trucks used for on-site and off-site transport, and worker vehicles.

To some extent, these direct GHG emissions will be controlled by existing EPA programs unrelated to the ROR remediation project. For example, EPA and the National Highway Traffic Safety Administration have developed programs designed to reduce fuel consumption from heavy-, medium-, and light-duty vehicles. By reducing fuel consumption, these programs will likewise reduce the associated GHG emissions.

In addition, more specific potential measures to reduce direct GHG emissions during the ROR Remedial Action will be evaluated during design and construction planning. Measures to be evaluated could include the following (where practicable):

- Use of clean on-road trucks (defined as model year 2017 or newer) to transport construction equipment and materials (and evaluation of the potential use of hybrid and electric models in the future as the electric vehicle market grows);
- Minimizing truck travel, where practicable and consistent with other project goals, to save energy and reduce emissions, taking into consideration that this objective will need to be balanced against the objective of minimizing the impact of track traffic on residential neighborhoods, which could require more circuitous truck routes;
- Use of local sources of construction materials (e.g., cap, backfill, and restoration materials) to the extent practicable so as to reduce emissions compared to those of longer-distance truck transport to the site;
- Limiting heavy-duty construction equipment and truck idling time where feasible (except for vehicles that need to idle to perform work, vehicles being serviced, or vehicles in a queue waiting for work);
- Improving operational efficiency of construction activities;
- Encouraging contractors to use local staff to perform site work as appropriate so as to limit long-distance commuting to the site; and

- Use of low-impact development methods in temporary construction areas where practicable and appropriate for the area. ("Low-impact development" refers to an overall design process that incorporates integrated sustainability. For example, if access to a given area is needed, application of low-impact development design principles would involve evaluation of siting the access road to minimize impacts to forested or other valuable habitat and to allow for repeat usage, instead of creating several access areas.)

Options to minimize direct GHGs may evolve over the course of the project, and new technologies will be considered during design and construction planning to the extent practicable and appropriate.

3.2.2 Minimizing Indirect Greenhouse Gas Emissions

One source of indirect GHG emissions consists of construction materials, which produce GHG emissions both through materials construction and placement and through manufacturing and transport of such material. Another source of indirect GHG emissions is from use of electricity. To some degree, the GHG emissions associated with electricity will be addressed by existing state programs unrelated to the ROR remediation.[6]

Potential specific measures to reduce indirect GHG emissions during the ROR Remedial Action will be evaluated during design and construction planning. Measures to be evaluated could include the following (where practicable):

- Use of recycled or reclaimed materials that meet the requirements detailed in project specifications, where available;
- Seeking opportunities to implement beneficial use or reuse of materials used in the project that would otherwise be considered a waste (e.g., reuse of materials utilized for construction of temporary access roads and staging areas for other purposes, beneficial use of clean soils excavated during grading of the UDF site) so as to limit the need for or extent of post-use transport and disposal of such materials;
- Evaluation of the use of solar panels or other renewable energy to power office trailers or stationary equipment; and
- Use of woody materials generated during tree clearing (as necessary to provide river access or to construct support areas) as part of restoration or for other purposes.

[6] For example, Massachusetts's Renewable Energy Portfolio Standard and Clean Energy Standard require that ≥80% of all electricity sold in the state must be clean or renewable by 2050. In addition, the MassDEP's Electricity Generator Emissions Limits will gradually restrict the amount of CO_2 that Massachusetts's remaining fossil-fuel power plants are allowed to emit.

4 References

Anchor QEA (Anchor QEA, LLC), 2022. *Final Revised Overall Strategy and Schedule for Implementation of the Corrective Measures*. Prepared for the General Electric Company. July 2022.

Anchor QEA, AECOM, and Arcadis, 2021. *Final Revised Rest of River Statement of Work*. Prepared for the General Electric Company. September 2021.

EPA (U.S. Environmental Protection Agency), 2005. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites*. EPA-540-R-05-012. December 2005.

EPA, 2012. *Clean and Greener Policy for Contaminated Sites EPA Region 1 Office of Site Remediation and Restoration*. Revised February 2012; accessed August 26, 2022. Available at: https://www.epa.gov/sites/default/files/2016-01/documents/r1grpolicy.pdf.

EPA 2019. *Climate Resilience Technical Fact Sheet: Contaminated Sediment Sites*. Accessed August 23, 2022. Available at: https://www.epa.gov/sites/default/files/2019-12/documents/cr_sediment_sites_fact_sheet_update.pdf.

EPA, 2020. *Revised Final Permit Modification to the 2016 Reissued RCRA Permit and Selection of CERCLA Remedial Action and Operation & Maintenance for Rest of River*. December 2020.

EPA, 2021a. Letter to: Andrew Silfer, General Electric Company. Regarding: Approval of GE's Final Rest of River Statement of Work, Housatonic Rest of River, GE-Pittsfield/Housatonic River Site. September 16, 2021.

EPA, 2021b. Letter to: Andrew Silfer, General Electric Company. Regarding: Conditional Approval of GE's June 9, 2020 Rest of River Statement of Work, Housatonic Rest of River, GE-Pittsfield/ Housatonic River Site. May 26, 2021.

EPA, 2022a. Superfund Climate Resilience. Accessed August 3, 2022. Available at: https://www.epa.gov/superfund/superfund-climate-resilience.

EPA, 2022b. *Superfund Climate Resilience: Vulnerability Assessment*. Accessed August 3, 2022. Available at: https://www.epa.gov/superfund/superfund-climate-resilience-vulnerability-assessment.

EOEEA (Executive Office of Energy and Environmental Affairs), EOPSS (Executive Office of Public Safety and Security), and MEMA (Massachusetts Emergency Management Agency), 2018. *State Hazard Mitigation and Climate Adaptation Plan (SHMCAP)*. September 2018. Available at: https://resilientma.mass.gov/shmcap-portal/#/full-plan.

EPA/GE (General Electric Company), 2000. *Consent Decree*. *United States of America, State of Connecticut, and Commonwealth of Massachusetts v. General Electric Company*, Civil Action Nos. 99-30225, 99-30226, 99-30227-MAP, entered by the United States District Court for the District of Massachusetts, Western Division. October 27, 2000.

MassDEP (Massachusetts Department of Environmental Protection), 2017. Sustainable Remediation – FAQs. Accessed August 2022. Available at: https://www.mass.gov/files/documents/2017/11/24/Sustainable%20Remediation%20FAQ.pdf.

Mufson, S, C. Mooney, J. Eilperin, and J. Muyskens, 2019. "2°C: Beyond the Limit: Extreme Climate Change Has Arrived in America." *The Washington Post*, August 13, 2019. Available at: https://www.washingtonpost. com/graphics/2019/national/climate-environment/climate-change-america/?stream=top (accessed August 18, 2022).

NE CASC (Northeast Climate Adaptation Science Center), 2018. *Massachusetts Climate Change Projections - Statewide and for Major Drainage Basins: Temperature, Precipitation, and Sea Level Rise Projections*. Accessed August 8, 2022. Available at: https://necasc.umass.edu/projects/massachusetts-climate-change-projections.

NOAA (National Oceanographic and Atmospheric Administration)/NESDIS (National Environmental Satellite, Data, and Information Service), 2022. *State Climate Summaries for the United States 2022*. Editors, K.E. Kunkel, R. Frankson, J. Runkle, S.M. Champion, L.E. Stevens, D.R. Easterling, B.C. Stewart, A. McCarrick, and C.R. Lemery.

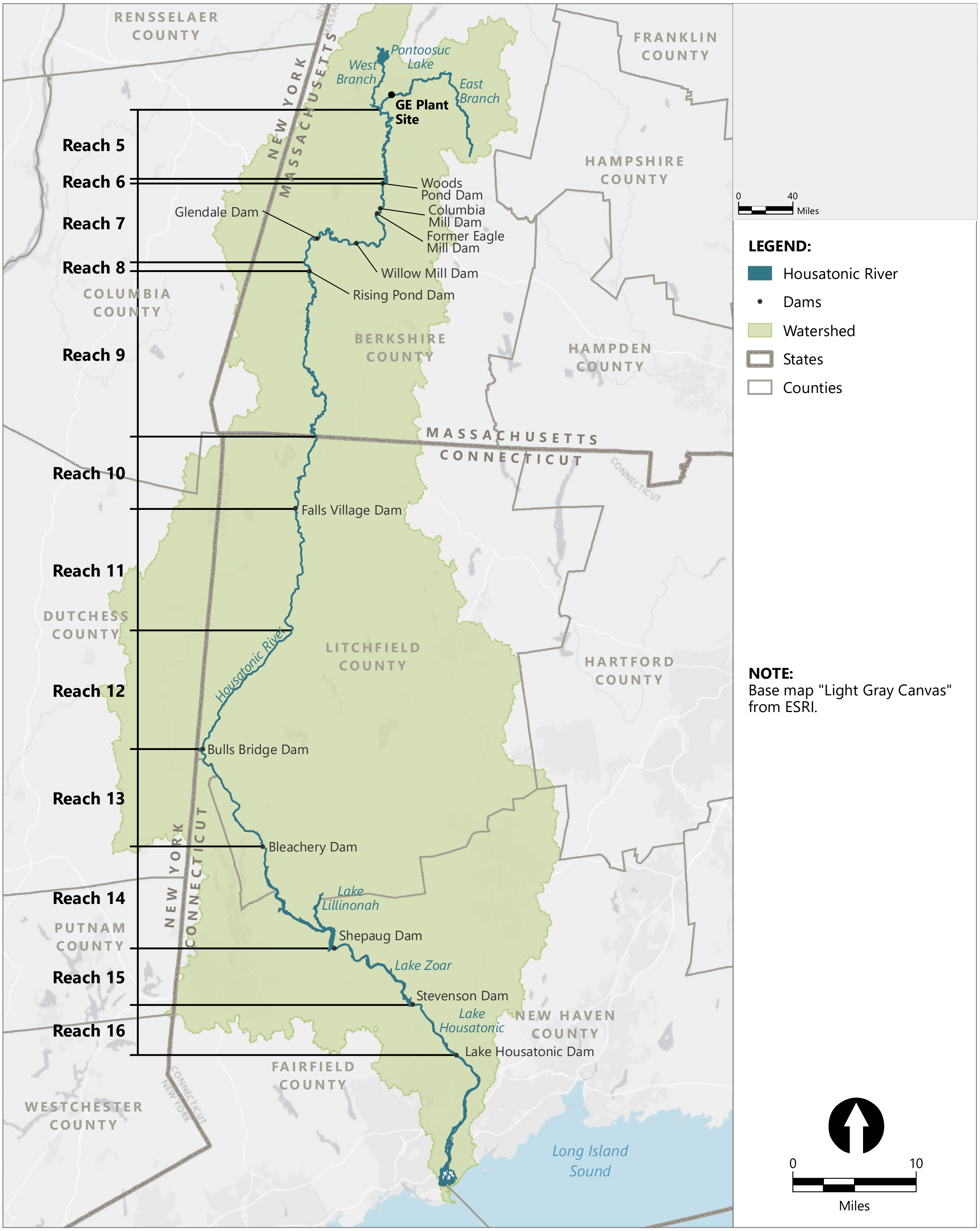
Palermo, M., S. Maynord, R. Miller, and D. Reible, 1998. *Guidance for In-Situ Subaqueous Capping of Contaminated Sediments*. Great Lakes National Program Office, Assessment and Remediation of Contaminated Sediments Program. EPA 905-B96-004. September 1998.

Resilient MA, 2022. "Climate Resilience Design Standards Tool." *Climate Resilience Design Standards & Guidelines*. Accessed August 30, 2022. Available at: https://resilientma.mass.gov/rmat_home/designstandards/.

USGCRP (U.S. Global Change Research Program), 2018. *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*. Editors, D.R. Reidmiller, C.W. Avery, D.R. Easterling, K.E. Kunkel, K.L.M. Lewis, T.K. Maycock, and B.C. Stewart. Washington, DC: U.S. Global Change Research Program. DOI: 10.7930/NCA4. 2018.

Young, S.S. and J.S. Young, 2021. "Overall Warming with Reduced Seasonality: Temperature Change in New England, USA, 1900–2020." *Climate* 9(12):176. Available at: https://doi.org/10.3390/cli9120176.

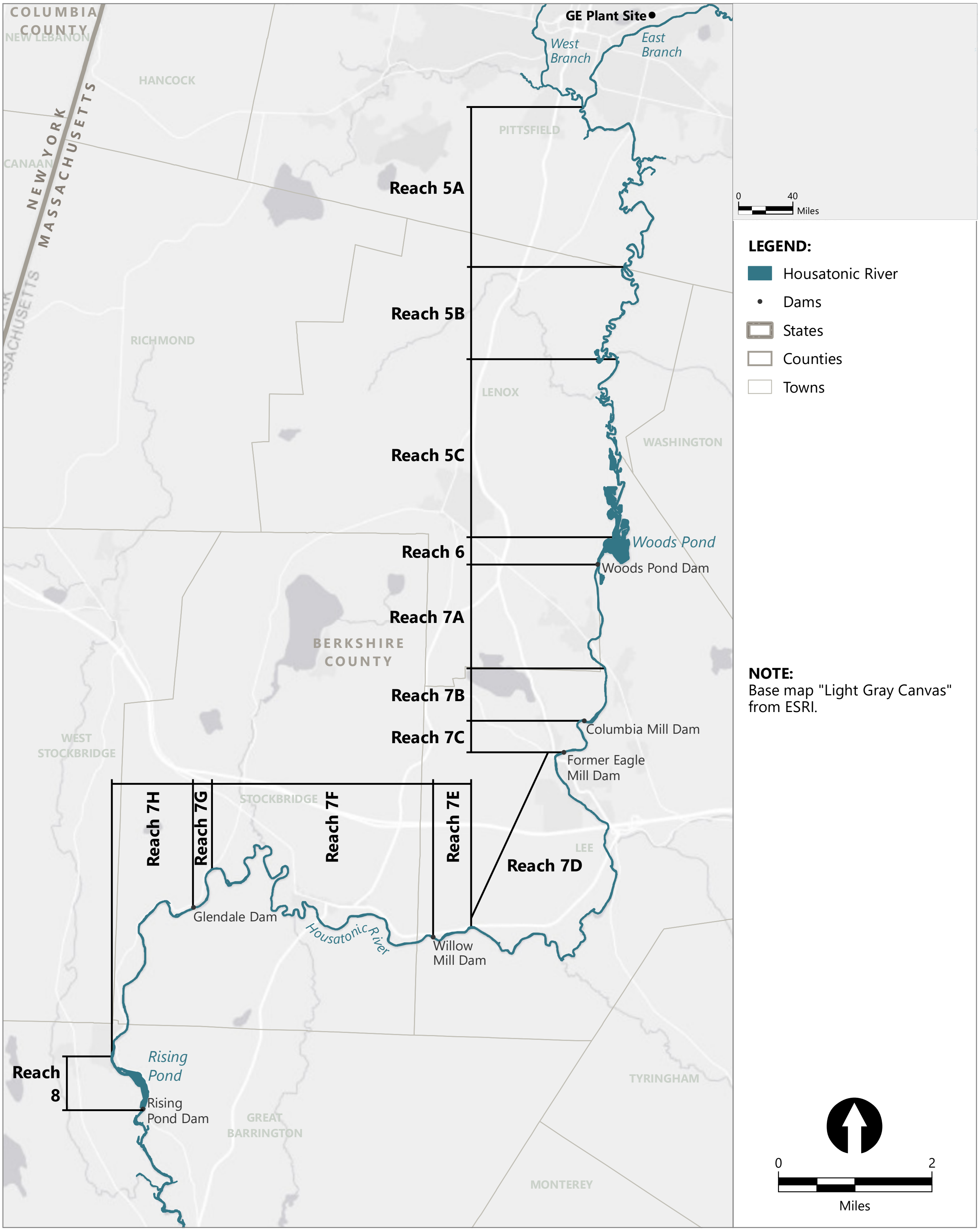
Figures



Publish Date: 2022/09/15, 11:42 AM | User: jlarson
Filepath: \\orcas\GIS\Jobs\GE_0469\HousatonicRiver\Maps\AQ_Fig1_SiteMapOverview.mxd

ANCHOR QEA

Figure 1-1
Housatonic River Map
Sustainability and Climate Adaptation Plan
GE-Pittsfield/Housatonic River Site



Publish Date: 2022/09/15, 1:26 PM | User: jlarson
Filepath: \\orcas\GIS\Jobs\GE_0469\HousatonicRiver\Maps\AQ_Fig2_SiteMapOverviewReach5to8.mxd

ANCHOR QEA

Figure 1-2
Housatonic River Map (Subreaches in Reaches 5 and 7)

Sustainability and Climate Adaptation Plan
GE-Pittsfield/Housatonic River Site