Attachment 12

Excerpts from EPA's Response to Comments on Draft Permit Modification and Statement of Basis (October 2016)

Response to Comments

on

Draft Permit Modification and Statement of Basis
for EPA's Proposed Remedial Action for the Housatonic River "Rest of River"
GE-Pittsfield/Housatonic River Site

SDMS: 593922

U.S. Environmental Protection Agency
Region 1 (EPA New England)

5 Post Office Square, Suite 100
Boston, MA 02109-3912

October 2016

Response to Comments
on
Draft Permit Modification and Statement of Basis for EPA's Proposed Remedial Action for the Housatonic River "Rest of River" GE-Pittsfield/Housatonic River Site

Table of Contents

DISCLAIMER v

ACRONYMS, ABBREVIATIONS, AND SYMBOLS vi

I. INTRODUCTION 1

I.A PURPOSE OF THIS DOCUMENT 1

I.B PUBLIC PARTICIPATION PRIOR TO EPA'S PROPOSED REMEDIAL ACTION 2

I.C PUBLIC PARTICIPATION ON EPA'S PROPOSED REMEDIAL ACTION 3

I.D EPA'S INTENDED FINAL DECISION AND DISPUTE RESOLUTION 4

I.E AVAILABILITY OF THE ADMINISTRATIVE RECORD 5

II. ALTERNATIVE EVALUATION/REMEDY SELECTION 6

II.A INTRODUCTION 6

II.B COMPARATIVE ANALYSIS FOR SEDIMENT AND FLOODPLAIN REMEDY 8

II.C COMMENTS IN SUPPORT OF THE REMEDY 27

II.C.1 Supporting Comments from State Government 27

II.C.2 Supporting Comments from Local Governments, Citizens, and Non-Governmental Organizations 29

II.D THE PROPOSED REMEDIATION IS INSUFFICIENT 30

II.E THE PROPOSED REMEDIATION IS TOO EXTENSIVE AND THE RIVER/FLOODPLAIN WILL BE DESTROYED 32

II.F PCB TOXICITY AND RISK ASSESSMENTS 39

III. PERFORMANCE STANDARDS 61

III.A PERFORMANCE STANDARDS AND CORRECTIVE MEASURES 61

III.B GENERAL PERFORMANCE STANDARDS 62

III.B.1 Downstream Transport and Biota Performance Standards 62

III.B.1.a Downstream Performance Standard 62

III.B.1.b Biota Performance Standards 74

III.B.2 Restoration Performance Standards 83

III.B.2.a Overall Impacts to the Ecosystem from Remediation Activities and Effectiveness of Ecological Restoration 83

III.B.2.b Effects of Remediation/Restoration on Specific Habitats 101

Table of Contents (Continued)

III.B.2.c Invasive Species 130
III.B.2.d Natural Resource Damage/Massachusetts Endangered Species Act 134

III.C RIVER SEDIMENT AND BANKS 143
III.C.1 Reaches 5A, 5B, and 5C 143
III.C.2 Backwaters Adjacent to Reaches 5, 6, and 7 153
III.C.3 Woods Pond 159
III.C.4 Reach 7 Impoundments 168
III.C.5 Rising Pond 182
III.C.6 Monitored Natural Recovery (MNR) for Flowing Subreaches in Reach 7 and Throughout Reaches 9 – 16, Including Impoundments 189
III.C.7 Engineered Capping 197

III.D FLOODPLAIN AND VERNAL POOLS 210
III.D.1 Floodplain 210
III.D.2 Vernal Pools 217

III.E INSPECTION, MONITORING AND MAINTENANCE/OPERATION AND MAINTENANCE 226

III.F TREATMENT/DISPOSITION 234
III.F.1 General Comments on Treatment/Disposition 234
III.F.2 Comparative Analysis for Treatment/Disposition Remedy 237
III.F.3 New and Innovative Technologies 270

III.G INSTITUTIONAL CONTROLS AND RELATED REQUIREMENTS 274

IV. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) 295

V. ADAPTIVE MANAGEMENT 318

VI. OTHER PERMIT-SPECIFIC LANGUAGE COMMENTS 320

VII. FINANCIAL ASSURANCE AND GE'S RESPONSIBILITY TO ADDRESS CONTAMINATION IN PERPETUITY 323

VIII. ROLE OF STATE AGENCIES, LOCAL GOVERNMENT, AND OTHER STAKEHOLDERS 329

VIII.A LACK OF DETAIL IN PERMIT 329
VIII.B STATE AND LOCAL ROLES 331
VIII.C OTHER STAKEHOLDER ROLES 335

IX. IMPACTS TO THE COMMUNITY AND EFFECTS OF REMEDY 336

IX.A QUALITY OF LIFE ISSUES 336
IX.B EFFECTS ON INFRASTRUCTURE 340
IX.C PROPERTY VALUES, ECONOMIC IMPACTS, AND TOURISM 343
IX.D COMPENSATION 344
IX.E GREENHOUSE GASES AND CARBON FOOTPRINT 351

Table of Contents (Continued)

IX.F ACCIDENTS AND INJURIES 352
IX.G USE OF LOCAL LABOR 352
IX.H ENVIRONMENTAL EDUCATION 352
X. COMMENTS ON THE STATEMENT OF BASIS 352
XI. OTHER COMMENTS 352
XI.A ARCHAEOLOGY 352
XI.B FUTURE STORM EVENTS 352
XI.C OPERATIONAL DETAILS AND ENGINEERING CONTROLS 352
XI.D CLIMATE CHANGE 352
XI.E NON-PCB COMPOUNDS 352
XI.F OTHER MISCELLANEOUS COMMENTS 352

List of Tables

Table 1. Disposal Sites in Table 1 of GE's October 27, 2014 Comments on EPA's 2014 Draft Permit Modification that had Off-Site Disposal of Contaminated Sediment/Soils

List of Attachments

Attachment A: Summary of the Changes made from the Draft to the Final Permit Modification (excluding changes to Attachment C – Summary of ARARs)

Attachment B: Summary of Changes to Attachment C – Summary of ARARs from the Draft to the Final Permit Modification

Attachment C: Public Comment Inventory to 2014 Draft Permit Modification and Statement of Basis

Attachment D: Cross-Reference Response Matrix for Public Comments on the 2014 Draft Permit Modification and Statement of Basis

Disclaimer

This Response to Comments document contains mostly verbatim comments received by the U.S. Environmental Protection Agency (EPA) on the Draft Permit Modification for the Housatonic River "Rest of River" during the public comment period from June to October 27, 2014. In some cases, similar comments from different commenters were summarized into one comment in order to reasonably streamline the process and assist the reader.

Additionally, some of EPA's responses are related to changes made to the Final Permit Modification issued in tandem with this document. To the extent that responses in this document differ slightly from the language in the Final Permit Modification, the Final Permit Modification language controls.

Acronyms, Abbreviations, and Symbols

µg	micrograms
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µg/m^3	micrograms per cubic meter
A/P	Actual/Potential
AC	Activated Carbon
ACEC	Areas of Critical Environmental Concern
AOC	Area of Contamination
AR	Administrative Record
ARARs	Applicable or Relevant and Appropriate Requirements
ATV	All-Terrain Vehicle
AWQC	Ambient Water Quality Criteria
BMP	Best Management Practices
BRA	Baseline Restoration Assessment
BRPC	Berkshire Regional Planning Commission
C.F.R.	U.S. Code of Federal Regulations
CAD	Combined Aquatic Disposal
CCC	Citizens Coordinating Council
CD	Consent Decree
CDF	Confined Disposal Facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CIP	Community Involvement Plan
CM	Corrective Measures
cm/yr	centimeters per year
CMP	Conservation and Management Permit
CMR	Code of Massachusetts Regulations
CMS	Corrective Measures Study
CMSP	Corrective Measures Study Proposal
$CO_2 - eq$	carbon dioxide equivalents

Acronyms, Abbreviations, and Symbols (Continued)

COC	Contaminant of Concern
CPUE	Catch Per Unit Effort
CRA	Cultural Resource Assessment
CRS	Cultural Resource Survey
CSTAG	Contaminated Sediments Technical Advisory Group
CT 1-D	Model in the CMS developed by GE for Connecticut Impoundments
CT DEEP	Connecticut Department of Energy and Environmental Protection
CT DEP	Connecticut Department of Environmental Protection, the predecessor of CT DEEP
CT	Connecticut
CTE	Central Tendency Exposure
CWA	Clean Water Act
CY	cubic yards
dbh	diameter at breast height
Decree	Consent Decree
DOD	Department of Defense
EA	Exposure Area
EAB	Environmental Appeals Board
EC20	20% effect concentration
EEA	Massachusetts Executive Office of Energy and Environmental Affairs
EFDC	Environmental Fluid Dynamics Code
EMNR	Enhanced Monitored Natural Recovery
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPC	Exposure Point Concentrations
ERA	Ecological Risk Assessment
ERDC	U.S. Army Engineer Research and Development Center
ERE	Environmental Restriction and Easements
ES	Executive Summary
ESA	Endangered Species Act
FCM	Food Chain Model
Fed. Reg.	Federal Register

Acronyms, Abbreviations, and Symbols (Continued)

FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FFS	Focused Feasibility Study
FP#	floodplain remedy alternative (number)
g/m^2	grams per square meter
GE	General Electric Company
GHG	greenhouse gas
GM	General Motors
gpm	gallons per minute
HEAST	Health Effects Assessment Summary Table
HGM	Hydro-geomorphic Setting
HHRA	Human Health Risk Assessment
HI	Hazard Index
HRI	Housatonic River Initiative
I, M & M	Inspection, Monitoring and Maintenance
IARC	International Agency for Research on Cancer
IC	Institutional Control
IMPGs	Interim Media Protection Goals
IRIS	Integrated Risk Information System
ISCP	Invasive Species Control Plan
kg/yr	kilograms per year
km	kilometers
LC20	20% reduced survival
LOAEL	Lowest Observed Adverse Effect Level
MA	Massachusetts
Mass Audubon	Massachusetts Audubon Society
MassDEP	Massachusetts Department of Environmental Protection
MassDFG	Massachusetts Department of Fish and Game
MassDFW	Massachusetts Division of Fisheries and Wildlife
MassDPH	Massachusetts Department of Public Health
MassFWB	Massachusetts Fisheries and Wildlife Board

Acronyms, Abbreviations, and Symbols (Continued)

MATC	Maximum Acceptable Threshold Concentration
MCP	Massachusetts Contingency Plan
MDPH/BEH	Massachusetts Department of Public Health / Bureau of Environmental Health
MESA	Massachusetts Endangered Species Act
mg/kg	milligrams per kilogram (for purposes of this document equivalent to ppm)
MNR	Monitored Natural Recovery
MOD	modified version of remedy option
MS4	Municipal Separate Storm Sewer System Permit
NAPL	Non-Aqueous Phase Liquid
NCD	Natural Channel Design
NCP	National Contingency Plan
NEH	National Engineering Handbook
NGO	Non-Governmental Organization
NHESP	Massachusetts Natural Heritage and Endangered Species Act
NHTSA	National Highway Traffic Safety Administration
NOAA	National Oceanographic Atmospheric Administration
Notice ERE	Notice Environmental Restriction and Easement
NRD	Natural Resource Damages
NRRB	National Remedy Review Board
NRWQC	National Recommended Water Quality Criteria
NTP	National Toxicology Program
O&M	Operations and Maintenance
OM&M	Operations, Maintenance, and Monitoring
OMB	Office of Management and Budget
OPCA	On-Plant Consolidation Areas
OSRTI	EPA Office of Superfund Remediation and Technology Innovation
OSWER	EPA Office of Solid Waste and Emergency Response
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl

Acronyms, Abbreviations, and Symbols (Continued)

PEDA	Pittsfield Economic Development Authority
ppm	parts per million
PRSC	Post-Removal Site Control Plan
PSA	Primary Study Area
psi	pounds per square inch
RAO	Remedial Action Objective
RCM	Reactive Core Mat
RCMCP	Restoration Corrective Measures Coordination Plan
RCMS	Revised Corrective Measures Study
RCRA	Resource Conservation and Recovery Act
RCSA	Regulations of Connecticut State Agencies
RD/RA	Remedial Design/Remedial Action
RfD	Reference Dose
RFI	RCRA Facility Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
ROR	Rest of River
ROW	right of way
RSR	Connecticut Remediation Standard Regulations
RTC	Response to Comments
SAV	Submerged Aquatic Vegetation
SED#	sediment remedy alternative (number)
SIP	Site Information Package
SOW	Statement of Work
SRBC	Screening Risk Based Concentrations
SWAC	Surface Weighted Average Concentration
TAG	Technical Assistance Grant
TBC	To Be Considered
TBD	To Be Determined
TD # or TD-#	Treatment/Disposition option
TD or T/D	Treatment/Disposition

Acronyms, Abbreviations, and Symbols (Continued)

TD 1 RR	Alternative of TD 1 that includes use of rail
TLC	Thin-Layer Cap
TOC	Total Organic Carbon
TSCA	Toxic Substance Control Act
U.S.C.	United States Code
UCL	Upper Confidence Level
US DOI	U.S. Department of Interior
USACE	United States Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WHO	World Health Organization
yds^3	cubic yards

I. Introduction

I.A Purpose of this Document

This document, which accompanies the Final Modification to the Reissued RCRA Permit (Final Permit Modification), satisfies the requirements set forth in the law, regulations, and Consent Decree governing this matter, *United States, et al., v. General Electric Company*, CA No. 99-30225 (D. Mass) (entered Oct. 27, 2000) (the Decree) for a response to comments pursuant to 40 .C.F.R. § 124.17. This document is also consistent with 40 C.F.R. § 300.430(f)(3)(F). Namely, this document specifies which provisions of the Draft Permit Modification have been changed in the Final Permit Modification, the reasons for the changes, and briefly describes and responds to all significant comments on the Draft Permit Modification raised during the public comment period or in the public hearing.[1]

In EPA's responses, EPA uses the term "commenter" to refer to the commenter except for purposes of comments from General Electric Company (GE), entities of the Commonwealth of Massachusetts, and the State of Connecticut. Those three entities are parties to the Decree, and all have a formal role in the remedy selection process. In light of that role, EPA believes it would assist the reader in understanding and readability if comments from those parties are identified by name, rather than the term "commenter." Within the Commonwealth, EPA received comments from the Executive Office of Energy and Environmental Affairs (EEA), the Department of Public Health, and the Fisheries and Wildlife Board. For purposes of this document, the terms "Massachusetts" or "the Commonwealth" refer to EEA, while the other entities are referred to individually by name.

In this Response to Comments, EPA briefly describes and responds to all significant comments raised during the public comment period, or during the September 2014 public hearing on the Draft Permit Modification and Statement of Basis for EPA's Proposed Remedial Action for the Housatonic River "Rest of River" (Statement of Basis). To the extent that a commenter included an introductory passage describing the comments to be made, and then followed up with more specific comments in the body of their comment letter, EPA has responded to the more detailed comments provided unless the introductory description included different information to be considered. For example, in GE's October 27, 2014 comment letter, GE provides an Executive Summary (Pages ES-1 through 10), background (pages 1-8), and an overview of comments on disposal (pages 9-11). The points made generally in the Executive Summary and overview are discussed further in GE's detailed comments in that same letter. In that situation, EPA has responded herein to the more detailed comments provided by GE in its letter.

[1] Whenever the Permit, Decree or any other original document is paraphrased or summarized in this response to comments the original meaning in the original document is not changed.

For purposes of this Response to Comments, EPA is describing the different iterations of the Resource Conservation and Recovery Act (RCRA) Corrective Action Permit, as follows:

- "Permit" describes the Reissued RCRA Permit incorporated into the Decree as Appendix G to the Decree, effective October 2000, and as modified in December 2007.
- "Draft Permit Modification" describes the June 2014 Draft Modification to the Reissued RCRA Permit issued by EPA for public comment.
- "Final Permit Modification" describes the October 2016 Final Modification to the Reissued RCRA Permit, which is accompanied by this Response to Comments.

The Final Permit Modification provides the Performance Standards and the appropriate Corrective Measures necessary to meet the Performance Standards to address polychlorinated biphenyls (PCBs) and any other hazardous waste, constituents or substances that have migrated from the GE facility to surface water, sediment, floodplain and bank soil, and biota in the Rest of River. The Final Permit Modification also includes the identification of the applicable or relevant and appropriate requirements under federal or state law requirements that are applicable or relevant and appropriate (ARARs) that must be met by the Corrective Measures, and the basis for waiver of any ARARs.

As explained further in this Response to Comments, EPA has made the following determinations. The remedy as outlined in the Final Permit Modification is protective of human health and the environment, complies with, or appropriately waives, all federal and state requirements that are applicable or relevant and appropriate to the remedy, and is cost effective. In addition, the remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedy also has been determined to be the least environmentally damaging practicable alternative to prevent contamination from impairing wetlands and aquatic habitats. To the extent that the remedy involves occupancy or modification of a floodplain, EPA has determined that there is no practicable alternative to doing so, and it is the least damaging practicable alternative. In addition, the remedy will not result in an unreasonable risk of injury to human health or the environment.

I.B Public Participation Prior to EPA's Proposed Remedial Action

Throughout the duration of the Rest of River project, EPA has kept the local community and other interested stakeholders up to date on various project investigations and activities. In 1998, EPA established a Citizens Coordinating Council (CCC) for EPA, the Commonwealth and GE to share with the public information on the GE-Pittsfield/Housatonic River Site (the Site), including the Rest of River area. EPA continues to hold regular meetings with the CCC to update it on the Rest of River as well as the other activities at the overall Site.

Throughout the Rest of River process, EPA has held an informal public input period for many deliverables generated for the Rest of River process and continues to place documents for the entire Site on its website and to maintain repositories throughout the affected communities.

During the Rest of River process, EPA has periodically issued public Fact Sheets regarding the activities, including on the following topics:

Based, in part on GE's Revised CMS and other information in the Administrative Record, EPA conducted a thorough evaluation of remedial alternatives pursuant to the remedy selection criteria in the Permit. This evaluation is described in EPA's May 2014 Comparative Analysis of Remedial Alternatives for the General Electric (GE) – Pittsfield/Housatonic River Project, Rest of River (Comparative Analysis), and summarized in EPA's June 2014 Statement of Basis that accompanied the Draft Permit Modification for public comment.

Section II.B through II.F below responds to general comments related to EPA's remedy selection (e.g., Performance Standards and Corrective Measures) for the sediment, riverbanks and Floodplain soil. Section III.F responds to comments related to EPA's selection of the Treatment/Disposition method and associated Performance Standards and Corrective Measures.

II.B Comparative Analysis for Sediment and Floodplain Remedy

Comments 737, 739, 746: GE asserts the following: EPA has purported to evaluate its proposed sediment/floodplain remedy (SED 9/FP 4 MOD) against other remedial alternatives under the Permit's nine remedy selection criteria in its Statement of Basis and Comparative Analysis. It concludes that, of all remediation alternatives, its proposed alternative "is best suited to meet the General Standards [of the Permit] in consideration of the Selection Decision Factors." In fact, EPA has not conducted such an evaluation under the Permit criteria for several key aspects and components of the proposed remedy, contrary to the Permit's requirement. In addition, for the aspects and components of the remedy that EPA has evaluated, its evaluation of remedial alternatives is not adequately supported and is thus arbitrary and capricious. These deficiencies are discussed in Comments 738 – 745. In addition, for several components of its proposed remedy, the Region has not even attempted to evaluate its proposal (or potential alternatives) under the Permit criteria. Thus, these components of the proposed remedy constitute an effort to make an end run around the Permit remedy selection criteria and, as such, conflict with the Permit. The components are discussed individually in Comments 740 – 745. For the aspects of the proposed sediment/floodplain remedy that the Region has evaluated, the evaluation presented in its Comparative Analysis and Statement of Basis, including its conclusion that its proposed alternative (SED 9/FP 4 MOD) is best suited to meet the Permit's General Standards in consideration of the Selection Decision Factors, is inadequately supported and contrary to the overall evidence. Each of the Permit criteria, and deficiencies in EPA's evaluation of each criterion, are discussed individually in Comments 747 – 756.

EPA Response 737, 739, 746: As demonstrated more specifically in Responses 738, 740 – 745, and 747 - 756, EPA's evaluation of remedial alternatives and selection of remedial components was undertaken in accordance with the Permit criteria and is supported by the Administrative Record.

Comment 747: GE asserts the following about the consideration of overall protection of human health and the environment. EPA's comparison of remedial alternatives based on their overall protectiveness of human health and the environment constitutes a misapplication of that General Standard. The underlying conclusion that alternatives that address the largest volume of sediment and floodplain soil provide the highest level of human health and environmental protection is erroneous, because it fails to consider other factors that affect the overall protectiveness of a remedy – e.g., the long- and short-term adverse impacts of remedy implementation on health and

the environment, the effectiveness of other means of risk reduction including institutional controls, and the ability to achieve comparable health and environmental goals with smaller remedies (e.g., less removal).

EPA rejects capping without removal and thin-layer capping as not protective. In fact, capping without removal can be an appropriate and protective part of the remedy in the deeper portions of Woods Pond and Rising Pond, and thin-layer capping can be effectively used in quiescent impoundments (such as in Reaches 7 and 8) to accelerate natural recovery.

EPA refers to attainment of the federal and state water quality criteria in its discussion of protectiveness. While these criteria are pertinent to the discussion of ARARs, their attainment is not an appropriate measure for assessing protectiveness, since those criteria are not based on an assessment of risks at this Site and do not take into account the necessary balancing of adverse impacts with residual risks.

EPA erroneously indicates that the more a remedy relies on institutional controls over longer time frames and larger areas, the less protective it is. In fact, by disfavoring institutional controls, EPA favors additional removal with greater ecological impacts, which, in turn, is less protective of the environment.

Overall, while EPA acknowledges that the standard of overall protection "requires a balancing of the short-term and long-term adverse impacts of the alternatives with the benefits achieved by each alternative," it does not provide a supportable balancing. It fails to recognize that much less extensive removal alternatives than proposed (with less extensive adverse impacts) can provide protection of health; and it does not recognize or describe the serious adverse environmental impacts of its proposed alternative or the tenuous ecological benefits. Instead, EPA simply concludes that restoration of the affected habitats can be achieved and that short-term impacts can be successfully mitigated. Thus, contrary to EPA's assertions, the proposed alternative does not "provide the best overall protection of human health and the environment."

EPA Response 747: EPA disagrees with GE's specific assertions, its characterization of EPA's analyses, and its conclusions. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Overall Protectiveness of Human Health and the Environment ("Overall Protectiveness"), analyzing the key tradeoffs among different alternatives. Section 2.2 of EPA's Comparative Analysis provides EPA's detailed evaluation of this criterion, analyzing the key tradeoffs among the different alternatives. In addition, EPA's analysis of the Overall Protectiveness of Human Health and the Environment is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. The modifications to the remedy between the Draft Permit Modification and Final Permit Modification are relatively minor and would not alter the conclusions reached by EPA in its evaluation of Overall Protectiveness.

EPA agrees that EPA's Comparative Analysis states the standard "requires a balancing of the short-term and long-term adverse impacts of the alternatives with the benefits achieved by each alternative." In fact, as EPA states in the introductory paragraph of Section 2.2 of the

Comparative Analysis, "The evaluation of whether a particular remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other Permit criteria, including but not limited to the following: (1) attainment of IMPGs, (2) compliance with ARARs, (3) long-term reliability and effectiveness, and (4) short-term effectiveness." (EPA responds to specific comments on the other Permit criteria below in Responses 748-755).

GE includes only minimal discussion of the selected remedy's reduction in risks to human health or the environment, and similarly GE minimizes discussion of other benefits of the selected remedy. In particular, GE omits virtually any reference, evaluation or comparison of how each alternative attains the IMPGs, which are risk-based metrics of the protection of human health and the environment. In essence, GE focuses primarily on the adverse effects of the proposed remedy and ignores the quantifiable risk reduction and attainment of IMPGs.

With respect to GE's assertion that a review of ARARs such as the Water Quality Criteria are not relevant to Overall Protectiveness, EPA disagrees. For example, the Water Quality Criteria listed as ARARs are indeed risk-based. While they were not part of the site-specific risk assessments, they do apply, and are an indication of risk and of Overall Protectiveness. Nonetheless, even if the evaluation of Water Quality Criteria were not considered relevant to Overall Protectiveness, it would not affect EPA's comparative analysis of Overall Protectiveness (and of course, the Water Quality Criteria remain ARARs to be met or waived during the remediation).

With respect to institutional controls, GE is incorrect. The Draft and Final Permit Modifications each rely extensively on institutional controls and continuing obligations to address the PCB contamination that will remain in floodplain and sediment. See Final Permit Modification Sections II.B.2.j through k and II.B.6. Alternatively, a significantly more extensive remedy would have been required to meet unrestricted use standards and preclude the need for institutional controls. At the same time, as Response 225 in Section III.G explains further, "EPA agrees that institutional controls should not substitute for more active response measures that actually reduce, minimize, or eliminate contamination unless such measures are not practicable, as determined by the remedy selection criteria. ... EPA believes, however, that institutional controls have a valid role in remediation ... [and] are a necessary supplement when some waste is left in place." Preamble to the National Contingency Plan, 55 Fed. Reg. 8706 (1990). EPA has determined, through its analysis of Permit criteria, that other measures are practicable.

Lastly, in support of its conclusions on Overall Protectiveness, GE references specific topics that it has raised substantively elsewhere (such as capping without removal, thin-layer capping, habitat restoration, institutional controls, and the amount of PCB removal). EPA responds substantively to those comments where GE has raised the substantive comment. See Section III of this Response to Comments.

Comment 748: GE states as follows. In comparing remedial alternatives based on control of releases, EPA relies on several points, none of which supports its selection of SED 9/FP 4 MOD. First, it relies on reductions in the annual PCB mass passing Woods Pond and Rising Pond Dams. However, remedial alternatives with substantially less removal would result in comparable annual PCB loads passing Woods Pond and Rising Pond Dams.

Additionally, EPA states that its proposed alternative would "nearly double the solids trapping efficiency of Woods Pond," which it says is "a mechanism to reduce downstream migration of PCBs" and would reduce "the release of PCBs downstream" in the event of "a serious breach or failure of the dam." However, sediment trapping efficiency is not equivalent to PCB trapping efficiency, there is very little difference between the proposed alternative and the alternative of partial shallow dredging and full capping of Woods Pond in terms of PCB transport past the dams, and the modest increase in sediment trapping efficiency resulting from the proposed alternative would not translate to any reduction in risk. Further, the potential for a failure or serious breach of Woods Pond is not realistic due to GE's monitoring and maintenance of the dam.

EPA relies on releases due to extreme flood events, arguing that in reaches subject to thin-layer capping, the thin-layer cap would not adequately control releases in an extreme flood event. However, even though thin-layer caps are not designed to be isolation caps, the EPA model, which includes an extreme flood event (as well as numerous other high flow events of lesser magnitude), predicts that, in the Reach 7 and 8 impoundments, the thin-layer capping material would remain stable over most of the capped area even during such events, and would mix with the existing sediments, thus significantly accelerating the reduction in PCB concentrations.

EPA Response 748: EPA disagrees with GE's specific assertions, characterization of EPA's analyses, and its conclusions. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Control of Sources of Releases, analyzing the key tradeoffs among different alternatives. That analysis is demonstrated in Section 2.3 of EPA's Comparative Analysis, pages 16-19. In addition, EPA's analysis of the Control of Sources of Releases is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. The modifications to the remedy between the Draft Permit Modification and Final Permit Modification are relatively minor and would not alter the conclusions reached by EPA in its evaluation of Control of Sources of Releases.

In support of its conclusions on Control of Sources of Releases, GE references specific topics that it has raised substantively elsewhere (such as the PCB mass passing Woods Pond and Rising Pond Dams, the trapping efficiency of Woods Pond and Rising Pond, the likelihood of dam failure/breach, and thin-layer capping). EPA disagrees with GE's substantive assertions and responds substantively to those comments where GE has raised the substantive comment. For example, see Section III.C.3 for responses related to Woods Pond, Section III.C.4 for responses related to thin-layer capping/Reach 7 Impoundments and Section III.C.5 for responses related to Rising Pond.

Comment 749: GE asserts as follows. EPA's evaluation of ARARs for the various alternatives also fails to provide a justifiable basis for selecting SED 9/FP 4 MOD. EPA recognizes that none of the alternatives would achieve the federal and state water quality criterion of 0.000064 µg/L in Massachusetts, but asserts that its proposed alternative and several other large-scale removal alternatives "would likely restore water quality in significant segments of the river (greater than 50% of the impoundments) in Connecticut." That conclusion is not justified given the high

uncertainty in the model extrapolations to Connecticut, which prevents the drawing of fine distinctions among alternatives regarding achievement of specific PCB concentrations at these low levels.

The Region also claims that SED 9/FP 4 MOD "is the least damaging practicable alternative," as required by several location-specific ARARs, because "it uses a less intrusive method of sediment remediation and balances the extent of remediation with avoidance, minimization, and mitigation in locations designated by the Commonwealth of Massachusetts as sensitive areas." That claim is unfounded. First, SED 9/FP 4 MOD is not the least damaging practicable alternative, because there are practicable alternatives that would be protective and have less adverse ecological impacts. Second, the so-called "less intrusive method of sediment remediation" (which is apparently a reference to the remediation of Reach 5A sediments largely from within the river channel), if feasible, could be used with any alternative. Third, the proposed alternative has definitely not balanced the extent of remediation with avoidance, minimization, and mitigation in sensitive areas.

EPA cites [the Massachusetts Endangered Species Act, or] MESA and claims that it will require (unspecified) measures to avoid, minimize, or mitigate impacts to state-listed species, and that such measures will "limit the impact to an insignificant portion of the local populations of affected species," as required by the regulations. EPA provides no support for this assertion or counter-assessment to GE's detailed MESA analysis in the RCMS. Indeed, EPA states that "a final MESA evaluation will not be completed until the remedy design phase." EPA's unsupported conclusion is contrary to the evidence that, for at least nine state-listed species, the takes resulting from the proposed alternative would impact a significant portion of the local populations – which would preclude implementation of the remedy under the MESA regulations (unless they are waived as ARARs). EPA further states that it will "work with the Commonwealth" to "ensure that an adequate long-term net benefit plan for the affected state-listed species is designed and implemented." However, the requirement for such a plan does not come into play where the take would impact a significant portion of the local population (since such a take is prohibited altogether) and, in any event, does not constitute an ARAR under CERCLA and is unauthorized in this case as an effort to recover additional NRD.

Finally, EPA fails to mention that its proposed alternative would not meet specific provisions of several other ARARs as discussed in several other Specific Comments. Overall, EPA's discussion of ARARs does not provide a basis for selecting its proposed alternative over others.

EPA Response 749: Except as specified below in this Response, EPA disagrees with GE's specific assertions, characterization of EPA's analyses, and its conclusions. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Compliance with Federal and State ARARs ("Compliance with ARARs"), analyzing the key tradeoffs among different alternatives. The analysis is demonstrated in Section 2.4 of EPA's Comparative Analysis, pages 19-20. In addition, EPA's analysis of the Compliance with ARARs is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another.

Note that based in part on GE's comments on the Draft Permit Modification, EPA has waived, or designated for potential waiver, three additional ARARs that had not been waived in the Draft Permit Modification. Specifically, EPA in this Final Permit Modification is waiving the Massachusetts Waterways regulation ARAR for dredging in an ACEC, and is potentially waiving the ARARs for temporary management of hazardous waste and solid waste in an ACEC during the cleanup. In addition, see EPA Response to Comments Section IV. Those changes, as well as other remedy modifications made for the Final Permit Modification, are not significant enough to alter the conclusions EPA reached in its Comparative Analysis evaluation of Compliance with ARARs.

In support of its conclusions on Compliance with ARARs, GE references specific topics that it has raised substantively elsewhere (such as compliance with the Water Quality Criteria in Connecticut, the determination as to the least damaging practicable alternative, and MESA) EPA responds substantively to those comments where GE has raised the substantive comment. See Section III.B.2 and Section IV of this Response to Comments.

In addition, EPA disagrees with GE's views regarding the less intrusive method of sediment remediation; EPA's proposal to use such a less intrusive method (i.e., remediation generally from within the river channel) is in fact one component of reducing damage of a practicable alternative. Moreover, even if that component could be used as a component of other alternatives, the combination of different elements in EPA's selected remedy to remediate the unacceptable risks while reducing any adverse effects of the remediation makes EPA's selected remedy the alternative that achieves the project purposes with the least damage to the ecological resources.

Finally, EPA disagrees with GE's discounting of the balancing EPA has performed in arriving at the selected remedy. The selected remedy properly balances the need for protection of human health and the environment and the extent of the remediation with the need for avoidance, minimization, and mitigation for state-listed species. EPA's approach is supported by the Commonwealth's Natural Heritage and Endangered Species Program (NHESP), which assisted EPA in developing the selected remedy's approach to avoid, minimize and mitigate effects on Core Areas. See NHESP's July 31, 2012 letter to EPA, which is Attachment B to the Final Permit Modification.

Comment 750: GE asserts as follows. Under the long-term reliability and effectiveness criterion, EPA's Comparative Analysis first discusses the magnitude of residual risk. That discussion focuses primarily on the reductions in fish fillet PCB concentrations resulting from the various alternatives. However, alternatives with substantially less removal than SED 9/FP 4 MOD could achieve comparable or nearly comparable reductions in fish fillet PCB concentrations. In addition, EPA relies on the extent to which the alternatives would achieve the direct-contact IMPGs in the floodplain and sediment EAs. However, even accepting EPA's PCB toxicity values and exposure assumptions, less extensive removal alternatives than SED 9/FP 4 MOD would achieve levels within EPA's acceptable cancer risk range and below an acceptable non-cancer hazard index for direct contact.

EPA next addresses the adequacy and reliability of the technologies involved, and in doing so makes a number of misstatements. First, EPA's blanket statement that thin-layer capping "is not

expected to be a reliable or effective component for this site fails to recognize the appropriateness of that technology for certain areas, such as the Reach 7 impoundments and Rising Pond. Second, EPA's assertion that "restoration is expected to be fully effective and reliable in returning [the affected] habitats, including vernal pool habitat, to their pre-remediation state," and that therefore "the likelihood of effective restoration is equal under any of the alternatives," is incorrect. Third, EPA's suggestion that institutional controls are unreliable and may not be effective is misguided since institutional controls can be an effective part of a remedy, and in this case, fish consumption advisories would need to remain in place in Massachusetts indefinitely under any alternatives to address future fish consumption.

EPA also addresses the long-term impacts of the alternatives on habitats and biota, but that discussion is unsupported and wrong in many respects. In contrast to the exhaustive assessment of habitat impacts in the RCMS, EPA has failed to quantify the impacts of SED 9/FP 4 MOD on any of the floodplain habitats, marking those as "TBD". Moreover, its qualitative discussion of the habitat impacts greatly underestimates the severity and duration of those impacts. The impacts of the RCMS alternatives on the various habitat types were described in detail in the RCMS, and the impacts of SED 9/FP 4 MOD on those habitats are discussed specifically in other comments. EPA's description plays down those impacts and asserts that, in any event, the impacts would all be short-term because restoration would be able to return all the habitats to their pre-remediation conditions and functions – which is untrue.

EPA stated, "There may be a temporary loss of woody debris and shade in Reaches 5A and 5B." In fact, such loss would be certain and long-lasting, since all mature trees on the riverbank and other floodplain areas subject to remediation would be removed, those on the riverbank would never be replaced, and those replanted in the floodplain would take at least 50 to 100 years to reach a mature condition.

EPA states, the impact of invasive species can be mitigated "via active control of invasive species." In fact, the large-scale removals that are part of SED 9/FP 4 MOD in both the river and floodplain, as well as the movement of vehicles and soil along the access roads and in the staging areas, would make the affected areas highly susceptible to colonization by invasive species in preference to native species; and in these circumstances, it would be very difficult, if not impossible, to adequately control the establishment and spread of the invasive species.

EPA states, "[P]roven techniques are available to provide adequate bank stabilization with minimal loss of this type of habitat." This is untrue as recognized by the Commonwealth and as discussed in other specific comments; even with the use of bioengineering techniques, the riverbank habitat loss from bank stabilization would last as long as the bank stabilization measures are in place.

EPA states, even though "it is not practical to replant large trees" on the banks, "normal growth will result in mature trees that overhang the river and essentially restore the vegetative character to its preremediation conditions." EPA does not and cannot explain how, if it is not practical to replant large trees on the banks, there could be a return of mature trees that overhang the river and re-establishment of pre-remediation vegetative conditions. In fact, that would not occur.

EPA states, "[O]ver time [stabilized riverbanks] are expected to" return to their current condition or level of function. In fact, as discussed above, the contrary is true; stabilized riverbanks will ***not*** return to their current condition or level of function.

EPA states that following the removal of mature trees from floodplain wetland forests, the replanted community "would progress as a maturing forest," and the relocation or loss of forest wildlife would be only "temporary" since their return "would be encouraged through proper restoration that reestablishes the functions of the ecosystem." As discussed in other specific comments, it would take at least 50 to 100 years for a replanted forested community to reach a mature condition comparable to current conditions – or potentially longer due to cumulative stresses from floods, changes in microclimate, changes in hydrology, and colonization by invasive species.

EPA states, "Implementation of effective restoration techniques would reestablish vernal pool functions that would allow sensitive vernal pool species . . . to return to the vernal pools following completion of remediation." As discussed in other specific comments and as recognized by the Commonwealth, it is erroneous to conclude that implementation of restoration methods would re-establish vernal pool conditions and functions. The evidence demonstrates that vernal pool creation or re-creation has a very low success rate and that, in most cases, vernal pool functions cannot be adequately replaced.

EPA states that restoration methods "will reestablish functions and values and minimize the potential for long-term negative impacts from the remediation." Once again, this blanket statement is incorrect.

In addition, EPA has failed to adequately evaluate the impacts of SED 9/FP 4 MOD on state-listed species. It has made no estimate of the number of such species that would be affected by that alternative or provided any substantive response to GE's MESA analysis in the RCMS. Rather, it simply suggests that use of the Core Area concept would ameliorate those impacts. As discussed in other specific comments, although the Core Area concept may reduce the impacts on such species to some degree, it would not prevent substantial adverse impacts of SED 9/FP 4 MOD on numerous state-listed species.

EPA Response 750: EPA disagrees with GE's specific assertions, characterization of EPA's analyses, and its conclusions. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Long-Term Reliability and Effectiveness, analyzing the key tradeoffs among different alternatives. EPA's analysis is demonstrated in Section 2.5 of EPA's Comparative Analysis, pages 20-35. In addition, EPA's analysis of Long-Term Reliability and Effectiveness is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. The remedy modifications made by EPA from the Draft Permit Modification to the Final Permit Modification are not significant enough to alter the conclusions EPA reached in its Comparative Analysis evaluation of Long-Term Reliability and Effectiveness.

To make its assertions on Long-Term Reliability and Effectiveness, GE references specific topics that it has raised substantively elsewhere (including fish consumption risks, the direct contact Interim Media Protection Goals (IMPGs), thin-layer capping (TLC), habitat restoration, bank stabilization, trees, Vernal Pools, reestablishing functions and values, and the Core Area concept). EPA responds substantively to those comments where GE has raised the substantive comment. For example, see Section III.B.2 for responses related to habitat restoration (including trees and invasive species), Section II.F for responses related to direct contact IMPGs; Section III.C.4 for responses related to thin-layer capping/Reach 7 Impoundments; Section III.G for responses related to Institutional Controls; and Section III.B.2 for responses related to MESA.

Comment 751: GE asserts as follows. EPA's discussion of IMPG attainment for the remedial alternatives is taken largely from the RCMS with the addition of an evaluation of SED 9/FP 4 MOD for some, but not all, IMPGs. For the human health IMPGs based on direct contact, EPA notes that, for the floodplain EAs, SED 9/FP 4 MOD would achieve the IMPGs based on a "human health risk target of $1x10^{-5}$ or $1x10^{-4}$ for RME receptors (depending on the impact to core habitat areas . . .), or an HI of 1." As discussed in other specific comments, alternatives with considerably less floodplain removal could likewise achieve the RME IMPGs based on either a $1x10^{-5}$ or $1x10^{-4}$ cancer risk and a non-cancer HI of 1 in all floodplain EAs. For direct contact with sediments, EPA recognizes that numerous remedial alternatives, including some with considerably less removal than SED 9/FP 4 MOD, would achieve the RME IMPGs based on a $1x10^{-5}$ cancer risk and a non-cancer HI of 1 in less than 10 years.

For the human health IMPGs based on fish consumption, EPA recognizes that none of the remedial alternatives would achieve the RME IMPGs in the Massachusetts portion of the River within the model projection period (over 50 years), and so it relies on attainment of the probabilistic CTE IMPG based on a non-cancer HI of 1 for adults. Various alternatives with much less sediment removal would likewise achieve that IMPG.

With respect to the ecological IMPGs, EPA relies mainly on the analyses presented in the RCMS for the alternatives evaluated there, and so GE's assessment in the RCMS would apply to those alternatives. For SED 9/FP 4 MOD, EPA has estimated IMPG achievement for several receptor groups (namely, benthic invertebrates, fish, piscivorous birds, and threatened and endangered species). For these receptors, alternative remedies that involve capping of surface sediments and less removal would achieve comparable attainment. For the remaining receptor groups, EPA has not estimated IMPG attainment for SED 9/FP 4 MOD, and thus does not have a supportable basis for favoring that alternative under this criterion. EPA does assert that, for amphibians, its vernal pools approach "will ensure that remediation of vernal pools will not result in more harmful impacts than the current exposure to PCBs." As discussed in other specific comments, that is incorrect, EPA states that SED 9/FP 4 MOD would protect those receptors by substantially reducing PCB concentrations in the sediments and soils that are the source of the PCBs in their aquatic and terrestrial dietary components. However, less extensive removal alternatives would do the same.

In any event, as the Commonwealth has noted, any effort to achieve the ecological IMPGs would be far outweighed by the inevitable ecological damage to the unique ecosystem in the PSA that would result from such an effort. In summary, the IMPG attainment factor does not provide a justifiable basis for favoring EPA's proposed alternative.

EPA Response 751: Except as specified below in this Response, EPA disagrees with GE's specific assertions, characterization of EPA's analyses, and its conclusions. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Attainment of IMPGs, analyzing the key tradeoffs among different alternatives. EPA's analysis is demonstrated in Section 2.6 of EPA's Comparative Analysis, pages 35-44. In addition, EPA's analysis of Attainment of IMPGs is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. The remedy modifications made by EPA from the Draft Permit Modification to the Final Permit Modification are not significant enough to alter the conclusions EPA reached in its Comparative Analysis evaluation of Attainment of IMPGs.

To make its assertions on Attainment of IMPGs, GE references specific topics that it has raised substantively elsewhere (including the direct contact IMPGs, fish consumption IMPGs, ecological IMPGs, purported impacts of attempting to meet ecological IMPGs). EPA responds substantively to those comments where GE has raised the substantive comment. For example, see Section II.F for responses related to direct contact IMPGs and ecological impacts, and Section III.B.2 for responses related to ecological IMPGs.

Also, in response to GE's assertions about Vernal Pools, EPA, based in part on GE's comments, has revised the approach for remediating Vernal Pools so that the first option for remediation is the application of a sediment amendment, such as activated carbon. Use of a sediment amendment is less intrusive than sediment excavation in Vernal Pools, and would have fewer potential impacts. The Final Permit Modification provides for excavation of Vernal Pools only if EPA determines that the placement of the sediment amendment cannot meet the relevant Performance Standard.

Additionally, GE characterizes incorrectly the Commonwealth's position. Based on its recent statements, the Commonwealth is clearly in support of the EPA remedy. As the Commonwealth stated in its 2014 comments on the Draft Permit Modification, "the Commonwealth supports EPA's Proposed Cleanup Plan for Rest of River. ... [T]he Proposed Cleanup Plan is protective of human health while employing a remediation framework developed in consultation with the Commonwealth and the State of Connecticut that is directed at preserving the dynamic character of the river ecosystem and avoiding, minimizing and mitigating remedy impacts to the affected wildlife and their habitats, with a particular focus on protecting state-listed species." In its letter endorsing the Proposed Cleanup Plan, the Commonwealth also explained in detail the differences from their 2011 comments, which GE references, to the current remedy.

> The Commonwealth's 2011 comments to EPA on the Revised CMS outlined a conceptual remediation approach that emphasized the need to carefully consider the potential impacts of the remediation on the Rest of River ecosystem when identifying and evaluating remedy alternatives. Comments by the State of Connecticut also underscored the value and importance of having EPA consult closely with the two affected states in the Rest of River remedy selection process.

Later in 2011, EPA invited both states to actively participate in a series of technical discussions with EPA that focused on educating each other on interests and concerns of the respective parties, and identifying shared remediation goals, priorities and processes, including as they relate to minimizing the impacts of potential remediation approaches on this unique Housatonic River ecosystem. An important milestone in this ongoing consultative process was EPA's issuance of its Status Report to the public in May 2012 entitled, "Potential Remediation Approaches to the GE Pittsfield/Housatonic River Site 'Rest of River' PCB Contamination." The Status Report outlined a conceptual framework for the remediation of Reach 5 river bed and banks, Woods Pond, downstream Impoundments in Reaches 7 and 8, the floodplain and Vernal Pools, Backwaters and called for the off-site disposal of contaminated soil and sediments. At that time, the Commonwealth expressed its support for the Status Report remedy because it was reasonably responsive to our interests and concerns about the need for a more balanced approach to designing and implementing a remedy for the Rest of River ecosystem.

EPA subsequently discussed the Status Report remedy with GE during 2013, while continuing to seek the input of the Commonwealth and the State of Connecticut during EPA's development of its draft Statement of Basis and Draft Reissued RCRA Permit based on the Status Report. The latter consultations with the two states also resulted in refinements and clarifications to the proposed remediation approach to Rest of River consistent with the Status Report.

October 27, 2014, Commonwealth of Massachusetts Comments on EPA's Proposed Cleanup Plan for Rest of River (June 2014).

These comments from the Commonwealth clearly demonstrate Massachusetts' support for the proposed remedy, as opposed to GE's characterization.

Comment 752: GE asserts as follows. In discussing the reduction of toxicity, mobility, or volume of wastes, EPA claims that SED 9/FP 4 MOD "surpasses all other alternatives" in reducing PCB toxicity and mobility because it would involve the application of [activated carbon, or] AC. That claim is disingenuous. The idea of adding AC was not raised until after the RCMS was submitted. To the extent that application of AC is warranted, after pilot testing, in certain areas (e.g., portions of Reach 5B and the backwaters) that are not subject to removal/capping, it could be implemented as part of any alternative and thus does not provide a basis for selecting SED 9/FP 4 MOD.

EPA also relies on the fact that, by deepening Woods Pond, SED 9/FP 4 MOD would increase the solids trapping efficiency of the Pond. However, solids trapping efficiency is not equivalent to PCB trapping efficiency, and the deepening of Woods Pond in SED 9/FP 4 MOD would have very little effect in reducing downstream PCB transport and would not result in any reduction in risks.

EPA Response 752: Except as specified below in this Response, EPA disagrees with GE's specific assertions, characterization of EPA's analyses, and its conclusions. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the

alternatives with respect to Reduction of Toxicity, Mobility or Volume of Wastes, analyzing the key tradeoffs among different alternatives. EPA's analysis is demonstrated in Section 2.7 of EPA's Comparative Analysis, pages 44-46. In addition, EPA's analysis of Reduction of Toxicity, Mobility or Volume of Wastes is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. The remedy modifications made by EPA from the Draft Permit Modification to the Final Permit Modification are not significant enough to alter the conclusions EPA reached in its Comparative Analysis evaluation of Reduction of Toxicity, Mobility or Volume of Wastes.

To make its assertions on Reduction of Toxicity, Mobility or Volume of Wastes, GE references a specific topic that it has raised substantively elsewhere (trapping efficiency of Woods Pond). EPA responds substantively to that comment where GE has raised the substantive comment. See responses in Section III.C.3 for issues related to the trapping efficiency for Woods Pond.

Additionally, GE is accurate in that the alternative, and its use of a sediment amendment like activated carbon, was added after EPA's series of technical discussions with Massachusetts and Connecticut. The use of a sediment amendment like activated carbon is part of the overall balanced approach of EPA, Massachusetts and Connecticut to address the unacceptable threats posed by the PCB contamination, while also taking steps to avoid, minimize and mitigate effects on the ecosystem. Notwithstanding the timing, the overall Comparative Analysis point is still valid that this treatment approach is not part of the other alternatives considered and in fact surpasses all other alternatives in reducing PCB toxicity and mobility. Contrary to GE's assertion, application of a sediment amendment may not be appropriate for all reaches of the River. The effectiveness of the amendment depends on a variety of factors including contaminant concentrations and distribution, substrate composition, and flow velocity.

Comment 753: GE states as follows. Short-term effectiveness includes consideration of the adverse impacts from remedial construction activities on the environment, the local community, and remediation workers. With respect to environmental impacts, EPA first addresses the potential that sediment removal activities would cause some resuspension of PCB-containing sediments into the water column and consequent increases in PCB levels in downstream surface water and aquatic biota. As EPA recognizes, the alternatives with the greater amounts of sediment removal, including SED 9/FP 4 MOD, would result in the most PCB resuspension.

EPA also addresses the adverse short-term impacts of the remediation activities on the various aquatic and terrestrial habitats. In virtually every case, EPA downplays these impacts by claiming that many of the impacts "can be mitigated by appropriate restoration activities." This conclusion cannot be supported. Due to its extensive remediation requirements and substantial habitat impacts, SED 9/FP 4 MOD would have more severe, long-lasting, and irreparable negative impacts on aquatic, riverbank, and floodplain habitats and the biota that inhabit them than alternatives with less extensive remediation.

In discussing the GHG emissions that would result from the various alternatives, EPA uses GE's estimates from the RCMS for the alternatives evaluated therein and has developed its own GHG estimates for SED 9/FP 4 MOD. EPA's estimate for the latter alternative (a total of 171,000

tonnes) is consistent with GE's estimate (a total of 170,000 tonnes). As shown by these estimates, SED 9/FP 4 MOD would result in greater GHG emissions than all but two of the other alternatives evaluated.

EPA also notes that all alternatives would involve an increase in truck traffic, with its attendant impacts. To address this factor, EPA compares the total number of truck trips for removal of excavated material and delivery of capping/backfill material, using GE's estimates from the RCMS for the alternatives evaluated therein and EPA's own estimates for SED 9/FP 4 MOD. EPA's estimates for SED 9/FP 4 MOD – a total of 150,500 truck trips or about 11,200 per year – are roughly comparable to GE's estimates for that alternative using the same assumptions, although GE's estimates are slightly higher – a total of approximately 155,000 truck trips (about 11,900 per year). This large number of truck trips exceeds those for most other alternatives and would cause considerable disruption to the affected communities, including increases in the likelihood of accidents, noise levels, vehicle emissions, and nuisance dust.

EPA compares the risk of accident-related injuries due to the increased off-site truck traffic, again using GE's estimates from the RCMS and EPA's own estimates for SED 9/FP 4 MOD. Those estimates indicate that the proposed alternative would result in 5.36 non-fatal injuries and 0.25 fatality over the life of the project. This is more than would result from most other alternatives.

EPA compares the risk of accident-related injuries to remediation workers, again using GE's estimates from the RCMS and EPA's own estimates for SED 9/FP 4 MOD. Those estimates indicate that the proposed alternative would result in 9.2 non-fatal worker injuries and 0.1 fatality over the life of the project. This is higher than the estimates for alternatives with many fewer labor-hours, lower than those with many more labor-hours, and comparable to other alternatives.

Overall, SED 9/FP4 MOD would have greater adverse short-term impacts than most of the other alternatives, including all of those with less extensive remediation.

EPA Response 753: EPA disagrees with GE's characterization of EPA's Comparative Analysis. EPA did take into account the estimates of adverse effects in the Short-Term Effectiveness criterion as part of EPA's remedy selection. GE recites the metrics of adverse effects of cleanup activities, but does not place those metrics in context. Of the seven alternatives with active remediation, the selected remedy, for most metrics, has more adverse effects than four alternatives, fewer effects than two alternatives, and in absolute terms, has roughly one-third the adverse effects of the alternative with the most PCB excavation.

Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Short-Term Effectiveness, analyzing the key tradeoffs among different alternatives. EPA's analysis is demonstrated in Section 2.8 of EPA's Comparative Analysis, pages 47-55. Also, importantly, GE did not point out that EPA's analysis of each sub-criterion within the Short-Term Effectiveness criterion is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another.

The remedy modifications made by EPA from the Draft Permit Modification to the Final Permit Modification are not significant enough to alter the conclusions EPA reached in its Comparative Analysis evaluation of Short-Term Effectiveness.

To make its assertions on Short-Term Effectiveness, GE references habitat restoration, a specific topic that it has raised substantively elsewhere. EPA responds substantively to that comment where GE has raised the substantive comment. For example, see Section III.B.2 for responses related to habitat restoration. Also see Responses related to truck traffic, accidents, and greenhouse gases in Section IX.

Comment 754: GE asserts as follows. In its discussion of implementability, EPA repeats a number of assertions that are erroneous. These include statements that "[r]estoration can reliably reestablish pre- remediation conditions for these [affected] habitats over the timeframes of the various alternatives," and that, "although thin-layer capping has been used at other sites, it is not expected to be a reliable or effective component for this site."

EPA also states that "[n]o regulatory restrictions are known that would affect the implementability of any of the alternatives under evaluation." However, EPA contends elsewhere that regulatory restrictions, notably the prohibition on location of waste facilities within an [Area of Critical Environmental Concern], would constitute an obstacle to the implementability of on-site disposal at two of the three identified sites. EPA fails to acknowledge that the prohibitions on certain activities within an ACEC would also apply to EPA's proposed alternative. Specifically, the state regulatory prohibition on siting a hazardous or solid waste facility in an ACEC would apply to the staging areas and rail loading facility under the proposed alternative, and the state regulatory prohibition on dredging in an ACEC would likewise apply to that alternative. Overall, there are no implementability issues that would favor SED 9/FP 4 MOD over other alternatives.

EPA Response 754: Except as specified below in this Response, EPA disagrees with GE's specific assertions, characterization of EPA's analyses, and its conclusions. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Implementability, analyzing the key tradeoffs among different alternatives. EPA's analysis is demonstrated in Section 2.9 of EPA's Comparative Analysis, pages 56-58. In addition, EPA's analysis of each sub-criterion within the Implementability criterion is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. The remedy modifications made by EPA from the Draft Permit Modification to the Final Permit Modification are not significant enough to alter the conclusions EPA reached in its Comparative Analysis evaluation of Implementability.

To make its assertions on Implementability, GE references specific topics that it has raised substantively elsewhere (e.g., habitat restoration and thin-layer capping). EPA responds substantively to those comments where GE has raised the substantive comments. For example, see Section III.B.2 for responses related to habitat restoration and Section III.C.4 for responses related to thin-layer capping/Reach 7 Impoundments. Additionally, based on this comment and others received, EPA, in the Final Permit Modification, has modified its determinations

regarding ARAR compliance in the ACEC. Specifically, EPA in this Final Permit Modification is waiving the Massachusetts Waterways regulation ARAR for dredging in an ACEC, and is potentially waiving the ARARs for temporary management of hazardous waste and solid waste in an ACEC during the cleanup. In addition, see EPA Response to Comments Section IV. The modifications to the remedy between the Draft Permit Modification and Final Permit Modification are relatively minor and would not alter the conclusions reached by EPA in its evaluation of Implementability.

Comment 755: GE asserts as follows. EPA has presented cost estimates for the sediment/floodplain remediation alternatives, excluding the estimated costs for treatment and/or disposition (TD) of the removed material (which are discussed separately). For all alternatives except SED 9/FP 4 MOD, EPA's cost estimates are based on GE's cost estimates in the RCMS, although EPA states that it "generally believes that GE may have under-estimated all costs.". EPA provides no support whatsoever for that assertion. GE has made its best estimate of the costs of each alternative, using cost estimating methodologies that were discussed with EPA without its objection and providing detailed backup in the RCMS; it has no way to evaluate EPA's unsupported claim that GE "may have under-estimated all costs."

For SED 9/FP 4 MOD, EPA made its own estimate – which is $326 million for the sediment and floodplain remediation excluding TD. GE's estimate for that remediation, again excluding TD, is $364 million. With off-site disposal (as required by EPA's proposal), GE's cost estimate for the proposed alternative is $678 million (with transport by rail) or $732 million (with transport by truck). As discussed in other specific comments, the substantial incremental costs of that alternative compared to less extensive alternatives are not proportional to or justified by the minimal incremental benefits, and thus SED 9/FP 4 MOD is not cost-effective.

EPA Response 755: EPA disagrees with GE's specific assertions, characterization of EPA's analyses, and its erroneous conclusions. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to cost, analyzing the key tradeoffs among different alternatives. EPA's analysis is demonstrated in Section 2.10 of EPA's Comparative Analysis, pages 58-59. In addition, EPA's analysis of the Cost criterion is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another.

For comparative analysis purposes, the cost estimates are used to compare different alternatives against each other. For the sediment/floodplain alternatives, the EPA and GE estimates ($326 million and $364 million, respectively), are roughly comparable to each other, and the differences between them are relatively small when viewed in comparison to the other sediment/floodplain alternatives. In fact, moreover, both estimates reinforce that the estimated remedy costs of the selected remedy are squarely in the mid-range of costs for different remediation alternatives. In terms of total cost, out of the eight alternatives reviewed, the selected remedy is less expensive than three, and more expensive than four alternatives; based on Present Worth, the selected remedy is less expensive than four alternatives and more expensive than three alternatives. See Comparative Analysis, Table 22 at page 59. Consequently, in terms of the Comparative Analysis, the relatively minor differences in cost would not significantly

affect the outcome of the comparative analysis within the cost criterion, or in the overall evaluation of the Permit criteria. In addition, the remedy modifications made by EPA from the Draft Permit Modification to the Final Permit Modification are not significant enough to alter the conclusions EPA reached in its Comparative Analysis evaluation of cost.

See Section III.F.2 for an explanation of the differences in cost estimated for treatment/disposal alternatives.

Comment 756: GE states as follows. For the reasons discussed in Specific Comments 746 - 755, EPA's overall conclusion that "SED 9/FP 4 MOD is best suited to meet the General Standards in consideration of the Selection Decision Factors" is not supportable and is thus arbitrary and capricious.

EPA Response 756: EPA disagrees with GE. EPA, upon evaluation of the comments received on the Draft Permit Modification, has determined that the selected remedy in the Final Permit Modification is best suited to meet the General Standards in consideration of the Selection Decision Factors, including a balancing of those factors against one another.

Comment 759: GE asserts the following: Under the process established by the CD and the Permit, the CMS Report was intended to serve as the primary basis for EPA's remedy proposal. The Permit imposes detailed requirements for the CMS Report, including the specification of detailed information that must be provided and specific criteria that must be evaluated for each remedial alternative (Permit Special Condition II.G). Further, the Permit requires that EPA approve, conditionally approve, or disapprove the CMS Report prior to the remedy proposal (Permit Special Condition II.H), and the CD requires that EPA will issue a remedy proposal only upon "satisfactory completion of the CMS Report" in accordance with the Permit (CD ¶ 22.n). In addition, the Permit and the CD provide GE with the right to administrative dispute resolution to challenge any EPA decision on the CMS Report (Permit Special Condition II.N; CD ¶ 141.a). These provisions all demonstrate that the information and evaluations provided in the CMS Report were intended to serve as the primary foundation for EPA's remedy proposal; they would have little meaning if EPA could simply put the CMS Report on the shelf and base its remedy proposal on its own separate evaluations. This does not mean that EPA must agree with the conclusions and recommendations in the CMS Report, but it does mean that the information and evaluations in that report (after any administrative dispute resolution) are to provide the necessary foundation for the remedy proposal.

In this case, as discussed above, GE prepared a detailed CMS Report and (in response to EPA's comments) an even more detailed Revised CMS Report (RCMS), as well as various ancillary reports required by EPA. However, in its January 17, 2014 letter on the RCMS, which was styled as a "conditional approval," EPA simply stated that it "does not necessarily agree" with the assertions, analyses, conclusions, or recommendations in the RCMS. It did not specify which ones it disagreed with, did not require revision of that report, and did not modify the report. As a result, the RCMS was not used as the basis for the remedy proposal, as required by the Permit and the CD. In addition, EPA's action deprived GE of its right under the Permit and the CD to administrative dispute resolution on the substance of EPA's determination on the RCMS, because EPA provided no substantive determinations for GE to dispute.

Instead, EPA developed its own proposed remedy, which is different from any of the RCMS alternatives. In doing so, EPA developed and relied upon many types of fundamental information and evaluations that it and/or the Permit required GE to include in the RCMS, but that are not, for the proposed remedy, included in the RCMS. These include a detailed description of alternative SED 9/FP 4 MOD, an evaluation of that alternative under the Permit criteria, and a description and evaluation of the off-site rail transport option (TD 1 RR).

EPA Response 759: EPA disagrees with GE's contentions on several bases. First, the Revised CMS is indeed a significant piece of the information used to propose and select the remedy. As can be seen from the references to the Revised CMS in EPA's Comparative Analysis and in the 2014 Statement of Basis supporting the Draft Permit Modification, the Revised CMS has been a significant factor. In fact, the Comparative Analysis and its attachments include approximately 60 separate references to the Revised CMS, and the Statement of Basis also includes multiple references.

Second, however, the Permit process dictates that other significant pieces of information also be evaluated in addition to the Revised CMS. As discussed in Section II.A of this Response to Comments and as stated in the Permit, EPA is to select the remedy "[b]ased on the information that the Permittee [GE] submits pursuant to this Permit and any other relevant information in the Administrative Record for the modification of this Permit . . ." (emphasis added). Clearly the Permit contemplates that EPA would not base its remedy evaluation and selection solely on the Revised CMS.

For example, to fulfill its responsibility to evaluate the alternatives in light of the nine Permit criteria, EPA prepared a thorough, detailed Comparative Analysis, which is in the Administrative Record. Moreover, the Permit issuance regulations at 40 C.F.R. Part 124 provide for EPA to prepare a Statement of Basis to briefly describe the derivation of the conditions of the draft permit and the reasons for them. See 40 C.F.R. § 124.7. EPA submitted the Statement of Basis for public review along with the Draft Permit Modification, and it is in the Administrative Record.

Additionally, EPA disagrees with GE's characterization of issuance of EPA's January 17, 2014 conditional approval of GE's Revised CMS. This EPA conditional approval was consistent with the requirements in Section II.H of the Permit, which states that "after the Permittee [GE] submits the CMS Report, EPA will either approve, conditionally approve or disapprove the Report." GE elected not to exercise its right in the Decree and the Permit to dispute this conditional approval letter. See Section XXIV of the Decree and Section II.N. of the Permit.

Finally, GE's characterization of the proposed remedy as newly created by EPA neglects to take into account how much of the proposed remedy is in fact based on the components of remedy alternatives that were in fact evaluated in the Revised CMS. SED 9 refers to Sediment Alternative 9, which was described and evaluated in Section 6.9 of GE's Revised CMS. FP 4 refers to Floodplain Alternative 4, which was described and evaluated in Section 7.4 of GE's Revised CMS. FP4 MOD includes the modification to address concerns raised by GE and the Commonwealth of Massachusetts in 2011 that alternatives could cause negative impacts on habitat for threatened and endangered species. In light of GE's and Massachusetts's concerns, EPA and Massachusetts developed a modified approach that includes, consistent with GE's

concerns, significantly less PCB contaminant removal in particular Core Areas for threatened and endangered species.

Overall, a large portion of the proposed remedy was in fact evaluated in GE's Revised CMS, and the parts that were not, were developed consistent with concerns that were raised following submittal of the Revised CMS.

Comment 760: GE asserts the following: In addition to the issues discussed in Comment 759, EPA has failed to provide in its remedy proposal package certain information and evaluations that it required GE to include in the RCMS and that are critical to the outcome. These include the following:

- EPA's September 9, 2008 comments on GE's initial CMS Report, as well as its January 15, 2010 conditional approval letter for GE's proposal to evaluate additional remedial alternatives, required that the RCMS present comprehensive MESA analyses, including evaluations of the impact of each alternative on state-listed species and habitats, how each alternative would comply with the MESA regulations, and the procedures to be followed to minimize adverse effects to state-listed species. As in other specific comments, EPA has not correctly described the MESA regulations and has conducted no assessment of the impacts of its proposed remedy on the state-listed species in the area.

- The Permit requires consideration of the long-term and short-term adverse habitat impacts of the alternatives, and EPA's September 9, 2008 letter required GE to give more consideration to measures to avoid, minimize, or mitigate those impacts. Yet EPA has not attempted to quantify the impacts of its proposed alternative on any of the specific floodplain habitat types.

- EPA's September 2008 comments required that the RCMS include a detailed description of the restoration requirements, including process and methods, for each alternative, including an illustration of how they would apply to certain example areas. As discussed in other specific comments, EPA's discussion of restoration is cursory and inadequate and does not include a discussion of any example areas.

- EPA's September 2008 comments required that the RCMS include the assumptions regarding staging areas, access roads, and infrastructure. EPA has not provided such assumptions for its proposed remedy.

- EPA September 2008 comments required that the RCMS provide a thorough description of the operation, maintenance, and monitoring (OM&M) requirements for each alternative. EPA has not provided such a description for its proposed remedy.

- EPA's September 2008 comments required that the RCMS provide a detailed analysis of riverbank stabilization methods, which must include areas, slopes, and bank height used to estimate the bank component of the remedy. Because EPA has not selected the locations for the bank remediation component of its proposed remedy, it has not provided this information. In addition, those comments required that the RCMS include information on short- and long-term bank alteration and its effects on obligate bank species, as well as information on

alternate approaches to eliminate or reduce negative effects on those species. EPA has not provided such an analysis.

- EPA's September 2008 comments required that the RCMS describe how work in vernal pools could avoid impacts to the species indigenous to those pools. As discussed in other specific comments, EPA has not done that (and could not do so, because work in vernal pools could not avoid such impacts).

- EPA's September 2008 comments required that the RCMS identify locations for off-site disposal of excavated material. EPA has not done that either.

In summary, by developing and issuing a proposed remedy that is different from the RCMS alternatives and not based on the RCMS without modifying or requiring a modification of the RCMS – or at least specifying the changes that would make the RCMS approved and conducting the necessary evaluations – EPA acted contrary to the Permit and the CD.

EPA Response 760: EPA disagrees with GE. EPA acted in accordance with the Decree and Permit in developing and issuing the proposed remedy, and in conditionally approving GE's Revised CMS.

First, as described more fully in Response 759, GE has neglected to point out how much of the proposed remedy in fact is based on the components of the remedy alternatives, which GE itself evaluated in the Revised CMS.

Second, it was entirely reasonable for EPA to evaluate the Revised CMS and to conditionally approve it, as EPA did in January 2014. The Permit provides for conditional approval as one of the EPA responses to a GE submittal under the Permit.

Third, EPA was also reasonable in determining the amount of information to provide in its remedy proposal package. EPA's remedy proposal package included the Draft Permit Modification and the Statement of Basis, as well as other information supporting that package in the Administrative Record, including the Comparative Analysis. In developing the remedy proposal, EPA considered the information submitted by GE in response to EPA's letters referenced in GE's comment, and the information, including the information provided by GE on each of the bulleted items in its comment, was available for public review as part of the Administrative Record along with other CMS-related documents. EPA's judgments are consistent with the Permit, Decree and permit proposal regulations at 40 C.F.R. Part 124, and included sharing an Administrative Record of information on which the public could provide comments. Moreover, it was fair of EPA to include in its remedy proposal other information beyond the Revised CMS that was relevant to the remedy proposal. (As the Permit provides, EPA is to select the remedy, "[b]ased on the information that the Permittee [GE] submits pursuant to this Permit and any other relevant information in the Administrative Record for the modification of this Permit ...". Permit, Section II.J.)

Comments 310, 341: One commenter suggested that GE must listen to local environmental groups who have spent substantial time studying this issue, while other commenters thought the citizens of Pittsfield are the real "stakeholders" in the proposed cleanup project and should have

a significant say in creating and approving a cleanup plan that is practical, fair, and preserves the river's ecosystem.

EPA Response 310, 341: EPA considered input and comments from environmental groups, the residents of Pittsfield, and all other stakeholders prior to issuing both the Draft and Final Permit Modification as well as at numerous other stages in the Rest of River process. During the design of the remedy, EPA will continue to solicit the public's views on GE's work plans. EPA's direction to GE on the remedy will take into account information EPA receives from the public. See EPA's Responses on State and community involvement at Section VIII of this Response to Comments.

II.C Comments in Support of the Remedy

II.C.1 Supporting Comments from State Government

Comments 21, 50: Joseph Larson, an emeritus professor of environmental conservation at the University of Massachusetts, Amherst, speaking on behalf of the Massachusetts Fisheries and Wildlife board, asserted the following:

The Division of Fisheries and Wildlife, which is supervised by our Board, is the largest landowner in the affected area of the Housatonic. The land and wetlands in our care were acquired by gift or purchase for donors and funds, where the expectation, backed by our pledge, is that these areas would be preserved in perpetuity for their natural and recreational values. They are officially recognized by the state and other authorities for its unique and rich natural resources. It is also an area that is highly valued for outdoor recreation by residents of Massachusetts. It annually attracts people from across the state and from other states in the nation.

Our Board recognizes that the PCB contamination poses a public health risk that must be addressed. We have provided extensive assistance to the EPA in the form of division staff time, field studies, and scientific analysis. We are also aware that there is no silver bullet solution that applies to every area that is contaminated with PCBs. Each area in the nation where PCB contamination exists has required the development of a unique approach that cannot be simply copied for any other contaminated area.

The remediation plan, including mass removal of PCBs from Woods Pond, presented by EPA, has been crafted to responsibly address public health risks while at the same time responsibly maintaining as much as possible of the natural and recreational values of this section of the Housatonic. It's been a difficult balancing act, but it is a Housatonic plan, and it has our full support.

EPA Response 21, 50: EPA acknowledges the support from the Massachusetts Fisheries and Wildlife Board.

Comment 315: Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) appreciates EPA's efforts to propose a remedial plan for Rest of River that will be conducted in a manner that prioritizes protection of public health balanced with a preservation of the natural ecology.

The continued failure of these two agencies to inform EPA and GE of the effect of extensive beaver population in the Study Area as documented in the maps & data gathered and compiled by the Massachusetts Division of Fisheries and Wildlife for the Upper Housatonic Area of Critical Environmental Concern, denied Project Designers and Peer Reviewers access to the obvious, that floodplain Core Areas containing PCBs under control by beavers are a 'source', not a 'sink' for PCBs at all times, but intensely so in episodes of hard rain or of high water flow. Due in part to the significant beaver activity that continually disturbs the floodplains, thus making the floodplains a source of PCBs, we should cleanup most of the PCBs.

Comment 483: Many of the floodplain and Core Areas not scheduled for remediation under the proposed plan are inundated during high water events and characterized by heavy beaver activity. This will result in PCBs from these areas being transported back into the river after it is remediated.

EPA Response 481, 483: The presence of beavers and their disturbance to the river and floodplain system will be addressed in designing and implementing the remedy. EPA will take this issue into consideration when reviewing and approving GE's work plans. However, EPA does not believe that revising the remedy to require a significant increase in removal of PCB-contaminated floodplain soil and sediment, such as Combination 6 (SED 8/FP 7), is the proper remedy or proper response to beaver activity. For additional information, see response in Section II.B of this Response to Comments for how EPA selected the floodplain/sediment remedy.

Comment 522: My main concern is that total dredging is proposed for Fred Garner Park in Pittsfield to Woods Pond in Lenox but no dredging is proposed from Woods Pond Dam downstream to the Connecticut border. If that is correct, I would like an explanation why.

EPA Response 522: The remedy does include sediment removal in Reach 7 Impoundments and Reach 8. For additional information on these components of the remedy, see responses in Sections III.C.4 and 5 of this Response to Comments. For information regarding the remedy for flowing reaches in Reach 7 and Reaches 9-16, see Section III.C.6.

II.E The Proposed Remediation is too Extensive and the River/Floodplain will be Destroyed

Comments 1, 81, 83, 91, 101, 177, 180, 334, 340, 347, 360, 367, 368, 511: A large number of commenters expressed concern that the current nature of the river and floodplain would be destroyed by the remediation and that the Rest of River area would not recover following remediation. This includes a number of residents who live along or near the river in vicinity of Reach 5A. The Canoe Meadows Wildlife Sanctuary was specifically mentioned as one area that could be irreparably damaged. One commenter believed that EPA is aware of the habitat destruction and lack of recovery that the remediation will allegedly cause, and another suggested leaving the PCB contamination in place until a remedy that will not impact the ambient habitat(s) is developed. Other commenters remarked that the floodplain supports an old-growth forest that took thousands of years to develop, and that it is this resource that will be irreversibly damaged by the remediation. Commenters stated that the benefits of the remediation do not justify the

damage to the ecosystem and that EPA should be looking at less invasive and destructive options.

Comments 532, 577, 580, 592: GE commented that the proposed remedy will cause irreparable harm to the unique Rest of River ecosystem and EPA's proposed remedy is based on the underlying assumption that alternatives that result in the removal of the largest volume of sediment and floodplain soil provide the highest level of human health and environmental protection. That assumption is incorrect, since it fails to consider other key factors that affect the overall protectiveness of a remedy, such as the long- and short-term impacts of remedy implementation on health and the environment, the effectiveness of other means of risk reduction including institutional controls, and the ability to achieve comparable health and environmental goals with smaller remedies (e.g., less removal). Even accepting EPA's PCB toxicity values, the proposed remedy goes beyond what is necessary to protect human health. The specific health bases given by EPA for the proposed remediation are to prevent unacceptable risks from PCB exposure through human consumption of fish and waterfowl from the River and through human direct contact with river sediments and floodplain soils. Even accepting EPA's toxicity values, a less extensive remedy would provide human health protection from PCB exposure via both of these pathways.

EPA may not order a remedy that would cause harm greater that the benefit it purports to provide. The Permit requires, as a General Standard, an evaluation of whether a remedial alternative would provide "overall" protection of human health and the environment (Permit Special Condition II.G.1); EPA guidance makes clear that "overall" protection of the environment requires a balancing of the short-term and long-term adverse environmental impacts of remediation with the residual risks. In this case, EPA's proposed remedy as a whole would cause greater ecological damage to the environment than any ecological benefit and thus would not provide "overall" protection of the environment.

EPA Response 1, 81, 83, 91, 101, 177, 180, 334, 340, 347, 360, 367, 368, 511, 532, 577, 580, 592: As discussed above in Section II.B, EPA based its remedy selection on an analysis of the remedy selection criteria set forth in the Permit. As part of this analysis, EPA considered the effects of potential remediation on the current nature of the river and floodplain and associated habitat value when selecting its remedy. EPA also considered the risks posed by PCBs present in the river system on human health and the environment. As discussed in Section II.F below, the PCBs present an unacceptable risk to human health and ecological receptors and that the PCB contamination must be remediated. This conclusion takes into account independently peer-reviewed risk assessments.

EPA considered the impacts of potential remediation alternatives and the potential harm to the environment when evaluating alternatives. EPA, in consultation with the Commonwealth, crafted a remedy that minimizes short-term impacts to key habitat areas and ensures that disturbed areas will be restored after remediation. See Section III.B.2 of this Response to Comments for a detailed response to concerns about potential damage to the habitat and to the current nature of the river and floodplain. Additionally, EPA disagrees with the statement that even accepting EPA's toxicity values, a less extensive remedy would provide human health protection from PCB exposure via direct contact. For more details see Responses 590 and 591 below.

Comment 615. GE asserts as follows: Several specific elements of EPA's proposed remedy are arbitrary and capricious or otherwise unlawful. These elements include the proposed remedies for Woods Pond, the Reach 7 impoundments, Rising Pond, and the backwaters (as well as other proposed remedy components). It should be noted that the EPA's removal volume estimates for these remedy components were based on those presented in the May 2012 Status Report; GE has developed updated volume estimates based on EPA's description of its actual proposed remedy. As a result, GE's volume estimates for some of these areas may be higher or lower than those presented by EPA.

EPA Response 615: As discussed in Section II.B above, EPA based its remedy selection on a thorough analysis of alternatives based on the remedy selection criteria set forth in the Permit. In addition, see Section III.C for responses to specific comments on Woods Pond, the Reach 7 Impoundments, Rising Pond, and the Backwaters.

Comments 80, 107, 346, 348, 366: Several commenters noted that they were disappointed that EPA did not accept the Commonwealth of Massachusetts January 2011 position, including the recommendation that the remedial alternatives presented to date would cause "irreparable harm to this unique, diverse and vital ecosystem that has been designated by the Commonwealth as an Area of Critical Environmental Concern (ACEC)"; that Commonwealth's position was ignored in order to appease 50 or less conservationists; and the Commonwealth's plan was very responsible and that the river and the surrounding habitat be left alone and that instead Woods Pond in Lenox be dredged on a periodic basis to remove PCBs.

EPA Response 80, 107, 346, 348, 366: It is important to note that the Commonwealth of Massachusetts supports the proposed remedy, and in its 2014 comments explained the distinction between its January 2011 comments and its support for the proposed remedy. See, for example, Response 751. While in 2011 the Commonwealth did express concerns about potential impacts of the remediation on the ecosystem when commenting on GE's Revised CMS (See Letter (with attachment) from Richard K. Sullivan, Jr., Kenneth I. Kimmell and Mary Griffin (MA EOEEA) to Susan Svirsky (USEPA), January 31, 2011, Re: Housatonic River Rest of River; Comments on Housatonic River - Rest of River, Revised Corrective Measures Study Report, October 2010), EPA and Massachusetts subsequently addressed those concerns through a series of technical discussions culminating in the 2012 status report that outlined a conceptual framework for the remedy, which explicitly focuses on avoiding, minimizing and mitigating impacts to Core Areas. As discussed more fully in Response 751, in its 2014 comments on the Draft Permit Modification, the Commonwealth—specifically the Executive Office of Energy and Environmental Affairs and its Department of Environmental Protection ("MassDEP") and Department of Fish and Game—expressly stated its support for the proposed remedy, which is "protective of human health while employing a remediation framework developed in consultation with the Commonwealth and the State of Connecticut that is directed at preserving the dynamic character of the river ecosystem and avoiding, minimizing and mitigating remedy impacts to the affected wildlife and their habitats, with a particular focus on protecting state-listed species." See also Response 751 above.

In addition, the Massachusetts Fisheries and Wildlife Board ("MassFWB"), which oversees the Commonwealth's Division of Fisheries and Wildlife (the largest landowner in the Rest of River area), also supports the proposed remedy. The MassFWB recognizes that the PCB contamination

at Rest of River "poses a public health risk that must be addressed." While noting that there is no "silver bullet solution" for sites contaminated with PCBs and that crafting the Rest of River remedy has been a "difficult balancing act," the MassFWB acknowledged that the proposed remedy "has been crafted to responsibly address the public health risks while responsibly maintaining the natural and recreational values of this section of the Housatonic."

Comments 102, 338: One commenter stated that the plan for capping and covering up the problem is ridiculous-it makes more sense to just leave the problem alone and clean up Woods Pond. There should also be a plan to prevent any contaminants from going over the dam. Dredging the Pond makes sense but there should be a system in place to be able to monitor and capture more PCBs before they go further down river. Another commenter stated the river should not be remediated except for a few hot spots such as Woods Pond sediment behind the dam.

EPA Response 102, 338: As discussed in Section II.F below, the PCBs present unacceptable risks to human health and ecological receptors and that the PCB contamination must be remediated to address those risks. This conclusion is based in part on independently peer-reviewed risk assessments. As discussed above and in Section II.B above and as described in the Statement of Basis and Comparative Analysis, EPA evaluated several remedial options, including one similar to the remedy proposed by the commenters (Combination Alternative 8.) As described in these documents, EPA did not select Combination Alternative 8 as the remedy in part because it was not protective of human health and the environment in the long-term, including not adequately meeting IMPGs for humans or ecological receptors and not meeting federal and state water quality criteria for freshwater aquatic life. (See Statement of Basis page 28.) In addition, remediating only Woods Pond would not address the PCB contamination and associated risks to human health and the environment in Reach 5 and the Backwaters located above Woods Pond.

EPA agrees that any plan should prevent, to the extent practicable, the mobilization and transport of contaminants downstream over Woods Pond Dam. In fact, the remedy in the Final Permit Modification reduces downstream transport of PCBs over Woods Pond Dam by 89%. For comparison, Combination Alternative 8 reduces downstream transport of PCBs over Woods Pond Dam by 62%. Statement of Basis page 30.

Comment 77: The costs and benefits of the remediation versus not remediating have not been sufficiently explained to the public.

EPA Response 77: EPA has conducted extensive outreach on the proposed remediation to explain the rationale for the proposed remedy and pros and cons of the proposed remedy compared to several alternatives, including no action. In June 2014, EPA widely distributed the Proposed Remedial Action (Draft Permit Modification) and an associated Statement of Basis describing the rationale for the proposed cleanup. This was followed by EPA presentations to the public on the proposed remedy on June 18, and June 24, 2014, and a presentation prior to a public hearing on September 23, 2014. In addition, EPA has made available on its web site and in the Administrative Record the May 2014 Comparative Analysis, which provides additional detail of the costs and benefits of evaluated alternatives, included no action. Additional outreach

activities on Rest of River include numerous CCC meetings, peer-review panel public meetings, the workshops and charrette, and a public meeting on GE's CMS.

Comment 103: EPA should not propose remediation plans without fully understanding the impacts of those plans.

EPA Response 103: EPA evaluated the effect of the proposed remediation in selecting the remedy. See Section II.B and Section II.D above.

Comment 364: A more intelligent approach to the river would be to make GE invest all the money they would have spent on a clean up to devise a way of cleaning the river without clear cutting forests and rip rapping the banks.

EPA Response 364: As discussed in Section II.F below, the PCBs present unacceptable risks to human health and ecological receptors and the PCB contamination must be remediated to address those risks. This conclusion is based in part on independent peer-reviewed risk assessments. As discussed above and in Section II.B above and as described in the Statement of Basis and Comparative Analysis, EPA evaluated several remedial options to address these unacceptable risks. Based on this analysis, EPA selected a balanced remedy that is protective of human health and the environment. EPA's rationale for the extent of remediation in the Final Permit is documented in its Statement of Basis and Comparative Analysis, as supplemented by this Response to Comments. The selected remedy reduces the cutting of forests (e.g., limited bank disturbance in Reach 5B) and precludes the riprapping of banks, except in limited areas where it is necessary to for the protection of adjacent infrastructure. Final Permit Modification at II.B.2.

Comments 3, 369, 512, 531: A number of commenters felt that currently available human health data do not justify the proposed extent of the remediation. One commenter felt that the danger to human health has not been substantiated with actual data and another commenter claimed that the human health risks from PCBs are exaggerated and have not been demonstrated, and there are no studies to confirm a serious health risk solely by PCB other than extrapolated over exposures of lab animals showing skin irritations. One commenter suggested that the ecological risks are exaggerated, that there are no studies that have demonstrated impacts to wildlife from PCBs due to the confounding effects of other contaminants. Accordingly, the arbitrary cleanup levels proposed (5 ppm) are in the river and floodplain and another commenter stated that the cleanup is not justified by the ecological risks.

Comment 350: At an average concentration of 15 ppm total PCBs, removal of 250,000 CY of material, as proposed for Reach 5A, would equate to removal of 3.75CY of PCBs, or about 0.75 CY per mile. If the 3.75 cubic yards were in a small area that would be cause for concern but the EPA feels it's better to take all the PCBs out of the Housatonic and concentrate them in a smaller area at an undisclosed location.

EPA Response 3, 350, 369, 512, 531: As discussed in Section II.F below, the PCBs present unacceptable risks to human health and ecological receptors and the PCB contamination must be remediated to address those risks. This conclusion is based in part on independent peer-reviewed risk assessments. Also, note that the 5 milligrams per kilogram (mg/kg) cleanup standard

referenced apparently refers to the Performance Standard for eroding riverbank in Reach 5A. This 5 mg/kg standard was selected as a reasonable measure to prevent recontamination of the river through erosion of contaminated riverbanks in Reach 5A, with the primary goal being to reduce fish tissue concentrations and the downstream transport of PCBs. See also Response 82 below and Section III.C.1 of this Response to Comments. The removed material will be disposed of off-site at an existing licensed facility.

Comment 14: The disruption caused by the remediation is not justified by being able to eat fish in 100 years. Individuals will not catch and eat fish from the river anyway because they can buy fish at local markets.

EPA Response 14: Consistent with the National Contingency Plan (NCP), EPA's long-term goal of reducing PCB fish-tissue concentrations to acceptable risk-based concentrations requires that EPA assume that fish and waterfowl could be consumed in amounts typical for a river with no use restrictions. Although the long-term goal may not be achieved in the near future, the cleanup plan and associated Performance Standards require that GE implement actions that are expected to significantly reduce the PCB concentrations in fish and waterfowl, thus allowing for limited consumption. In addition, the reduction of PCBs in fish tissue resulting from the cleanup will significantly reduce the health risk for those individuals who elect to catch and consume fish above the recommended consumption advisory levels.

Comment 98: The PCBs have been buried for many years and should just be left undisturbed. Remediation will cause them to become airborne or sent downstream.

Comment 190: Today, the PCBs in the riverbed are safely sequestered in the sediment so our neighborhood receives zero to infinitesimal actual exposure.

EPA Response 98, 190: EPA disagrees. There are currently significantly elevated levels of PCBs present in the surficial floodplain soil and sediment, providing an exposure pathway to human and ecological receptors, including fish and waterfowl. Figure 4-8 of GE's RCRA Facility Investigation Report shows the PCB concentrations in six-inch depth intervals throughout Rest of River, and definitively demonstrates that PCB concentrations are not buried. In addition, PCB concentrations in aquatic biota (e.g., benthic invertebrates and fish), which integrate their exposure to PCBs in both sediment and water, as well as, through bioaccumulation in the food chain, also clearly demonstrate the ongoing exposures to very high concentrations of PCBs in Rest of River. In addition, data collected and the modeling demonstrate that PCBs are continuously released from their current locations in the sediment bed and riverbank and are transported downstream. See Figure 1, Attachment 7 to the Comparative Analysis. SED 2 is Monitored Natural Recovery (MNR). Even after 52 years, there is 13 kg/year of PCBs passing over Woods Pond and approximately 6 kg/year of PCBs deposited in the floodplains.

With regard to remediation causing airborne PCBs, when the 1 ½ Mile Reach Removal was conducted, a notification level was set at 0.05 micrograms per cubic meter ($\mu g/m^3$) and an action level was set at 0.1 $\mu g/m^3$ based on 24-hour average for PCB concentrations in air. Monthly air monitoring performed between 2002 and 2006 indicated that there were no exceedances of the action level, and one sample that exceeded the notification level.

For Rest of River, EPA anticipates that GE will be required to use engineering controls and best management practices to minimize the potential for airborne PCBs. In addition, GE will be required to propose an air monitoring plan with health based action levels. While there may be an increase in airborne PCB concentrations in areas close to the remediation for a short period of time, GE will be required to meet action levels for airborne PCBs. If these levels are exceeded, then GE will be required to initiate additional evaluations and engineering controls. In addition, the River is being remediated progressing generally from upstream to downstream to address PCBs that may migrate during cleanup work.

Comment 528: It is not necessary to remediate the river, the river has already remediated itself. Repeated flooding and resuspension of contaminated sediments has removed the contamination, transporting it downstream and out to the ocean.

EPA Response 528: EPA disagrees with the commenter that the river has already remediated itself. As noted in Response 98, 190, the many samples collected from river sediment show elevated concentrations of PCBs in both surficial sediments and at depth. In addition, the continuing erosion of contaminated river banks provides a significant ongoing source of PCBs to the river, while flooding continues to deposit contaminated sediment on the floodplain and re-suspend contaminated sediment for transport downstream. This has resulted in the necessity for human consumption advisories for fish and other biota in MA and CT since the 1970s, which continue today. One of the General Standards that must be met by the remedy is the Control of Sources of Releases, thus EPA believes it is necessary to implement the Final Permit Modification to control downstream transport, as well as to satisfy the other Permit criteria.

Comment 584: GE asserts the following. The Housatonic River model does not extend into Connecticut, and predictions of future PCB levels in fish in the Connecticut impoundments are based on extrapolations from the EPA model using a number of simplifying assumptions and factors without confirmatory data. The results of those extrapolations are too uncertain and unreliable to support distinctions among alternatives regarding achievement of specific PCB concentrations at the low levels that exist in fish in Connecticut. In any event, those extrapolations do not show significant differences between the proposed remedy and smaller removal remedies in reducing fish PCB concentrations in Connecticut.

EPA Response 584: GE developed a model (CT 1-D model) as part of the CMS to predict fish tissue concentrations in Connecticut in order to compare the effectiveness of remedial alternatives. GE Revised CMS at 3-45. GE concluded that even given the large uncertainty in the CT 1-D methodology, the level of combined accuracy/precision was considered acceptable and that the model can be used to develop future predictions in the Connecticut portion of the river. GE Revised CMS, Appendix J at J-15. According to GE's CT 1-D model, the selected remedy reduces PCB concentrations by a factor of ten compared to MNR. (Statement of Basis Page 33 and Table 4. and at Comparative Analysis at 22 & Table 4.) Compared to GE's preferred alternative cited in its Revised CMS (SED 10), the selected remedy reduces fish tissue in Connecticut concentrations by a factor of five. EPA Statement of Basis at 33 & Table 4; Comparative Analysis at 22 & Table 4. The model was used for its intended purpose, which is comparing between remedial approaches, and in this case was relevant to EPA proposing a remedy approach that was more likely to result in appropriate reductions in fish tissue contamination as compared with other alternatives preferred by GE.

II.F PCB Toxicity and Risk Assessments

Comments 42, 43, 44, 68: We know from extensive research on human health and ecological systems that PCBs are incredibly toxic at low levels. Every year we learn new dangers from PCBs. Just last year the World Health Organization determined that PCBs are a known human carcinogen.

Continued research in the peer review literature indicates that community members surrounding PCB-contaminated sites have elevated concentrations of PCBs in their bodies. The commenter provided an attachment with an extensive list of journal articles on the toxicity of PCBs. The entire community around the Housatonic River is likely exposed to PCBs at levels that are causing biological responses, including depressed immune systems, learning disabilities in children, and abnormal development of the fetus.

Low levels of PCBs interfere not only with fish reproduction, amphibian reproduction, bird reproduction, but also with bird behavior and bird songs. The soil invertebrates, insects, worms, and the minute crustaceans that live not only in the river, but also in the soils, are subject to these same adverse effects.

A thorough cleanup of the Housatonic is necessary not just because the animals in the Housatonic system are being impacted by PCBs, but also because PCBs are impacting all other animals on earth, including human beings.

Comment 578: GE asserts as follows: The best scientific evidence demonstrates that the PCB toxicity values that EPA used in its HHRA, which are based on studies of laboratory animals, substantially overstate both the carcinogenic potential and the non-cancer impacts of PCBs in humans. In fact, comprehensive reviews of human studies have concluded that: (a) there is no credible evidence that PCBs have caused cancer in humans, even in highly exposed PCB workers; and (b) there is no credible evidence that exposure to PCBs at environmental levels has caused adverse non-cancer effects. Moreover, laboratory studies have demonstrated clearly that human cells are many times less sensitive to the effects of PCB than the cells of the laboratory test animals used in the studies on which EPA's toxicity values are based [GE Attachment J].

EPA Response 42, 43, 44, 68, 578: The proposed remedy is necessary to protect human health and the environment from PCB contamination released by GE's Pittsfield facility. EPA selected a balanced remedy that is protective of human health and the environment. EPA's rationale for the extent of remediation in the Final Permit Modification is documented in its Statement of Basis and Comparative Analysis, as supplemented by this Response to Comments. Independent Peer-reviewed risk assessments have concluded that PCBs and other contaminants of concern pose unacceptable risks to human health and the environment in Rest of River.

Contrary to GE's arguments, the Human Health Risk Assessment (HHRA) and Ecological Risk Assessment (ERA) show that the PCB contamination in the Housatonic River poses unacceptable risks to human health and the environment. EPA performed the HHRA and the ERA using the best available science and the risk assessment process outlined in the NCP, 40 C.F.R. Part 300, and agency guidance. The EPA Rest of River HHRA and ERA were more comprehensive, detailed, and inclusive of public input than is typical for hazardous waste sites. See Response 231, Section II.F of this Response to Comments for more detail on the discussions with the ERA and HHRA process.

Unlike most CERCLA/RCRA sites, the Rest of River HHRA and ERA were reviewed by review panels comprised of independent risk assessment experts. Decree ¶¶ 22.c, d. The panel members were selected not by EPA but by a selection contractor mutually agreed upon by GE and EPA. Before the peer reviewers commenced their panel discussion at each peer review, GE and members of the general public, including the States, were provided opportunities to submit written comments and make oral presentations to both peer review panels. Decree, Appendix J, Step 1 and Step 3. Appendix J to the Decree outlines peer-review processes for Rest of River, and includes specific details about the public's ability to provide oral presentations at the peer review meetings, including, "GE will have a minimum of one hour to present such oral comment." Decree, Appendix J, Step 3. While critical of some specific aspects of the assessments, the peer reviewers' comments were generally supportive of both the HHRA and the ERA.

GE had many opportunities to review and comment on the risk assessments as they were developed.

GE asserted that EPA's toxicity values for PCBs used in the HHRA are too conservative while other commenters believe they are not conservative enough. EPA's HHRA uses published toxicity values for each contaminant of concern. These toxicity values quantify the relationship between the average daily doses calculated in the exposure assessment and the potential cancer risks and non-cancer health effects. GE claims that these values substantially overstate the cancer and non-cancer human health risks of PCBs while other commenters believe the toxicity values substantially understate health effects. While GE and others may disagree with the values selected, neither has shown any credible evidence that EPA abused its discretion in setting these values or that the values lack a rational basis.

In fact, the HHRA PCB toxicity values are based on sound, peer-reviewed scientific inquiry. The HHRA used toxicity values published in EPA databases and reports. Specifically, the HHRA used, where possible, toxicity values published in EPA's Integrated Risk Information System ("IRIS"). These IRIS values have undergone extensive scientific peer review. For contaminants of concern for which toxicity values are not published in IRIS, provisional values were obtained from the Health Effects Assessment Summary Tables (HEAST). EPA derived these IRIS and HEAST toxicity values in accordance with all applicable EPA guidance.

EPA's process for evaluating human epidemiological and animal evidence to determine the carcinogenicity and cancer potencies of chemicals, including PCBs, is set forth in Agency guidelines (USEPA, 1976, 1984, 1986c, 1994, 1996a). The guidelines were developed within the Agency, published in the Federal Register for external comment, and peer reviewed by a panel of expert scientists in the fields of carcinogenesis, toxicity, exposure, and related scientific disciplines from universities, environmental groups, industry, labor, and other governmental agencies. EPA responded to comments on the draft guidelines and made changes based on a review of the comments submitted by these groups and individuals. The guidelines were also submitted for review to EPA's Science Advisory Board, an external scientific review panel. Agency guidelines for assessing carcinogens are consistent with the scientific approaches that are used by national and international agencies (e.g., the National Toxicology Program [NTP, 1984] and the International Agency for Research on Cancer (IARC, 1987) for evaluating the carcinogenicity of chemicals.

EPA's process for evaluating human epidemiological and animal evidence to determine the noncancer toxicity of chemicals, including PCBs, is set forth in the Agency's guidelines (USEPA, 1986a-b, 1991, 1992, 1993a, 1996b, 1998) and the background document on non-cancer toxicity provided on IRIS (USEPA, 1993b). The guidelines cover a variety of health endpoints, including Developmental Toxicity (USEPA, 1986b, 1991); Reproductive Toxicity (USEPA, 1996b); Neurotoxicity (USEPA, 1998); Female Reproductive Risk (USEPA, 1986a); and Male Reproductive Risk (USEPA, 1986a). The guidelines were developed within the Agency, published in the Federal Register for external comment, and peer reviewed by a panel of expert scientists from universities, environmental groups, industry, labor, and other governmental agencies working in various fields associated with non-cancer toxicity, including developmental toxicity, neurological toxicity, endocrine effects, etc. EPA responded to comments on the draft guidelines and made changes based on a review of the comments submitted by these groups or individuals. The guidelines were also submitted for review to EPA's Science Advisory Board, an external scientific review panel.[2]

---

[2] References for this response:

International Agency for Research on Cancer (IARC, 1987). "IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Supplement 7, Overall Evaluations of Carcinogenicity: An Updating of IARC Monographs Volumes 1-42." Lyon, France.

NTP. 1984. Report of the Ad Hoc Panel on Chemical Carcinogenesis Testing and Evaluation of the National Toxicology Program, Board of Scientific Counselors. Available from: US Government Printing Office, Washington, D.C. 1984-421-132:4726.

USEPA 1976. Interim procedures and guidelines for health risk and economic impact assessments of suspected carcinogens. Federal Register 41:21402-21405.

USEPA. 1984. Proposed guidelines for carcinogen risk assessment. Federal Register 49:46294. November 23.

USEPA. 1986a. The Risk Assessment Guidelines for 1986. Office of Health and Environmental Assessment, Washington, D.C. EPA/600/8-89/043, July

USEPA. 1986b. Guidelines for the Health Assessment of Suspect Developmental Toxicants. Federal Register 51 (185) 34028-34040, 24 September 1986.

USEPA. 1986c. Guidelines for carcinogen risk assessment. Federal Register 51:33992-34003.

USEPA. 1991. Guidelines for Developmental Toxicity Risk Assessment. Federal Register 56 (234) 63798-63826, 5 December 1991

USEPA. 1992. Guidelines for Exposure Assessment. Federal Register 57 (104) 22888-22938, 29 May 1992

USEPA. 1993a. Workshop Report on Developmental Neurotoxic Effects Associated with Exposure to PCBs. U. S. EPA, Risk Assessment Forum, Office of Research and Development, Washington, D.C. EPA/630/R-92/004, May, 1993.

EPA issued its initial HHRA in June 2003 and in July 2003 GE submitted comments to the peer review panel that, *inter alia*, argued that EPA's toxicity values were overly conservative. The initial HHRA and the comments on the HHRA received from the public (including GE) were subjected to peer review by a panel of independent risk assessment experts. The peer review panel was specifically charged with evaluating the toxicity assessment. While the peer reviewers generally agreed with the toxicity assessment in the initial HHRA, EPA chose to exercise its option to revise and reissue the document to explicitly address comments from the peer reviewers.

The revised HHRA, issued in February 2005, included an expanded discussion of toxicity values, and summarized additional toxicity studies.

Notwithstanding the studies cited by GE, the overall scientific consensus remains: PCBs can cause cancer and many other health impacts. Notably, EPA has not revised the IRIS toxicity factors for PCBs at any point since the HHRA was issued. Additionally, since that time, the World Health Organization officially reclassified PCBs in general as a known human carcinogen in contrast with a probable human carcinogen. Thus, the Agency's toxicity values used in the HHRA remain well-supported.

Comment 85: One scientist commented that it is not possible to show causality in an epidemiological study, yet he also claims that PCBs cause high blood pressure.

Comments 86, 88: The health risks due to current conditions are not supported by Mass DPH's studies in Pittsfield. Studies conducted by the Massachusetts Department of Public Health showed no higher levels of PCBs in Pittsfield residents (specifically Lakewood and Allendale teachers) than are present nationally.

Comment 104. Justification of the remediation for cancer prevention is unconvincing, particularly since it has never been demonstrated that there is a direct causal link between PCB exposure and cancer. I have certainly had much more than average PCB exposure from my years along the river, and yet it did not show up in my blood to a level higher than the national average.

USEPA. 1993b. Reference Dose (RfD): Description and Use in Health Risk Assessments. Background Document 1A. USEPA, National Center for Environmental Assessment (NCEA), Office of Research and Development, Washington, D.C. March 15, 1993.

USEPA. 1994. "Report on the Workshop on Cancer Risk Assessment Guidelines Issues." Office of Research and Development, Risk Assessment Forum, Washington, D.C. EPA/630/R-94/005a.

USEPA. 1996a. Proposed guidelines for carcinogen risk assessment. Federal Register 61 (79) 17960-18011. April 23.

USEPA. 1996b. Guidelines for Reproductive Toxicity Risk Assessment. Federal Register 61 (212) 56274-56322. 31 October 1996.

USEPA. 1998. Guidelines for Neurotoxicity Risk Assessment. Federal Register 63 (93) 26926-26954, 14 May 1998.

Comment 359: For forty years PCBs have been studied as a possible carcinogen, and after forty years the results are inconclusive.

Comment 579: GE asserted that at the Housatonic River Site, the lack of adverse human health effects of PCBs is borne out by empirical evidence showing no elevated cancer rates or elevated blood PCB levels among individuals in communities along the Housatonic River.

EPA Response 85, 86, 88, 104, 359, 579: EPA's guidance requires action to protect human health and the environment when risks exceed certain levels, as opposed to taking action only when confirmed health effects in a given population are confirmed. PCB toxicity and site – specific risk assessments are discussed in Section II.F below.

In addition, note that recently the World Health Organization officially reclassified PCBs in general as a known human carcinogen as opposed to a probable human carcinogen. In 2012, the World Health Organization's (WHO) International Agency for Research on Cancer (IARC), changed the carcinogenicity category of PCB-126, one of the 209 different PCB molecules, from Group 2A – Probably Carcinogenic to Humans, to Group 1 – Carcinogenic to Humans. And in 2013, IARC changed the category for PCBs in general and all dioxin-like PCB congeners to Group 1 – Carcinogenic to Humans. Polychlorinated biphenyls and polybrominated biphenyls / IARC Working Group on the Evaluation of Carcinogenic Risks to Humans (2013: Lyon, France), as published in IARC Monographs on The Evaluation of Carcinogenic Risks to Humans, Volume 107. 2015.

Comment 181: I question whether the PCBs in the river are doing major damage to my health in comparison to other substances in our environment.

EPA Response 181: This Final Permit Modification is not designed to address other substances in the environment outside of those related to the GE-Pittsfield/Housatonic River Site and Rest of River. The primary contaminant in Rest of River is PCBs; and PCBs have been classified as a known/probable carcinogen in humans, and to cause other negative health effects. See other responses in this Section II.F.

Comments 545, 757: In a lawsuit brought by GE in the early 1990s challenging EPA's adherence to its IRIS toxicity values in the absence of a rulemaking proceeding, GE and EPA reached a settlement agreement, which was filed in the court (Settlement Agreement in General Electric Company v. Browner, No. 93-6151251, D.C. Circuit, Oct. 25, 1993). That agreement and a subsequent EPA guidance document issued to the EPA regions, entitled Use of IRIS Values in Superfund Risk Assessment (EPA, 1993), require that, if an outside party questions the use of IRIS values and presents alternative toxicological information that may be used in place of the IRIS values, EPA must "consider all credible and relevant evidence before it."

In its comments on the HHRA for the Rest of River, GE presented evidence that PCBs do not cause cancer or adverse non-cancer effects in humans and that the laboratory animals on which EPA's IRIS toxicity values are based are more sensitive to these PCB effects than humans (AMEC & BBL Sciences, 2003, Attachments J and K). In addition, it presented alternative quantitative toxicological information on the non-cancer Reference Dose (RfD) for PCB, showing that the RfD in IRIS (20 ng/kg-day) was at least an order of magnitude more stringent

than warranted by the scientific evidence (due to the use overly conservative uncertainty factors), and thus should be increased by 10 times to 200 ng/kg-day (id., Attachment N). However, the EPA Region did not consider this alternative information, but simply relied on the IRIS toxicity values, including the RfD, in its HHRA. That conflicts with the above- referenced Settlement Agreement and guidance.

More recent evidence further supports GE's position that the PCB RfD should be changed. A recent paper by Carlson et al. (2012) [a copy of which GE provided with its comments] shows that new in vitro data indicate that the rhesus monkeys used in the study on which the current IRIS RfD is based are substantially more sensitive to PCBs than humans and that the current RfD should actually be adjusted to 18,000 ng/kg-day (900 times higher than the current RfD). The Region should consider this information as well.

EPA Response 545, 757: The comment refers to an EPA document, Use of IRIS Values in Superfund Risk Assessment (1993). This document does indicate that "toxicological information other than that in IRIS may be brought to the Agency by outside parties. Such information should be considered along with the data in IRIS in selecting toxicological values; ultimately, the Agency should evaluate risk based upon its best scientific judgment and consider all credible and relevant information available to it." Moreover, the complete language of the EPA guidance document advises that "while all credible and relevant information must be considered, departing from the IRIS value is generally discouraged where the information submitted consists of data previously evaluated in developing that value."

In Appendix N of its July 2003 comments on the draft Human Health Risk Assessment (HHRA) and in its presentation to the peer-review panel, GE raised this same comment and summarized its analysis regarding the stringency of the Aroclor 1254 Reference Dose. Virtually all of the peer-review panelists concurred that EPA applied toxicity values appropriately. Upon reviewing GE's comments and the peer reviewers' findings, EPA continued to use the IRIS RfD for Aroclor 1254 in the HHRA. In the final HHRA, EPA explains why it chose to use the IRIS RfD for Aroclor 1254 based on the type of PCBs present at the Rest of River Site and also in light of toxicological and epidemiological evidence from the scientific literature published since the RfD was established. In addition, see Response 42 *et al.* and Response 85 *et al.* above in this section on EPA's position on the toxicity of PCBs.

Finally, EPA followed the process outlined in the Decree, which was agreed to by GE and EPA, for developing the HHRA.

Comment 62: What is the chemical half-life of the most heavily chlorinated PCB congeners?

EPA Response 62: EPA assumes that this question concerns the rate at which PCBs in the environment are broken down by the processes of photolysis and biochemical degradation into comparatively less-toxic chemicals, as opposed to the rate at which PCB concentrations in environmental media may change as PCB molecules are transferred to, and potentially transported by, other media. For example, in the Housatonic River PCBs adsorbed onto sediment may desorb into the water column and be transported downstream or be transported as part of the bedload and/or suspended solids, and PCBs in the water column may volatilize at varying rates into the overlying atmosphere. These processes do not result in any change in the

toxicity of the individual PCB molecules or the total PCB mass in the environment (although they can potentially change local PCB concentrations), and therefore they do not apply to the issue of half-life of particular congeners.

Strictly speaking, the concept of half-life applies to processes that follow first-order (or exponential) decay, as is the case with radioactive isotopes where the rate of decay is independent of the concentration of the isotope and other environmental factors. In the case of PCBs in the environment, and particularly PCBs that are found in natural soils and sediments, the rate of decay is dependent in part on factors such as initial concentration, matrix (e.g., soil or sediment) characteristics, climate, micro-organisms present, presence or lack of oxygen (i.e., aerobic/anaerobic conditions) and numerous others (Carberry, J.G. 1994. *Enhancement of bioremediation by partial preoxidation.* pp. 543-597. In: Remediation of Hazardous Waste Contaminated Soils. D.L. Wise and D.J. Trantolo (Eds.) CRC Press.). As a result, the biochemical degradation of PCBs may not be represented properly by the concept of half-life (e.g., Hopf, N.B., A.M. Ruder and P. Succop. 2009. *Background levels of polychlorinated biphenyls in the U.S. population.* Sci. Total Environ. 407: 6109-19.). Nonetheless, there is some indication that PCB degradation at least approximates first-order decay in some situations and the rate of PCB degradation has been quantified in terms of half-life in a variety of technical publications (e.g., Doick, K.J., E. Klingelmann, P. Burauel, K.C. Jones and K.T. Semple. 2001. *Long-term fate of polychlorinated biphenyls and polycyclic aromatic hydrocarbons in an agricultural soil.* Environ. Sci. Technol. 39: 3663-70).

PCB degradation processes in the environment typically progress more slowly for the more highly chlorine-substituted PCB congeners and therefore these congeners are generally considered to have longer half-lives. However, even within the more heavily chlorinated PCB congeners, often considered to be those congeners with seven or more chlorine substitutions, the rate of decay varies considerably depending upon the actual number of chlorines and their position on the biphenyl ring structure. All of these considerations, as well as the large number of individual congeners that could be considered "heavily chlorinated" make it impossible to provide a definitive response to the question of half-life, but in general half-lives on the order of a few to several decades have been reported for the more heavily chlorinated congeners (Erickson, M.D. 2001. *PCB properties, uses, occurrence, and regulatory history.* pp. xi – xxx. In: PCBs: Recent Advances in Environmental Toxicology and Health Effects. L.W. Robertson and L.G. Hansen (Eds.). University Press of Kentucky, Lexington; Sinkkonen, S. and J. Paasirvirta. 2000. *Degradation half-times of PCDDs, PCDFs and PCBs for environmental fate modeling.* Chemosphere 40: 943-9.). In addition, it is important to understand that the extremely elevated PCB concentrations identified in some areas of the Rest of River would require multiple such half-life periods before concentrations reach levels that would permit unrestricted use of the river and floodplain.

Comment 64: Although the State of Massachusetts claims that populations on fish and ducks in the system are stable, they are nonetheless highly contaminated, and therefore unacceptable.

EPA Response 64: EPA agrees that fish and wood ducks and mallard ducks in the Rest of River have highly elevated and unacceptable concentrations of PCBs in their tissues.

In the EPA's Ecological Risk Assessment, fish in the Rest of River were determined to be at "low to moderate" risk from exposure to PCBs. Wood ducks in the Rest of River were determined to be a "high" risk from exposure to PCBs.

However, because both fish and migratory waterfowl (e.g., wood ducks) are a food source for fishers and hunters, EPA's Human Health Risk Assessment concluded that the elevated concentrations of PCBs in these two groups were sufficiently high to pose a risk to humans using either group as food. In fact, consumption of fish from the river was the highest risk route of exposure investigated in the HHRA. As indicated by the fishing and hunting advisory currently in place for the Rest of River area, the Commonwealth agrees that PCB concentrations in fish and ducks in the Rest of River are unacceptable. As a result, remediation of the Rest of River, to the extent it is related to reduction of PCB concentrations in fish and ducks, is proposed by EPA as a means of reducing human health risks.

Comment 82: The background risk for getting cancer during one's lifetime is roughly 40% and the risk of dying from cancer is one in four for men and one in five for women, yet EPA's cleanup standard for Rest of River is based upon EPA's ***mathematical calculation*** that will reduce the risk of cancer to between ***1 in 10,000 to 1 in a million*** -- a completely unrealistic standard. It is important to note that there is no scientific evidence that supports a standard of 5 parts or 25-50 parts per million; there are just the EPA's risk calculations.

EPA Response 82: The NCP directs EPA to select remedies that result in human cancer risks that fall within the risk range of 1 in 1,000,000 (expressed as 1×10^{-6}) to 1 in 10,000 (1×10^{-4}) and that do not pose unacceptable non-cancer risks. Where the cumulative risk to an individual exceeds this range, i.e., greater than 10^{-4}, action is generally warranted, and EPA's "point of departure" for remedy selection is at the more stringent, or protective, (i.e., 10^{-6}) end of the risk range. EPA followed this guidance when selecting Performance Standards. The Performance Standards set for floodplain soil in the Final Permit Modification are based on the more stringent of either the non-cancer risks or the cancer risks of 10^{-5} (Primary Standard) or 10^{-4} (Secondary Standard). None of the Floodplain Performance Standards to protect human health are based on the 10^{-6} (one in a million) cancer risk. Also, note that the 5 mg/kg cleanup standard referenced in the comment apparently refers to the Performance Standard for eroding riverbank in Reach 5A. This 5 mg/kg standard was not selected based directly on risk assessments, but rather was selected as a reasonable measure to prevent recontamination of the river through erosion of contaminated riverbanks in Reach 5A, with the primary goal being to reduce fish tissue concentrations and the downstream transport of PCBs. See also Section III.C.1 of this Response to Comments.

Comment 175: Cleanup standards for Exposure Areas 61-66, which seem to be utility rights of way, have the highest numerical cleanup standards of all areas and uses. Because utility areas are often frequented by local adults and children who hike, dog walk, bike, motor bike, and ride ATVs, these areas should be reclassified as General Recreation, older child (high use).

EPA Response 175: The commenter is correct that Exposure Areas 61-66 are evaluated using the utility worker scenario. During the HHRA process EPA observed that distinct activities could occur at different locations within an exposure area. In these cases, a risk assessment was conducted for the activity as a whole and for the exposure area as a whole. For the Phase 2

Direct Contact Human Health Risk Assessment, EPA retained three areas for evaluation where utilities are located and where trails were identified within the utility corridor. Accordingly, these areas have been assigned separate EAs that cover only trails and walking paths. These are Exposure Area (EA) 4, 12, and 37b:

- EA 4 is a high-use area located south of Pomeroy Avenue and includes the portion of utility corridor 61 where a trail was identified. EPA and GE personnel observed dirt bike riding, riding ATVs, hiking, walking, dog walking and wild crop gathering in EA 4. Based on the types of higher exposure activities observed, EA 4 was evaluated for the young child, older child, and adult receptors. Utility worker exposure is evaluated in EA 61.

- EA 12 includes two maintained utility easements. The first easement extends north to south from the Holmes Road bridge crossing over the Housatonic River and extends south to the City of Pittsfield waste water treatment plant and crosses portions of numerous state-owned and privately owned areas. The second easement extends east to west and crosses a state-owned area. EPA and GE personnel observed dirt bike riding, riding ATVs, walking, hiking, biking, dog walking and wild crop gathering. Based on the types of higher exposure activities observed, EA 12 was evaluated for the young child, older child, and adult receptors. Both utility worker and recreational exposure occur at these easements; however, recreational exposure is evaluated for EA 12 because it would result in the higher exposure. Utility worker exposure on the second easement is also evaluated in EA 63 to separately address the safety of utility workers.

- EA 37b is located north of New Lenox Road and covers a portion of Utility Corridor 66. EA 37b is a high-use subarea of the larger EA 37 where hikers, bird watchers, and hunters were observed using the utility easement. EA 37b was evaluated as the general recreational scenario for the older child, and adult receptors. Utility worker exposure is evaluated separately in EA 66.

These EAs have Performance Standards (referred to as cleanup standards in the Draft Permit Modification) set for General Recreation as recommended by the commenter. As shown in the table below, these Performance Standards are much more stringent than the Performance Standards for utility corridors. In addition, floodplain soil in frequently used subareas, which include portions of EA's 4, 12, and 37b, require the top 3 feet of soil be excavated and replaced to achieve the Performance Standard presented in Table 2 of the Final Permit.

Except as described above, EPA and GE did not observe evidence of active trails or paths on EA 61-66. Therefore, these areas were evaluated as utility right of ways and Performance Standards were set to be protective of utility workers.

The table below compares the Performance (Cleanup) Standards for the EAs where active trails and paths were identified to the Performance Standards for utility corridors.

Exposure Area	Primary Performance Standard (mg/kg)	Secondary Performance Standard (mg/kg)
4, 12, 37b (General Recreational)	14	27
61-66 (Utility Worker)	169	242

EPA believes the Final Permit Modification is protective in areas with trails and paths since the areas identified as trails/paths have separate EAs with Performance Standards based on a high use recreation exposure scenario. In addition, for the remaining areas of the utility corridors, the Performance Standards for the protection of utility workers also need to be met.

Comment 231: Have the human health and ecological risk assessments completed in 2003 been updated with new numbers and information?

EPA Response 231: As discussed in the responses above in this Section II.F, in June of 2003 EPA issued the HHRA for public comment and review by the HHRA peer-review panel. Following the peer-review process established in the Decree, EPA released the Responsiveness Summary to the Peer Review of the HHRA in March of 2004. Based on recommendations from the peer review, EPA issued an updated HHRA in February of 2005. In addition to issuing the updated HHRA, an 11 page summary was publically released that described the changes and additions included in the March 2005 updated HHRA. Finally in June of 2005, EPA issued the Responsiveness Summary to Public Comments on New Information for the HHRA.

EPA followed a similar process for the ERA. In July of 2003 EPA issued the ERA for public comment and review by the ERA peer review panel. Following the peer-review process established in the Decree, EPA released the Responsiveness Summary to the Peer Review of the ERA in June of 2004. Based on recommendations from the peer review, EPA issued an updated ERA in November of 2004. In addition to issuing the updated ERA, a 10 page summary was publicly released that described the changes and additions included in the November 2004 updated ERA. Finally in March of 2005, EPA issued the Responsiveness Summary to Public Comments on New Information for the ERA.

Comment 232: The HHRA assumed a maximum exposure of 50 fish meals per year and an average exposure of 7 meals per year. Is this information from a survey of local fishermen? These exposure assumptions will not protect subsistence fishers.

EPA Response 232: The estimated fish meals per year used in the HHRA exposure assessment was not based on a survey of local fisherman because it was considered inappropriate to estimate fish consumption from an area where a fish consumption prohibition had been, and remains, in effect. The assumption was that any local fish consumption survey would provide data that was biased low compared to fish consumption from an uncontaminated river. It is EPA's policy to evaluate fish consumption at a rate that would be applicable to an uncontaminated river; to do otherwise would inappropriately minimize the amount of cleanup necessary to achieve target post-remediation risk levels.

The fish consumption rate was derived, as described in the HHRA, on a fish consumption study for a river in Maine that was considered similar to the Housatonic River and not under a fish

consumption warning that could reduce local consumption rates. The maximum and average consumption rates used in the HHRA were based on this survey.

Subsistence fishing was not evaluated in the HHRA. EPA attempted to locate subsistence fishing populations in both the Massachusetts and Connecticut portions of the river and none was found. EPA noted in the HHRA that if subsistence fishing populations were identified in the future, additional evaluation would be necessary.

EPA continues to believe the assumptions used for fish consumption in the HHRA are appropriate.

Comments 84, 585, 586, 587, 588, 589: The following are asserted by GE or another commenter: EPA used unrealistic exposure assumptions in the Human Health Risk Assessment. For example, EPA assumed that a person will be walking barefoot up to his ankles in sediment Monday, Wednesday and Friday every week of the months of April through November and continue doing that for 93 years. That is the kind of nonsense that drives the cleanup standards that become the justification for the need to cleanup to five parts per million instead of 25 to 50 or even more parts per million.

Many of the HHRA's RME exposure assumptions that underlie the EPA-approved IMPGs based on direct contract are unrealistic and unsupported and overstate exposures and risks. This was demonstrated in detail in GE's comments on the initial and revised drafts of the HHRA and in GE's initial IMPG Proposal.

For many of the floodplain EAs that EPA determined fall into a general recreational scenario, EPA has assigned an assumed frequency of use that is implausibly high and inconsistent with empirical data on actual frequency of use. For 62 EAs that EPA has designated as "high use" recreational areas, EPA assumes that an individual would use those areas 90 days per year and would continue to do so for 47 years. For other EAs, designated as "medium use" or "low use" recreational areas, EPA has assumed an exposure frequency of 60 days per year or 30 days per year, respectively, for the same duration. These exposure frequencies are unrealistic, particularly given that many of these areas are subject to physical constraints, such as wetlands, dense vegetation, and steep slopes.

The unrealistic nature of the exposure frequencies assumed in the HHRA was demonstrated by an empirical Floodplain User Survey conducted from April through October 2002, which revealed that most floodplain areas receive little or no recreational use, and therefore many of the exposure frequencies used in the HHRA substantially overestimate use. The Floodplain User Survey, for example, found 24 EAs for which EPA assigned a recreational exposure frequency of 90 days per year but at which the survey showed either no recreational users or six or fewer total recreational visits over the season, despite the extensive coverage of the survey. Clearly, if the frequency of use assumed by EPA in those EAs were occurring, the survey would have observed more usage.

Additional unrealistic and overstated exposure assumptions in the HHRA, other than those listed in paragraph above, include: (a) overstated exposure frequencies for the dirt biking and sediment exposure scenarios; (b) assumed daily soil ingestion rates that are based on pre-1997 studies and

are twice as high as those developed based on more recent studies with improved protocols; and (c) the HHRA's assumption that individuals would obtain 100% of their total daily soil ingestion from the floodplain (as opposed to other areas, such as home, work, school, other recreational areas) even for floodplain recreational activities that are relatively short in duration.

To illustrate the impact of using the overstated exposure assumptions noted in Specific Comments 587 and 588, GE has determined what the cleanup standards would be if those assumptions were replaced with more reasonable (but still conservative) assumptions. For that purpose, GE has used the alternate RME IMPGs that GE identified in its initial IMPG Proposal, which were based on more realistic assumptions for the exposure parameters discussed above; but it has adjusted them so that the toxicity inputs are based on EPA's PCB toxicity values. GE has applied these cleanup standards to the floodplain EAs using the same approach used by EPA – i.e., applying the more supportable Primary and Secondary Cleanup Standards to the same EAs to which EPA applied its Primary and Secondary Cleanup Standards. The results of this exercise show that application of these more supportable cleanup standards to the floodplain EAs would require removal of approximately 10,000 cubic yards of soil, compared to the 75,000-80,000 cubic yards of removal required by EPA's proposed remedy.

EPA Response 84, 585, 586, 587, 588, 589: Commenters (a private citizen and GE) assert that exposure assumptions in the HHRA are unrealistic and overstate exposures and human health risks. In fact, the exposure assumptions properly estimate levels of exposure for human populations, including persons most at risk. Under the NCP, "acceptable exposure levels" must "represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety." See 40 C.F.R. § 300.430(e)2(i)(A)(1). In accordance with this regulation and Agency guidance, the HHRA evaluated the central tendency exposure risks for persons with "average" exposure, as well as reasonable maximum exposure ("RME") for "high-end" or "maximally exposed" persons. HHRA Section 7.1.

The exposure assumptions used in the HHRA were established following the procedures outlined in EPA guidance. For example, EPA's 1995 *Guidance for Risk Characterization* states that the "high end [RME] descriptors are intended to estimate the exposures that are expected to occur in small, but definable, "high end" segments of the subject population." EPA's 1992 *Guidelines for Exposure Assessment* defines the RME as "... a plausible estimate of the individual risk for those persons at the upper end of the risk distribution. The intent of this description is to convey an estimate of risk in the upper range of the distribution, but to avoid estimates which are beyond the true distribution." EPA's 1990, *Risk Assessment Guidance for Superfund* notes that "The intent of the RME is to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures." The RME risk serves as the point of departure in remedy selection as outlined in the NCP. The CTE exposure was also evaluated consistent with EPA's Risk Characterization Policy and Handbook to provide the risk manager with additional information to consider while making decisions.

The basis for and derivation of each exposure assumption used in the HHRA is described in detail in both the initial and revised Phase 2 Direct Contact Risk Assessment HHRA (Volume IIIA, Appendix B). All exposure assumptions, including assumptions about recreational use, dirt biking and sediment exposure scenarios, and soil ingestion rates, were derived from site-specific

information when available or Agency guidance. See Final HHRA, Volume IIIA, Appendix B, Section 4. In particular, incidental ingestion rates and recreational exposure assumptions are based on information discussed in Subsections 4.5.2 and 4.5.3.

The exposure assumptions used in the initial HHRA were among the subjects reviewed by the Peer Review Panel. As summarized on page 16 of the HHRA Responsiveness Summary, five of the seven members of the Peer Review Panel for the HHRA commented that the approach, including the selection of exposure scenarios, receptors, exposure parameters, and risk estimates used to estimate risk from direct contact, was reasonable and consistent with EPA policy.[3] EPA agrees with the majority of the Peer Review Panel members that the assumptions used to estimate risk from direct contact were reasonable and consistent with EPA policy.

Comments 590, 591: GE asserts that even accepting EPA's exposure assumptions, a less disruptive remedy than proposed by EPA would still achieve levels within EPA's acceptable cancer risk range and below an acceptable non-cancer hazard index for direct contact, and thus would adequately protect health. For example, Alternative SED 10/FP 9, which would involve removal of approximately 26,000 cubic yards of floodplain soil and 235,000 cubic yards of sediment, would achieve the EPA-approved RME IMPGs based on a 10^{-4} cancer risk and a non-cancer HI of 1 in all of the floodplain and sediment EAs, and would achieve the EPA-approved RME IMPGs based on a 10^{-5} cancer risk and a non-cancer HI of 1 in the majority (over 65%) of the direct-contact floodplain EAs and in all but one of the sediment EAs.

It is significant that EPA accepts 10^{-4} cancer risks for fish consumption and for direct contact exposure in Core Area 1, but not for direct contact in other EAs. EPA has provided no health basis for that distinction. Since a smaller removal alternative such as SED 10/FP 9 would achieve cleanup levels based on a 10^{-4} cancer risk and a non-cancer HI of 1 in all EAs, it would provide protection of human health from potential risks due to direct contact.

EPA Response 590, 591: EPA disagrees with GE's assertion. First, EPA notes that attainment of IMPGs, including direct contact IMPGs, is only one of the decision factors that EPA balanced in selecting the remedy, and GE only discusses the least stringent cancer risk IMPG for protection of human health from the direct contact pathway and completely ignores the attainment of ecological IMPGs. Second, GE argues in essence that EPA should select the least costly alternative that would achieve the least stringent human health risk levels allowable under the NCP, and that EPA erred in selecting a remedy that achieves more stringent levels.

The NCP provides that the most stringent cancer risk level (10^{-6}) is the "point of departure for determining remediation goals for alternatives when ARARs are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple pathways of exposure." (40 C.F.R. § 300.430(e)(2)(i)(A)(2)). The preamble to the NCP explains that this "point of departure," ...expresses EPA's preference for remedial actions that result in

[3] One reviewer considered the selection of exposure parameters reasonable, but thought that the combination of exposure parameters resulted in overly conservative risk estimates for most of the scenario/receptor combinations. Another reviewer commented that individual exposure parameters were too high and the combination of exposure parameters resulted in extreme estimates of risk, rather than risk to an RME.

risks at the more protective end of the risk range, but this does not reflect a presumption that the final remedial action should attain such a risk level. Factors related to exposure, uncertainty and technical limitations may justify modification of initial cleanup levels that are based on the 10-6 risk level. The ultimate decision on what level of protection will be appropriate depends on the selected remedy, which is based on the criteria described in § 300.430(e)(9)(iii). (55 Fed. Reg. 8666-01, 8718–19 (March 8, 1990)).

Thus, EPA begins its evaluation at the most stringent end of the risk range (10^{-6}), and adjusts that target downward only where necessary given site-specific factors.

With respect to the specific cancer risk IMPG raised by GE, which again is the least stringent allowable cancer risk level, the SED 10/FP 9 proposal favored by GE achieves the 10^{-5} cancer risk level in fewer of the floodplain areas than the proposed remedy, which achieves the 10^{-5} risk level in all of the frequently used subareas and from 71% to 100% of the floodplain/sediment exposure areas, depending upon the extent of remediation conducted in NHESP Core Areas 2 and 3, to be decided on a case-by-case basis.

Other alternatives may achieve less stringent IMPGs as GE claims. But the Final Permit Modification best meets the Permit's general standards, in consideration of the selection decision factors, including a balancing of those factors against each other. The proposed remedy achieves a non-cancer hazard index of one, provides more protection against cancer risks, and ensures long-term protection of the environment from risks posed by PCBs.

This conclusion is supported by the Administrative Record, including without limitation the Comparative Analysis.

Comments 607, 612, 613: GE asserts that in contrast to the adverse ecological impacts of the proposed remedy, the ecological risks identified by EPA are tenuous and uncertain at best. EPA guidance specifies that the purpose of ecologically based remediation is "the recovery and maintenance of healthy local populations and communities of biota," not to protect "organisms on an individual basis." However, many of the studies and conclusions in EPA's ERA on which the ecological IMPGs were based focused on effects on individual animals, rather than local populations and communities, and used highly conservative and, in some cases, unsupportable assumptions and inputs that overstate risks.

The absence of any discernible adverse impacts of PCB exposure on the local wildlife populations and communities in the Rest of River is evidenced by the presence of numerous, diverse, and thriving plant and animal populations in the PSA, including numerous state-listed rare species, that continue to reproduce and inhabit the PSA despite the presence of PCBs in the area for over 70 years. As stated by the Commonwealth in its January 2011 comments on the RCMS, despite the "legacy of contamination" in the River and floodplain resulting from the PCB releases "from the 1930s through the 1970s," the "Housatonic River Watershed encompasses a rich and unique ecosystem supporting many rare plant and animal species and their associated habitats, including wetlands, floodplains, vernal pools, surface waters, and forested areas."

The current thriving Rest of River ecosystem demonstrates the uncertainty that there are any residual risks from PCBs to local populations and communities of wildlife in the Rest of River,

conditions determined using updated environmental data collected post issuance of the permit as well as attainment of other Performance Standards such as the Downstream Transport performance standard and attainment of State-specific fish tissue performance standards (currently identified as benchmarks but should be changed to performance standards).

EPA Response 445: EPA concurs that in general, to be consistent with the Permit, there should be a distinction between Performance Standards and Correctives Measures. Therefore, in the Final Permit Modification, EPA clearly delineates the Performance Standards from the Corrective Measures necessary to meet the Performance Standards, and a definition of Corrective Measures was included.

In the Final Permit Modification, footnote #9 is now in reference to a Corrective Measure. The amount of bank excavation (and other activities) will be based on the requirements to achieve the applicable Performance Standards.

See Response to Comments Section III.B.1 for issues related to the Downstream Transport and Biota Performance Standards.

III.B General Performance Standards

III.B.1 Downstream Transport and Biota Performance Standards

III.B.1.a Downstream Performance Standard

Comment 403: EPA has projected that the proposed remediation will decrease the annual mass of PCBs transported downstream by 89%, but this will still leave an unacceptable 11% of the current downstream transport to continue unabated for hundreds of years into the future. This is not a satisfactory outcome; the remediation should reduce downstream transport to zero.

EPA Response 403: As discussed in response to other comments, EPA based its remedy selection on an evaluation of all the remedy selection criteria, including three General Standards for Corrective Measures – Overall Protection of Human Health and the Environment, Control of Sources of Releases, and Compliance with ARARs, as well as an evaluation and balancing of six Selection Decision Factors – Long-Term Reliability and Effectiveness, Attainment of IMPGs, Reduction of Toxicity, Mobility or Volume of Wastes, Short-term Effectiveness, Implementability, and Cost. Based on this analysis, EPA selected a balanced remedy that significantly reduces, but does not eliminate, the downstream transport of PCBs. For example, the remedy is expected to reduce the downstream transport of PCBs over Woods Pond and Rising Pond by 89% compared to existing conditions. EPA's rationale for the extent of remediation in the Final Permit Modification is documented in its Statement of Basis and Comparative Analysis, as supplemented by this Response to Comments. EPA continues to believe that the remedy in the Final Permit Modification is appropriate and significantly controls sources and reduces the downstream transport of PCBs.

Furthermore, reducing downstream transport to zero would be extremely difficult. EPA evaluated 9 alternative remediation combinations in the Comparative Analysis, including a combination alternative that would remove 2,902,000 cubic yards of contaminated sediment and

soil. Even with that level of removal – over three times the removal of the selected remedy – the estimated downstream transport reduction is not 100%. Comparative Analysis, Tables 3 and 15.

Comment 428: Connecticut strongly supports the provisions of the permit which are designed to decrease downstream transport of PCBs. Connecticut views these provisions as the key to attaining all other goals for the river.

EPA Response 428: EPA acknowledges Connecticut's support of these provisions.

Comment 447: The remedy must maintain the requirements to control transport of PCBs downstream into Connecticut and the adaptive management provisions that allows for adjustments to the remedy in order to achieve these goals. The draft permit should be modified to indicate that an exceedance of the Downstream Transport Performance Standard would be addressed with the authority under paragraph 39a of the Consent Decree and CERCLA.

EPA Response 447: First, the Final Permit Modification remedy does maintain the requirements to control transport of PCBs downstream into Connecticut (e.g., removal of an estimated 990,000 cubic yards of contaminated sediment and soil, containment measures such as Engineered Caps, and the Downstream Transport Performance Standards). Comparative Analysis at Table 3; Final Permit Modification Sections II.B.2.i, and II.B.1.a, respectively. Second, the remedy also maintains the Adaptive Management provisions. Final Permit Modification, Section II.F. Third, the Decree requires GE to achieve and maintain Performance Standards, including the Downstream Transport Performance Standard, and the Decree includes a number of possible avenues for EPA to ensure Performance Standards are achieved and maintained and the remedy remains protective of human health and the environment. Paragraph 39.a is one such potential avenue for an EPA response. However, given that the Decree provisions apply to the Rest of River response action, it is unnecessary to reference one specific Decree standard in the Permit.

Comment 482: EPA's Downstream Transport Performance Standards are designed to fail. The measurement of flow rates is limited to periods of low flow and averaged over periods of time. This hides the effects of episodic hard rain and high flow conditions that transport PCBs out of the unremediated Core Areas and back into the River.

EPA Response 482: EPA disagrees that flow rates specified in the Downstream Transport Performance Standard are limited to low flow and that the standard is inappropriate. As demonstrated in the Administrative Record, the standards are set for average daily flows that capture 98% of the flows. (Memo from Edward Garland, HDR, to Scott Campbell, Performance Standard Flow Based Annual Average PCB Flux Methodology, April 25, 2014). The appropriateness of the Standard is addressed more specifically in Responses 662, 663, and 664.

Comment 662: GE asserts the following: The Downstream Transport Performance Standard in the draft Permit specifies particular annual average values for PCB flux over Woods Pond Dam and Rising Pond Dam. Exceedance of this standard would occur if the annual average PCB flux is greater than the standard (at either Woods Pond Dam or Rising Pond Dam) in three or more years within any five-year period after completion of the remedial construction activities. The annual average flux values specified by this proposed standard were simply derived from model

predictions of the annual average PCB fluxes that would occur at these dams in the future under the proposed remedy. These flux values were not based on an analysis of risk, and EPA has made no showing that the specified PCB flux values are tied to reductions in risk or are otherwise justified under the Permit's remedy selection criteria. As such, they are arbitrary.

EPA Response 662: The Downstream Transport Performance Standard is fully justified under the Permit's remedy selection criteria, and therefore is not in the least arbitrary.

The nine Permit criteria used for remedy selection are specified as three General Standards - 1) Overall Protection of Human Health and the Environment, 2) Control of Sources of Releases, and 3) Compliance with ARARs; and six Selection Decision Factors. The General Standards are considered "threshold criteria," and alternatives that do not meet these threshold criteria do not warrant further consideration. (See the *Advanced Notice of Proposed Rulemaking (ANPR): Corrective Action for Releases From Solid Waste Management Units at Hazardous Waste Management Facilities*, Federal Register, Vol. 61, No. 85, Wednesday, May 1, 1996) As defined in the Final Permit Modification, a Performance Standard means cleanup standards, design standards and other measures and requirements necessary to protect human health and the environment. EPA developed the Downstream Transport Performance Standard to ensure that the Corrective Measures meet the General Standards and that PCB transport downstream does not exceed what is expected following implementation of the remedy. Downstream transport of excessive concentrations of PCBs would endanger human health and the environment, would represent a lack of control of sources of releases, and could also impair attainment of water quality ARARs, thus not meeting the General Standards. The Performance Standard requires that, if exceeded, GE evaluate and identify the potential cause(s) of the exceedance and propose to EPA for review and approval additional actions necessary to achieve and maintain the Performance Standard. This provides a mechanism to ensure that the General Standards are met following implementation of the Corrective Measures and that the remedy remains protective of human health and the environment.

Overall Protection of Human Health and the Environment
Currently there is a consumption advisory for people eating fish in both the MA and CT portions of the Housatonic River and for other wildlife from the river in MA, as well as unacceptable risks to ecological receptors, due to PCBs from the GE facility. These advisories and risks are primarily driven by biota tissue concentrations which in turn are affected by the concentration of PCBs in water and sediment. The Corrective Measures specified in the Final Permit Modification are expected to reduce fish and other biota tissue concentrations, resulting in the reduction of these risks. However, the remedy is not expected to fully eliminate these risks in the near-term, and an excess flux of PCBs downstream will impact the expected risk reductions, and hamper any further risk reductions to concentrations that achieve the Long-Term Biota Standard and/or acceptable concentrations for risks to ecological receptors.

Control of Sources of Releases
The Final Permit Modification specifies that the evaluation of Control of Sources of Releases includes, but is not limited to, the extent to which the alternative "would mitigate the effects of a flood that could cause contaminated sediment to become available for human or ecological exposure." The Downstream Transport Performance Standard will be used to monitor the

effectiveness of the Corrective Measures specified in the Final Permit Modification in controlling exposure to contaminated sediment following flood events, as well as under other flow conditions. It also provides a mechanism to evaluate the cause of downstream transport of contaminated sediment if in fact downstream sediment transport occurs, resulting in human or ecological exposures.

Water Quality ARARs
Chemical-specific ARARs include Federal and State water quality criteria for PCBs. These criteria are the freshwater chronic aquatic life criterion of 0.014 microgram per liter (ug/L) and the human health criterion (based on consumption of water and/or organisms) of 0.000064 ug/L. It is expected that, when the Corrective Measures are implemented and maintained, the criteria for freshwater aquatic life will be achieved in MA and CT.

The criteria for consumption of water and/or organisms is not expected to be achieved in any of the river reaches in MA, however, it is expected that the Corrective Measures would restore water quality consistent with this criterion in 50% or more of the CT reaches. Because this criterion is not expected to be met in MA, EPA is waiving it under both Federal and State ARARs as technically impracticable in MA. The control of the excessive flux of PCBs (as monitored and, if necessary, addressed by the Downstream Transport Performance Standard) is critical in achieving the expected compliance with water quality ARARs.

Nothing in the Permit or Decree prescribes the particular quantitative method by which EPA is to set Performance Standards measuring the effectiveness of the remedy. To the contrary, the Decree requires EPA to develop the model, subject to multiple stages of Peer Review, and including comments from GE, as a first step in evaluating alternatives for cleaning up the River (see Decree, ¶¶ 22.g. h. and i.). The Decree also requires EPA to set Performance Standards, and does not preclude EPA, in its expert judgment, from using the Peer-Reviewed model simulations to establish Performance Standards in the absence of any other means to predict future performance of the Corrective Measures.

Specifically, a more stringent Performance Standard for general downstream transport was initially proposed by EPA in its August 2012 response to the National Remedy Review Board comments: namely achieving and maintaining a maximum of 2.0 kg/year PCB flux rate (mass per time) over Woods and Rising Pond Dams. This initial more stringent proposal was based upon the model work, but was ultimately adjusted after EPA and its consultant, HDR evaluated comments received by GE during the 2012/2013 Technical Discussions. In particular, during the Technical Discussions, EPA, CT DEEP, and GE worked together to craft the structure of the Downstream Transport Performance Standard presented in the Draft Permit Modification and now included in the Final Permit Modification. As a result, the approach set forth in the Final Permit Modification now accounts for variation in average annual flows and applies an uncertainty factor to predicted results. Had EPA relied on the absolute values of the model predictions, the Downstream Transport Standard would be more stringent.

Second, the Downstream Transport Performance Standard is clearly justified under the Permit's remedy selection criteria. In addition to the risk/protectiveness basis, one of the three General Standards for the remedy selection in the Permit is to reduce the bioavailability of PCBs through "control of sources of releases," Permit II.G.1.b, p. 20. Here the Downstream Transport

Performance Standard measures the effectiveness of the remedy in achieving this objective by measuring the levels of PCBs transported downstream. PCBs traveling downstream are an uncontrolled source. They are bioavailable to human and ecological receptors and could cause recontamination of the floodplains. As defined in the Final Permit Modification, a Performance Standard means cleanup standards, design standards and other measures and requirements necessary to protect human health and the environment. Permit, Definition 16. The Downstream Transport Performance Standard is related to risk reduction because it measures the effectiveness of the remedy in achieving source control objectives. Contrary to GE's argument, this Standard includes a clear human health or environmental risk-based justification.

Comment 663: GE asserts the following: The Downstream Transport Performance Standard is based on the assumption that the specified flux values can and will be achieved by the proposed remedy. That assumption, in turn, is based on the assumption that EPA's model accurately predicts future PCB fluxes. In fact, however, EPA's model was not designed and is not appropriately used for prediction of such absolute values, as recognized by EPA in its Model Calibration Responsiveness Summary. Although model results are useful for comparisons among remedial alternatives, they are not sufficiently accurate, and should not be used, to establish absolute numerical standards, as EPA has proposed for the Downstream Transport Performance Standard. EPA's use of the model results accounts for variability in flow in this application does not otherwise account for model uncertainty in any way, which further contributes to the arbitrariness of that proposed standard.

EPA Response 663: EPA disagrees. To the extent that EPA relies on the model results, EPA also accounts for model uncertainty in a number of ways. EPA recognizes that there is uncertainty in the model predictions due to a number of factors, including future boundary conditions, atmospheric inputs, the magnitude and spatial distribution of PCBs in unremediated areas, and the assumptions incorporated into the remediation scenarios of the model for elements such as releases of PCBs during dredging and the incorporation of dredging residuals into a cap. The approach followed to develop the Downstream Transport Performance Standard accordingly includes several mechanisms to provide a margin of safety against incorrectly identifying an exceedance of the standard. One is the use of a 95% prediction limit, which means that only 2.5% of the annual average PCB fluxes would be expected to exceed the 95% prediction curve around the regression of annual fluxes versus annual flows (2.5% above the upper prediction limit and 2.5% below the lower prediction limit). As GE states, this is to account for uncertainty based on annual variability in the PCB load due to the variability in flow. In addition, it accounts for the variability in annual PCB loads for years with the same annual average flow. Also, the standard for each flow-bin is set at the upper end of the flow range, so that the margin of safety for annual average flows less than the upper limit of the flow range is greater. For up to half of the flow range, the standard is equivalent to more than a 99% prediction limit, meaning that a single annual average flux would be expected to be above the standard once in more than 99 years.

An additional factor accounts for model uncertainty through the condition defined for the occurrence of the Performance Standard exceedance, which is annual average fluxes greater than the standard in 3 or more years in a 5-year period. Statistically, annual average fluxes would be expected to be above the upper prediction limit no more than once in 40 years (2.5% above the upper prediction limit), however values above the standard would not be classified as an

exceedance unless there were three in 5 years (60%). The combination of the specification of the standard for each flow bin at the upper end of the flow range and the criteria for assessing an occurrence of an exceedance provide account for uncertainty in the model predictions. Lastly, the standard flux only applies on days with daily average flow less than or equal to a 98% cutoff flow (excluding the highest 2% of daily flows), thereby eliminating the uncertainty with measuring and predicting PCB flux at these high flow events. Taken together, all of these elements of the Downstream Transport Performance Standard consider model uncertainty, including, but not limited to, annual variability in flow.

With respect to the model design, EPA recognizes that uncertainty in factors, including future boundary conditions (as stated in the Model Calibration Responsiveness Summary, EPA, January, 2006) result in uncertainty in the predictions of absolute concentrations. By considering these uncertainties in developing the flux standard, EPA is acknowledging and accounting for the uncertainty in predicted absolute values for flux values. Had EPA relied on the absolute value of the model prediction, the flux standard would be much more stringent.

Comment 664: GE asserts the following: There is no known precedent at any of the major contaminated sediment sites in the country for a performance standard such as the flux standard proposed by EPA, which establishes a numerical standard for future, post-remediation conditions – as opposed to a goal or remedial action objective (RAO) for such conditions – with specified consequences (other than continued monitoring) if that standard is not met. Indeed, the consequences specified by the Region for an exceedance of this standard are problematic.

EPA Response 664: While this type of standard may not be common, EPA regulations or policies do not prohibit having Performance Standards that are appropriate given the site-specific circumstances and the other components of the remedy. In this instance the combination of different remedy components including the Downstream Transport Performance Standard is best suited under the Permit criteria. The Permit criteria include the General Standard of Control of Sources of Releases, for which this Performance Standard is directly applicable. The remedy includes significant elements of containment and MNR, as well as avoidance of remediation for certain Core Areas, all in lieu of PCB removal. Given those elements, it is reasonable to have the remedy include another component that can ensure that the emphasis on containment, MNR and Core Areas (as opposed to a greater emphasis on PCB excavation) continues to yield an effective remedy that is protective and controls sources of releases.

Comment 665: GE asserts the following: The proposed requirement that, in the event of an exceedance of the Downstream Transport Performance Standard, GE must determine the cause is overbroad. Given the many factors that could potentially lead to an exceedance of the specified flux values at Woods Pond Dam and/or Rising Pond Dam, it may well not be possible to determine the cause. The most that could be done is to evaluate potential causes to determine whether a cause or causes can be identified.

EPA Response 665: GE expresses concern about being able to identify the cause of an exceedance, and states that the most that could be done is to evaluate potential causes to determine whether a cause or causes can be identified. The Final Permit Modification provision for the Downstream Transport Performance Standard addresses both those concerns. Specifically, EPA notes that the specific language of that Performance Standard (Section

II.B.1.a.(1)) was revised to allow GE to identify "potential" causes, and also allows for consideration that there is more than one cause. Providing GE, as Permittee, the opportunity to identify potential cause(s) is a reasonable approach to implementation. The specific language of Permit Section II.B.1.a.(1) is as follows:

> In the event that this Downstream Transport Performance Standard is exceeded, the Permittee shall evaluate and identify the potential cause(s) of the exceedance and propose, to EPA for review and approval, additional actions necessary to achieve and maintain the Performance Standard.

Moreover, if there were any disagreement between GE and EPA as to whether GE had satisfied that provision, the Decree contains a Dispute Resolution provision for disagreements on this and other deliverables related to the cleanup. Note that this provision is very similar to that for the Biota Performance Standard, so a very similar rationale applies. See EPA Response 674, 675.

Comment 666: GE asserts the following: The Downstream Transport Performance Standard would provide that, in the event of an exceedance, EPA "may consider modifications to the Rest of River remedy in accordance with its authority under the CD and CERCLA." EPA's authority under the CD to require GE to conduct additional response actions beyond the actions required by the initially selected remedy is limited to the situation in which the CD covenant reopeners are met – i.e., where EPA determines that the exceedance constitutes new information or conditions and that that new information or conditions, together with other relevant information, indicate that the selected remedy is no longer protective of human health or the environment.

EPA Response 666: EPA disagrees with GE's views on EPA's ability to require additional response actions under the Decree. EPA and GE agree that EPA's authorities include use of the Pre- and Post-Certification Reservations of Rights, or "reopeners", under Paragraphs 162-163 of the Decree. Additionally, though, EPA has the ability pursuant to its oversight authorities under the Decree to require actions in EPA's response to any GE submittal under the Decree. See Decree Section XV. Moreover, the Decree affords EPA the ability to require modifications of the Rest of River SOW if necessary to achieve and maintain Performance Standards or to carry out and maintain the effectiveness of a response action. See Decree Paragraph 39. Note also that the Final Permit Modification has modified the provision for EPA's determination on an exceedance. The Draft Permit Modification provided that EPA would determine any additional actions necessary to achieve and maintain the Performance Standards "in accordance with the CD and CERCLA," and the Final Permit Modification provides that EPA's determination would be "in accordance with the CD".

Comment 667: GE asserts the following: The proposed Downstream Transport Performance Standard conflicts with the CD and Permit requirements that the remedy decision must specify the particular remedial actions required, rather than giving the Region a blank check to determine such actions in the future. Paragraph 22.n of the CD provides that EPA's proposal must specify not only the Performance Standards but also the specific corrective measures that it determines are necessary to meet the Performance Standards, rather than giving the Region the discretion to develop and mandate additional corrective measures later, which would not have been evaluated under the Permit's remedy selection criteria. Additionally, CD Paragraph 22.p provides that the final permit modification will obligate GE "to perform the selected Rest of River Remedial

Action and O&M," thus indicating that that remedial action will be known and quantifiable at that time. Similarly, Special Condition II.J of the Permit states that the final permit modification "will set forth the selected Performance Standards and corrective measures for the Rest of River area" – again showing that the corrective measures are to be specified in that decision. These provisions demonstrate that, while the Rest of River Remedial Action was expected to include Performance Standards, the parties intended that those Performance Standards would be ones whose achievement would be ascertainable and attainable by doing certain specified work, rather than leaving the required work for a later EPA determination. This was intended to provide GE with certainty and finality at the time of the Rest of River remedy selection.

EPA Response 667: EPA disagrees with GE's assertions that additional response actions, when necessary, must all be defined in the Final Permit Modification. It is undisputed that EPA has authority to issue Performance Standards, as it is intended that the Final Permit Modification include Performance Standards. Decree ¶¶ 23, 24; Permit II.J. And it is undisputed that there are consequences under the Decree for failure to achieve and maintain Performance Standards. For example, in such cases, the Decree specifically provides for modification of the Rest of River SOW to include modified work to achieve and maintain Performance Standards, Decree ¶ 39.a, or to seek additional response action if certain covenant reservation, or "reopener" conditions are met. Decree ¶¶ 162, 163. Thus, even though the Permit calls for EPA to set forth "the appropriate corrective measures necessary to meet the Performance Standards," Permit II.J. (emphasis added), the controlling Decree recognizes that it will not always be possible or *appropriate* to identify all Corrective Measures necessary to meet and maintain the Performance Standards at the time of the Final Permit Modification. Decree ¶39.a. Indeed, the Decree specifically recognizes that there is no "warranty or representation of any kind" that compliance with the selected Corrective Measures will achieve Performance Standards. Decree ¶ 40.

GE argues that certain provisions of the Decree and Permit imply that together they were "intended to provide GE with certainty and finality at the time of the Rest of River remedy selection." In fact, no provision of the Decree or Permit explicitly or implicitly provides the certainty and finality now demanded by the GE. Indeed, the Decree directly contradicts such a strained interpretation by explicitly providing for additional response actions to achieve and maintain Performance Standards:

> if EPA determines that modification to the work specified in the ... the Rest of the River SOW, ... is necessary to achieve and maintain the Performance Standards or to carry out and maintain the effectiveness of a particular Removal or Remedial Action, EPA may require that such modification [of the work] be incorporated in the ... the Rest of the River SOW.

Decree ¶39.a (emphasis added).

Comment 668: GE asserts the following: An open-ended Downstream Transport Performance Standard that allowed EPA to require GE to conduct additional, unspecified response actions if the standard was exceeded would prevent EPA itself, as well as GE, other stakeholders, and the public, from conducting a meaningful evaluation of the proposed remedy under the applicable Permit criteria. Unless one knows the full extent of remediation actions necessary to meet the Performance Standards, one cannot apply the Permit criteria. For example, a requirement for

significantly more removal to meet a Performance Standard could materially change the analysis of impacts (and thus overall protectiveness) and costs. Thus, such an approach is inconsistent with the Permit requirement to fully consider the above criteria in evaluating remedial alternatives and selecting a remedy.

EPA Response 668: EPA disagrees with the GE's views. EPA performed a very thorough, meaningful evaluation of the proposed remedy, and the alternatives, under the applicable Permit criteria. The scope of EPA's evaluation included potential cleanup approaches for sediments in Reach 5A, 5B, 5C, bank soils in Reach 5A and 5B, alternative approaches for Woods Pond, Reach 7, Rising Pond, Reaches 9-16, Floodplains and Vernal Pools. Overall, see the Comparative Analysis, Section 2, which demonstrates that EPA performed its thorough evaluation of the overall remedy, and nothing in the Decree or Permit requires EPA to perform that type evaluation on all potential, future activities that might be needed to achieve or maintain protection of human health and the environment, or an effective remedy. Moreover, if GE's claims that no additional new or modified work can be required for the Rest of River because any such work would not have been subject to the "nine criteria analysis required"[4] for other Corrective Measures at the time of the permit modification were correct, it would render superfluous individual Decree provisions, such as Decree Paragraph 39.a and the Decree's Operation and Maintenance (O&M) provisions (Decree, Paragraph 4 definition of O&M includes "all activities required to maintain the effectiveness of the Remedial Action for the Rest of the River as required under an Operation and Maintenance Plan developed for the Rest of the River Remedial Action)." Decree ¶ 4. In the Final Permit Modification, the O&M program requires "other response actions necessary to achieve and maintain compliance with Performance Standards." Final Permit Modification, II.C. Under GE's formulation, neither modified work pursuant to Paragraph 39.a nor O&M work could ever be required because such work can never be subject to the allegedly relevant analysis -- it is unknowable at the time of remedy selection what modified work or O&M will be necessary to achieve and maintain Performance Standards. (Additionally, as to the GE's concerns about the "nine criteria analysis" applying during Paragraph 39.a. modification of work, any disagreement need not be resolved today. This question should be resolved during dispute resolution under the Decree, if and when EPA ever determines that modification of the work is necessary under Decree Paragraph 39.a., and if and when GE disputes that determination. It is well settled that contractual terms should not be interpreted to render any provisions superfluous, and GE's argument is incorrect. In addition, not all components of the remedy require the level of analysis demanded by GE. In short, the Decree reinforces that future potential adjustments may be needed, and neither the Decree nor the Permit requires that all work required for the Rest of River Remedial Action be subject to a fixed analysis at the time the Final Permit Modification is issued.

Comment 669: GE asserts the following: The proposed Downstream Transport Performance Standard would constitute a "contingency remedy" under EPA guidance, because it would be contingent on a future event (i.e., an exceedance of the standard). EPA guidance requires that a

[4] Note that while the "nine criteria" are significant to remedy selection, the Decree and Permit provide that EPA may select the remedy based upon the CMS (which includes an evaluation of the alternatives under the nine criteria) and the information in the Administrative Record. Decree ¶ 22.p; Permit II. J.

contingency remedy (as well as the selected remedy) be evaluated fully against the remedy selection criteria, and indicates that if that is not done at the time of initial remedy selection, it will need to be done to invoke the contingency at a later point in time. For any additional response actions that might be required in response to an exceedance of the Downstream Transport Standard, EPA's proposal has not evaluated the Permit's remedy selection criteria, and it does not propose that that be done in the future. As such, it would conflict with EPA guidance as well as the Permit.

EPA Response 669: GE argues that any additional work required by an exceedance of a Performance Standard would constitute a "contingency remedy" that has not been fairly evaluated under the relevant criteria. EPA does not agree that this is a contingent remedy. While CERCLA guidance is relevant, it is not controlling. The process for selecting a remedy here is pursuant to the RCRA permitting process as set forth in the Decree. Moreover, the Decree itself contains several permissible conditional response action obligations. For example, the Decree authorizes Performance Standards for a Conditional Solution, including as may be identified for the Rest of River: for example, when a property owner declines a land use restriction offer from GE, then GE may need to undertake additional cleanup if the land use changes. Decree ¶ 34. Similarly, in certain circumstances when necessary to carry out the effectiveness of the response action or when the selected remedy fails to achieve and maintain Performance Standards, the Decree also obligates GE to undertake additional response actions to ensure the effectiveness of the remedy or to achieve and maintain those Performance Standards. Decree ¶39.a. Those additional response actions contribute to the effectiveness of the cleanup, but necessarily cannot be defined at the time of the remedy decision. Likewise, in certain emergency situations, GE must "take all appropriate action to prevent, abate, or minimize" the release or threat of release. Decree ¶91. Thus, the Decree contemplates that not all work, contingent or otherwise, required for the Rest of River, such as O&M, can or need be subject to a fixed analysis at the time of the Final Permit Modification. Thus, the requirement here to undertake additional work in response to failure to maintain and achieve Performance Standards is no different than failure to meet and achieve any other Performance Standard, and does not constitute an impermissible contingent remedy.

Additionally, a determination on whether an EPA-ordered additional response action is permissible is not currently ripe. Under the Permit, an exceedance cannot occur until three or more years after the completion of construction-related activities. (Final Permit Modification, II.B.1.a.(1)). Then if GE proposes to EPA additional actions necessary to achieve and maintain the Performance Standard, and EPA disapproves of GE's proposal, GE has its rights pursuant to the Decree's Dispute Resolution provisions to dispute EPA's determination. See Decree, Section XXIV.

Comment 670: GE asserts the following: The proposed approach to the Downstream Transport Performance Standard would also allow an impermissible end run around the covenants in the CD. Those covenants prohibit the United States from seeking to require GE to conduct additional response actions beyond those specified and required under the CD, unless the reopener conditions are met (i.e., that new information or conditions are discovered that indicate that the selected remedial action is not protective of human health or the environment) (CD ¶¶ 161, 162, 163). While the CD provides that EPA will conduct periodic reviews of the Rest of River remedial action and may select further response actions in the course of those reviews

(CD ¶¶ 43.c, 44), it also provides that GE is obligated to perform such actions ***only*** if the covenant reopener conditions are satisfied (CD ¶ 46). An approach that would allow EPA to require GE to conduct additional response actions (not specified in the remedy decision) in the future without satisfying the reopener conditions would violate the covenants.

EPA Response 670: In claiming that these Performance Standards violate the Decree's covenants, GE ignores the provisions of Paragraph 39.a, and the general obligation to achieve and maintain Performance Standards, including but not limited to through the inspection and Operation and Maintenance provisions. GE only points to the Decree's provisions regarding reopener conditions or five year review, Decree ¶¶ 43.c, 44, 46, 161-3, while ignoring the separate authority to require additional response actions to achieve and maintain Performance Standards set forth in Paragraph 39.a of the Decree, and in the Operation and Maintenance requirements of the Decree. Decree, Paragraph 4 definition; Paragraph 22. As a result, GE is wrong to claim that EPA's attempt to require GE to conduct additional response actions (not specified in the remedy decision) in the future without satisfying the reopener conditions would violate the Decree." That is exactly what Paragraph 39.a. and the separate inspection and Operation and Maintenance provisions allow. Paragraph 39 represents an obligation separate from the covenant reopeners in Paragraph 162-163, an obligation that recognizes that during the course of designing and implementing a particular response action, EPA may determine that a modification to the specified work may be needed to be undertaken to achieve and maintain the Performance Standards or to carry out and maintain the effectiveness of a remedy. Paragraph 39 reflects the recognition that modifications or adjustments to the remedy approach may be necessary during design/implementation, and that depending on the extensiveness of the modification, EPA may require GE to perform them through modification of the Rest of River SOW or Work Plans. In short, these Performance Standards, like any other Performance Standard, are not a violation of the Decree's covenants.

Comment 671: GE asserts the following: Paragraph 39.a of the CD is consistent with the conclusion expressed in Comment 670. That provision states that, if EPA determines that modification to the Rest of River work "is necessary to achieve and maintain the Performance Standards . . . , EPA may require that such modification be incorporated in [the relevant work plans]; provided, however, that a modification may only be required pursuant to this Paragraph to the extent that it is consistent with the scope of the response action for which the modification is required and does not modify the Performance Standards" (except with agreement of the parties and approval of the Court) (emphases added by GE). Given the requirement that the Rest of River remedy decision must specify not only the Performance Standards but the actions necessary to meet them, EPA's authority under Paragraph 39.a to require modifications of the Rest of River work does not extend to requiring additional remediation actions later to meet the Downstream Transport Performance Standard, because that would not be "consistent with the scope of the [Rest of River] response action." Rather, any such requirement would be barred by the U.S. covenants in Paragraph 161. In addition, to the extent that such additional remediation actions would modify any other Performance Standard for the Rest of River Remedial Action or the Performance Standards for any of the upstream Removal Actions under the CD, that would be precluded by the provision of Paragraph 39.a that modifications thereunder cannot modify the Performance Standards.

EPA Response 671: EPA disagrees with GE's conclusions on Paragraph 39. Achievement of the Downstream Transport Performance Standards is part of the response action; thus, additional actions to achieve and maintain those Performance Standards are consistent with the scope of the response action. There could be additional remediation actions that are consistent with the scope of the response action that do not modify Performance Standards. Precluding any additional response actions at this point would render Paragraph 39.a. meaningless. In addition, see Response 670 above.

Comment 672: GE asserts the following: An open-ended Downstream Transport Performance Standard that allowed EPA to require GE to conduct additional, unspecified response actions if the standard was exceeded could deprive GE of its ability to obtain a timely Certification of Completion of the Rest of River Remedial Action, with the certainty it provides. Under Paragraph 88 of the CD, once GE concludes that it has completed the Rest of River Remedial Action, it is to submit a written report requesting EPA to certify that the Remedial Action is complete. EPA must respond, either by agreeing (and issuing the Certification) or by telling GE the specific activities that GE must undertake to complete the work and achieve the Performance Standards. The CD draws a bright line between completion of the Remedial Action and operation and maintenance (O&M). The Certification of Completion for the Remedial Action issues when the Remedial Action is done, ***excluding*** O&M. However, if the Downstream Transport Standard were interpreted to allow EPA to require GE to conduct additional response actions to address an exceedance (without meeting the reopener conditions), EPA could, at the completion of the prescribed remediation activities, decline to issue a Certification of Completion on the ground that further remediation might be required in the event of a future exceedance of the standard. The result would be an infinite do-loop in which GE is deprived of the certainty that it has undertaken the tasks necessary to complete the Remedial Action. This is inconsistent with the intent of the parties in negotiating the CD.

EPA Response 672: GE claims that these Performance Standards conflict with the Certification of Completion provisions of the Decree. Decree ¶ 88. However, these Performance Standards function like any other Performance Standard. If at the time of completion of Remedial Action for the Rest of River, the Performance Standards have been attained and there is no violation of the Performance Standard, GE is entitled to a Certification of Completion. However, the Certification of Completion would not eliminate the ongoing applicability of the Performance Standard. The ongoing obligation of maintaining any Performance Standard continues through O&M following Certification of Completion.

Comment 741: GE asserts as follows: EPA has not conducted an evaluation of the proposed PCB Downstream Transport Performance Standard against potential alternative standards. Further, if that standard were interpreted to allow the Region to require additional response actions in the event of an exceedance (without going through the CD covenant reopeners), it cannot have evaluated (or allowed others to evaluate) those additional response actions (or alternatives to them) under the Permit criteria, since such actions are currently undefined; and it has not provided for such evaluation to be conducted in the future.

EPA Response 741: In response to EPA not conducting an evaluation against potential alternative standards, there is no requirement in the Permit or Decree to that requires all Performance Standards be evaluated against "other potential standards." Also, this downstream

transport, or flux, standard was developed with input that GE provided during the technical discussions held between GE, EPA and the States from August 2012 to December 2013 and revisions to the draft standard were made during those discussions. For example, see the April 25, 2014 Memorandum from Edward Garland, HDR, to Scott Campbell, Weston [both contractors to the EPA/Corps of Engineers]. Furthermore, see Responses 662 and 664 above.

With regard to requiring potential response actions in the event of an exceedance of the standard, see Reponses 668 and 669 above.

Comment 439, 456: CT DEEP recommended specific operational requirements and engineering controls to be included in the Permit. These include the following:

Emplacement of activated carbon is required in several sections of the permit. The addition of activated carbon must be managed in such a manner as to prevent downstream transport of the activated carbon under any flow conditions.

Anchored silt screens should be placed around the dredge during work and at the outlets of Woods Pond and Rising Pond to minimize transport of sediment downstream.

EPA Response 439, 456: The Decree and Final Permit Modification both provide that GE will propose Work Plans for the implementation of the response action. (Decree, Para. 22.x, y; Final Permit Modification, II.H). Operational details and engineering controls will be included in these Work Plans, which will be subject to EPA review and approval.

Comment 318: The technique for measurement of PCB flux at Woods Pond and Rising Pond dams should be described. How results are to be measured is an important consideration of a specification.

EPA Response 318: Based in part on this comment, the Final Permit Modification includes a description of how flux will be measured at Woods Pond and Rising Pond. Permit at II.B.1.a.(2).

Comment 448: A work plan should be required to establish the details associated with measuring and assessing compliance with the Downstream Transport Performance Standard. Development of this work plan should be added to Section II.B.11 of the permit, and require EPA and Connecticut review and approval.

EPA Response 448: Section II.B.11.e. of the Draft Permit Modification (Section II.H.5. of the Final Permit Modification) includes the requirement for the submittal of a Plan for Measuring Compliance with Performance Standards. This plan is the mechanism for a proposal for measuring and assessing compliance with the Downstream Transport Performance Standard. Connecticut's role in reviewing and commenting on submittals is discussed in Response to Comments Section VIII.B.

III.B.1.b Biota Performance Standards

Comments 228, 262, 407: One of the expected outcomes of the remediation, as discussed on p. 11 of the Statement of Basis, is a reduction in PCB concentrations in biota what will allow increased human consumption of fish and other biota taken from the river, within a short time

after remediation is completed. Why is this the goal? Even with capping, fish tissue will take a while to decrease, so why not specify a longer-term solution and a complete remediation? EPA selects the fish tissue concentration associated the average (CTE) non-cancer risk as the Performance Standard. Why is this used as the Performance Standard rather than the concentration associated with the MRE (sic)? With regard to fish consumption, it is not clear why Massachusetts residents are limited to 7 fish meals per year from the river while Connecticut residents are judged on 365 meals per year.

EPA Response 228, 262, 407: The Short-Term Biota Performance Standard sets an average PCB concentration of 1.5 mg/kg in fish fillets to be achieved within 15 years of completion of remedial activities in the applicable reach of the River. If the Short-Term Biota Performance Standard is exceeded in two consecutive monitoring periods after that 15-year period, GE must identify the potential cause(s) of the exceedance and propose additional actions necessary to achieve and maintain the relevant Standard, and EPA will determine any such additional actions in accordance with the Decree.

EPA took care in establishing the Short Term Biota Performance Standard (the "Short Term" standard) to be an achievable measure of the remedy's performance and progress. Consumption of PCB-contaminated fish is a major unacceptable risk to human health in the river; thus, it is important to use PCB concentrations in fish tissue as a basis for measuring risk reduction. Based on computer modeling, this Short-Term standard is expected to be readily achieved within the prescribed timeframes. It was selected based on the probabilistic risk assessment central tendency exposure (CTE) adult exposure Hazard Index (HI) of one. Conversely, the Long-Term Biota Monitoring Performance Standards were based upon more conservative exposure assumptions (or in this case, assumptions regarding the amount of fish or duck tissue consumed), using the probabilistic risk assessment Reasonable Maximum Exposure (RME) 1×10^{-5} cancer risk for fish in Massachusetts and duck breast in Massachusetts and Connecticut and, at the request of CT DEEP, a calculation assuming 365 fish meals per year and a 1×10^{-6} cancer risk for fish tissue in Connecticut. See Section II.B.1.b.(1)(b) footnote 3. Because it is anticipated that the Short-Term Biota Performance Standard will be achieved in the short-term, EPA established the complementary Long-Term Biota Monitoring Performance Standard to measure the remedy's long-term success at achieving additional risk reduction and measuring progress towards long-term risk reduction goals in Massachusetts and Connecticut.

The Short-Term standard should not be misconstrued as the ultimate goal for risk reduction from consumption of fish. The goal is to achieve a PCB concentration of 0.064 mg/kg in Massachusetts and 0.00018 mg/kg in Connecticut, or at a minimum, monitor progress towards those goals. The selected remedy is expected to achieve significantly more progress towards this goal beyond just achieving the Short-Term standard. Furthermore, the added reduction can be very significant for purposes of whether, and if so, at what level, a consumption advisory needs to be maintained by the Massachusetts Department of Public Health, which is currently set at 1 mg/kg, or their Connecticut counterparts, who may use the more stringent 0.00018 mg/kg standard in setting advisories.

For instance, for Woods Pond, the projected fish tissue concentration is approximately 1.0 mg/kg 15 years after remediation, approximately one-third lower that the Short-Term standard. Therefore, by applying the Biota Short Term Performance Standard in a given reach 15 years

after remediation is completed, EPA accounts for uncertainties in remedy performance, including those associated with model predictions of performance.

As the River, and biota that inhabit and feed from the River, begin to recover after implementation of the remedy, PCBs in fish tissue are expected to decrease, first, in compliance with the Short-Term standard, and then further over time. Fish tissue concentrations will be monitored over time and, depending on their concentrations, may allow for easing of biota consumption advisories and for increased human consumption. Thus, the CTE-based Short-Term standard, which assumes approximately seven fish meals per year from the river, is just one check of the remedy's expected performance and progress. Continued reductions in fish tissue concentrations will allow for consumption of many additional fish meals without unacceptable risk, but this performance may be achieved at different rates in different parts of the river and some reaches of the river may never be able to achieve "unlimited" fish consumption (or the RME-based standards), thus requiring continued advisories and institutional controls.

The Final Permit Modification was revised to clarify that the Connecticut-specific fish tissue concentration of 0.00018 mg/kg (and the accompanying duck breast and Massachusetts-based fish tissue standards) is included in the Long-Term Biota Monitoring Performance Standard and that GE is required to continue to monitor the progress towards achieving these fish tissue concentrations. Final Permit Modification, at II.B.1.b.(2). The Final Permit Modification also requires GE to cooperate with the states regarding all biota consumption advisories issued by the EPA, Massachusetts, and/or Connecticut until such time that the advisories are discontinued. Permit at II.B.6.a. However, EPA believes it is inappropriate to set achievement of 0.00018 mg/kg in fish tissue in Connecticut as a Performance Standard, in part, because none of the modelling for the remedial alternatives evaluated indicated that this was feasible.

Regarding the question as to why EPA has not selected a longer-term solution and "complete remediation," EPA considered a wide range of cleanup options, including those with larger volumes of contamination being removed from the river and less reliance on capping (e.g., Alternative SED8 in the Comparative Analysis). As discussed in response to other comments, EPA based its remedy selection on an evaluation of all the remedy selection criteria. Based on this analysis, EPA selected a balanced remedy that significantly reduces fish consumption risks. EPA's rationale for the extent of remediation in the Final Permit Modification is documented in its Statement of Basis and Comparative Analysis, as supplemented by this Response to Comments. EPA continues to believe that the remedy in the Final Permit Modification is appropriate and significantly reduces the risks associated with fish consumption. For a "complete remediation" option as described by commenter, the closest alternative evaluated was the SED 8 alternative. While the SED 8 alternative does remove more PCBs than other alternatives, and reduces the downstream transport of PCBs more fully than other alternatives, it also had higher costs, and higher short-term impacts than other alternatives. In light of EPA's evaluation of all nine criteria pursuant to the Permit, EPA determined that the selected remedy was the best suited remedy.

Comments 72, 193: The Plan sets a Performance Standard for PCBs in biota of 1.5 mg/kg (ppm) in fish tissues in 15 years and 0.064 mg/kg for the "long term" in MA. These values are too high and do not protect against cancer or non-cancer effects, according to EPA guidance. Fish tissue PCB levels of 0.012 mg/kg or less are necessary to reduce cancer risk to acceptable levels for one

fish meal a week. The Biota Performance Standard in the Permit is woefully inadequate. EPA guidance lists PCB levels in fish that are protective for cancer or non-cancer effects, associated with a range of fish consumption rates. The Permit indicates that a fish tissue PCB concentration of 1.5 mg/kg (ppm) shall be achieved within 15 years (Permit page 13, section 2 a), but EPA recommendations for PCB levels are orders of magnitude lower than 1.5 mg/kg for any level of fish consumption (see table below taken from EPA guidance: EPA-823-F-99-019 September 1999). PCB levels in fish need to be less than 0.006 mg/Kg in order to allow one meal a week without an increased cancer risk. The EPA plan will not support safe fish consumption for the anticipated future in MA or CT. The proposed fish tissue concentration performance standard of 1.5 mg/kg (to be achieved in 15 years following remediation) will not be protective of human health at anything above a minimal consumption rate, nor will it protect individuals with PCBs already in their body.

EPA Response 72, 193: As part of the Decree process, GE developed, and EPA approved numerous site-specific IMPGs for fish tissue concentrations, including the least stringent IMPG of 5.7 mg/kg (CTE, 10^{-4} excess cancer risk, probabilistic risk assessment) to 0.0019 mg/kg (RME, 10^{-6} excess cancer risk, deterministic risk assessment). The Permit does not require EPA to select the most stringent IMPG as a Performance Standard. As discussed in Response 228 *et al.*, the Short-Term standard should not be misconstrued as the ultimate goal for risk reduction from consumption of fish. The Short-term Biota Performance Standard, 1.5 mg/kg, based on the probabilistic risk assessment CTE adult exposure Hazard Index (HI) = 1, was set at the *minimum* acceptable outcome of the remediation, while the Final Permit Modification makes clear that the goal is Long-Term Biota Monitoring Standard of 0.064 mg/kg[5] in Massachusetts and 0.00018 mg/kg in CT.[6]

As described in the Statement of Basis, EPA expects the selected remedy to reduce PCB concentrations in biota, allowing increased human consumption of fish and other biota taken from the river within a short time after remediation is completed, and to greatly reduce the downstream transport of PCBs. This should result in further reductions in PCB levels in fish in both Massachusetts and Connecticut, which, over time, should allow the consumption of additional fish meals or increased consumption of other biota. EPA included the Short-Term Biota Performance Standard in the Final Permit Modification to provide a measure of this aspect of remedy performance. EPA modified the language from the Draft Permit Modification to better explain and differentiate between the Short-Term and Long-Term standards.

As shown in Attachment 10 to the Comparative Analysis, the remedy achieves the Short-Term Biota Standard in all Reaches (except 5B, where the modeling excludes the impact of a sediment amendment on fish tissue concentrations) and also achieves several other IMPGs, thus showing significant risk reduction. Furthermore, as also shown in Attachment 10, none of the remedies evaluated, including Combination Alternative 6 which requires the removal of all sediment with PCBs greater than 1 mg/kg (an estimated 2,252,000 cubic yards), comes anywhere near achieving fish tissue concentrations of 0.006 mg/kg in Massachusetts. In fact, the model predicts

---

[5] Based on the probabilistic RME and 1 x 10^{-5} cancer risk.

[6] Based on CT DEEP consumption calculation assuming 365 fish meals per year and a 1 x 10^{-6} cancer risk.

the most aggressive remedy, Combination 6, achieves fish tissue concentrations ranging from 0.10 and 0.35 mg/kg in Massachusetts; which are between one and two orders of magnitude higher than 0.006 mg/kg. Clearly, it is not practical to achieve this fish tissue concentration.

In reviewing the alternatives, based on the information above, the Administrative Record and Permit criteria, EPA selected a remedy that includes multiple Performance Standards related to reduce unacceptable risks from contaminated biota. Relevant remedy components include the many PCB removal and containment components of the remedy that will reduce bioavailability of PCBs, and the establishment of the Short-term Biota Performance Standards and Long-Term Biota Monitoring Performance Standards. EPA believes that that combination of actions, within the selected remedy, is best suited in light of the Permit criteria.

Comments 440, 449: Connecticut asserts as follows: The Connecticut-specific fish tissue values, currently identified as benchmarks by EPA, need to be continued as part of the proposed remedy and provided the full status as a Performance Measure so that attainment of fish tissue levels consistent with Connecticut's goal to eliminate the need to limit consumption based on PCB contamination can be realized and that the adaptive management components of the remedy be applied and enforced, as needed, to attain these goals. The draft RCRA Permit incorporates the Connecticut fish tissue value as a Long-Term Biota Benchmark. "Performance Standards" are defined for the Rest of the River as "the cleanup standards ....set forth in...the final modification of the Reissued RCRA Permit to select the Rest of the River Remedial Action, or the Rest of the River SOW." As such, the Performance Standards establish the enforceable conditions and compel additional actions if necessary to meet the Performance Standard. The Long-Term Biota Value for Connecticut should be identified as a Performance Standard.

EPA Response 440, 449: To address these concerns, in Section II.B.1.b of the Final Permit Modification, EPA further clarified the basis for, the relationship between, and the use of what are now termed the Short-Term Biota Performance Standard and the Long-Term Biota Monitoring Performance Standard. This change also addressed the concern that a "Benchmark" may not have the same meaning or effect of a "Performance Standard." See also Response 228 *et al.*

EPA generally agrees with Connecticut on applying and enforcing, if needed, adaptive management principles as the cleanup goes forward. However, with respect to doing so to attain fish tissue levels consistent with the Connecticut –specific fish tissue values, EPA has established those as Monitoring Performance Standards, not for active remediation, for the reasons cited in Response 228 *et al.* above in this Section. EPA will ensure the Monitoring Performance Standards are complied with, and will evaluate the monitoring information received in the context of the remedy going forward.

Comment 450: The permit triggers additional investigations and potential remedy modifications if the Biota Performance Standards are exceeded in two consecutive monitoring periods after the 15-year initial period. This provision should be modified to also require such additional investigations and potential modifications if the Biota Performance Standards are exceeded in any three years within a five year period.

EPA Response 450: EPA does not believe this revision is necessary and that the current Performance Standard is sufficient to protect against unacceptable risks to human health and the environment.

Comments 581, 582: GE asserts the following: EPA acknowledges that none of the remedial alternatives evaluated, including its proposed remedy, would achieve the fish consumption IMPGs based on EPA's Reasonable Maximum Exposure (RME) assumptions, which would allow unrestricted fish consumption in the Massachusetts portion of the River within the model projection period (over 50 years). As a result, under all alternatives, fish consumption advisories would need to remain in place indefinitely to protect human health from the asserted risks due to fish consumption. To support its proposed remedy, EPA relies on the predicted attainment of a fish consumption IMPG based on its Central Tendency Exposure (CTE) assumptions derived from a probabilistic risk analysis method set forth in the HHRA. EPA's model predictions indicate that its proposed remedy would achieve the probabilistic CTE IMPG based on a non-cancer hazard index (HI) of 1 for adults (1.5 mg/kg in fish fillets) in all Massachusetts reaches except one (Reach 5B) within the 52-year model projection period. However, attainment of that CTE IMPG would not avoid the need for continued fish consumption advisories.

EPA Response 581, 582: EPA has acknowledged that under all alternatives, Institutional Controls (including but not limited to fish consumption advisories) would likely be needed for a period of time following remediation as part of the actions to protect human health. However, the selection of the remedy is based on which alternative is best suited to meet the General Standards for Corrective Measures in consideration of the Selection Decision Factors, including a balancing of those factors against each other. EPA has concluded, as supported by the Administrative Record, including without limitation the Comparative Analysis, that the selected remedy best satisfies this analysis. Furthermore, although this risk level (CTE, HI =1) is included as a Performance Standard that must be met, the Final Permit Modification clearly states that the goal is to achieve an PCB concentration of 0.064 mg/kg in Massachusetts (the RME for a 1×10^{-5} cancer risk) and 0.00018 mg/kg in Connecticut. See also Response 228 *et al.* above.

Comment 583: GE asserts the following: A less extensive remedy would also achieve the same probabilistic CTE IMPG for fish consumption in Massachusetts. For example, Alternative SED 5 would achieve the HI = 1 CTE IMPG in all Massachusetts reaches except one within the model projection period – and in fact would achieve other CTE IMPGs (i.e., those based on a 10^{-5} cancer risk and a non-cancer hazard index of 1 for children) in more reaches than the proposed alternative. Alternatives involving less removal in Woods Pond, the Reach 7 impoundments, Rising Pond, and the backwaters would result in comparable reductions in fish tissue concentrations and comparable attainment of the probabilistic CTE IMPG as the proposed remedy.

EPA Response 583: As provided in the Administrative Record, including without limitation the Comparative Analysis, EPA believes that the selected remedy is best suited to meet the Permit General Standards in consideration of the Permit decision factors, including a balancing of those factors against each other.

In addition, the alternative cited by GE, SED 5, relies in part on thin-layer capping in Backwaters and Reach 8 and MNR in the Reach 7 Impoundments. The use of thin-layer capping provides a high level of uncertainty in performance and is not likely to perform as well as the model predicts. Response to Comments Section III.C.7 also discusses how GE's evaluation in its Revised CMS, including the evaluation of SED 5, overstates the long-term effectiveness of thin-layer capping. In addition, as discussed in the Comparative Analysis, remediation with excavation and Engineered Capping can be designed with no net loss of flood storage capacity (p. 5 and Attachment 14, p 10), whereas, thin-layer capping, which is placed on top of existing sediment, cannot be implemented without a loss of flood storage capacity. Response to Comments Section III.C.7 also discusses the effectiveness of MNR in the Reach 7 Impoundments.

Comment 673: GE asserts the following: The Biota Performance Standard consisting of an average PCB concentration of 1.5 mg/kg (wet weight) in fish fillets (skin off) in each reach of the river and the backwaters is based on the fish consumption IMPG that was developed using a probabilistic risk analysis, CTE exposure assumptions, and potential non-cancer impacts to adults. EPA assumes that the proposed remedy can achieve this standard based on model predictions. However, the EPA model was not designed to be used, and cannot be reliably used, for the prediction of such absolute numerical values.

EPA Response 673: EPA disagrees. The use of the Short-Term Biota Performance Standard ("Short-Term Biota Standard") is appropriate because its structure and numerical value reflect the uncertainties of modeling.

EPA did consider the uncertainty of the model in developing the Short-Term Biota Standard. The Final Permit Modification does not require that the Short-Term Biota Standard become effective until 15 years after the completion of remediation activities in a particular reach. If EPA were to consider the model to be predictive of absolute concentrations as GE claims, then EPA would have had the Short-Term Biota Standards become effective much sooner than the 15 year period. For example, in Reach 5A, the model predicts that the remedy would achieve the Short-Term Biota Standard approximately 8 years after the remediation in Reach 5A was complete. Yet the Short-Term Biota Standard takes effect 15 years after remediation, when the modelled concentration is approximately 0.6 mg/kg, 60 percent lower than the standard of 1.5 mg/kg. Similarly, for Woods Pond, the projected fish tissue concentration is approximately 1.0 mg/kg 15 years after remediation, approximately one-third lower that the Standard. Therefore, by setting the Short-Term Biota Standard 15 years after remediation is completed in a given reach, EPA is accounting for uncertainties in the remedy performance, including those associated with model predictions of performance.

Comments 674, 675: GE asserts the following: The establishment of a numerical Biota Performance Standard with consequences should the standard not be achieved raises similar issues to those discussed in Comments 662 – 672 with respect to the consequences of exceeding the Downstream Transport Performance Standard. The requirement that, in the event of an exceedance of the Biota Standard, GE must determine the cause is overbroad, because many factors can affect fish tissue concentrations and thus it may well not be possible to determine the cause of an exceedance. Further, as with the Downstream Transport Standard, in the event of an exceedance, EPA's authority under the CD to require GE to conduct additional response actions

beyond those prescribed by the selected remedy is limited to the situation in which EPA determines that the covenant reopener conditions are met. To the extent that the standard were interpreted to allow EPA to require GE to conduct such additional response actions without going through the covenant reopeners, it would be beyond EPA's authority for the same reasons discussed for the Downstream Transport Standard. (674) In addition to proposing the Biota Performance Standard, the Draft Permit includes Long-Term Biota Benchmarks, consisting of reach-wide average PCB concentrations for fish fillets in Massachusetts (0.064 mg/kg), fish fillets in Connecticut (0.00018 mg/kg), and duck breasts in all areas along the river (0.075 mg/kg). The Draft Permit states that GE "shall evaluate progress toward achieving these benchmarks" through a long-term monitoring program. There is no requirement – or provision that EPA may require – that GE implement any additional response actions (other than continued monitoring) based on these benchmarks or on a comparison of PCB concentrations in fish fillets or duck breasts to those benchmarks, including a determination that monitoring is not demonstrating continued progress toward achieving those benchmarks. To avoid any future question, EPA should clarify that no such additional response actions will be required on the basis of these long-term benchmarks. (675)

EPA Response 674, 675: With respect to GE's concern about being able to identify the cause of an exceedance of this Performance Standard, EPA disagrees with GE's assertion that the requirement is overbroad. EPA notes that the specific language of that Performance Standard (Section II.B.1.b.(1)(a)) was modified in the Final Permit Modification to require GE to identify "potential" causes, and also allows for consideration that there is more than one cause. Providing GE, as Permittee, the opportunity to identify potential cause(s) is a reasonable approach to implementation. The specific language is as follows:

> In the event that the Short-Term Biota Performance Standard is exceeded in any two consecutive monitoring periods after the 15 year period [from completion of construction]..., the Permittee shall evaluate and identify the potential cause(s) of the exceedance and propose, to EPA for review and approval, additional actions necessary to achieve and maintain the Performance Standard.

Moreover, if there were any disagreement between GE and EPA as to whether GE had satisfied that provision, the Decree contains a Dispute Resolution provision for disagreements on this and other deliverables related to the cleanup. Note that this provision, and the GE's concern, is similar to the Downstream Transport Performance Standard on this issue. See Response 665.

Second, as with the discussion on the Downstream Transport Performance Standard, EPA disagrees that EPA's authorities to respond to an exceedance are as limited as GE suggests. See Response 666 above for that discussion.

Third, GE asks for clarification that with respect to the Long-Term Biota Benchmarks of the Draft Permit Modification (which is now the "Long-Term Biota Monitoring Performance Standard" in the Final Permit Modification) that no additional response actions will be required on the basis of these long-term standards. EPA responds more specifically to that comment at Response 440, 449. As discussed in that Response, EPA further clarified the basis for the relationship between, and the use of what are now termed, the Short-Term Biota Performance Standard and the Long-Term Biota Monitoring Performance Standard.

Comment 676: GE asserts the following: There is no justification for EPA's establishment of the long-term benchmark of 0.00018 mg/kg for fish fillets in Connecticut. That benchmark is not and cannot be an ARAR, since it was not promulgated after notice-and-comment rulemaking. It is based on an assumed cancer risk of 1×10^{-6} for an adult and the assumption that an adult eats a meal of Housatonic River fish 7 days per week every day of the year for 64 years. This translates to a consumption rate of 227 grams of Housatonic fish per day. The assumption that people would eat a meal of Housatonic fish every day of their lives for 64 years is patently unreasonable. This is true even for subsistence anglers, although EPA found no evidence of such subsistence fishing populations in Connecticut. In fact, in prior comments on the HHRA, CT DEP (now CT DEEP) argued that, for subsistence anglers, based on a 1999 study, the HHRA should use consumption rates of 43.1 grams/day for lower income populations and 59.2 grams/day for Southeast Asian populations; and EPA, in its Responsiveness Summary to Public Comments on New Information for HHRA, found even those rates unsupported. Further, this benchmark is an order of magnitude more stringent than EPA's (and Connecticut's) water quality criterion of 0.000064 µg/L, which is based on human consumption of fish and would equate to a fish PCB concentration of approximately 0.002 mg/kg. The fact that CT DEEP has developed this benchmark and requested the EPA Region to include it in the Draft Permit is no justification for doing so in the absence of a determination by EPA that there is a health basis for this benchmark. EPA has not determined, and has no basis for determining, that a far stricter fish tissue benchmark is justified to protect health in Connecticut than in Massachusetts.

EPA Response 676: As to GE's concern about the Long-Term Biota Monitoring Performance Standard being an ARAR, EPA has not identified it as an ARAR. EPA has identified it as a Monitoring Performance Standard. As such it fits within the Final Permit Modification's definition of a Performance Standard, including cleanup standards, and other measures and requirements necessary to protect human health and the environment. Final Permit Modification, Definition 21. Here, EPA is measuring the effectiveness of the remedy in reducing the bioaccumulation of PCB levels, as part of the Permit's General Standards of overall protectiveness of human health and the environment, and controlling sources of releases. EPA Response 440, 449 provides, EPA will ensure that the monitoring required pursuant to the Long-Term Biota Monitoring Performance Standard is performed pursuant to the Final Permit Modification. As to GE's concern about the basis for the Connecticut Long-Term Biota Monitoring Performance Standard, it is, indeed, a risk-based value based on exposure assumptions provided by CT DEEP and incorporated into the Final Permit Modification. The rationale for this concentration was provided by CT DEEP. See Fish Consumption Advisories, Calculated Risk-Based Levels (Default Fish Ingestion Rates and Exposure Assumptions for Human Health Risk Assessments Attached, EPA, October 28, 2011).

While the Long-Term Biota Monitoring Performance Standard does not, in itself, require completion of further response actions beyond the monitoring delineated pursuant to the Final Permit Modification, it does allow EPA to better assess the effectiveness of the remedy. Finally, the Long-Term Biota Monitoring Performance Standard is one component of the chosen remedy that is best suited to meet the General Standards for Corrective Measures in consideration of the Selection Decision Factors, including a balancing of those factors against each other.

Comment 742: GE asserts that the deficiencies discussed in Comment 741 with regard to the Downstream Transport Performance Standard also apply to the proposed Biota Performance

Standards. [Comment 741 is: EPA has not conducted an evaluation of the proposed PCB Downstream Transport Performance Standard against potential alternative standards. Further, if that standard were interpreted to allow the Region to require additional response actions in the event of an exceedance (without going through the CD covenant reopeners), it cannot have evaluated (or allowed others to evaluate) those additional response actions (or alternatives to them) under the Permit criteria, since such actions are currently undefined; and it has not provided for such evaluation to be conducted in the future.]

EPA Response 742: With regard to the evaluation of the Standard, see Response 741. Note that this standard was also discussed with GE, EPA and the States during technical discussions that were held from August 2012 to December 2013.

With regard to requiring potential response actions in the event of an exceedance of the standard, see Reponses 668, 669, 674, 675 above.

III.B.2 Restoration Performance Standards

III.B.2.a Overall Impacts to the Ecosystem from Remediation Activities and Effectiveness of Ecological Restoration

Comment 21.a: I am speaking for the Massachusetts Fisheries and Wildlife Board. The Division of Fisheries and Wildlife, which is supervised by the Board, is the largest landowner in the affected area of the Housatonic.

Our Board recognizes that the PCB contamination poses a public health risk that must be addressed. We are also aware that no silver bullet that applies to every area contaminated with PCBs. Each area in the nation where PCB contamination exists has required development of a unique approach that cannot be simply copied for any other contaminated areas.

The plan presented by EPA has been crafted to responsibly address the public health risks while responsibly maintaining the natural and recreational values of this section of the Housatonic River. It has been a difficult balancing act, but it has our full support.

EPA Response 21.a: EPA acknowledges the support of the Massachusetts Fisheries and Wildlife Board. See also Response 21 in Section II.B of this Response to Comments.

Comment 455: Connecticut supports habitat restoration in areas which will be disturbed by remedial actions.

Comment 492: The Massachusetts Executive Office of Energy and Environmental Affairs commented as follows: The Proposed Cleanup Plan properly requires the development and implementation of a restoration program that results in the restoration of impacts caused by the corrective measures to the full range of wildlife species and habitats. The Commonwealth looks forward to working closely with both EPA and GE during the development and implementation of this critical component of the Proposed Cleanup Plan, with the objective of fully restoring the existing ecological resources of the PSA impacted by the corrective measures. In addition, the Commonwealth appreciates that EPA has made clear in the Proposed Cleanup Plan that nothing in the restoration provisions "shall be construed or deemed to satisfy the separate net benefit

Standards. [Comment 741 is: EPA has not conducted an evaluation of the proposed PCB Downstream Transport Performance Standard against potential alternative standards. Further, if that standard were interpreted to allow the Region to require additional response actions in the event of an exceedance (without going through the CD covenant reopeners), it cannot have evaluated (or allowed others to evaluate) those additional response actions (or alternatives to them) under the Permit criteria, since such actions are currently undefined; and it has not provided for such evaluation to be conducted in the future.]

EPA Response 742: With regard to the evaluation of the Standard, see Response 741. Note that this standard was also discussed with GE, EPA and the States during technical discussions that were held from August 2012 to December 2013.

With regard to requiring potential response actions in the event of an exceedance of the standard, see Reponses 668, 669, 674, 675 above.

III.B.2 Restoration Performance Standards

III.B.2.a Overall Impacts to the Ecosystem from Remediation Activities and Effectiveness of Ecological Restoration

Comment 21.a: I am speaking for the Massachusetts Fisheries and Wildlife Board. The Division of Fisheries and Wildlife, which is supervised by the Board, is the largest landowner in the affected area of the Housatonic.

Our Board recognizes that the PCB contamination poses a public health risk that must be addressed. We are also aware that no silver bullet that applies to every area contaminated with PCBs. Each area in the nation where PCB contamination exists has required development of a unique approach that cannot be simply copied for any other contaminated areas.

The plan presented by EPA has been crafted to responsibly address the public health risks while responsibly maintaining the natural and recreational values of this section of the Housatonic River. It has been a difficult balancing act, but it has our full support.

EPA Response 21.a: EPA acknowledges the support of the Massachusetts Fisheries and Wildlife Board. See also Response 21 in Section II.B of this Response to Comments.

Comment 455: Connecticut supports habitat restoration in areas which will be disturbed by remedial actions.

Comment 492: The Massachusetts Executive Office of Energy and Environmental Affairs commented as follows: The Proposed Cleanup Plan properly requires the development and implementation of a restoration program that results in the restoration of impacts caused by the corrective measures to the full range of wildlife species and habitats. The Commonwealth looks forward to working closely with both EPA and GE during the development and implementation of this critical component of the Proposed Cleanup Plan, with the objective of fully restoring the existing ecological resources of the PSA impacted by the corrective measures. In addition, the Commonwealth appreciates that EPA has made clear in the Proposed Cleanup Plan that nothing in the restoration provisions "shall be construed or deemed to satisfy the separate net benefit

mitigation in the Massachusetts Endangered Species Act (MESA),"and notes further that the Proposed Cleanup Plan also includes the separate and distinct requirement that GE mitigate the impacts of corrective measures on state-listed species and habitats in accordance with MESA.

EPA Response 455, 492: EPA acknowledges the States' support for the habitat restoration requirements and looks forward to working closely with these agencies in the implementation of habitat restoration efforts.

Comment 17: The remediation should clearly indicate what restoration will be performed, and restoration should include interaction with the community. Stream restoration is a fully developed field of practice and research. Current procedures and standards of practice offer sophisticated approaches to restoring waterways such as the Housatonic, points not acknowledged in the Plan. Another erroneous assumption inherent in the Plan is that once the contamination is removed, the system cannot be restored to conditions at least similar to conditions prior to the remediation. Stream restoration is conducted with great success around the nation and quite a bit in Massachusetts and throughout New England.

Comment 46: The remediation should take advantage of the recent advances in ecological restoration.

Comment 48: Plants should be extracted from areas to be remediated and cultured for use during the restoration phase of the project.

Comment 94: The restoration and recovery of the river following cleanup in the first two miles on the East Branch is not a good model for similar processes in Rest of River due to differences in geomorphology and extent of wetlands.

Comment 129: Where rare plants or animal populations could be extirpated by cleanup activities, GE should investigate methods to collect individual plants and animals from local populations of particularly vulnerable species, hold them during cleanup activities, and then re-establish them once restoration has been completed.

Comment 130: One hundred years ago, almost all of the river floodplain was in active agricultural use. The very significant ecologically rich areas which exist today were almost non-existent in that setting and thus have established themselves over the intervening decades. It is reasonable to expect that post-cleanup restoration efforts, such as bio-engineering bank and replanting floodplain vegetation, will reduce the re-establishment time to less than 60 years.

Comment 148: We urge EPA to require GE to consider measures to protect rare, endangered or threatened species, such as capturing individuals, holding them during cleanup activities, and then re-introducing them once habitat restoration has been completed.

Comment 206: Many of the state-listed species on which EPA bases the need for limited cleanup also exhibit remarkable responses to restoration. The National Remediation Review Board (NRRB) Site Information Packet evaluates each of the plausible effects of the cleanup plan on the habitats found within the Rest of the River. In discussing the effects of bank stabilization and other aspects of the current plan, the NRRB describes both the need for restoring plants and wildlife but also the natural tendency for habitats to recover. As the EPA region response to the

NRRB's report states, ten of the state-listed plant species are affiliated with habitats prone to natural and anthropogenic disturbance and are early succession species, and therefore quick to return given the right circumstances. The EPA's response also states that many of the listed wildlife have alternative habitats and could likely move and return after remediation. As both the Mass Audubon and the NRRB have suggested, the most vulnerable state-listed plants could be removed, cultivated and returned post-remediation. The removal and restoration of the submerged aquatic vegetation (SAV) and native plants on the Hudson during PCB remediation provides an example of the viability of such a process.

Comment 223: If it has been decided, as discussed on p. 10 of the Statement of Basis, that a restoration program will be required for the areas to be remediated, these efforts need to be extended to the areas determined to be too sensitive to remediate. Many of the same restoration methods will work in both areas and ultimately more PCBs will be removed to not further threaten sensitive species.

Comment 251: On p. 31 of the Statement of Basis, EPA notes that restoration will be effective in returning habitats to their pre-remediation state. If this is the case, why are alternatives that specify major sediment removal with subsequent restoration maligned for their impact on the environment?

Comment 273: EPA states on p. 40 of the Statement of Basis that the effects of remediation in the floodplain would not be permanent and would be mitigated following remediation. This needs to be kept in mind for all removal-driven options, i.e. the effects are not permanent because restoration will mitigate and begin the rebuilding of the ecosystem.

Comment 399: Ecological restoration methods including transplant or reseeding of rare species into disturbed areas should be considered along with the lessons learned from the pilot vernal pool restoration studies.

EPA Response 17, 46, 48, 94, 129, 130, 148, 206, 223, 251, 273, 399: EPA has reviewed and considered this information and these opinions in its analysis of the Permit criteria. Based on that analysis, EPA has made a determination regarding the appropriate balance of the criteria in the Final Permit Modification. EPA has determined that the remedy described in the Final Permit Modification provides the best balance in terms of reducing risk and minimizing long-term ecological impacts. As crafted, the remedy limits short-term impacts in key habitats and ensures that disturbed areas will be restored after remediation. Thus, EPA's remedy reasonably accepts some short-term impacts in favor of long-term protection of the environment.

Specifically, EPA, in consultation with the Commonwealth and the State of Connecticut, believes that the selected remedy best meets the permit criteria in part, because it:

- Provides the best balance between meeting the ecological cleanup goals while minimizing and mitigating the impact of the remedy on the river's ecosystem and its state-listed species and habitats;
- Is protective of human health in all areas, including state-designated Core Areas;
- Considers and reduces the impacts on floodplain habitat, especially in Core Areas; and,

- Includes Restoration of Areas Disturbed by Remediation Activities as a general Performance Standard (Section II.B.1.c of the Permit).

There are specific provisions in the Final Permit Modification to avoid impacts to key habitats designated as "Core Area 1" by the Massachusetts Division of Fish and Wildlife. Core Area 1 includes the "highest quality habitat for species that are most likely to be adversely impacted by PCB remediation activities." (Final Permit Modification, Attachment B.) GE must avoid excavation in Core Area 1 habitat except in limited areas where necessary to meet Secondary Floodplain Performance Standards. Additionally, no excavations shall occur in Vernal Pools except as necessary to meet Floodplain Performance Standards (unless application of an amendment such as activated carbon fails to meet the Vernal Pool Performance Standards, and even then, no excavation will occur in Core Area 1 Vernal Pools) or Backwaters (unless PCBs are greater than 50 mg/kg) in Core Area 1. Also, bank excavation is significantly limited in Reach 5B and limited in Reach 5A to a lesser extent. Furthermore, in Core Areas 2 and 3 impacts will be minimized and, on a case-by case basis, avoided. Phasing the work will also disperse the effects of the construction activities over time (the remedial action period is estimated to be 13 years) and space (a distance of over 30 miles). These and other restrictions will limit the short-term ecological impact of implementing the remedy.

The reduction in PCB exposures and the active restoration that will occur after implementing the remedy ensure that the long-term benefits of remediation outweigh the short-term harm. Performance Standards set forth in Section II.B.1.c.(1). of the Final Permit Modification require GE to:

(a) Implement a comprehensive program of restoration measures that addresses the impacts of the Corrective Measures on all affected ecological resources, species and habitats, including but not limited to, riverbanks, riverbed, floodplain, wetland habitat, and the occurrence of threatened, endangered or state listed species and their habitats, and,

(b) Return such areas 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.

Section II.B.1.c.(2). requires GE to follow a four-step restoration process. GE must assess pre-remediation conditions; develop restoration objectives and criteria for Corrective Measures; develop a restoration coordination plan to be performed during the implementation of the Corrective Measures; and, finally, design and implement a Restoration Plan for all areas disturbed by the remediation activities. There will be opportunities for input from stakeholders during this process.

The Restoration Corrective Measures Coordination Plan (RCMCP) outlined in Section II.B.1.c.(2). includes the specification of protocols to be implemented prior to and during construction to minimize impacts to species including, for example, propagation and relocation of species. Section II.B.1.c.(2)(c)v provides for specification of protocols to be implemented prior to and during construction to minimize impacts to threatened, endangered or state-listed species and their habitats, including elements discussed above as well as other measures such as seed-banking, transplanting, wildlife exclusion barriers, and turtle tracking.

EPA has and will continue to stay abreast of the state of the science of ecosystem restoration as it applies to all aspects of the Rest of the River project to ensure that the project considers state of the science techniques and methods. Ecosystem restoration is an emerging science that has been practiced successfully at many large riverine sites. EPA has published specific guidance on aquatic restoration. In addition, several federal agencies, including the National Research Council, Natural Resources Conservation Service and the Fish and Wildlife Service have published guidelines for river restoration projects. Additional guidelines are available from non-profit organizations, such as the Society for Ecological Restoration—a non-profit organization comprised of individuals and organizations from around the world representing the public, private, and non-profit sectors. Scientific literature and the work of restoration practitioners provides additional information and specific technical guidance. In recent years, the number of river restorations has grown significantly, and restoration techniques are used to achieve a wide array of goals, such as removing contaminants, and providing fisheries and wildlife habitat.

EPA will continue to consider the successes and lessons learned at a full range of remediation and restoration projects. Examples of riverine restoration projects include a 35-acre contaminated wetland and stream remediation and restoration project at Loring Air Force Base in Maine. After only 6 years, large areas of remediation were virtually indistinguishable from the areas prior to disturbance. Another example is the remediation of the Clark Fork River in Montana, where hazardous mining waste contaminated 43 miles of river bed sediments and the floodplain. The state of Montana developed a restoration plan to restore river and floodplain habitats, maximize the long-term beneficial effects and cost-effectiveness of restoration activities, and improve natural aesthetics. Remediation and restoration activities have begun, with contaminated soil being removed and replaced with clean soil, and streambanks stabilized and replanted with native vegetation. In addition, immediately upstream on the East Branch of the Housatonic, restoration of the river was performed following remediation, and in the floodplain as well. While rivers are unique and restorations vary depending on the setting, these and other example projects show that restoration on the scale of the Rest of River ecosystem is feasible. However, given the variation among settings, EPA concurs that developments in the field of ecosystem restoration should be considered as a whole and no one project should serve as the sole model for the Rest of River project.

Over time, ecological restoration techniques have been refined to improve the likelihood of success. EPA concurs that the restoration should take advantage of future improvements as well. The Final Permit Modification incorporates this concept by requiring GE to implement an adaptive management approach in implementing the Remedial Action. As stated in Appendix G of the June 2011 NRRB Site Information Package, adaptive management of strategy implementation and monitoring is another important component of the restoration approach, which will be used to ensure that Performance Standards are met. Adaptive management will be used to test restoration techniques and approaches to determine which ones result in the desired restoration/recovery trajectory during the design of the phases of the project.

Comment 533: GE asserts the following: The proposed remedy would cause substantial, extensive, and irreversible harm to the Rest of River Ecosystem. While that ecosystem has thrived in presence of PCBs, it is nonetheless vulnerable in many respects, a unique place with unique and sensitive riparian habitats and substantial biodiversity. The Region's proposed remedy would inevitably cause more harm to these habitats and their biodiversity than it could

possibly relieve or prevent. Furthermore, EPA has no support for its claim that restoration is expected to be fully effective in returning the Rest of River habitats to their pre-remediation state following the proposed remediation, and therefore the likelihood of effective restoration is not equal under any of the alternatives.

Comment 738: GE asserts the following: Although EPA has listed the acreage (or miles) of each habitat type that would be impacted by the various remedial alternatives, it has failed to quantify the impacts of its proposed alternative on several types of floodplain habitats, including floodplain wetland forest, shrub and shallow emergent wetlands, deep marshes, and vernal pools. Instead, it has marked those impacts "TBD" on the asserted ground that such impacts "are to be determined based on habitats and occurrences of state-listed species as defined by the Core Areas." Similarly, it has not estimated the number of state-listed species that would be affected by its proposed alternative. In the absence of such quantification, EPA cannot have adequately considered the important Permit criteria of short-term and long-term adverse ecological impacts of its proposed alternative relative to other alternatives; and it has made it difficult for others to evaluate its proposal under those criteria.

Comment C17, C18: GE asserts the following: SED 9/FP 4 MOD would involve removal of close to one million cubic yards of sediment and soil, directly impacting approximately 370 acres of the PSA ecosystem. The impacts of disruption of this magnitude were specifically identified in the Revised Corrective Measures Study (CMS). The Revised CMS also evaluated the extent to which these negative impacts could be mitigated and the inevitable long-term impacts of work despite such mitigation. In the face of these detailed site-specific evaluations, EPA's Comparative Analysis for the Rest of River (May 2014) concludes that any negative impacts of SED 9/FP 4 MOD, or any remedial alternative evaluated in the Revised CMS, can be quickly and effectively reversed. That conclusion ignores the Revised CMS, additional site-specific evaluations done by the Commonwealth of Massachusetts, and the "significant body of knowledge with respect to ecosystem restoration" to which EPA refers and which we discuss in detail in "A Scientific Response to EPA's Conclusion that Restoration of the Housatonic Rest of River Will Be Fully Effective and Reliable." Any restoration attempted after a project of the nature and scope of SED 9/FP 4 MOD would not be fully effective or reliable in returning these habitats to their pre-remediation ecological condition. The best one could hope for is that these efforts would be partly effective at returning some types of habitats to a semblance of their pre-remediation state after an extended period. Larger combinations of sediment and soil removal like SED 9/FP 4 MOD would have a much greater negative impact on the PSA ecosystem than other combinations like SED 10/FP 9, the ecologically sensitive approach, or the alternative proposed by the Commonwealth of Massachusetts.

EPA Response 533, 738, C17, C18: Remediating and restoring the Rest of River is necessary to ensure the long-term health of the ecosystem. As discussed above, PCBs pose significant risks to aquatic life and wildlife in the Housatonic River, particularly in the PSA. While elements of the ecosystem that are unaffected by PCBs continue to function (e.g., the plant community), pollution from GE's Pittsfield facility has significantly degraded many aspects of the Housatonic River environment. Left alone, the ecosystem will not repair itself for several decades or even centuries. Remediation and restoration will support and accelerate the natural ecosystem recovery processes. While remediation of the river and floodplain at this scale cannot be accomplished to any meaningful level without impacts to the present state of the river and

floodplain, the restoration activities will mitigate impacts caused by the remediation. Over the long-term, restoration activities will return the processes sustaining diverse river and floodplain communities.

EPA has reviewed the state of the science of ecological restoration and provided examples focused on river restorations involving larger river channels and/or remediation in the Comparative Analysis (See Comparative Analysis Attachment 12). These examples show that, following restoration of impacted sites, it is possible to restore both the ecological function of areas and appearance after they are disrupted in projects on a large scale. The examples also serve to highlight the common practices that helped to establish the restoration success. Thus, EPA has concluded that implementing remediation and restoration as required in the Final Permit Modification will result in the return of the functions, values, characteristics, vegetation, habitat, species use, and other attributes, to the extent feasible and consistent with the remediation requirements. With respect to precise acreage impact estimates, as EPA explained in Table 6 of Comparative Analysis, EPA estimates the area of the floodplain to be affected to be 45 acres, and that specific locations and habitat types are to be determined based on habitat and occurrences of state-listed species as defined by the Core Areas.

EPA guidance and the Permit criteria require that the short and long-term effects of remediation (as well as other factors) must be evaluated comprehensively to identify the best suited alternative under the Permit criteria. In the case of the Housatonic River and its floodplain, EPA believes that the best suited alternative is the one presented in the Final Permit Modification. Also see Response 593 below regarding the Commonwealth's position.

Comment 593: GE asserts that, based on substantial evidence in the record, including evidence presented in the RCMS and in the comments submitted by the Commonwealth of Massachusetts, and with no serious effort by the Region to present any new contrary evidence, the proposed remedy would cause unavoidable, substantial, extensive, and irreparable harm to the Rest of River ecosystem, particularly in the PSA. As discussed in the RCMS and noted by the Commonwealth in its designation of the Upper Housatonic River as an ACEC and its comments on the RCMS, this ecosystem is biologically unique, with substantial biodiversity and wildlife habitat and an exceptional number of state-listed rare species. The proposed remedy would severely impact all of these aspects of this unique ecosystem.

EPA Response 593: As noted in EPA's Response 533, 738 and C17, C18, remediating and restoring the Rest of River is necessary to ensure the long-term health of the ecosystem due to the risks posed by PCBs. While remediation of the river and floodplain at this scale cannot be accomplished to any meaningful level without some impacts to the present state of the river and floodplain, the restoration activities will mitigate impacts caused by the remediation. EPA's Response 17 *et al.* above provides additional details on the state of restoration science and examples of remediation projects where restoration has been successful in restoring riverine and floodplain habitats. EPA's response also describe how adaptive management will be used to test restoration techniques and approaches to determine which ones result in the desired restoration/recovery trajectory during the design of each phase of the project.

It is important to note that the Commonwealth of Massachusetts supports the proposed remedy, despite the short-term impacts to the environment. Throughout its comments, GE misleadingly

suggests that the Commonwealth does not support EPA's proposed remedy. While in 2011, the Commonwealth did express concerns about potential impacts of the remediation on the ecosystem when commenting on GE's Revised CMS, EPA and Commonwealth subsequently addressed those concerns through a series of technical discussions culminating in the 2012 Status Report that outlined a conceptual framework for the remedy, which explicitly focuses on avoiding, minimizing and mitigating impacts to Core Areas. In its 2014 comments, the Commonwealth—specifically the Executive Office of Energy and Environmental Affairs and its Department of Environmental Protection (MassDEP) and Department of Fish and Game (MassDFG) —expressly stated its support for the proposed remedy, which is "protective of human health while employing a remediation framework developed in consultation with the Commonwealth and the State of Connecticut that is directed at preserving the dynamic character of the river ecosystem and avoiding, minimizing and mitigating remedy impacts to the affected wildlife and their habitats, with a particular focus on protecting state-listed species."

The Massachusetts Fisheries and Wildlife Board (MassFWB), which oversees the Division of Fisheries and Wildlife (the largest landowner in the Rest of River area), also supports the proposed remedy. The MassFWB recognizes that the PCB contamination at Rest of River "poses a public health risk that must be addressed." While noting that there is no "silver bullet solution" for sites contaminated with PCBs and that crafting the Rest of River remedy has been a "difficult balancing act," the MassFWB acknowledged that the proposed remedy "has been crafted to responsibly address the public health risks while responsibly maintaining the natural and recreational values of this section of the Housatonic."

Comment 594: GE asserts that, in its discussions of the ecological impacts of the proposed remedy, EPA acknowledges impacts on the various types of habitat, but asserts that all of those impacts would be short- term, because the affected habitats can be successfully restored so as to re-establish their pre- remediation condition and functions. EPA thus concludes that "restoration is expected to be fully effective and reliable in returning [the affected] habitats, including vernal pool habitat, to their pre-remediation state," and that, "[a]s a result, the likelihood of effective restoration is equal under any of the alternative." EPA's claims regarding the severity and duration of the habitat impacts and the effectiveness and reliability of restoration are unsupportable and unjustified.

Comment 594.a: GE asserts the following: While EPA has quantified the impacts of its proposed remedy on aquatic and riverbank habitats, it has not quantified the impacts of its proposed remedy on the specific floodplain habitats, claiming that such impacts "are to be determined based on habitats and occurrences of state-listed species as defined by the Core Areas" (Comp. Analysis, p. 29). GE has quantified the impacts of the proposed remedy on the various affected habitat types based on the Region's descriptions of that proposed remedy, existing data, and a reasonable identification of the locations of access roads and staging areas necessary to implement that remedy. Those impacts are listed, by habitat type, in Table 11 and depicted, for the PSA, on Figures 5a through 5f. The proposed remedy would impact over 400 acres of the Housatonic River ecosystem, including several types of sensitive habitats (e.g., riverbanks, floodplain wetland forests, and vernal pools).

EPA Response 594, 594.a: EPA's approach is justified and well supported. Remediation with subsequent restoration is necessary within the Rest of River due to PCB contamination that poses

unacceptable risks to human health and the environment, as demonstrated in EPA's HHRA and ERA. Addressing the contamination will result in some unavoidable temporary impacts, but will provide significant benefits for the river and its floodplain in the long term. Response 533, 738, C17, C18 and Response 17 *et al.* provide additional details on the state of restoration science and reference examples of successful restoration projects which support EPA's position that restoration will mitigate the ecosystem impacts of remediation.

Also, there are specific provisions in the Final Permit Modification to avoid impacts to key habitats designated as "Core Area 1" by the Massachusetts Division of Fish and Wildlife. Core Area 1 includes the "highest quality habitat for species that are most likely to be adversely impacted by PCB remediation activities." GE must avoid excavation in Core Area 1 habitat except in limited areas where necessary to meet Secondary Floodplain Performance Standards. Additionally, no excavations shall occur in Vernal Pools, except as necessary to meet Floodplain Performance Standards (unless application of an amendment such as activated carbon fails to meet the Vernal Pool Performance Standards, and even then, no excavation will occur in Core Area 1 Vernal Pools) or Backwaters (unless PCB concentrations are greater than 50 mg/kg) in Core Area 1. Also, bank excavation is significantly limited in Reach 5B and limited in Reach 5A to a lesser extent. Furthermore, in Core Areas 2 and 3 impacts will be minimized and, on a case-by case basis, avoided. Phasing the work will also disperse the effects of the construction activities over time (the remedial action period is estimated to be 13 years) and space (a distance of over 30 miles). These and other restrictions and required procedures will limit the short-term ecological impact of implementing the remedy.

Comment 595: GE asserts that the impacts of remediation activities on the affected habitat types and the constraints on restoration techniques that would prevent re-establishment of pre-remediation conditions and functions for several of those habitat types were discussed in detail in the RCMS (e.g., section 5.3). Further, the negative impacts of the proposed remedy on these habitats are discussed specifically in comments by Professors Robert Brooks, Aram Calhoun, and Malcolm Hunter, a copy of which is provided in [GE] Attachment C hereto. Those comments also demonstrate that those impacts cannot be avoided through timing of the remedial construction work and that, due to the limitations of restoration techniques, the adverse impacts on some of the habitats would be long-lasting. Even EPA's consultant recognizes that the unavoidable impacts of the proposed remedy and any attempt to rectify those impacts will result in a "novel ecosystem" different than the "probable trajectory" of the "original ecosystem" but for the disturbance of the remedy. EPA's Statement of Basis and Comparative Analysis of Alternatives ignore this critical conclusion of its own consultant.

EPA Response 595: The remediation and restoration would be unnecessary if PCBs from GE's Pittsfield facility were not currently contaminating many miles of the Housatonic River and many acres of the adjacent floodplain. Addressing the contamination in these areas will result in some unavoidable temporary impacts, but will provide significant benefits for the river and its floodplain in the long term. After remediation and restoration, it is understood that the Rest of River will not mirror what is observed today, an environment compromised in many ways by high concentrations of PCBs, nor what was there 100 years ago before PCBs were released into the river when the area had been largely cleared for agricultural use. To the extent that the remediation and restoration creates a "novel ecosystem," this is preferable to the currently contaminated ecosystem. Accordingly, the goal of the ecological restoration is to restore,

following remediation, the functions and ecosystem services that exist today but without the significant impairment from PCB contamination.

See Response 604, C19 for EPA's responses to concerns regarding long-lasting habitat impact. Also, EPA's responses to the individual points raised in comments by Professors Brooks, Calhoun, and Hunter from Attachment C of GE's comments can be found in Responses C1 through C29.

Comment 596: GE asserts that Professors Brooks, Calhoun, and Hunter have prepared a separate critique of EPA's claims that restoration would effectively and reliably re-establish the pre-remediation conditions and functions of the affected habitats, including the EPA consultant's report contained in Attachment 12 to the Comparative Analysis. That critique, which references 30 sources not considered by EPA, most of which have been peer reviewed, is provided in Attachment D to GE's comments. It includes a showing that none of the other sites referenced in that EPA consultant report as examples of "successful" restoration provides any precedent for restoration of an ecosystem remotely like that in the Rest of River. In fact, reviews of prior restoration efforts have shown low success rates in re-establishing ecological functions for rivers and vernal pools. As the Professors conclude: "If EPA's proposed remedy is implemented, the Rest of River will be severely impaired for many decades, perhaps centuries, and restoration efforts will constitute just a small Band-Aid on a gaping wound."

EPA Response 596: In the field of ecosystem restoration, as with nearly any scientific discipline, there is a large body of literature available and the authors of the literature often present diverging viewpoints. As GE notes in Attachment D to its comments on the Draft Permit Modification, its search of the literature generated 9,874 references on river, stream, or floodplain restoration as of July 17, 2014. GE's Attachment D provides a selected list of 30 technical papers from this body of work; the majority of which are relatively new.

EPA's review of the papers selected by GE leads to the determination that, in general, the conclusions in these papers do not suggest that the Restoration Performance Standards established in the Final Permit Modification will not be achievable. Nonetheless, EPA intends to consider the relevant information contained in these papers in reviewing GE's proposed Restoration Corrective Measures required by the Final Permit Modification.

The focus of several of the research papers cited by GE appears not to be on remediating and restoring rivers that have been contaminated and that present unacceptable risks to human health and the environment. Rather, the focus appears more to be on the evolving nature of the river restoration science and the debate on how best to restore ecosystems in general. For example, GE cites the following paper, which is described as "a case study that proposes a set of technical monitoring and assessment measures in an effort to assess success and discern failures in river restoration." (Buchanan, B.P., M.T. Walter, G.N. Nagle, and R.L. Schneider. 2012. *Monitoring and assessment of a river restoration project in central New York.* River Research Applications 28:216-33). According to the authors of this paper the main impetus for this project was to protect properties along a reach of the Six Mile Creek where bank erosion had become severe. In another example, GE cites the following paper which describes reasons for failure of one stream rehabilitation project. Smith, S.M., and K.L. Prestegaard. 2005. *Hydraulic performance of a morphology-based stream channel design.* Water Resources Research 41(11):

W 1 1413:1-17. This project was a stream rehabilitation project on a gravel bed tributary to the Patapsco River in Maryland. As the authors describe "The Deep Run reconfiguration was proposed to reduce sediment loading to a riparian wetland located immediately downstream of the project reach. The wetland project was created by gravel extraction in the Deep Run valley, which lowered the floodplain elevation." These papers highlighted issues with projects that had significantly different objectives than those of the Rest of River project: removing highly contaminated sediment and soil with subsequent restoration of the functions and values of the impacted systems.

EPA's Attachment 12 (River & Floodplain Restoration) to its Comparative Analysis provides some relevant examples of successful ecological restoration projects across various settings and scales. These example projects demonstrated successes following restoration of impacted sites, illustrating that it is possible to restore both the ecological function and appearance of areas after they are disrupted. These examples also highlight the common practices that helped to establish the restoration success. While no two sites are identical, examples of projects were selected where the project was of particular relevance to the Housatonic River in that they were large rivers and streams with a floodplain connection and/or with sediment/soil remediation (much of the current literature base includes much smaller river systems than the Housatonic and/or very different primary restoration goals, such as maintaining a specific stable channel form).

GE states in Attachment D to its comments on the Draft Permit Modification that "None of the case studies cited as examples of successful restoration is appropriate for comparing the potential outcomes of the proposed remediation and restoration efforts in the Rest of River...." However, GE bases that argument on the premise that the Rest of River area is "ecologically vibrant," and that the examples that EPA provides "were focused on rivers that were physically, chemically, and biologically degraded." As the Housatonic River and its floodplain are chemically and biologically degraded by the PCB contamination present, and the area has been physically degraded through historical alteration of the river channel and floodplain, EPA believes these examples serve as EPA intended.

Response 604 and C19 address GE's comment that "The Rest of River will be severely impaired for many decades, perhaps centuries..." Any individual points raised in Attachment D to GE's comments on the Draft Permit Modification not covered in other comments are addressed in Responses D1 through D4.

Comment 603: GE asserts that the impacts of the proposed remedy would extend beyond the footprints of the areas that are physically disturbed by remedial construction activities and for access roads and staging areas. There will be significant "edge effects" or "spillover effects" outside of those footprints due to potential increases in erosion and sedimentation (even with controls), the spread of invasive plant and animal species to such areas, changes in microclimate, and the effects of noise from construction and traffic on sensitive bird and mammal species during the breeding and rearing seasons.

Comment C20: "Edge effects" will cause significant negative impacts in areas extending beyond the footprint of the actual remediation work. These impacts will include potential increases in erosion and sedimentation, the spread of invasive exotic plant and animal species, changes in microclimate, and noise from construction and traffic that can disturb sensitive bird

and mammal species. Exactly how far those edge effects reach could vary considerably. Some effects such as microclimate changes are usually measured in tens of meters but movement of invasive plants and animals may reach hundreds of meters (Laurance et al. 2002). If we look at the full impact of SED 9/FP 4 MOD, using 100 meters as a reasonable estimate of the lateral extent of edge effects, it is apparent that almost the entire PSA is likely to be affected (Fig. 2 [in GE's comments, Attachment C]). These estimates likely understate the negative impacts of SED 9/FP 4 MOD because they do not include the substantial edge effects related to more than 3.5 miles of bank stabilization. Because banks are linear, they are particularly extensive sources of edge effects. Furthermore, despite EPA's stated goal of protecting what it has designated as Core Area 1 habitat (owing to its importance as habitat for immobile state-listed species), it is proposing the devegetation and excavation of areas within 100 meters around those areas. As depicted in Figure 3 [in GE's comments, Attachment C], the 100-meter wide area around Core Area 1 habitat should also be protected as a buffer because of the edge-effect phenomenon. Finally, it is noteworthy that all of these edge effects except for noise generated by remediation activities will persist long after the remediation work is complete, indefinitely in the case of invasive species that become established.

EPA Response 603, C20: EPA acknowledges and shares the concerns noted regarding potential spillover effects that might occur during the construction phases of the remediation and restoration. EPA's Final Permit Modification addresses these issues and provides the framework for minimizing and mitigating them. Each of the specific effects delineated in these comments is addressed briefly below. However, applicable to all of these issues is the fact that, as demonstrated by the body of data and other information developed at Rest of River over the last 15 years, wildlife is currently impacted by the existing PCB contamination and human health risks exist. As noted in the Comparative Analysis and Statement of Basis, EPA believes that the long-term environmental benefits of removing and/or isolating the PCB contamination in the River and surrounding areas will outweigh short-term effects and temporary loss of functions that will occur as a result of the remediation and subsequent restoration activities.

Erosion and Sedimentation – Erosion and sediment controls are a necessary component of any construction activity and are guided by Best Management Practices (BMPs). The Performance Standards and Corrective Measures outlined in EPA's Final Permit Modification require that GE develop Remedial Design/Remedial Action Work Plans. EPA anticipates that these plans will: 1) provide appropriate erosion/sediment control measures, 2) ensure that reconstruction of river banks will minimize erosion, considering the principles of natural channel design, in areas where PCB-contaminated sediments are removed, 3) maximize the use of bioengineering methods when reconstructing riverbanks, and 4) provide for the selection of appropriate cover/cap material for the Erosion Protection Layer of Engineered Caps.

To minimize the negative effects of construction on the community and adjacent habitats, BMPs such as phased construction, dust suppression techniques, perimeter air monitoring, and other engineering controls will be required during remedial construction. There are several techniques that can control erosion by working in conjunction with the geomorphic processes and conditions of the construction site, including minimizing the time between removal of the pre-construction cover and establishment of the post-construction cover.

Microclimate – Effects of remediation and restoration activities on the existing microclimate may include temporary loss of shading, increases in surface water and soil temperatures, increased wind velocities, and increased evapotranspiration, among others. As noted in the NRRB Site Information Package, remediation and restoration of the river and floodplain at this scale cannot be accomplished to any meaningful level without short-term impacts to the present state of the river and floodplain. However, EPA believes that phasing the project and performing construction in relatively small areas of the project at any given time will reduce the scale of these impacts. In addition, implementation of a comprehensive ecological restoration program will initiate an accelerated recovery of the ecosystem that will not only alleviate impacts caused by the remediation, but also, over the longer term, create processes that will sustain diverse river and floodplain communities.

Noise – EPA acknowledges the concern that construction-related noise during remediation activities may affect wildlife breeding and rearing of young in some species, but believes such effects will be localized and can be mitigated. Through consultation with the state and federal wildlife agencies, EPA will ensure that the remedial construction plans to be developed by GE, to the extent possible, avoid, minimize, and mitigate these effects. Time and scheduling constraints on construction activities will limit the amount of disturbance at any one time and restrict construction disturbance to seasonal schedules that allow use of the riparian corridor by native species. Furthermore, only a portion of the river system will be affected at one time, so the effects in any one area will be limited to a relatively short period of time, leaving other unaffected areas as refugia.

GE also asserts that a 100-meter buffer is necessary surrounding the Core 1 Areas to protect against the edge-effect phenomena, and implies that EPA already plans to devegetate and excavate areas within this buffer zone. Core Area habitats were established by the NHESP to "guide efforts to avoid, minimize and mitigate impacts to state-listed species." The NHESP did not require that further "buffer zones" surrounding the Core Area 1 habitats would be necessary to achieve this objective. In addition, the specific areas in the floodplain that will undergo remediation (including any in a so-called "buffer zone") have not yet been determined; when Remedial Design/Remedial Action (RD/RA) Work Plans are developed, EPA anticipates requiring that GE be cognizant of any areas in close proximity to the Core Area habitats.

Also see Response 147 *et al.* below.

Comment 604: GE asserts that, as a result of its direct and indirect impacts, the proposed remedy would cause fragmentation of and an overall loss of connectivity in the contiguous, largely undisturbed forested riparian corridor in the [Primary Study Area or PSA], which is important to the viability and sustainability of populations of native species that depend on that near-continuous corridor for daily use, dispersal, and migratory movements. Given the constraints and limitations on restoration methods, the PSA ecosystem would not recover entirely from that loss.

Comment C19: GE asserts the following: There will be extensive perforation of the vegetation in Reaches 5A and 5B (i.e., numerous patches cleared of what is currently unbroken vegetation), and in some places SED 9/FP 4 MOD will sever the linear forested riparian corridor of the PSA, such as in and near Exposure Areas (EAs) 2-6, 16-18, 20-24, and 32-34 (Fig. 1 [GE's

Comments], Attachment C). Indeed, in three of these places (all but EA 16-18), the proposed remediation reaches laterally across almost the whole PSA. The estimated total of 45 acres of floodplain that would be disrupted by SED 9/FP 4 MOD (see page 34 of the Comparative Analysis) may seem modest, but the locations of these areas are critically important given the narrowness of the riparian corridor in those areas. More importantly, EPA's estimates do not include the extensive area of access roads and staging areas, and related clearing that will be required in connection with the excavation of soil in these areas.

EPA Response 604, C19: EPA disagrees with GE's statement about recovery of the ecosystem.

To maintain, to the extent practicable, undisturbed forest corridors in the PSA and minimize adverse impacts to disturbance-sensitive species, EPA has included language in the Adaptive Management and Coordination of Corrective Measures portions of the Final Permit Modification requiring phasing and anticipates requiring GE to develop remediation plans that include a phased approach to construction and subsequent restoration. Phasing the work will disperse the effects of the construction activities over time (the remedial action period is estimated to be 13 years) and space (a distance of 30 miles), and provide optimal coordination of restoration with remedial activities, including support areas. This will limit ongoing disturbance to any one area and allow native species to continue using river corridor habitats in post-restoration areas and areas yet to be disturbed. The Final Permit Modification requires GE to address these concerns in the restoration plans, which will be reviewed and approved by EPA (after consultation with the States). In addition, GE will be required to submit plans proposing the location of infrastructure (e.g., roads and staging areas). EPA will review these plans carefully to ensure that habitat disturbance and fragmentation is kept to the minimum extent practicable. The Final Permit Modification also provides for the use of adaptive management to improve and adjust construction as well as restoration methods during later phases. Also see Response C5 *et al.* below.

In general, the complex ecosystems that currently exist within the project area are present despite anthropogenic activities that have been influencing land cover in the area since the 1700s. These historical activities significantly affected the ecological conditions and processes around the river, including vegetation types and succession, river meandering, downstream transport of sediment via accelerated bank erosion, and deposition in the floodplain. In addition to historical straightening and damming of the channel, the river and surrounding forests were impacted by the clearing of riparian areas for agriculture and development. Urban development and historical agricultural activities in the upper PSA resulted in loss of vegetation in the floodplain and riparian areas. Following these past disturbances, the ecosystem was left to adjust and recover naturally, which has resulted in the current conditions in the PSA. An active restoration program will speed up the natural process of ecosystem recovery following remediation. EPA's ecological restoration strategy is to mitigate the short-term impacts related to the remediation activities, not to restore the ecosystem back to some historic, unaltered, pristine state. After remediation and restoration, it is understood that Rest of River will neither mirror what is observed on-site today – an environment that has been compromised in many ways by high concentrations of PCBs – nor what was there 100 years ago before PCBs were released into the river. Instead, the goal of the ecological restoration is to restore the functions and ecosystem services that currently exist.

Comment 605: GE asserts that EPA's proposed remedy would have severe adverse impacts on state-listed species. Although EPA's proposal would limit remediation in Core Area 1, that would not avoid substantial impacts on state-listed species. Although EPA has not estimated the number of state-listed species that would be affected by its proposed remedy, GE has conducted such an assessment, building on the detailed assessment that was provided in Appendix L of the RCMS. This updated assessment for the proposed remedy is provided in [GE] Attachment E, which presents, for each potentially affected species, an evaluation of whether a "take" would occur, the estimated extent of the local population, and the estimated impact on a significant portion of the local population. This assessment shows that the proposed remedy would involve a "take" of 25 state-listed species and would adversely impact a significant portion of the local populations of at least 9 of those species.

Comment 606: GE asserts that, despite EPA's proposal of limited remediation in Core Area 1, impacts on state-listed species would occur in other areas. Given the nature of the work in the proposed remedy, at least three state-listed species (American bittern, wood turtle, and common moorhen) would be adversely affected to a substantial degree, experiencing an impact to a significant portion of their local populations. Further, despite NHESP's use of American bittern as an example of a species with lower conservation concern, Massachusetts Audubon's recent State of the Birds Report lists American bitterns as "locally and strongly declining; conservation action urgent." NHESP's additional claim that the habitats of the Core 2 species are "more easily restored" is belied by the evidence. Additionally, since Core Area 3 refers to areas with dense concentrations of state-listed species (i.e., overlapping habitat for eight or more such species), implementation of remediation activities in those areas would contribute to the overall impacts on those species. Indeed, given that definition, Core Area 3 would seem to be at least as deserving of special protection as Core Area 1.

EPA Response 605, 606: EPA does not agree with GE's view on the remedy impacts on state-listed species. On the contrary, the benefits of removing or significantly decreasing the exposure of such species, and others, to high levels of PCB contamination, outweigh the short-term impacts. EPA's opinion is shared by the Commonwealth of Massachusetts, whose responsibility it is to administer the MESA. As discussed in the Commonwealth's 2014 comments on EPA's Proposed Cleanup Plan for Rest of River, the Commonwealth has been providing comments to EPA on the remediation of the Rest of River since 2008 and has been involved in discussions with EPA and the State of Connecticut since 2011. As a result of this collaboration, and after a thorough review of the components of the remedy that potentially could result in a "take" of state-listed species, the Commonwealth expressed its support for EPA's proposed remedy, noting that the plan would be protective of human health and that the plan is "directed at preserving the dynamic character of the river ecosystem and avoiding, minimizing and mitigating remedy impacts to the affected wildlife and their habitats, with a particular focus on protecting state-listed species." Moreover, the Commonwealth specifically addressed the consistency of the proposed remedy with the MESA requirements and supports the proposed remedy. See also Attachment B to the Final Permit Modification, the July 31, 2012 letter from the Massachusetts Division of Fisheries and Wildlife.

In addition to the Commonwealth, the Massachusetts Audubon Society, one of the larger landowners along the Rest of River, also provided extensive comments on EPA's proposed remedy. Nowhere in its comments does Mass Audubon express concerns regarding the impact

of the proposed remedy on the American bittern, nor on state-listed species in general. The Audubon 2013 "State of the Birds" report cited in Comment 606 does include a species-specific review of the status of American bittern. However, one of the primary reasons listed in the Audubon report for the declining local populations of this species is habitat degradation, with "chemical contamination" cited as one of the major causes of habitat degradation. EPA agrees with this assessment. In fact, the American bittern was specifically evaluated in the ERA, and it was concluded that "American bitterns feeding and reproducing in the Housatonic River PSA are at a high risk of toxicity from exposure to PCBs in these reaches." Based on this information, EPA concludes that the long term benefits of remediating the contamination that poses a threat to American bitterns will outweigh any temporary disruption of remedy construction in their contaminated habitat.

See also Response 17 *et al.* above for information regarding the approach to Core Areas.

Comment C1: GE asserts that EPA suggests that an Adaptive Management framework will be employed in the implementation of SED 9/FP 4 MOD but overlooks the fact that such a framework would require much more time than EPA proposes, especially when dealing with slow ecological processes like the growth and succession of vegetation.

Also, in Attachment D to its comments, GE asserts as follows: All of the remediation in Reaches 5A, 5B, and 5C and their associated backwaters is scheduled to be completed in just 8 years. Adaptive management requires significant time, especially when dealing with slow ecological processes like the growth and succession of vegetation. The fundamental feature of adaptive management is learning from past experience, and that requires time to: monitor the results or outcomes of actions; assess if goals were met and unintended consequences incurred; and develop new approaches based on lessons learned. In the context of vegetation restoration, it is likely to take at least 5-10 years just to be able to judge if the restoration effort is on track to be successful (e.g., planted trees are surviving and the site is not overrun with exotic species.) Thus, even at sites where the goal is to restore fast-growing plants, like annuals, rather than trees or shrubs, it is not reasonable to suggest that in just 8 years one can make multiple trips around the cycle of adaptive management.

EPA Response C1: EPA disagrees that the proposed time frame for implementation of SED 9/FP 4 MOD precludes the use of an adaptive management approach as part of the remedy. Following an adaptive management approach, remedial construction plans will be developed with the view toward incorporating opportunities to learn from current and past project activities in order to improve future activities and the overall performance of remediation and restoration activities. Doing so will require that the time for monitoring and data evaluation be included in the project schedule in order to identify actions that can be taken to improve the overall project performance, in terms of satisfying project objectives. The time invested will produce dividends in the form of reduced uncertainty as the project proceeds, increased confidence in the success of project outcomes in terms of risk reduction and project objectives, and lower total project costs by reducing the time and expense associated with rework and other problems.

Over the course of the project, there will be numerous opportunities to make improvements in operational components of the project by selecting the appropriate metrics and using them in an adaptive management approach. In some cases, formal adaptive management can be employed

to optimize operational practices. For example, uncertainty regarding the relative performance of different dredge bucket sizes could be resolved by testing the performance of a 1- versus a 3-cubic yard bucket, using dredging production rate and mass of resuspended sediment as performance metrics. These types of metrics can be easily evaluated and used to make adaptive management decisions well within the time frame of the project. In other cases, these opportunities will emerge through "trial and error" (e.g., observations in the field indicate that dredging with a 1-minute cycle time releases more suspended sediment into the water column than dredging with a 2-minute cycle time). As an example that such an approach can be successful, an Adaptive Management Plan, focusing on metrics that could be evaluated within a suitable time frame, was developed by GE for Phase I of the Upper Hudson River remedial action (Quantitative Environmental Analysis, LLC. 2008. Phase I Adaptive Management Plan.), a project that was completed in a much shorter time than is proposed for the SED 9/FP4 MOD alternative.

GE implies that it will not be possible to evaluate the success of plantings of trees and shrubs, as well as the effectiveness of invasive species control during the project duration in Reach 5 and therefore an adaptive management approach involving such metrics is not possible. EPA notes, however, that just such evaluations were made shortly after completion of the ½-Mile and 1 ½-Mile remediation projects on the East Branch of the Housatonic River, and were reported by GE in its required annual monitoring reports (see, for example, the annual monitoring reports for ecological restoration activities in the Upper ½ Mile Reach and the 1 ½ Mile Reach, such as the Upper ½-Mile Reach 2005 Annual Monitoring Report, and subsequent Annual Monitoring Reports). In no case does GE suggest in these reports that evaluation of the success of vegetation plantings or invasive species control against the established performance metrics is unreliable, ineffective, or should not be used to inform potential corrective actions. This is exactly how such information would be used in the Rest of River as part of adaptive management which continues into post-remediation activities.

See also Section V of this Response to Comments for information regarding Adaptive Management.

Comment C22: GE asserts the following: As is discussed in Section 5.2.3 of the Revised CMS, given the numerous animal and plant species that would be affected by SED 9/FP 4 MOD, with their individual life cycles and growing seasons, there is no way that the remedial construction work could be timed to prevent direct adverse impacts to all species. For example, sediment removal and/or capping could be scheduled to avoid working in the river during the breeding or emergence season for one generation of animals, such as dragonflies, mayflies, and possibly spawning fish (typically late spring and summer), but this approach would not avoid all adverse effects because the impacts would last well beyond the immediate construction season, affecting breeding and emergence in subsequent seasons. Similarly, for animals with high site fidelity, such as the American bittern, even if remediation work occurred only during periods when they are not present, only direct mortality would be avoided. The habitats would be negatively impacted for multiple years. In most cases, loss of habitat equates to loss of populations, with subsequent negative impacts to food webs within the ecosystem. With specific reference to plant species, there is no time of year that would avoid adverse impacts, since even winter removal activities would affect either the plants themselves (at least their underground roots and rhizomes) or their seed banks or both. Similarly, winter

work would adversely affect the species that often spend the winter on the river bottom, such as the wood turtle or larvae of dragonflies. In short, there would be no time of the year in which remedial construction activities would not cause adverse impacts to many plant and animal species. Although a few temporal strategies could reduce the harm to some degree, the adverse impacts of SED 9/FP 4 MOD would still be significant.

EPA Response C22: EPA agrees that the timing of remedial construction alone is not a complete solution to avoid, minimize, or mitigate effects to all state-listed species. Section II.B.1.c. of the Final Permit Modification references additional measures to be considered such as, without limitation, propagation, relocation, seed-banking, transplanting, exclusion barriers, and turtle tracking. In addition, the work will be phased through time (13 years) and location (30 river miles) and much of the area will not be remediated, providing refugia as well as ongoing source areas for plant and animal species.

Comment D3: GE asserts the following with respect to "designation of a reference site" being identified in Appendix D of EPA's Comparative Analysis as one of the elements of a successful restoration plan: The uniqueness of the Housatonic River and floodplain make this [designation and description of the reference site] impossible. We note that EPA hasn't identified any system that is anything like a reasonable analog that might serve as a reference system.

EPA Response D3: EPA disagrees that there are not reasonable analogues to be used as reference areas. EPA recognized the unique nature of the Housatonic River and floodplain when selecting reference sites for use in the project. During the development of the ERA, EPA gave careful consideration to the potential confounding factors associated with the selection of reference areas. Reference areas were chosen based on similarity to the PSA in terms of natural communities, area, and land use. Necessary features of the reference areas included emergent, shrub, and forested wetland communities, considerable area occupied by or adjacent to forest land, and lack of extensive residential use. Reference areas could contain some housing and agricultural land, as these features were present in the PSA. Four separate reference areas located in the Housatonic Watershed were identified to compare to differing conditions in the PSA. ERA Appendix A.1 (Section II, pages 15-17) provides descriptions of these reference areas. In addition, locations with low or no PCB concentrations within the PSA in appropriate habitats were used as reference areas for specific studies. In the course of developing remediation and restoration design plans, GE could consider these reference areas selected for the ERA.

Comment D4: GE asserts the following: It will be critically important to tie post-project monitoring and assessment both to measures taken prior to remediation and to "as-built" conditions immediately following construction. Some improvements compared to "as-built" conditions are likely but the negative changes compared to the pre-project conditions are certain to be profound.

EPA Response D4: EPA agrees that it is critical to tie together pre-existing conditions with remedial measures and restoration activities as well as monitoring and maintenance activities. To this end, as specified in the Final Permit Modification Section II.B.1.c. GE is required to

- Perform a baseline assessment of pre-remediation conditions;

- Develop restoration performance objectives and evaluation criteria;
- Develop a restoration corrective measures coordination plan (tying remediation to restoration);
- Design a restoration plan to return all areas disturbed by the remediation activities to pre-remediation conditions; and
- Perform post restoration monitoring and maintenance activities.

EPA anticipates that GE will document "as-built" conditions and compare to pre-remediation conditions. However, EPA does not agree that, following implementation of this active and rigorous restoration program, negative changes will be as profound as speculated by GE. The requirements EPA has built into the Final Permit Modification are a reasonable method supported by science to minimize negative changes compared to pre-remediation conditions.

III.B.2.b Effects of Remediation/Restoration on Specific Habitats

Sediment Bed and Banks

Comment 90.a: The current cleanup plan relies on MNR in large areas of the river designated as core habitats to avoid disturbance of ecosystems that support several state-listed species. The consensus remains that this methodology is inadequate as the long-term consequences to these fragile ecosystems outweigh any short-term disruption caused by a more effective cleanup. The field of stream restoration provides a suite of effective tools to both mitigate habitat disruption as well as facilitate a return to equilibrium post remediation. However, the current plan fails to acknowledge the full extent of these tools and resorts to an insufficient cleanup. Finally, the entire Housatonic River will not require stream restoration. The plan should account for each reach on a case by case basis based on river morphometry and cleanup measures. Stretches of the Housatonic with lower flow rates and higher silt accumulations tend to accumulate more contaminants than high velocity areas of the river. Thus the lower velocity sections of the river, such as Reach 5B, tend to be contaminant hot spots. Such areas make good candidates for stream restoration, due to both the elevated contaminant levels and the ease of in-river construction in low flow areas. The Rest of River system will be more capable of returning to a natural state after comprehensive remediation followed by sound restoration.

EPA Response 90.a: As discussed in the Statement of Basis, the remedy is intended to "achieve Performance Standards while minimizing impacts on river dynamics and other ecological processes, and on the abundance of state-listed and other wildlife species." The use of MNR in selected reaches provides the "best balance between addressing human health risks and ecological risks and negative impacts of remedial work on the river's ecosystem."

EPA disagrees that Reach 5B is a "hot spot" for sediment compared to other reaches of the river. Average and median surficial PCB concentrations in sediment in Reach 5B are less than in surficial sediment in Reaches 5A, 5C, the Backwaters and Woods Pond (Figure 4-8 and Table 4-8, September 2003 GE RCRA Facility Investigation Report). PCB data collected from the Housatonic River confirm the considerable spatial variability in PCB concentrations in sediment, not only among river reaches but within each reach and subreach. The heterogeneity of PCB concentrations in sediment precludes the identification of sediment units with clearly defined

PCB concentration boundaries (i.e., hotspots). In part, due to these lower surficial PCB concentrations, the final remedy in Reach 5B requires removal of sediment with PCB concentrations greater than or equal to 50 mg/kg and the placement of an amendment such as activated carbon and/or other comparable amendments to reduce the bioavailability of the remaining PCBs in the sediment bed. In contrast, more extensive sediment removal and restoration is required in Reaches 5A, 5C, the Backwaters and Woods Pond.

EPA agrees that sound restoration approaches are necessary within the remediation reaches to achieve the long-term goals of the project. The use of stream restoration techniques (including consideration of Natural Channel Design (NCD) principles) is included in the Final Permit Modification. It specifies a hierarchy of bank stabilization methods to be used, where appropriate, to reduce bank erosion while maintaining the dynamic nature of the Housatonic River. EPA agrees that the final remediation plan will need to consider geomorphic processes in each reach and adjust the proposed restoration accordingly. EPA also agrees that stream restoration is not required throughout the entire Housatonic River corridor. In implementing the remedy, GE will be required to submit to EPA for review and approval a number of deliverables including conceptual and final remedial designs and restoration plans that will include the application of stream restoration techniques.

See also Responses 17 *et al.*, 455, 492, 533 *et al.*, 593, 594, 595, 596 above in this Section and Section III.C.6 of this Response to Comments regarding MNR.

Comment 597: GE asserts that the proposed remedy would impact the entire river channel in Reaches 5A and 5C and at least 3.5 miles of the riverbanks in Reach 5A. As the Commonwealth has noted, such work would "inevitably cause severe and long-lasting destruction of the Housatonic River ecosystem and state-listed rare species," and the Commonwealth therefore proposed no riverbed excavation (outside of Woods Pond) and no riverbank excavation or stabilization. Although the proposed remedy specifies that this work should be conducted "considering the principles of Natural Channel Design," that would not avoid the severe and long-lasting destruction noted by the Commonwealth. For example, regardless of the technique used, the sediment removal/capping would kill all existing benthic invertebrates in the area, damage existing fish populations, and alter the current substrate type. These effects would last until natural deposition from upstream changes the substrate back to a condition approximating its pre-remediation condition and benthic invertebrates and fish recolonize these reaches – which could take many years, during which invasive aquatic plant and animal species would have an advantage.

Comment C2: GE asserts that the sediment removal and/or capping would remove or bury the existing aquatic vegetation and benthic invertebrates, and displace the fish. The substrate will be dependent on deposition from upstream to begin its recovery, but the timeframe for that process is uncertain. While some recolonization would occur, primarily by drift from upstream reaches of the river, it would be slow, taking years to decades. Of concern is that much of the Housatonic River upstream of the PSA is quite urbanized, meaning less diverse source populations will be available for recolonization downstream. It is likely that common and invasive species would arrive first, particularly those tolerant of changes in substrate materials. Less tolerant sensitive and rare species may never recolonize reaches where removal of the original substrate or riverbanks is extensive over long sections. SED 9/FP 4 MOD would destroy

126 acres of aquatic riverine habitat. Thus, aquatic communities are unlikely to match the pre-remediation communities in terms of composition, species richness, and relative abundance of species.

Comment C3: GE asserts removal and replacement of substrate will adversely affect groundwater processes that are critical to both vertebrates and invertebrates. In particular, groundwater provides a base flow to a river during times of reduced surface flows. Groundwater flows also create a hyporheic zone in the riverbed where invertebrate and fish larvae can flourish. Disturbance of these discharge pathways by dredging, capping, and bank remediation will adversely affect groundwater-dependent habitats and flow patterns, and also destabilize the base of riverbanks, resulting in bank slumping and further erosion (e.g., Hester and Gooseff 2010). For small sections of riffles, there is evidence that if substrate is properly constructed, a functioning hyporheic zone can be restored (Kasahara and Hill 2006), but the restoration of this zone at a scale of miles of riverbed is highly uncertain. Under SEP 9/FP 4 MOD, much of Reach 5A will be directly destroyed by direct remediation of riverbed and riverbanks. Those reaches not remediated will be isolated from intact riverine habitats and/or become highly disturbed due to construction activities above and below their location. Where bank remediation is conducted in sections of Reach 5B, those sections will suffer similar fates. Figures 1 and 2 [of GE's comments, Attachment C] show the extensive fragmentation generated by the road and staging area system required to access the areas that would be remediated.

Comment C14, C15: GE asserts that removal of sediment in the impoundments would also remove any viable propagules (the organisms and their eggs, seeds, or regenerative tissue of any kind) in the sediment removed. Capping or backfilling would change the substrate from organic sediment over silt and fine sand to a substrate composed of the capping or backfill material. Over time, invertebrates and aquatic plants would recolonize the impoundments, although different species would be expected to dominate, at least initially, due to the changed substrates. For example, there is a high probability of invasion by non-native species - such as water chestnut (already prevalent in Woods Pond), as well as Eurasian water milfoil, curly-leaf pondweed, and potentially others not yet able to establish populations under current conditions - in areas within the photic zone. Such species are likely to immigrate and dominate, with few management strategies to avoid this occurrence.

Since impoundment remediation would kill most occupying organisms and displace the rest, at least temporarily, biological recovery would depend on colonization from outside the impoundments from upstream sources. Commonly occurring macroinvertebrates from upstream areas would be expected to recolonize the impoundments, as would aquatic plants, with such plants or their propagules arriving with flow into the impoundments. While fish would move back into the remediated impoundments readily, the composition and relative abundance of fish would vary, at least initially.

As sand and organic sediments are deposited from upstream, a biological community in the impoundments that is consistent with those conditions would be expected to develop. However, the length of time for such a community to develop, the number of organisms that may be present, and the presence of any specialized species are all uncertain. The restoration of impoundments is most likely to follow lake restoration technology, which is relatively mature. Although most lake restoration projects have been focused on vegetation and pollutant

management, there is a substantial body of knowledge concerning dredging of sediments to deepen water bodies and/or remove pollutants. Also, undesirable plant species can be more easily removed with aquatic harvesters compared to emergent, shrub, or forested sites (see National Research Council 1992 for a review of methods).

Comment C16: GE asserts that sediment removal and capping in the backwaters would cause changes in surface substrate type from silts or mucky organic material to sand, which would last until enough silt and organic material have been deposited through flood events to approximate current conditions - which could take a decade or longer. There would be changes in vegetative characteristics corresponding to the change in substrate type and elevation. With these changes in substrate and hydrology, there would be a proliferation of invasive exotic plant species.

There would be a change in the wildlife communities using the backwaters until such time as the substrate, hydrologic, and vegetative conditions of the backwaters return to conditions comparable to pre-remediation conditions - which is uncertain. There is high potential for the loss of certain sensitive (e.g., state-listed) species, such as the American bittern and common moorhen.

The potential for restoration of backwaters is better than for most other aquatic habitat types. Backwaters, having direct connections to the river, will readily receive propagules of plant species and mobile animals can move into these areas rapidly. The techniques for their restoration are most like those used for lakes and reservoirs, and thus there is abundant information available on how to proceed. Although comparable habitats can probably be constructed, there remains a major question about whether the desired plant and animal species can be attracted to and flourish within the restored backwaters. The specter of overwhelming colonization by invasive exotic plants remains present.

EPA Response 597, C2, C3, C14, C15, C16: EPA disagrees with the statement that "SED 9/FP 4 MOD would destroy 126 acres of aquatic riverine habitat." On the contrary, the remediation will restore approximately126 acres of currently contaminated aquatic riverine habitat. As discussed in the HHRA and ERA, benthic invertebrate populations in the Rest of River are demonstrably compromised by the high concentrations of PCBs in riverine sediments, particularly in depositional areas, and fish tissue is highly contaminated. Removal and capping of these contaminated sediments will allow benthic invertebrates to re-colonize the area and establish robust populations uncontaminated by PCBs, and will result in decreases in fish tissue concentrations, thus decreasing risks to human health and the environment.

The proposed remedy would remediate the entire river bed in Reaches 5A and 5C and would impact limited river banks in Reach 5A, or approximately 35% of the 10 linear miles of bank in that most upstream subreach, as well as selected areas of Reach 5B, the Backwaters and Impoundments. After sediment removal (sufficient to construct the appropriate Engineered Cap), the river bed will be returned to its former grade by placing the Engineered Cap to contain any residual PCB contamination. EPA recognizes that removal of the sediment in these reaches of the Housatonic River will create a short-term disruption to the ecosystem (e.g., to benthic invertebrates, fish populations, substrate composition, and colonization by invasive species), however, sediment removal and capping is necessary to mitigate the significant threat to human health and environment caused by GE's PCBs.

In recognition of these short-term impacts, EPA included measures in the proposed remedy to mitigate them to the extent possible. First, the remediation will be conducted using a phased approach, thus an entire reach will not be affected at any single time or place. Phasing the remediation (and restoration) will provide many species with areas not subject to remediation adjacent to the construction for refugia. The Restoration Performance Standards and Corrective Measures also include provisions for the management of impacts to state-listed species as necessary.

Second, the proposed remedy requires that the Engineered Cap include in its design a habitat layer approximating the natural sediment characteristics. Therefore, there should be minimal long-term effects on substrate composition. Furthermore, as shown following the remediation of the Upper 2-Mile Reaches, there will be significant redeposition of sediment from upstream sources and reworking of surficial sediment, which will further assist in returning the natural characteristic of the riverbed. Restoration techniques may include the planting of aquatic vegetation to accelerate the recovery process.

Third, the extent and timing of recovery of benthic invertebrates and fish populations in these reaches following remediation would be considerably more rapid than asserted by GE. There is an excellent example of the recovery that can be expected which was documented in the studies conducted upstream in the East Branch of the Housatonic River following the extensive remediation in the ½-Mile and 1 ½-Mile Removal Reaches (these actions included remediation of the river bed, all banks, and much of the floodplain immediately adjacent to the river). In 2007, approximately one year following completion of remediation of these two miles of river, EPA conducted a quantitative survey of benthic invertebrate populations and a semi-quantitative survey of fish populations at three transects in the 1 ½-Mile Removal Reach. The results of the investigation showed that benthic invertebrate populations had recolonized the sediment bed as measured by species richness, density, and diversity, and that the benthic community had higher diversity, increased abundance, and increased presence of pollution-intolerant taxa than before the remediation occurred. The fish species composition and numbers also were observed to meet expected conditions. In addition, tissue PCB concentrations in the invertebrates, which form the base of the aquatic food chain, were reduced by over 99% as compared with pre-remediation levels. Using similar field and laboratory methods, GE conducted surveys at the same three locations in 2012 and obtained substantially the same results, with even further reductions in tissue PCB concentrations observed (GE, 2012). There is no reason to believe that recovery in Reaches 5A and 5C, following sediment remediation, will be any less rapid or complete, particularly considering that recovery will be enhanced by placement of a habitat layer as part of the Engineered Cap.

Fourth, in these surveys, there was no indication of colonization by either invasive aquatic plant or animal species documented by EPA or GE. The development of an invasive species control plan is required by the Final Permit Modification, which EPA anticipates will include management strategies to control any invasive aquatic vegetation.

Similarly, there is no indication from these surveys that the removal of contaminated sediment and subsequent placement of an Engineered Cap have caused any meaningful change in groundwater flow and/or the presence of a hyporheic zone in the riverbed. GE cites a publication by Hester and Gooseff (2010) which is claimed to argue that "Disturbance of

[groundwater flows in the riverbed] by dredging, capping, and bank remediation will adversely affect groundwater-dependent habitats and flow patterns, and also destabilize the base of riverbanks, resulting in bank slumping and further erosion (e.g., Hester and Gooseff 2010)." EPA has reviewed the Hester and Gooseff paper and disagrees with GE's interpretation of the paper with regard to the adverse effects caused by dredging, capping, or bank remediation. On the contrary, the Hester and Gooseff publication is a discussion of the importance of consideration of the hyporheic zone as part of stream restoration projects, and provides an argument for the inclusion of restoration of the hyporheic zone as part of stream restoration, which the authors clearly accept as a legitimate and valuable method for improving the overall ecological quality of rivers and streams. EPA agrees with this recommendation. Using another citation (Kasahara and Hill, 2006), GE notes that restoration of the hyporheic zone is possible but not at the scale of riverbed remediation included as part of SED 9/FP 4 MOD. The Kasahara and Hill publication does in fact support the first part of this comment, but the latter part, i.e., that restoration of the hyporheic zone on a scale of miles is unlikely, is not supported by this citation.

Fifth, in the case of the banks in Reach 5A that will be remediated, extensive ecological restoration using the well-established principles of bioengineering and natural channel design are expected to lead to a recovery similar to that observed in the 1 ½-Mile Removal Reach.

With regard to the position of the Commonwealth quoted in the comment, EPA notes that these remarks were part of the Commonwealth's 2011 response to GE's Revised CMS, not to the 2014 proposed remedy or the 2015 Intended Final Decision. The current position of the Commonwealth is stated in its October 27, 2014 comment letter, as follows: "we support . . . the more specific approach to remediating the Reach 5 river banks set forth in the Proposed Cleanup Plan, which is . . . responsive to the Commonwealth's concern about ensuring that the fundamental, dynamic character of the river remains intact following the necessary remediation of eroding banks." With regard to the effect of remediation in the Backwaters on state-listed species, the Commonwealth of Massachusetts worked with EPA to develop the SED9/FP4 MOD preferred alternative and identified Core 1 areas that have high-quality habitat for state-listed species. The Backwaters in these Core 1 areas will not be subject to excavation unless PCB concentrations exceed 50 mg/kg, a significantly elevated concentration that results in substantial risk to the environment. The Commonwealth has responsibility for ensuring the long-term protection of state-listed species and is fully supportive of EPA's Final Permit Modification.

Also see Responses 147 *et al.*, and 604, C19 in this Section.

Comment 598: GE asserts that the proposed riverbank stabilization/excavation work, even if Natural Channel Design or "bioengineering" techniques are used, would cause an enduring negative change in the character of those banks, because it would: (a) prevent significant bank erosion and lateral channel movement, thus eliminating the vertical and/or undercut banks that provide critical habitat for certain birds and other animals, and reducing adjacent wetland habitats; (b) require the removal and permanent elimination of mature trees overhanging the River, thus changing the character of the banks from their current wooded condition to a more open condition; (c) produce a long-term reduction in slides and burrows of certain mammals and reduce access routes for reptiles, amphibians, and smaller mammals between the River and the floodplain; and (d) increase the potential for colonization by invasive exotic species.

EPA Response 598: The Final Permit Modification provides for removal of contaminated soil from eroding riverbanks in Reach 5A, and soil with PCB concentrations greater than 50 mg/kg from riverbanks in Reach 5B. EPA recognizes the value of undisturbed river banks and their role in providing habitat for some species of mammals, birds, and other taxonomic groups as well as in providing stability against erosional forces. However, EPA also recognizes, and has demonstrated via direct observations, data, and the Housatonic River Modeling Study, that many areas of river bank in Reach 5A are highly contaminated with PCBs originating from the GE facility in Pittsfield, MA and that eroding PCB-contaminated banks contribute significantly to PCB contamination that is transported downstream. Therefore, the proposed remedy requires contaminated, erodible banks in 5A and areas greater than 50 mg/kg in banks in 5B be excavated and restored. The four issues raised in this comment are: reduction of bank habitat and adjacent wetlands, removal/elimination of mature trees along the banks, reduction of burrows, slides and access routes for various animal species; and an increase in the potential for colonization by invasive exotic species. Each of these points is addressed below.

After remediation activities are completed, restoration practices will be implemented that address the impacts of the remediation on river banks and that restore, to the extent practicable, the functions, values, characteristics, species use, and other ecological attributes existing prior to remediation. The proposed remedy requires that GE employ a design approach for the restoration of river banks, using Natural Channel Design principles in Reach 5A, that will emphasize bioengineering methods. The bioengineering methods (e.g., woody debris toe protection) will provide a variety of habitats. Recognizing that the bank remediation/restoration will affect only a limited amount of the nearly 20 miles of river bank in Reach 5, EPA considers the short-term effects of bank remediation/restoration to be acceptable considering the long-term benefits of PCB removal and associated reduction in risk and downstream transport.

Similarly, EPA recognizes that some mature trees will need to be removed to remediate the banks. The Final Permit Modification stipulates ecological restoration activities that will promote and accelerate the regeneration of mature forest along the impacted banks, rather than result in a permanent change to a more open condition along the River. As noted above, the amount of bank disturbance is limited, thereby minimizing the removal of mature trees. As shown by GE's bank vegetation monitoring following remediation of the ½-Mile Removal Reach, the timely establishment of canopy trees on restored river banks can be accomplished; in 2008, which was the 7th year of monitoring, all planted areas had canopy tree numbers that exceeded the Target Performance Standard. Monitoring results in 2010 further confirmed success in establishing canopy trees as documented in the Annual Monitoring Report (2011). Based on the proven re-vegetation success that has occurred upstream, and at other large restoration projects, EPA expects similar success when requiring an active restoration program for the Rest of River, including the replanting of canopy trees.

Because the extent of bank remediation will be limited to only a portion of Reach 5A, the disruption of wildlife use, including slides and burrows of mammals and access routes for reptiles, amphibians, and smaller mammals between the River and the floodplain, will also be limited. In addition, local observations from the 1 ½-Mile Reach, which involved much more extensive bank stabilization than will be necessary in the Rest of the River, show the existence of a robust beaver population a few years following bank stabilization. The beaver population rebounded so successfully in this area that additional plantings, herbivore control measures, and

continued maintenance of protective tree cages were necessary to help ensure successful re-vegetation as documented in the Annual Monitoring Reports. Based on the large extent of undisturbed banks and the monitoring observations at the upstream remediation project, EPA expects any reduction in slides and burrows and access routes for reptiles, amphibians, and smaller mammals to be temporary.

With regard to the final point, EPA recognizes that colonization by invasive species during and following remediation and restoration, as with any project, is a serious concern, particularly in disturbed or newly planted areas, as well as downstream Impoundments and, to a lesser extent, in the Backwaters. As a result, and as specified in Section II.H.18.b. of the Final Permit Modification, an Invasive Species Control Plan is a required part of the Operation and Maintenance Plan, which will be part of the Rest of River Statement of Work and incorporated into an adaptive management approach.

Also see Responses 147 *et al.* below. For discussion on impacts to wetlands, see Response C11.

Comment C24: GE asserts the following: In areas in which bank stabilization will purportedly be avoided, riverbanks composed of silts and sands are likely to become unstable when the river channel is excavated and bank stabilizing vegetation is removed. This will have a long-term (many decades, possibly centuries) effect on large trees along the destabilized riverbanks that provide significant shade and woody debris to the aquatic ecosystem. To be more specific, woody debris provides cover and substrate that is important to many aquatic and semi-aquatic species, and shading limits water temperature increases. In the absence of this shade, aquatic plant growth and water temperature would likely increase and change the suitability of the habitat for temperature-sensitive species. This loss of cover would also result in a loss of wind protection, as well as decreased amounts of large woody debris and overall organic material. When riparian trees are removed from a previously closed-canopy stream, the underlying energy regime may change from allochthonous resources to an autocthonous one driven by primary production, and this may shift the stream further away from the desired ecological state, often toward algae-dominated streambeds (Sudduth et al. 2011). When combined with excess sediments (likely during bed and bank remediation), desirable periphyton (forming the base level of aquatic food webs) and benthic invertebrate communities can be severely depressed. Figure 1 [of GE's Comments, Attachment C] identifies examples of places where, under SED 9/FP 4 MOD, the riverine corridor will be fragmented by removal of native vegetation, especially mature trees in the floodplain and along riverbanks, which will have all of these adverse effects.

EPA Response C24: GE's assertion refers to remediation in Reach 5A. EPA recognized the importance of retaining bank vegetation where possible, and as such, the Corrective Measures in the Final Permit Modification require GE to perform remediation generally from within the river channel. Remediation from within the river will eliminate the requirement for removing all bank vegetation (including the large trees) as GE claims, and allows for the selective remediation of the contaminated eroding banks as required in the Final Permit Modification.

GE's speculation of the outcomes cited from Sudduth *et al.* 2011 has limited applicability to the remediation of Reach 5A. This reach is not a predominantly closed-canopy system in its present state. Ongoing pre-remediation river processes have regularly resulted in bank erosion and loss of mature riparian trees over past decades since revegetation following the historic clearing of

the adjacent floodplain. The Corrective Measures for Reach 5A specify that the remediation and subsequent restoration of the river bed and target banks will be implemented considering the concepts of Natural Channel Design and with engineering measures to control the release of suspended solids. Locations of bank remediation will be determined during remedial design, thus GE's Figure 1 is largely speculative. See also Response 600 *et al.*

Comment 599: GE asserts the following: A recent review by Palmer et al. (in press 2014) of ecological restoration projects in rivers and streams identifies the shortcomings with the Natural Channel Design approach – notably, its failure to address chemical and biological processes – and shows that river restoration is fraught with problems and has had disappointing outcomes to date. The authors concluded that "there remains a major emphasis on the use of dramatic structural interventions such as completely re-shaping a channel despite growing scientific evidence that such approaches do not enhance ecological recovery . . . ." This study of 644 river restoration projects found that only 16 percent showed any improvement in biodiversity and that was relative to the prior degraded state of the project sites, not a thriving ecosystem like that of the Upper Housatonic River system.

EPA Response 599: When taken in its entirety, the Palmer *et al.* paper does not lead to the conclusion that the proposed remediation and restoration of the Rest of River cannot be successful in implementing the principles of Natural Channel Design (NCD). Rather, there are numerous observations made by the authors that are germane to the remediation and restoration of the Rest of River and are fully supportive of the measures that EPA has specified in the Final Permit Modification.

First, Palmer *et al.* note, relative to ecological processes, that "an over-reliance on channel design may obfuscate efforts to identify the factor that most limits recovery of a stream; quite often this factor is water quality, and thus ecological recovery will not occur until the source of pollutants is removed." (emphasis added) Palmer *et al.* also note that "As with restoration of any ecosystem, the most successful and sustainable approaches should target the source of degradation and focus on the appropriate scale." (emphasis added) The authors also conclude that "efforts at watershed and riparian scales that target restoration of hydrological processes and prevention of pollutants from entering the stream appear to offer the most promise." The authors observe "In any case, once stressors, such as nonnatives, uncontrolled runoff, or pollutant inputs, are removed, restoration theory suggests that a stream should recover on its own (Falk *et al.* 2006). This form of restoration is the ultimate type of functional restoration because the stressors exert their impact by influencing the processes, both ecological and physical, that define healthy rivers (Gilvear *et al.* 2013)." These points show that the paper's conclusions support the focus in the Final Permit Modification on removal of PCB contamination from the river, banks, and floodplain followed by the active restoration of remediated banks and adjacent floodplain.

The conclusions that Palmer *et al.* make regarding complete channel reshaping are not applicable to the specific challenges for the Housatonic River and the Final Permit Modification. First, the channel restoration projects reviewed by Palmer *et al.* did not specifically include contamination removal as the primary objective. Second, Palmer *et al.*'s comments apply less to the channel work in the Final Permit Modification because, unlike many of the projects referenced in the paper, the post-remediation restoration goal is not to enhance biological diversity or improve

existing habitat, values and functions, but to replicate existing functions and values post-remediation. Therefore, the focus of the Proposed Remedial Action is fundamentally different from the goals set for the majority of stream restoration projects reviewed by Palmer *et al.*

Perhaps most important to reiterate in response to this comment, the Final Permit Modification is not an NCD project; instead, it is a contamination removal project. The cornerstone of the Final Permit Modification is to address contamination in river sediment and floodplain soil along the length of the degraded river corridor. The intent of the NCD and bank stabilization techniques proposed by EPA is to reduce the potential for erosion of contaminated banks and the subaqueous caps, thereby preventing additional pollutants from entering the stream system, where risks from exposure to PCBs are high. EPA fully understands that a critical aspect of the project involves applying NCD principles not in a vacuum, but as one tool to be used in concert with an active remediation and restoration program.

Comment 517: The cleanup on the East Branch has destroyed the habitat. It was once possible to see schools of legal-sized fish any time, but now only small fish are seen. Studies of lower organisms in this area are not relevant to the health of the river.

EPA Response 517: EPA disagrees with the assertion that the completed cleanup and restoration in the East Branch (½-Mile and 1 ½-Mile Reaches) has destroyed the habitat in this section of the Housatonic River. On the contrary, all data collected since completion of the remediation indicate greatly improved ecological conditions, with robust populations of resident species of invertebrates and fish.

With regard to schools of large fish being visible frequently in the East Branch, that type of observation is not consistent with the observations made before and during the remediation by EPA and its consultants. Regardless of whether or not it is contaminated with PCBs, this section of the river is simply not large or diverse enough to provide habitat for schools of large fish and lacks the refugia and other habitat features necessary to support large amounts of fish biomass. A semi-quantitative electrofishing survey conducted at three locations in the 1 ½-Mile Reach following the completion of remediation (WESTON 2007 Post-Remediation Aquatic Community Assessment -1 ½ Mile Removal Reach) demonstrated the presence of fish populations dominated by various smaller species. These populations are typical in both species composition and population density for the area. Although larger fish were occasionally encountered, large resident populations of such species have not been observed and are not anticipated in this habitat.

The use of benthic invertebrates as an indicator of the general ecological health of rivers and other aquatic habitats has a long history and is today not only relevant but is one of the most widely applied methods for assessing the condition of aquatic habitats. Indeed, benthic invertebrates comprise the basis for EPA's 1999 Rapid Bioassessment Protocols, a comprehensive and well-established methodology that is used nationally by both federal and state agencies, in addition to researchers, environmental consultants and other environmental professionals, as a means of evaluating the health of rivers and streams. Aspects of the bioassessment protocols were applied as part of the two post-remediation surveys of benthic invertebrate populations in the East Branch (WESTON, 2007; and General Electric Company October 24, 2012, Re: 1 ½ Mile Reach of Housatonic River 2012 Aquatic Macroinvertebrate Sampling Report, 2012). These studies indicate the presence of a robust community of benthic

insects and other invertebrates, with a relative abundance of pollution-intolerant insect taxa (EPT taxa) that was indicative of high-quality habitat. These observations were supported by an observed decrease of over 99% in PCB concentrations in sediment and biota tissue in the East Branch reaches.

Floodplain and Core Habitats

Comment C4: GE asserts the following: Excavating floodplain soils to a depth of one foot or three feet, as proposed by EPA, requires removal of all floodplain vegetation and at least one foot of soil. The upper layers of soil near the surface usually are those that have high organic matter, plant propagules, and soil biota. These soils also provide burrowing habitat for fossorial species of mammals, amphibians, reptiles, and invertebrates. Floodplain soils, particularly if saturated, serve as over-wintering habitat for those species of amphibian or reptiles that hibernate. The proposed remediation will kill individuals of animal and plant species during the excavation process as soils are removed and transported elsewhere, and eliminate their habitats for years to centuries.

Comment C8: GE asserts the following: The main direct negative impact to shrub and shallow emergent wetlands from floodplain soil remediation would be from vegetation and soil removal. Vegetation clearing would cause substantial direct effects, as these wetlands provide: (1) nesting, burrowing, and/or escape habitat and food for birds, amphibians, reptiles, mammals, and invertebrates, including important nesting habitat for migratory neo-tropical songbirds and, in the emergent areas, nesting habitat for two state-listed bird species (American bittern - Endangered, and common moorhen -Special Concern, as of 9-7-14); (2) a significant yearly infusion of biomass, consisting of fallen leaves, decaying herbaceous plants, and woody material, which make up a significant component of the underlying organic layer and are part of the foundation of the food web of these ecosystems; and (3) an effective system for cycling and transforming nutrients, evapotranspiring significant quantities of water, and helping to attenuate flood flows by increasing vegetation roughness.

EPA Response C4, C8: EPA agrees that removal of floodplain soil to a depth of 1 to 3 feet will also remove the vegetation growing there, and that the upper layers of soil in a floodplain typically have high organic matter and contain plant propagules and soil biota. Unfortunately, in the case of the Housatonic River floodplain, the upper layers of soil, as well as deeper layers in many locations, are also contaminated by PCBs released over a period of decades from GE's Pittsfield facility, and it is those upper layers of soil that ecological receptors and recreational and other users of the floodplain contact. As shown in the peer-reviewed Ecological and Human Health Risk Assessments, such direct-contact exposure results in unacceptable risks in some areas, and it is these areas that are targeted for remediation under the selected remedy.

It is unfortunate, but unavoidable, that individuals of some plant and animal species will be impacted in the limited areas targeted for remediation, but EPA believes that the alternative, leaving concentrations of PCBs that pose risk to human health and the environment, is worse. All areas slated for soil removal will be backfilled to original grade with soil of similar characteristics to that removed, and will also undergo active restoration. As demonstrated in the remediation of the floodplain in the Upper 2 Miles, with restoration, native biota will recolonize these areas relatively rapidly; there is no reason to believe that this process will require centuries. In fact, the current floodplain communities (referred to by GE as "mature") did not take centuries

to become established, as they were disturbed when much of the river was modified and realigned and the floodplain cleared as recently as several decades ago.

In all, an estimated 45 of the more than 1,000 acres of floodplain habitat are proposed for remediation sequentially over a period of years, with some additional areas that will be affected by temporary infrastructure. The remaining areas of the floodplain will provide a large amount of nesting and burrowing habitat for species temporarily displaced by the remediation, and natural recovery of the remediated habitats, accelerated by active restoration, will restore the important ecosystem structure and functions (e.g., food web and nutrient cycling).

With regard to state-listed bird species, and other state-listed species inhabiting the floodplain, EPA notes that the Commonwealth of Massachusetts, which has responsibility for ensuring the health and protection of these species, has reviewed the remediation plan and is fully supportive of EPA's decision. EPA worked closely with the Commonwealth in developing SED 9/FP 4 MOD to ensure that it would be consistent with the MESA, and the Commonwealth agrees that limited soil removal in the floodplain is unfortunately necessary for the long-term protection of human health and the environment.

Comment C5: GE asserts the following: There are multiple sources of water that feed these floodplain ecosystems (e.g., groundwater slope seepage, groundwater discharge from seasonally high water tables in the floodplain, and overbank flooding of the river). While efforts could be made to reconstruct the pre-existing swale systems to approximate current drainage patterns, the potential is high for larger overbank floods to cause erosion and destabilization in recently restored areas of the floodplain. The surface topography of the floodplain reflects the influence of floodwater dynamics. Thus, recently excavated soils will be highly exposed to erosion and transport by heavy precipitation and/or floodwaters because it is not possible to revegetate them quickly enough to risk exposure to a significant storm event. Exposing large areas of soil has the potential to subject other unaltered habitats in the floodplain and river to severely damaging sedimentation. Overbank flooding and subsequent floodplain deposition and erosion from surface flow patterns, along with remnant meander scars and levee formation, produce distinct surface topographic and soil variations that then affect biological conditions.

Comment C10: GE asserts the following: Due to the changes in hydrological conditions (as described above for the entire floodplain system), the vegetation currently present in the shrub and shallow emergent wetlands is likely to change. Species that can tolerate a broader range of conditions are likely to be more abundant than those species which require specific habitat conditions within shrub and shallow emergent wetlands. For example, the exotic species purple loosestrife might replace native buttonbush. These changes in vegetation would last until such time as soil and hydrological conditions comparable to pre-remediation conditions return to these wetlands so as to support a vegetative community similar to the pre-remediation community. Given the unpredictable and likely slow rate of organic soil accumulation, it could take a decade or more to reach conditions that would support shrub or emergent plant communities comparable to current communities. It is uncertain whether certain sensitive species, such as the state-listed species, would return.

Comment C12: GE asserts the following: The implementation of remediation activities will have a long-term impact on other floodplain functions as well. For example, the removal of

surface soils in the floodplain would alter soil moisture levels, soil infiltration rates, and groundwater flow. These changes, together with the removal of sediments in the river (which controls the rate and level of groundwater flow in the valley), would alter the groundwater recharge/discharge function of the affected floodplain areas. This function should return as flood deposition restores soil conditions and the disturbed areas become vegetated and root systems stabilize the floodplain soils, but such a return could take decades and would be dependent upon unpredictable flood dynamics, which themselves would be affected by alterations to the river channel and/or banks.

These changes to the PSA floodplain could result in either wetter conditions, such as from the loss of evapotranspiration due to tree removal or from soil compaction resulting in greater perching of surface waters, or drier conditions, such as from the use of sandier topsoils or from changes in overbank flooding and grading that result in decreased flood flows onto the floodplain. Without knowing the source of replacement soils or the dynamics of the reconfigured river channel, the potential hydrologic conditions of the remediated floodplain remain unknown, thereby reducing the chances of correcting problems through adaptive management.

EPA Response C5, C10, C12: No justification is provided for the assertion that widespread changes in hydrological conditions in the floodplain will occur as a result of the limited amount of remediation to be conducted, or for the assertion that changes in hydrological conditions would be sufficient to produce significant changes in the vegetation and species present in these areas. The floodplain remediation specified in the Final Permit Modification will affect only approximately 45 of the 1,000 acres of floodplain in Reaches 5 and 6. Construction will proceed in a phased approach from upstream to downstream and will require several years to complete. Accordingly, only a small portion of the floodplain will be exposed to potential erosion at any time, and appropriate controls will be required to reduce the possibility of erosion due to a significant storm event and/or overbank flooding. Restoration activities will require the detailed surveying of pre-remediation conditions (e.g., soil and vegetation characteristics and species use). Following the backfill with clean soil of similar characteristics, erosion will be further prevented by use of appropriate temporary cover and stabilizing materials until vegetation planted during ecological restoration has become established. Replication of pre-remediation conditions, including surface micro-topography, will also be required.

EPA recognizes that there are multiple sources of water to the Housatonic River floodplain, as listed in the comment. Indeed, it is one of these sources of water – overbank flooding – that has been primarily responsible for transporting PCB contamination released from GE's Pittsfield facility laterally out of the river channel and across the floodplain such that the 1 mg/kg PCB concentration isopleth approximates the 10-year floodplain boundary and defines the limit of the GE/Housatonic River site. However, EPA does not agree that implementation of the floodplain remediation specified in the Final Permit Modification will result in conditions that will either interfere with the drainage patterns and seasonal flooding or lead to significant erosion and destabilization of portions of the floodplain. GE's observations provide a listing of hypothetical adverse impacts that could result from any construction activity involving soil disturbance. There are numerous best management practices and methods that EPA expects will be implemented during construction to minimize the potential impacts enumerated in this comment. Further, EPA believes that the low potential that any of these impacts may actually affect a small

area of the floodplain is fully balanced by the reduction in the human health and ecological risks from the high concentrations of PCB contamination in the soil.

The comments also, as written, appear to presume the lack of active restoration and invasive species control programs. In the limited areas of floodplain to be remediated, pre-remediation conditions will be documented in detail. The active restoration and robust invasive species monitoring and maintenance programs outlined in the Final Permit Modification will require that careful attention be given to avoid the very scenarios of GE's speculation.

Also see Response 147 *et al.* below.

Comment C9: GE asserts the following: shrub and shallow emergent wetlands typically contain soils with high organic content (typically mucky silt or histosols [organic soils]) that have formed over many decades. It is unlikely that sufficient volumes of comparable organic soils could be found for use in any restoration effort, and attempts to manufacture such soils are not reliable, since the soil chemistry and seed bank of the on-site soils are specific to the existing Housatonic River floodplain system. The use of heavy machinery in these areas would likely cause soil compaction, which would affect the permeability of these soils, which influences plant colonization (e.g., slows the process of recolonization by native species and makes surface soils more susceptible to proliferation of invasive exotics), as well as adversely affecting the groundwater recharge/discharge and flood flow alteration functions of the floodplain. Replacement soils would be less conducive to the formation of the necessary subterranean burrows required by certain animals for overwintering, hinder the re-establishment of a native plant community, and facilitate proliferation of invasive plant species. Soil compaction is particularly problematic in shallow emergent marshes. These wetland types contain soft, organic soils that are extremely difficult to work in with heavy machinery when wet - which is most, if not all, of the time - and very difficult to keep dewatered during construction. The likely result would be creation of wetlands that are not the same as those of the current ecosystem. The plant communities would be different, and they would be conducive to colonization by invasive exotics. These new marshes would become less suitable for the current community of wetland-dependent wildlife.

EPA Response C9: Selecting backfill material (including manufactured soil, also referred to as engineered or amended soil) that best mimics the characteristics of the soil currently present is a restoration technique that will also serve to offset the soil disruption that is an unavoidable effect of the remediation. EPA recognizes that it will likely not be possible for backfill to duplicate exactly all of the physical, chemical, and biological qualities of existing floodplain soils. However, the use of soil that is reasonably similar to natural soils is implicit in the Restoration Performance Standard requiring excavated areas to be backfilled to original grade and pre-remediation conditions, and engineering specifications for backfill soil will be subject to EPA review and approval. Other engineering controls will also be necessary to prevent the compaction of backfill soil during and after placement. Ecological restoration in these areas will enhance the ability of backfilled areas to serve substantially the same functions as they did prior to remediation. Finally, EPA notes that less than 5% of the floodplain in the PSA is expected to be excavated; therefore, even if the backfilled soils ultimately present any of the problems cited in the comment despite EPA's oversight, such problems will be limited to a number of small, non-contiguous areas of floodplain and/or subject to additional actions by GE to alleviate the

concern(s). EPA believes that any short-term environmental effects are justified by the reduction of unacceptable human health and ecological risks by the excavation of contaminated floodplain soil.

In recent years, recognizing the limitations of conventional construction equipment in wetland environments, significant advances have been made in the production of suitable equipment, typically with low ground pressure. Examples are marsh buggies (also referred to as amphibious carriers), which exert 1.2 to 1.5 psi on the soil surface. Another example is the use of construction mats of various types suited to specific wetland conditions. These types of equipment not only allow for construction in wetland environments, but greatly reduce subsequent soil compaction.

EPA disagrees that it would be preferable to allow elevated concentrations of PCBs to remain in wetland soil for the extremely long time necessary for natural processes to reduce their concentrations below levels that pose a risks to human health and the environment. Short-term effects are an unfortunate, but unavoidable, result of any remediation. Taken to its conclusion, the logic presented in this comment could be used as an argument against any remediation of any contamination. Accordingly, the Permit criteria require that the short and long-term effects of remediation (as well as other factors) must be evaluated comprehensively to identify the best suited alternative under the Permit criteria. In the case of the Housatonic River and its floodplain, EPA believes that best suited alternative is the one presented in the Final Permit Modification.

Comment C11: GE asserts the following: The return of wildlife communities comparable to the pre-remediation communities in these shrub and emergent wetlands would depend on the return of soil, hydrological, and vegetative conditions. In the meantime, many common game and non-game avian species, as well as state-listed species (e.g., American bittern, common moorhen, wood turtle), would be lost from these wetlands, and the return of the state-listed species is doubtful. Where shrub and shallow emergent wetlands are disturbed by floodplain soil removal or ancillary facilities (access roads and staging areas), it is expected that restoration efforts would result in re-establishment of most pre-remediation functions of these wetlands over time. However, given the constraints described above, this recovery time is uncertain and would likely be measured in decades. In addition, there is a serious risk of additional invasive exotic species expansion into these areas. Moreover, depending on the extent of the disturbances and the length of time over which they last, some of the pre-remediation functions of these wetlands, such as providing habitat for state-listed species, may not return for a much longer period, if ever, in some of the affected wetland areas.

EPA Response C11: EPA recognizes that the necessary remediation of the limited areas of these PCB-contaminated habitats will unfortunately displace individuals of resident species and disrupt the communities for a short period of time. However, as the remediation will occur in limited areas (approximately 16 acres of scrub/shrub and emergent wetlands) of the floodplain (with some additional areas impacted by temporary infrastructure), significant areas of wetland habitat will remain undisturbed over the entire duration of the remediation which is spread over both location and time. These areas will provide refugia for the mobile species of concern. Specific restoration methods (e.g., propagation, relocation) will be required to accelerate the recovery of the habitats.

With regard to state-listed species, the Commonwealth of Massachusetts, which is responsible for the protection and management of these species, participated in the development of the plan for limited remediation of these habitats and is fully supportive of the Final Permit Modification. EPA will work closely with the MA Natural Heritage Program to implement strategies (e.g., limits to seasonal work, relocation, propagation, restoration of specific habitat features) to minimize impacts to these species during and following remediation.

In addition, development of an effective plan for management and control of invasive species (such as that implemented in the first two miles) is a requirement specified in the Final Permit Modification, and EPA will ensure that the invasive species control plan is properly structured and implemented.

Also see Response 147 *et al.* below.

Comment 90: The details on how the removal of contaminated material from the river and floodplain will be performed and how the excavated material and replacement clean material is processed and transported should influence the decision on the extent of the cleanup, as demonstrated by the decision to reduce the level of cleanup in Core Area 1, which is just about 100% wetlands and has the highest concentration of priority habitats in the whole River system. There is no way to conduct the cleanup required and process and transport the contaminated and clean material in that area without destroying Core Area 1. [The Rest of River area includes several Core Area 1 locations. The commenter did not specify which Core Area 1 location is being referred to in the comment. For purposes of including an example of a Core Area 1 location as part of EPA's response, EPA assumes the commenter is referring to the large tract of Core Area 1 in Reach 5A generally located between and to the north of Palomino Drive and Eric Drive in Pittsfield, Massachusetts.]

EPA Response 90: EPA believes that the cleanup required can be completed, including the processing and transporting of contaminated and clean material while still being protective of the Core Area 1 locations. To achieve a balance between reducing the risk of PCBs eroding from a bank into the river and reducing risk to human health to acceptable levels in the floodplain soils while still maintaining the habitat functions, values, and other attributes of the floodplain and the river, the Final Permit Modification includes Performance Standards and Corrective Measures that focus not only on reduction of the risks associated with the PCB contamination, but also on the minimization of remedial impacts and restoration of all ecological resources and habitats impacted by the Corrective Measures, to the extent feasible.

To reduce construction-related impacts to the floodplain and riverbanks, the removal and capping of Reach 5A (which includes portions of Core Area 1) will generally use engineering methods employed from within the river channel or other methods approved by EPA. For Reach 5A, riverbanks that are excavated will be reconstructed to minimize erosion considering the principles of Natural Channel Design. This will allow the maximum use of bioengineering methods in restoring riverbanks. See the Section III.C.1 of this Response to Comments for additional information. In addition, in the Final Permit Modification, the Performance Standards for floodplain remediation have been revised to explicitly include the following:

(d) Permittee shall avoid excavation in Core Area 1 habitat (other than Frequently Used Subareas) except in limited areas where necessary to meet Secondary Floodplain Performance Standards in Table 1.

(e) Permittee shall minimize the impacts from remediation on a case-by-case basis [permit language also includes a footnote with additional details here] for Core Areas 2 and 3 (as shown in Attachment B); however, at a minimum, Secondary Floodplain Performance Standards in Table 1 shall be attained.

Final Permit Modification at II.B.3.a.(1)(d) and (e).

These Performance Standards will reduce the impact on Core Area 1 by only requiring remediation as necessary to meet the least stringent, but still protective, standard for human health. Although not directly stated in the comment, the Performance Standards also require minimization of impacts in sensitive areas referred to as Core Areas 2 and 3.

Also, the Final Permit Modification includes a Performance Standard for the Restoration of Areas Disturbed by Remediation Activities, as discussed above.

Finally, GE is required to comply with Applicable or Relevant and Appropriate Requirements including, but not limited to, any activities to satisfy the separate net benefit mitigation standard in the Massachusetts Endangered Species Act (MESA).

Specific details of the construction plans (e.g., equipment, transport, staging areas) will be developed during the various Remedial Design documents, which allows for public input and the use of an adaptive management approach.

EPA believes that the Performance Standards, Corrective Measures, processes and procedures GE is required to adhere to in the Final Permit Modification will ensure that remediation is limited in sensitive Core Areas and that both floodplain and river habitat will be successfully restored, to the extent feasible, to pre-remediation conditions.

Comment 516: If the mature forest bordering many areas of the river is cut as part of the remediation, it will not be reestablished in our lifetime, and may never become reestablished. The assessment that this forest is only 60 years old is far off the mark in many areas.

EPA Response 516: Please see Response 600 *et al.* below.

Comment 600: GE asserts the following: The proposed remedy would impact 36 acres of floodplain wetland forested habitat. It would require the removal of all mature trees in those areas, resulting in a long-term loss of mature wetland forested habitat, which is vital to the health of the riverine/floodplain ecosystem of high importance to the Commonwealth. Assuming these trees are replanted, it would take at least 50 to 100 years for a replanted forested community to reach a mature condition comparable to current conditions – or potentially longer due to cumulative stresses from floods, changes in microclimate, changes in hydrology, and colonization by invasive species. During that period, there would be a loss of the coarse woody debris and leaf litter that provides habitat for numerous woodland species, a decrease in the floodplain's flow alteration function, changes in soil composition, a loss of the forest wildlife

species that utilize the mature forested habitats, and a fragmentation of the largely undisturbed forested riparian corridor in the PSA that is critical to the dispersal and migration of various wildlife species.

Comment C6: GE asserts that soil removal and the related removal of trees and coarse woody material would affect the distinct floodwater-influenced microtopography of the floodplain forest, reducing the floodplain roughness that produces flow resistance and thus contributes to the important flood flow alteration function of the floodplain. Reduction in roughness cannot be countered because the vegetative cover would become less dense due to floodplain clearing activities, and no amount of planting can counter the reduction in roughness. These conditions would result in faster flows during flood events, more erosion, and less infiltration. Reduced infiltration will likely reduce sustaining base flow to the river.

Comment C7: GE asserts that even with ecological restoration following remediation, replicating the structure and composition of the existing floodplain forest is unlikely. Although it is feasible to replace emergent and shrub species within a few years with direct planting, replacing forested habitat is much more complex, as the successional trajectory for a forest is much different than that for emergent, herbaceous, or shrub communities. Through competition, forests go through a reduction in numbers of stems from seedlings (up to 3 feet tall, 5,000-10,000+ stems/acre) to saplings (3-10 feet tall, < 5 inches in diameter, 1,000-3,000 stems/acre) to pole stage after about 20-30 years (5-11 inches in diameter, 500-1,000 stems/acre) to mature trees (> 11 inches in diameter, 100-200 stems/acre), usually occurring at more than 50 years after planting. Moreover, forests often have uneven size/age classes, as does the forested floodplain in the PSA. Planting replacement trees in a cleared area all at the same time could not reproduce these characteristics. Thus, even under optimum conditions (i.e., with invasive exotic species kept under control, which is highly unlikely over large areas), the developing forest would be an even-aged community for more than 25 years, with minimal structural profile diversity and associated significant reduction in overall wildlife diversity.

Comment C23: GE asserts the following: The remediation proposed in Reaches 5A, 5B, 5C, and their associated backwaters is scheduled to be completed in just 8 years (Fig. 4 [from GE's comments, Attachment C]). This means that extensive areas will be simultaneously denuded of their natural vegetation. This is of particular concern where the dominant vegetation is large silver maples. These trees are currently tall enough to support canopy-dwelling birds, have crowns wide enough to shade the river and backwaters, and have trunks old enough to provide dens for cavity-dwelling mammals and birds and to become large woody debris in the river. However, if SED 9/FP 4 MOD is implemented, these mature forests will, within just 8 years, be replaced with saplings that will take at least 50 years to reach tree height, and probably well over 100 years to develop full-size crowns and boles.

Comment C24: GE asserts the following: Many of the trees found within the floodplain in Reaches 5A and 5B are about 50 to 75 years in age, and the mature forests bordering Reach 5C and around Woods Pond are most likely 75 to 100 years old or older. In EA 2, for example, cottonwood and silver maple occur as multi-stemmed clumps (about 8 trees/acre), 12-36 inches in diameter at breast height (dbh), with complex root masses. A multi-aged forest produced over time will have a portion of large-diameter stems (> 15-inch dbh) suitable for producing cavities. Cavity-nesting birds (e.g., screech owls, wood ducks, and pileated woodpeckers) and mammals

(flying squirrels, bats) that use tree cavities and the bark of old trees return to these nesting, resting, and feeding sites over multiple years. Loss of the mature forest trees along the riparian corridor would remove these critical breeding habitats, and thus, many individuals of these species. In the best case, it will take 50 to 100 years for the mature forest to be reestablished. However, reestablishment could take even longer due to the cumulative stresses of floods, changes in microclimate, changes in hydrology and colonization by invasive species.

During the period of at least 50 to 100 years until the mature forest is re-established (if that occurs at all), the tree canopy would be more subject to sunlight and wind impacts and there would be a reduction in large woody material. The decrease in availability of mature trees and forested habitat would reduce the capacity of the floodplain forest to support species dependent on such habitat, such as pileated woodpeckers, thrushes, a variety of warblers and owls, and mammals such as the fisher and bobcat. As the replanted forest develops, it goes through stages of supporting different communities until such time as it reaches maturity. Younger, developing plant communities support a different wildlife community that is characteristic of early and mid-level successional habitats. Thus, EPA's conclusion regarding a "temporary loss" is inapplicable to these floodplain forests.

EPA Response 600, C6, C7, C23, C24: EPA acknowledges that the PCB remediation activities will directly affect aspects of forest ecology raised in the comments such as the production of coarse woody debris and leaf litter, flood flow alteration, and soil characteristics in the short-term and on a localized scale as was recognized in the Comparative Analysis. However, the remediation and its unavoidable short-term impacts will remove PCB contamination from the floodplain soil, and the restoration requirements specified in the Final Permit Modification will result in a mature forest becoming reestablished following restoration, benefiting the river and floodplain ecosystems. The impact to the forest and its ecosystem functions will be temporary, and the ecosystem, as it has in the past, will recover as succession transforms the young vegetation that initiates the restoration process into a mature restored forest.

Based on results of ecological characterization studies in the early 2000s, EPA estimated (via dating techniques) that the trees in the forest areas of the PSA to be remediated vary in age, with some as old as 100 or more years. Considered as a whole, however, the floodplain forests in the Rest of River area consist primarily of much younger trees. The Housatonic River and its floodplain have been heavily impacted by human activity over the past 300 years, including clearing and deforestation of nearly the entire watershed.

There are restoration techniques available to mitigate the specific types of effects noted in the comments. For example, during floodplain restoration, coarse woody debris can be introduced through the reuse of tree trunks that were removed during remediation, and similarly, woody materials can be introduced during bank restoration. Trees that will be planted within the remediated areas during restoration activities will begin to produce leaf litter in their first years, so the loss after clearing is a matter of degree and is temporary, as these planted trees grow and produce increasing amounts of leaf litter. While floodplain roughness in each of these limited areas may be reduced immediately following completion of contaminated soil removal and backfill with clean soil, effective roughness could be returned by appropriate restoration activities, including restoring microtopography, replacement of coarse woody material reserved during site clearing, as well as installation of various temporary ground cover and barriers to

flow. Construction methods can be employed that avoid excess soil compaction. EPA expects that GE will propose any or all of these methods, along with others, to control the potential for flood flow alteration and restoration of the microclimates present in the floodplain as well as other adverse effects following remediation and restoration. If there is an unexpected event or outcome such as flood impacts to newly established vegetation, the maintenance program required in the Final Permit Modification provides a mechanism to mitigate the effects.

It is true that in many situations, because of the time necessary for the growth of mature trees, large trees of varying size classes may be one of the last components to become established in a developing forest. However, EPA believes that GE overstates this concern with regard to the Housatonic River floodplain remediation activities. The forested floodplain remediation is planned for an estimated 36 of the 1000 acres of the total floodplain area, with some additional disturbance required for supporting infrastructure. The dominant tree species in the floodplain are relatively fast growing in comparison to the statistics provided by GE. The Housatonic River floodplain forests are dominated by silver and red maple and cottonwood, tree species that grow at a very rapid rate. The silver maple (*Acer saccharinum L.*) is one of the fastest growing deciduous trees of the eastern and mid-western forests. It can grow 3-7 feet per year achieving a mature height of 90 feet, and is a source of fast shade, large woody debris, and litter in streams. Silver maple shares many of its sites with red maple (*Acer rubrum L.*), a medium sized tree that grows 2-5 feet per year reaching a mature height of 68 feet. The cottonwood (*Populus deltoids*) is also fast-growing (up to 6 feet per year) and is also dominant in the forested floodplain of the Rest of River. Therefore, while it may be true as a generalization that restoration of some mature forest communities can be difficult and slow to achieve, the dominance of these species in the natural communities and conditions of Rest of River supports EPA's position that restoration of forested floodplain in these areas is feasible in a reasonable time frame following remediation.

It is also important to consider the history of the Housatonic River floodplain forest, which may appear to be a natural ecosystem that has evolved over millennia, but in fact has recovered in the relatively recent past from even more severe disturbances related to agricultural and other anthropogenic influences. This recovery process occurred naturally over the past 60-100 years, not aided by active restoration activities and without careful monitoring and adaptive management. With an active restoration program in place to promote and track the restoration response after remediation, the historical ecosystem response to human intervention supports EPA's position that substantial recovery will not require centuries following remediation, but rather a much shorter period of time. The restoration program will include active planting, transplanting, and seeding of native species occurring in the undisturbed floodplain and riparian forest. The survivorship, health, and growth of planted trees will be monitored post-construction, and vegetation management will be required to promote optimal growth rates of forest tree species. In this way, the planting efforts will generally be designed to restore former forested areas in as short a time frame as is feasible, relying on both planted and volunteer trees and shrubs.

Only a relatively small percentage of the floodplain will be disturbed during the estimated 8 years of work in Reaches 5A, 5B, and 5C. Even this work will be dispersed through time and location, which will allow the refugia of nearby mature forest habitat to remain and mobile species to move among mature forest patches during the remediation and restoration activities. As restored areas mature, migration and/or dispersal and re-introduction of mature forest species

can be expected. The riparian corridor will remain because work in such a limited area of the floodplain will only temporarily create small openings that will have minimal impact on corridor integrity and contiguity. In addition, phasing of the remediation and the careful location of infrastructure will prevent these impacts from occurring for the entire duration of the project, further reducing its impact.

Finally, EPA notes even if ultimately any of the problems that are described in the comments occur despite EPA's oversight, such problems will be limited to a number of small, non-contiguous areas of floodplain and/or subject to additional actions by GE to alleviate the concern(s). EPA believes that any short-term environmental effects are justified by the reduction of unacceptable human health and ecological risks by the excavation of contaminated floodplain soil.

EPA's belief in the success of this recovery is supported by the documented success of restoration activities at numerous sites, including in the 1 ½-Mile Phase 4 Floodplains properties, where GE planted over 650 trees and shrubs. With proper maintenance and replanting when necessary, GE achieved nearly a 100% survival rate. As an example, for the 79 cottonwoods planted in May 2010 in the 1 ½ Mile, 77 were healthy and the average height of the trees by the summer of 2012 (two years later) was at least 24.2 feet, with 58 of the trees having a recorded height of greater than 25 feet as documented by GE in 2012. Similarly, post-remediation monitoring of the adjacent riverbanks in both the ½-Mile Reach and 1 ½-Mile Reaches of the Housatonic River indicates that the trees and shrubs planted as part of the riverbank restoration efforts have been meeting or exceeding the Performance Standards for survivorship and areal cover. EPA expects that the future restoration of affected areas in the Rest of River will produce similar results.[7]

Also see EPA Response C5 *et al.*, 147 *et al.*, 603, C20, and C9 of this Section.

Comment 363.a: The mile and a half upstream that was cleaned is a dead zone. Before the cleanup there were large fish in the river, now there are none. The diverse forest canopy has been replaced by a monoculture of small trees and bushes.

EPA Response 363.a: The response to the portion of this comment regarding the absence of large fish in the 1 ½ -Mile Reach is provided in the EPA Response 517.

EPA disagrees with the characterization that vegetation on the riverbanks and floodplain in the 1 ½ -Mile Reach is a monoculture of small trees and bushes. EPA conducted extensive pre-remediation vegetation surveys along the riverbanks in order to develop post-remediation

---

[7] **References for Responses 600 *et al.*, and 363.a:**

Arcadis. 2009. *2008 Annual Monitoring Report, 1 ½-Mile Reach of the Housatonic River.* Revised May 2009.
Arcadis. 2015. *2014 Annual Monitoring Report, 1 ½-Mile Reach of the Housatonic River.* January 2015.
Weston Solutions, Inc. (Weston). 2007. *2006 Annual Restoration Monitoring Report, 1 ½ Mile Removal Reach, General Electric (GE)/Housatonic River Site.* February 2007.
Woodlot Alternatives, Inc. 2002. *Ecological Characterization of the Housatonic River.* Report prepared for U.S. Environmental Protection Agency Region 1, Boston, Massachusetts. September 2002.
GE report submitted September 11, 2012. *Summary of August 2012 Inspection Activities for the Group 4C Floodplain Properties.*
Weston. 2011. *March 2011 1 ½-Mile Reach Completion Report.*
Arcadis. 2010. *Housatonic River Floodplain-Non-Residential Final Completion Report.*

planting plans that would lead to the establishment of vegetation similar in types and diversity to that in the area prior to the remediation. Based on the survey and a preference for native riparian species, over 6,000 native trees and shrub were planted consisting of a mix of black willow, box elder, silver maple, cottonwood, silky dogwood, northern arrowwood, winterberry holly, red-osier dogwood, and choke cherry. In the floodplain adjacent to the last stretch of the 1 ½-Mile Reach, an additional 1,300 trees and shrubs consisting of the species planted on the riverbanks plus red maple, sugar maple, river birch, paper birch, white birch, white pine, American cranberry, red oak, green ash, eastern hemlock, and serviceberry were planted. Clearly a wide variety of native riparian and floodplain plantings were installed to restore the banks and floodplain (Arcadis 2010, Weston 2011).[8]

As evidence of the effectiveness of active restoration, post-remediation monitoring in the 1½-Mile Reach of the Housatonic River indicates that the trees and shrubs planted as part of the riverbank restoration efforts have been meeting or exceeding the Performance Standards for survivorship and areal cover (Weston 2007, Arcadis 2009, 2015). Visual observations and quantitative assessments during monitoring performed between 2004 and 2014 show that woody vegetation survivorship (including volunteer plants) has generally been good, and growth was characterized as healthy and vigorous, with many of the trees with heights exceeding 25 ft. (Weston 2007). EPA expects that future restoration efforts in the Rest of River will experience similar results.

Comment 521: Cutting of mature trees as part of the remediation will adversely impact mating pairs of bald eagles that have been seen in the ROR area.

EPA Response 521: EPA recognizes the importance of protecting Threatened and Endangered species such as bald eagles, and is coordinating with the Commonwealth of Massachusetts and the State of Connecticut to identify high-quality habitats for state-listed species and to guide remediation efforts in avoiding and minimizing adverse impacts to the species. This response focuses on describing the bald eagle's general habitat requirements, the recorded occurrences for this species (including breeding pairs) in the proposed remediation areas, the overall habitat potential in the remediation area, and the steps that would be taken to protect the species from harm as a result of remediation activities.

Bald eagles are found in Massachusetts and Connecticut as year-round, wintering, or migrating inhabitants. Although the number of eagles has been increasing gradually in recent years in these two states, the species is currently listed as "Threatened" by both the Massachusetts NHESP under the MESA and by the Connecticut Department of Energy and Environment (CT DEEP) under the Connecticut Endangered Species Act. The bald eagle was removed from the federal list of endangered and threatened species in 2007, but is still federally protected by the Bald Eagle and Golden Eagle Protection Act of 1940 and the Migratory Bird Treaty Act of 1918.

In Massachusetts and Connecticut, bald eagles typically prefer areas of open water for feeding with nearby tall trees for roosting and nesting. Fish and waterfowl are the preferred foods. Eagles require large amounts of forested shoreline with trees for nesting and perching. Nests are

[8] *Id.*

located 30 to 120 feet from the ground in live trees that are relatively large and typically taller than surrounding trees. The nests usually lie below the tree crown to afford protection from the elements. Wintering eagles require suitable trees for night roosting that may be many miles from feeding areas but in locations protected from wind. In winter, bald eagles may congregate at areas with open water where fish and waterfowl are abundant. It is thought that the eagle population in Massachusetts is limited primarily by the number of large water bodies surrounded by mature forest. Bald eagles, particularly nesting pairs and winter-roosting birds, are easily disturbed by human activity; disturbance may cause nest abandonment. See CT DEEP 2010. *Bald Eagle Fact Sheet* and NHESP. 2016. *Bald Eagle Rare Species Fact Sheet.*

Although bald eagles were observed in the area of the Housatonic River during the ecological characterization studies, no nesting eagle pairs were observed in the Housatonic River PSA or in the Rest of River. Between 1998 and 2001, eagles were not observed breeding during raptor surveys within Reaches 5 and 6 or in any of the three nearby reference areas, though there were incidental bald eagle observations, including attempted nesting, in the vicinity of Woods Pond and at the Threemile Pond reference area. The NHESP (personal communication from L. Glorioso, NHESP, to Stantec Consulting Services Inc., April 29, 2015) reports that the only record of eagle nesting in the area was a 2005 observation of nest maintenance about 1 mile north of Woods Pond (the nest was abandoned unfinished). Publicly available information also indicates that in 2008 there were 72 wintering bald eagles counted in Massachusetts, and 26 pairs maintaining territories, including one pair on the Housatonic River. Similarly, the CT DEEP reports that in 2010, 18 pairs of eagles made nesting attempts in Connecticut, with nesting attempts and territorial behavior observed in 6 of the state's 8 counties.

The Housatonic River in the PSA and Rest of River areas contains open water feeding habitat for bald eagles. Existing riparian forests with tall, mature trees along the shorelines provide potential perching opportunities for feeding eagles. Some of these forests also contain trees potentially suitable for nesting, particularly superstory conifers in the undeveloped areas with low levels of human-caused disturbance. Based on eagle observations and known preferences, one of the most likely areas with nesting potential exists in the vicinity of Woods Pond on the eastern side of the river in the undeveloped October Mountain State Forest, which extends east to Washington Mountain Lake where eagles were observed feeding.

The Massachusetts Division of Fisheries & Wildlife has identified Priority Habitats for state-listed species in the PSA, and the NHESP has further identified "Core Habitat Areas" (based on field-documented occurrences) representing delineated habitats for listed species. As of 2012, these Core Areas did not include bald eagle as a species in the delineated habitats, suggesting that, even though bald eagle habitat exists in the Rest of River, it is not considered Priority Habitat. Nonetheless, EPA is committed to protecting the species.

EPA recognizes that the activities associated with PCB remediation will impact some of the mature trees located within the Rest of River that could be used by eagles for nesting and perching. However, the remediation will remove PCB contamination and reduce the concentrations of PCBs in fish, their preferred food. The remediation activities will only affect a small portion of the mature trees within the Rest of River. Project phasing will help to limit and spread out the effects to the riparian forest habitats and ecology, thereby maintaining stretches of the river for bald eagles to utilize during construction.

The Massachusetts NHESP and CT DEEP maintain and update data on listed species occurrences. The two states have been, and EPA anticipates will continue to, work cooperatively with EPA to assess the potential impacts to bald eagles and other listed species and their habitats as part of the proposed remedial activities in the Rest of River. This collaborative process will continue to help guide the cleanup efforts to avoid, minimize, and mitigate impacts to listed species and natural communities. As the planning and implementation of the remediation and restoration activities move forward, EPA will continue to work closely with these state agencies to identify listed species habitats and site-specific concerns (e.g., bald eagle nests) that may be affected by the cleanup activities.

Vernal Pools

Comment 601: GE asserts the following: The proposed remedy could impact up to 43 vernal pools (27 acres) in the PSA. Use of conventional remedial techniques in vernal pools would cause severe harm to those pools and loss of the sensitive amphibians that inhabit them due to changes in the hydrology, vegetative characteristics, and soil composition of the vernal pools. Moreover, those changes are likely to be irreversible since, contrary to EPA's assertion, there is no scientific support for the suggestion that vernal pool restoration will successfully return the affected pools to their pre-remediation condition. The evidence demonstrates that vernal pool creation or re-creation has a very low success rate and that, in most cases, vernal pool functions cannot be adequately replaced. The Commonwealth has likewise expressed its belief that "restoration of these vernal pools will not result in the actual replication of the vernal pools and associated amphibian communities that existed prior to removal of the pools."

Comment 602: GE asserts the following: In addition to the impacts on the vernal pools themselves, the proposed remedy would adversely affect varying portions of the critical 100-foot and 100- to 750-foot buffer zones around vernal pools in the PSA, which provide important non-breeding habitat functions (including cover, temperature and moisture regulation, foraging sites, and overwintering sites) for the vernal pool species. The proposed remedy would impact up to 52% of the 100-foot zone and up to 29% of the 100- to 750-foot zone for individual pools. In total, it would adversely affect approximately 10 acres within 100 feet and 60 acres within 100-750 feet of the vernal pools in the PSA. These impacts would disrupt those areas' important non-breeding functions for vernal pool amphibians, and thus further decrease the chances of successful restoration.

Comment C25: GE asserts the following: The most important and distinguishing feature of vernal pools is their hydroperiod, or the timing of flooding (when and how long before they dry down). The hydroperiod is what distinguishes these environments from permanent ponds and lakes by providing breeding habitat for obligate vernal pool species that excludes breeding populations of predatory organisms (e.g., bull frogs, green frogs, snapping turtles) (Calhoun and deMaynadier 2008). Hydroperiod is influenced by hydro geomorphic setting (HGM), defined by where a pool occurs in the landscape (e.g., groundwater or surfacewater depression, floodplain or perched setting) (Leibowitz and Brooks 2008) and in-pool characteristics (e.g., sediment types and stratigraphy, microtopography, foliage cover). It is very unlikely that soils that will be used to replace the soil excavated from the vernal pools and the adjacent areas will have the same permeability as the current soils in the vernal pools, particularly given the complex inter-bedding of silt and mucky soil layers in the existing soils. Replacement soils with a different permeability would not retain comparable amounts of surface waters and may not allow for comparable flow

of groundwater into or out of the pools. Pool replacement soils may subside, leading to longer hydroperiods.

Attempts to reestablish hydroperiod are unlikely to be successful (see Calhoun et al. 2014). Similarly, the reconstruction of the swales that convey water into and out of the vernal pools and re-establishment of riverbank conditions that would preserve the overbank flooding into the swales are unlikely to result in conditions that match current conditions. Minor changes in the surface elevations at control points where surface water is conveyed into and through the swales could significantly alter the quantity of flow to the vernal pools. In addition, loss of mature trees surrounding vernal pools would change rates of evapotranspiration, usually making the habitats wetter, and thus less suitable for obligate vernal pool species. When existing pools are disturbed, as will be the case for as many as 43 vernal pools in the PSA, efforts to reproduce the full complement of soil and hydrologic characteristics are unlikely to re-establish existing or comparable hydroperiods within the vernal pools.

Comment C26: GE asserts the following: Vernal pool remediation would involve the removal of the surficial soil, together with the vegetative cover, tree stumps, roots, and woody debris, in all or a portion of the vernal pools and the adjacent areas. These soil disturbances would have a significant direct effect on vernal pool wildlife. The soil compaction associated with the remediation, as previously discussed in connection with shrub/emergent wetlands, would similarly result in long-term changes in hydrologic patterns. The remediation would also remove physical components of the vernal pools that are critical to vernal pool ecology- e.g., the organically enriched soils, which provide a medium that supports the food chain (microbial nutrient transformers), affect permeability so as to keep the pools from drying out too soon, and facilitate groundwater flow in groundwater-influenced vernal pools (Leibowitz and Brooks 2008). Further, the remediation would affect the surrounding landscape characteristics that affect the timing and quantity of surface water and groundwater inputs into the pool and conveyance of water out of the pool (e.g., their juxtaposition with fluvial swales that flood waters into the pools). As a result, important elements of the vernal pool animals' life cycles, including breeding for obligate vernal pool species, would be disrupted. Tree clearing within and immediately adjacent to the vernal pools would also produce substantial direct adverse effects on the vernal pool ecosystem, as these mature trees provide shade that moderates surface water, soil, and air temperatures and evaporative losses, and additionally provide a significant yearly infusion of biomass (fallen leaves, twigs, and branches) that serves as the base of the detrital food web and as cover from predators (Baldwin et al. 2006b).

Comment C27: GE asserts the following: Vernal pools may function as discrete aquatic systems, but they often occur in clusters, allowing a metapopulation (a set of sub-populations) of amphibians to disperse among the pools (Gibbs and Read, 2008). It is the proximity of vernal pools with slightly differing, but generally suitable habitat characteristics, as currently present in the PSA, which provides the necessary network of breeding sites to keep the local population of a species intact. Vernal pool amphibians display a high degree of fidelity to breeding sites (Berven and Grudzien, 1990; Vasconcelos and Calhoun 2006), but opportunities for occasional exchange of genetic material among individuals by dispersing juveniles from different subpopulations are important to avoid reproductive isolation (Gibbs and Read, 2008). This exchange can occur when pools are present within an appropriate habitat matrix, such as the contiguous area of mature forest in the PSA. If the physical structures or hydrologic regimes of

the pools are altered, or the habitat matrix shifts to a non-forest habitat type, as would occur if SED 9/FP 4 MOD is implemented, then amphibian populations are at risk. Adult and emigrating juvenile amphibians have been shown to avoid clearcut areas adjacent to vernal pools (Patrick et al. 2006). Disruption of connectivity that is essential for dispersing animals, along with loss of the critical features of the forest floor that provide cover, temperature and moisture regulation, foraging sites, and overwintering sites to vernal pool species (see deMaynadier and Hunter 1998; Calhoun and deMaynadier 2004), as would occur under SED 9/FP 4 MOD, would constrain subsequent colonization and recolonization of the impacted vernal pools by obligate vernal pool species. Additionally, conversion to more open pools (e.g., less shade and forest cover) will likely promote use of those pools by habitat generalists such as green frogs or bullfrogs, both voracious predators of pool obligates (Vasconcelos and Calhoun 2006).

Comment C28: GE asserts that the impacts of SED 9/FP 4 MOD on vernal pools and associated habitat would be largely unavoidable as impacts would be significant regardless of the time of year of operations. Working in the pools when the amphibians have left the pools for the season would avoid one set of impacts (i.e., to the breeding and larval stages), but would simply displace impacts to the terrestrial life stage of the vernal pool amphibians, as vernal pool amphibians spend the majority of their annual life cycle in the surrounding forest. Even if the remediation work were to occur during the low-flow season and after the spring breeding and migration period, this would not avoid direct mortalities to vernal pool juveniles and adults living in the leaf litter or in shallow burrows. These are slow moving organisms that are especially vulnerable to ground disturbance or soil compaction. Further, the impacts of remediation in a given pool would last multiple years beyond the season in which that remediation takes place, thereby adversely affecting the breeding potential of the local population. Because vernal pool amphibians have strong site fidelities, they may unsuccessfully attempt to return to disturbed vernal pools, even if the pools are no longer suitable for breeding as we expect would be the case here.

Comment D1, D2: GE asserts the following: First, the evidence of breeding by any vernal pool amphibian sufficient for certification of a vernal pool under the Commonwealth's regulations is not appropriate to evaluate the potential population-wide effects on pool-breeding amphibians by destruction of both pool and terrestrial habitat at the scale proposed by EPA for the Rest of River. The MA NHESP's evidence-of-breeding criterion for certification is designed to protect vernal pools with this modest showing, not to maintain the population persistence of more diverse populations of pool-breeding amphibians or to maintain other vernal pool ecosystem services (e.g., resting and foraging sites for mammals, birds, and other herpetofauna (Mitchell et al. 2008)), biogeochemical services including nutrient cycling and transformations (Capps et al. in press), or hydrologic functions (Mushet et al. in revision). These guidelines were NOT intended or crafted for determining whether a remediated pool meets the goal of sustaining current population levels of pool breeding amphibians or other landscape-scale pool functions (see Lichko and Calhoun 2003, Calhoun et al. 2014). Second, EPA's experience with the remediated and "restored" vernal pool known as 8-VP-1 is no evidence that the over 40 vernal pools that could be affected by EPA's proposal (as an upperbound estimate) can be effectively restored. The single remediated vernal pool does now provide appropriate breeding habitat for wood frogs in some years (following a dry-down year) but also serves as a potential sink in years when hydrologic conditions allow green frogs to successfully breed there, which is devastating for sensitive vernal pool species. This mixed result tells us nothing about the effect of the

remediation proposed by EPA for the Rest of River. The relevant study would require baseline research on amphibian breeding populations of an analogous section of river with multiple pools and associated terrestrial habitat followed by a recovery study. Given that this is not possible, one needs to rely on broader scale studies that compare reference pools to mitigated pools with sample sizes large enough to be statistically significant (Calhoun et al. 2014). Findings from these studies are more relevant to guiding decision-making with respect to pool integrity in this system than are findings from a single, relatively undisturbed site where there is a strong local population of pool-breeders to recolonize a pool.

EPA Response 601, 602, C25, C26, C27, C28, D1, D2: Based in part on these GE comments, EPA has modified the Vernal Pool requirements to emphasize alternatives to excavation of Vernal Pools. EPA is aware of the challenges that may be posed in the remediation and restoration of excavated Vernal Pools, but disagrees with the comment that this will result in irreversible changes and have a very low chance of success. EPA believes that the long-term environmental benefits of stabilizing and/or addressing the risks posed by PCB contamination in the Vernal Pools will outweigh short-term changes and temporary loss of functions that may happen as a result of remediation activities.

EPA has reviewed the literature articles cited by GE in its comments and the state of the science related to the history and efficacy of Vernal Pool restoration and creation in the context of the Housatonic River cleanup. It is clear that Vernal Pool restoration in particular (as opposed to Vernal Pool creation) can be accomplished successfully with a careful approach and attention to detail. In the evaluation of 15 Vernal Pool creation projects in New England, Lichko and Calhoun (2003, Attachment D-15 to GE's comments) note that failures of pool creation projects to replace key Vernal Pool functions were due primarily to lack of clear goals, poor planning, poor execution, and lack of clear criteria for measuring success. Other studies are in accord with these conclusions, and indicate that an important factor in the success of Vernal Pool creation is evaluating and replicating physical and biological conditions of reference pools and/or those pools to be restored, particularly in regard to hydroperiod and pool morphology.

Based on comments received by GE, the Final Permit Modification includes modified Vernal Pool requirements to avoid excavation to the extent possible by specifying the use of an activated carbon (or similar) amendment of Vernal Pool soils. Activated carbon amendments reduce the bioavailability of organic contaminants by increasing the organic carbon content of the contaminated medium which binds the PCBs. Application of these amendments has shown promise in a number of scenarios as discussed in Attachment 3 to the Comparative Analysis. Activated carbon (AC) and similar amendments are increasingly being used successfully as a component of the remedy at contaminated sediment sites (Patmont C.R., U Ghosh, P LaRosa, C.A. Menzie, R.G. Luthy, M.S. Greenberg, G. Cornelissen, E Eek, J. Collins, J Hull, T Hjartland, E Glaza, J Bleiler, and J Quadrini. 2014. *In Situ Sediment Treatment Using Activated Carbon: A Demonstrated Sediment Cleanup Technology.* Published by the Society of Environmental Toxicology and Chemistry. October 2014 (Patmont *et al.*)). EPA believes there is a reasonable expectation that the application of AC will be successful, resulting in the avoidance of excavation in at least some of the contaminated Vernal Pools designated for remediation. To the extent that the area adjacent to the Vernal Pool is disturbed by the application of AC, GE will be required to restore the area to pre-remediation condition. Only if the application of the amendment is determined to be unsuccessful does the proposed remedy

require excavation and restoration of the Vernal Pools. Furthermore, should the AC approach not work, the Final Permit Modification specifies that no excavation is required in Core Area 1 and GE is required to minimize the impacts from excavation in Core Areas 2 and 3 on a case-by-case basis.

In the event that AC amendment is not successful in achieving the required reduction of bioavailability, and excavation and restoration of the Vernal Pools outside of Core Area 1 is required, EPA believes this can be successfully accomplished. EPA acknowledges that, if performed haphazardly, the cleanup and subsequent restoration efforts of Vernal Pools have the potential to cause changes in sediment types, soil structure and composition, degree of soil compaction and resulting permeability, pool size and depth and overall hydrologic regime, pool hydroperiod, microtopography, vegetation characteristics, shading and foliage cover, litter and coarse woody debris, characteristics of surrounding forested areas, habitat connectivity and other important parameters of these ephemeral pool features. However, these and other potential impacts can be eliminated or reduced by a well-designed remediation and restoration program such as the one outlined in EPA's Final Permit Modification. In such a program, the timing, duration, and phasing of remediation and restoration and other methods would be considered to minimize impact on local populations. See also Response 600 *et al.* for details with respect to concerns regarding the effects of tree clearing. Consideration will also be given to any remediation required in areas surrounding the pools to minimize adverse effects to the terrestrial life-stages of the amphibians to the extent possible.

In developing the Final Permit Modification, EPA coordinated with the Commonwealth of Massachusetts and the State of Connecticut regarding cleanup approaches, and evaluated remediation alternatives against the Permit's general standards and decision factors. The Final Permit Modification includes a requirement for avoidance and minimization of impacts to species and habitats regulated under the Massachusetts Endangered Species Act, and will employ an adaptive management approach as well as monitoring and maintenance. The phased approach to remediation construction over an estimated 13 years will also help to mitigate short term impacts on Vernal Pool habitats.

Despite GE's assertions to the contrary, the Vernal Pool remediation efforts by GE in the 1.5-Mile Reach in 2006 at Vernal Pool 8-VP-1 provide a good indication of the potential for successful Vernal Pool restoration following the removal of PCBs. After restoration, as documented by both GE and EPA in post-remediation inspection reports, in a short time Vernal Pool 8-VP-1 was providing breeding habitat for Vernal Pool amphibian species, providing ecological functions similar to the pre-remediation pool, and was shown to be meeting the Massachusetts criteria for a certified Vernal Pool. While the greatest wood frog egg mass count observed prior to remediation was 31 (in 2003), counts substantially increased following remediation to 75 in 2010, more than 100 in 2011, 60 in 2012, 170 in 2013, 59 in 2014, 96 in 2015, and more than 47 in 2016 (some had already hatched). In addition, hundreds of fairy shrimp were observed most years following remediation. In years where fairy shrimp were not observed, their absence was attributed to the hydrologic conditions in that or previous year(s). Prior to remediation, green frogs were observed in 34 of 45 Vernal Pools studied by EPA, including 8-VP-1. Therefore, GE's implication that that restoration of the Vernal Pool resulted in the presence of green frogs post-remediation is incorrect. The data demonstrate a clear improvement in the conditions in the Vernal Pool following remediation and restoration, not

simply a satisfactory "pass" of the NHESP breeding criteria and "mixed results" for the Vernal Pool as GE claims.

GE asserts that a "relevant study" is required prior to Vernal Pool remediation. During the Ecological Characterization, EPA compiled data on over 60 Vernal Pools over a period of three years, with detailed surveys conducted on 17 pools, and additional data in 8 pools. These data provide a baseline of pre-remediation conditions in the Vernal Pools in the PSA. In the Final Permit Modification, GE is required to perform additional sampling and gather data to update the baseline characterization of the Vernal Pools. GE is then required to implement the application of an amendment such as activated carbon (AC) in an initial set of 10 pools and monitor the effectiveness and any ecological impacts on the pools and restore any disturbed adjacent areas. GE will then submit a proposal for how to address the remaining Vernal Pools which is subject to review and approval by EPA in consultation with the states. Only then, as GE asserts after a "relevant study," will remediation be performed on the remaining Vernal Pools.

EPA acknowledges that the habitat surrounding a Vernal Pool is as important as the pool itself in supporting populations of Vernal Pool species and that, to varying degrees, remediation may have the potential to cause short-term changes in some floodplain characteristics in these buffer areas, which may include temporary disruption of connectivity among Vernal Pools. However, EPA believes that these short-term effects will be mitigated by an active restoration program and are off-set by the reduction in demonstrated risks to the amphibian populations. It is expected that disruption of the pools, the surrounding buffer zones, and pool connectivity will be minimal with the application of a relatively un-intrusive application of a sediment amendment such as AC. In the event that the remediation plans require disturbance of the buffer zones, the restoration program requires thorough documentation of pre-remediation conditions, including in these buffer zones, and active measures following remediation activities to return the area to the pre-existing conditions, to the extent feasible.

Comment C29: GE asserts the following: There is no published research on the effect of the use of activated carbon on vernal pool breeding invertebrates and amphibians. The case studies referenced by EPA have no relevance to vernal pools as EPA's own consultant, the Isosceles Group, recognized (see Attachment 3 to the Comparative Analysis). It would be reckless to research the potential impacts of this treatment technique in the sensitive ecology of the PSA. In any event, vernal pools in which activated carbon was used as an alternative to excavating the pools would still be adversely affected by the clearing and excavation of the 100-foot and the 100- to 750-foot zones around the pools.

EPA Response C29: The Final Permit Modification does not include requirements for the clearing and excavation of 100- to 750-foot zones surrounding the pools. The floodplain remediation plans have not yet been developed; they will be proposed in phases during project implementation, and EPA anticipates requiring GE to minimize the effects on the buffer zones surrounding the pools where feasible.

With regard to the effects of the application of AC in the Vernal Pools, Attachment 3 to the Comparative Analysis documents the effects to benthic invertebrates from the application of a sediment amendment found in the peer-reviewed literature. Contrary to GE's assertion, Attachment 3 has no statement about relevance, and in fact some of the case studies in

Attachment 3 are highly relevant to the use of AC in the remediation of Vernal Pools in the Floodplain. A more recent comprehensive review of the potential for adverse ecological effects from the application of AC is provided in Janssen E.M-L. and Beckingham, B.A., 2013 Biological Responses to Activated Carbon Amendments in Sediment Remediation. *Environ. Sci. Technol.*, 2013, *47* (14), pp 7595–7607. In this paper, the authors found adverse effects occurring in one-fifth of 82 tests, and that higher AC dose and smaller AC particle sizes, while further reducing bioaccumulation of hydrophobic organic contaminants, may induce stress in some organisms.

Further documentation is provided in Patmont *et al.* This paper reviews general approaches to the application of AC in the field at more than 25 sediment sites, and reviews the ecological effects associated with AC amendments. The authors identify particular conditions where adverse ecological effects may occur, however reaches the overall conclusion that remediation using AC is a proven, reliable technology that is appropriate for full-scale application at a variety of sediment sites.

Thus, there is a large body of work supporting the full scale field application of AC, with known cautions as to circumstances that result in adverse effects versus successful outcomes. EPA expects that this work will be used to guide the design of the remediation of the initial 10 Vernal Pools using AC or a similar sediment amendment.

Also see Responses 601 *et al.* and 660 in this Section.

III.B.2.c Invasive Species

Comment 147: Language should [be] inserted into Section II.B.3.c.(4) of the Permit (Preconstruction Preparation Requirements) requiring that effective measures be taken to avoid introducing invasive species. How will such species be controlled?

Comment 173: Successful invasive species control will require a long-term commitment, and therefore the Invasive Species Control Plan should establish standards for the long-term, post-construction control of invasive species, likely on the order of decades rather than years. This plan and all activities associated with it must also cover appropriate safeguards for all equipment and worker footwear, clothing, etc. as well as any activity in contact with the river or which will flush or put water back into the river.

Comment 185: A detailed invasive species study, control, monitoring and remediation plan, with specifics on eradication of any invasive species introduced into other reaches, must be developed and included in the Permit, augmenting the Permit's current requirement that GE must develop a control plan as part of its Statement of Work. Invasive species should include all plant and animals so classified, including consideration given to those so classified in other states which have not yet been introduced into the river. Such a robust plan will be required at least during the entire cleanup period and should require reactivation during any post-cleanup remediation.

Comment C13: GE asserts the following: The plant communities in primary successional systems, as would be formed by these extensive remediation activities, are generally dynamic, and it is under these conditions that aggressive and exotic species readily take hold. This is a very real risk to the overall success of restoration activities, as the plant community is one of the

foundations of the overall ecosystem. If non-native species out-compete native ones, the animals that depend on the native plants may be lost as well. Successful replacement of shrub and shallow emergent wetlands is more likely than for forested components of the floodplain - the latter being highly unlikely - but is still fraught with numerous issues related to how the overall configuration of river channel, bank structure, and floodplain topography are integrated to produce the essential hydrologic, soil, and vegetation elements required of these systems. Regarding the potential success for floodplain plant communities, the significant lag time for growth of mature trees will always be an issue. There are limitations to controlling the colonization and spread of invasive plants in aquatic and riparian ecosystems. As proposed, the remediation plans are not likely to replace the structure, function, or biodiversity of the floodplain components of the existing riverine ecosystem.

Comment C21: GE asserts the following: Invasive exotic plants are already present in the PSA, with 18 problematic species identified, and SED 9/FP 4 MOD will most likely increase the extent of their coverage. Invasive exotics will outcompete the native species currently present in the PSA because of the extensive areas of exposed soil (both backfill and new sediments), less competition from natives removed during remediation, and more sunlight following forest canopy removal (a factor relevant to both aquatic and terrestrial species). Furthermore, roads, staging areas, and the movement of vehicles and soil will all increase invasions of propagules of invasive exotics. EPA implies that controlling invasive exotics is straightforward, but this is not the case. One analysis (Kettenring and Adams 2011) examined 335 research papers covering control of 110 invasive exotic plant species and reported: *"Regardless of control method, our meta-analysis revealed that few studies produced gains in native plant cover, density or biomass."* They also warned about the negative ecosystem impacts of invasive control: *"Herbicide was the most commonly implemented and, according to our meta-analysis, the most effective control method for reducing invasives. However, native species response to herbicide was highly variable, probably because this broad-scale approach can hinder native species establishment through seed limitation."* In fact, there can be unintended consequences of using particular techniques to control invasive exotics (see Skurski et al. 2013).

EPA Response 147, 173, 185, C13, C21: EPA recognizes that colonization by invasive species during and following the Proposed Remedial Action, as with any project, is a serious concern, particularly in disturbed or newly planted areas, as well as downstream Impoundments and, to a lesser extent, in the Backwaters. EPA recognizes that control of invasive species can be difficult, particularly the control of invasive forms of submerged aquatic vegetation, but "difficult" should not be interpreted to mean that properly implemented control measures will not be successful. EPA recognizes there is a risk that some invasive species already in the Housatonic River system may increase, at least temporarily, as a result of the remediation.

EPA concurs that a well-designed and implemented long-term invasive species control plan is necessary to effectively manage invasive species both during and after implementing Corrective Measures. Requirements have been included in the Final Permit Modification in Section II.H.18.b for an Invasive Species Control Plan, specifying identification of invasive species prior to implementing remediation activities and monitoring and maintenance requirements during and after implementation of Corrective Measures. The specifics of these programs will be determined, with EPA review and approval, during the Rest of River Scope of Work process.

EPA anticipates the Invasive Species Control Plan will include, but not be limited to, components of the successful program for the 1 ½ Mile Reach Removal Action, as specified in the Final Post-Removal Site Control Plan (PRSC), which is Appendix A to the 1 ½ Mile Reach Final Completion Report. The PRSC describes the maintenance and monitoring requirements to be implemented by GE following completion of the 1 ½-Mile Reach remediation. Major components of the PRSC for the 1 ½-Mile Reach Removal Action are as follows:

- Establishing a maintenance standard of 5% invasive species in a given area;
- Monitoring to be performed by experienced personnel with at a minimum five years of experience and an undergraduate degree in a science pertinent to the proposed work;
- Qualitative and quantitative inspections will be performed and results documented on field form and summarized in summary tables;
- Areas identified during qualitative and quantitative inspection that do not meet the Maintenance Standard will be flagged and the necessary corrective actions implemented to meet the Maintenance Standard;
- Corrective actions to be implemented within 30 days of inspections;
- Personnel performing invasive species control shall be licensed in the State of Massachusetts.

The successful implementation of the 1 ½-Mile Reach Invasive Species Control Program (ISCP) in accordance with the PRSC is documented in annual Re-Vegetation Inspection Reports, subject to EPA review. In addition, GE implemented a similar program in accordance with EPA's 2008 Interim PRSC Plan. These inspection reports document that the Maintenance Standards for the quantitative component for invasive species have been achieved in every year that inspections have been conducted for the 1 ½ -Mile Reach. (Re-Vegetation Monitoring Inspection 1 ½ Mile Reach of Housatonic River General Electric (GE), 2008 – 2015.) Invasive species cover has not exceeded 5% in any of the established monitoring plots since inception of the program. EPA notes that invasive species detected during qualitative inspections are noted and corrective action is discussed between EPA and GE. Corrective action for the removal of invasive species may include physical removal and/or the application of herbicides or other appropriate methods following any and all requirements for use of these products in the vicinity of a waterbody. While the application of herbicide is known to be an effective control, it is possible however unlikely that there may be the unintended consequence of adverse effects to native/desirable vegetation. The Invasive Species Control Program will be designed to carefully assess the appropriate corrective action and response for various circumstances. The subject of herbicide application for invasive species control in the 1 ½ -Mile is further discussed in Response 363.b, 520.

Prior to implementing Corrective Measures for the Rest of River , Section II.B.1.c. in the Final Permit Modification requires a thorough baseline assessment of pre-remediation conditions to be conducted as part of the development of a restoration plan for areas impacted by the remedial action. This Baseline Restoration Assessment would include identification of state-listed and representative species, identification of invasive species, evaluation of Vernal Pool hydrology, and other characteristics of the habitats to be impacted by the remediation.

Section II.H. of the Final Permit Modification specifies that GE be required to submit, for EPA review and approval, an overall strategy for implementing the Correctives Measures. A component of this overall strategy will be an Inspection, Monitoring, and Maintenance Plan, which will include an Invasive Species Control Plan (see Section II.H.18.b.). The RD/RA workplans will also include appropriate safeguards to ensure that site activities do not introduce or spread invasive species in the river or floodplain.

Section II.C. of the Final Permit Modification specifies the requirement for an Operations and Maintenance (O&M) Plan, as a component of the Final Remedial Action Completion Report, implemented upon completion of the Remedial Action for the Rest of River. The O&M program will be implemented to maintain the effectiveness of the Corrective Measures, to evaluate MNR, and to conduct maintenance, repair, or other response actions necessary to achieve and maintain compliance with Performance Standards. A component of the O&M program is the requirement for inspections and maintenance of restoration activities, including invasive species control. The O&M Plan would be developed by GE and subject to review and approval by EPA.

The length of time for the implementation of post-construction monitoring and maintenance will be proposed by GE for review and approval by EPA. EPA anticipates the proposed length of time developed for implementation of the invasive species control plan may differ from the actual implementation period based on effectiveness of the program, site conditions, and other factors. For example, the results of summer vegetation monitoring surveys in restored areas of the 1 ½ Mile Reach reported that invasive species cover was below 5% in all monitoring plots and achieved the applicable Performance Standard, but also recommended continued treatment with herbicide and revised treatment strategies to optimize the growth of native plants (Stantec 2007). The requirement for GE to develop and implement a control plan and then monitor the success of that plan during the post-construction operation and maintenance phase, will ensure that invasive species will be kept under control during and after completion of the Remedial Action.

Also see Response 600 *et al.*

Comment 363.b: We have been told that Glyphosate (Roundup) is being sprayed on the riprap banks to control non-native invasives. This is more dangerous to the health of river than the PCBs.

Comment 520: Upstream in the "cleaned" areas there is now a plague of non-native invasive plants. Some of these plants are so noxious that there is no chance we will ever see the mix of plant and animal life that was there before the cleanup work. Currently, herbicides such as Roundup (Glyphosate) are being used in the floodplain to attempt to control this invasion. This chemical has been linked to a reduction in small creature populations, and several common commercial formulations have been shown to have major long-term effects. Plants exposed to the chemical have shown an increasing resistance to its use, requiring use of greater concentrations to be effective.

EPA Response 363.b, 520: There is no reason to believe, nor data to suggest, that the limited application of herbicides to control invasive species on revegetated banks remediated or disturbed as part of the East Branch remediation is causing any immediate or long-term harm to

the river or to adjacent habitats, including the desirable vegetation and animal populations on the banks themselves. The substantial ecological and human health effects of the PCBs present in the river and floodplain, on the other hand, have been thoroughly documented in the peer-reviewed Ecological and Human Health Risk Assessments. Rather than causing harm to the river, the use of herbicides to control invasive species is a necessary component of site maintenance activities and provides long-term benefits to the area.

The selective use of herbicides for invasive species control is specified in the Final Post-Removal Site Control Plan (PRSC) for the 1 ½-Mile Reach Removal Action. The PRSC describes maintenance and monitoring requirements to be implemented by GE following completion of the 1 ½-Mile remediation, including, among a variety of other requirements, the revegetation of riverbank areas. An important component of those maintenance activities is the control of invasive species, an issue of concern to both EPA and the public, as evidenced by comments regarding invasive species addressed above. The use of herbicides is necessary for control of invasive species and, by extension, necessary for the long-term successful re-establishment of desirable plant species on revegetated banks. The PRSC also specifies appropriate controls on the use of herbicides including, for example, the requirement that the application of herbicides is performed only by personnel licensed for such application in the State of Massachusetts, and that herbicide application not be conducted in windy conditions.

The herbicide selected for use in the 1 ½ Mile Reach invasive species control program is Rodeo®, a Glyphosphate-containing product specifically formulated to be safe for aquatic use. Roundup® is a different Glyphosphate product that is not used in the invasive species control program. Although both products contain Glyphosphate as their active ingredient, there are differences in the specific formulations, principally in the surfactant additives, that make Rodeo® a better choice for use in areas adjacent to the river. Both these products, along with other Glyphosphate formulations, are approved and legal for use in the United States and have widespread application in the agricultural industry. They have also shown to be relatively harmless to aquatic life, with the obvious exception of the plant growth they are intended to control. It is particularly important to note that the invasive species control program in the PRSC specifies the use of herbicide on a targeted and limited "as-needed" basis and in selected areas where invasive species have or might become a problem for the successful regrowth of native vegetation, and herbicides are not being broadly used on the rip-rapped banks.

EPA is aware that the International Agency for Research on Cancer (IARC) has recently reclassified Glyphosphate as a Group 2A probable carcinogen, however EPA's Integrated Risk Information System (IRIS) assessment of Glyphosphate remains unchanged, concluding that there is insufficient evidence that Glyphosphate causes cancer in animals. Glyphosphate-containing herbicides can be effective, particularly when such products are used as intended and in a limited, targeted manner, as is the case for control of invasive species in remediated areas of the Housatonic River site.

Also see Response 147 *et al.*

III.B.2.d Natural Resource Damage/Massachusetts Endangered Species Act

Comment 677: GE asserts the following: The proposed remedy contains habitat restoration requirements. These include requirements that GE must perform a baseline assessment of pre-

respect to whether the Director should allow a take – which would be required for a regulation to constitute an ARAR under the CERCLA definition (CERCLA § 121(d)(2)A)).

Comment 686: GE asserts the following: Application of the MESA Net Benefit requirement, requiring GE to conduct unspecified conservation and management measures in return for a take, would constitute an attempt to recover compensation for a take, which is a form of NRD. As noted in [Comments 677, 678, 680, 681, and 682], GE has already provided compensation for NRD at this Site, and has a covenant from the federal and state governments not to seek additional NRD (except in the case of dam failure, which is not relevant here). Thus, any attempt to require additional conservation and management measures would undermine those covenants and conflict with the Decree.

EPA Response 684, 685, 686: It is premature to determine if the specific actions that will occur during remediation will result in a "take" of any state-listed species. During the design of the remedy, if EPA determines that a "take" that would impact a significant portion of the local population of a species occurs, EPA will identify that to GE, and GE would have the right, as with any design/implementation dispute, to pursue Dispute Resolution under the Decree, including review by U.S. District Court.

With respect to the Net Benefit provision, EPA's Final Permit Modification's Summary of ARARs table has the following Synopsis for this provision of the MESA:

> A proposed activity in mapped Priority Habitat for a state-listed rare, threatened, endangered species or species of special concern, or other area where such a species has occurred may not result in a "take" of such species, unless it has been authorized for conservation and management purposes that provide a long-term net benefit to the conservation of the affected state-listed species. A conservation and management permit may be issued provided an adequate assessment of alternatives to both temporary and permanent impacts to state-listed species has taken place, an insignificant portion of the local population would be impacted by the project or activity, and an approved conservation and management plan is carried out that provides a long-term Net Benefit to the conservation of the state-listed species. Projects that will alter a designated Significant Habitat must be reviewed to ensure that they will not reduce the viability of the habitat to sustain an endangered or threatened species.

Similarly, based in part on GE's comments, the Summary of ARARs table now includes the following as part of the Actions to be Taken to Achieve this requirement:

> To the extent that unavoidable impacts result in a take of state-listed species, EPA would follow the regulatory requirements with respect to implementing a conservation and management plan providing for a long-term net benefit to the affected state-listed species.

GE argues that if there is a "take" of a species which results in a "significant" portion of the local population being impacted by the project or activity, the requirement to submit a Conservation and Management Plan providing for a Net Benefit to the species would not apply, because the "take" is prohibited outright.

Massachusetts Division of Fisheries and Wildlife (MassDFW) has affirmed for EPA that under the MESA regulations, if a determination of a take is made, the project or activity must either be modified to eliminate the take or the proponent must obtain a conservation and management permit ("CMP") pursuant to 321 CMR 10.23. More specifically, in addition to showing that the impacts from the remedial action have been avoided, minimized and mitigated, the MESA regulations at 321 CMR 10.23(2)(a)-(c) set forth three separate, distinct and substantive Performance Standards that must be met in order to obtain a CMP authorizing a take under MESA:

a) there has been an adequate assessment of alternatives to both temporary and permanent impacts;

b) only an insignificant portion of the local population of the affected state-listed species will be impacted, and

c) an approved conservation and management plan provides for the long-term Net Benefit for the conservation of the state-listed species. The term "Net Benefit" is defined in the MESA regulations at 321 CMR 10.01 to mean (1) an action(s) that contribute significantly to the long-term conservation of a state-listed species, and (2) that conservation contribution exceeds the harm caused by the proposed project or activity.

As noted above, MassDFW has affirmed for EPA that the insignificant impact on local population and the Net Benefit Performance Standards in 321 CMR 10.23(2)(b) and (c) are separate and distinct substantive requirements applicable to the permitting of a take. More specifically, in order to authorize a take, 321 CMR 10.23(2)(b) requires that there be an "insignificant impact" to the *local* population of the affected state-listed species. In comparison, 321 CMR 10.23(2)(c) requires that a Net Benefit be provided to the affected state-listed species *as a whole* (i.e., beyond the geographic location of the local population of that species).

If a take will have a significant impact on the local population of the affected species, in order to move forward, such an activity would need to be redesigned or coupled with a form of mitigation that would result in an insignificant impact on the local population. In that regard, there are certain forms of mitigation designed to enhance the local population, thereby lessening the overall impact of a project. For this reason, MassDFW typically requires an applicant to evaluate whether a Net Benefit can be provided, even in cases where there is a preliminary assessment that the activity will impact a significant portion of the local population. This approach is appropriate because after-the-fact habitat management and habitat restoration could off-set remediation impacts in certain cases, which should be considered in evaluating the level of impact on the local population resulting from a particular remedial alternative in site-specific locations.

During design and implementation of the proposed remedy, if, despite that evaluation and potential mitigation, a significant impact on the local population remains, EPA, in consultation with MassDFW, will evaluate whether it is appropriate to waive the requirement of an insignificant impact on local population pursuant to CERCLA Section 121(d)(4), such as if it is technically impracticable to comply with that requirement. GE remains obligated under the MESA regulations to comply with the separate, distinct and substantive Net Benefit Performance

Standard in 321 CMR 10.23(2)(b) to compensate for the resulting take through the implementation of a conservation and management plan.

EPA disagrees with GE's position that MESA provides too much discretion to the decision maker on determining whether to permit a "take," and that amount of discretion does not satisfy CERCLA 121(d)'s requirement that an ARAR be "standard, requirement, criteria or limitation." The MassDFW Director's authority to permit a take of a State-listed species is subject to and limited by several specific standards established in the MESA regulations. First, as outlined above, the DFW's Director's authority to authorize a take is subject to the Performance Standards at 321 CMR 10.23(2), which place limits on such authority. Furthermore, the MESA regulations at 321 CMR 10.23(7) ("General Mitigation Standards Applicable to Individual and General Conservation and Management Permits Issued by the Director") specifically address the general mitigation standards to be applied by the DFW Director in issuing CMPs. This regulation directs the Director to apply the areal habitat mitigation ratios specified therein that correspond to the affected category of state-listed species: 3:1 for endangered species; 2:1 for threatened species; and 1.5:1 for species of special concern.

While the MESA regulations reserve the right to deviate from the applicable mitigation ratio or allow an alternative mitigation approach, discretion to do so is subject to the process and criteria specified therein. Specifically, the decision-maker is required to determine in writing that the alternative mitigation ratio or mitigation approach is either sufficient or required to meet the Net Benefit standard. In making such determination, the decision-maker must also consider, at a minimum, the five factors identified in the regulation, which involve specific conservation management considerations such as the threats to and population density of the affected state-listed species, the size and configuration of both the habitat impact and quality of the habitat proposed to be protected.

With respect to GE's argument on the MESA-required activities being precluded by the Natural Resource Damage covenants in the Decree, EPA disagrees with this characterization. See above Response 677 *et al.*

III.C River Sediment and Banks

III.C.1 Reaches 5A, 5B, and 5C

Comments 55, 57, 79, 95, 116, 140, 207, 209, 212, 227, 320, 325, 358, 421, 422, 513: EPA should clarify and provide a rationale for the sediment cleanup criteria in Reaches 5A, 5B and 5C and for why there is no numeric target for cleanup of sediment in Reaches 5A and 5C. In addition, some commenters believed that the cleanup level of 50 mg/kg in Reach 5B was not stringent enough to protect wildlife and human health and limit downstream transport of PCBs. Another commenter believed that the cleanup level of 50 mg/kg should be applied in Reach 5A, thus minimizing impacts to the neighborhoods in this area. One commenter suggested there should be uniform target cleanup concentrations throughout the areas to be remediated and that there are no differences between the various reaches that would justify such large differences in cleanup targets.

EPA Response 321: The Backwaters are primarily net depositional areas (Figure 3.5-35 Final Model Documentation Report: Modeling Study of PCB Contamination in the Housatonic River, Weston, November 2006), therefore transport of any residual PCB contaminated sediment to the floodplain from the Backwaters is expected to be minimal. In addition, in areas outside of Core Area 1 the sediment above 1 mg/kg will be removed and replaced with an Engineered Cap. Similarly, for Core Area 1, sediment above 50 mg/kg will be removed and replaced with an Engineered Cap. Thus, the Backwaters that remain with concentrations greater than 1 mg/kg will be significantly reduced by the remediation, and will be limited in area. With respect to potential additional response actions, please see Response 669 in Section III.B.1 of this Response to Comments, and note also that pursuant to Section X of the Decree, EPA will conduct periodic reviews of the remedial action after completion.

Comment 380: How did EPA arrive at a cleanup target of 3.3 ppm for vernal pools and backwaters in some Alternatives but 5.6 ppm in others? The cleanup target should be to 1 ppm for these habitats for all of the alternatives.

EPA Response 380: The Performance Standard for removal and capping of sediment for Backwaters is 1 mg/kg outside of Core Area 1 and 50 mg/kg for Core Area 1. See Section III.D.2 for the rationale for the Performance Standards for Vernal Pools.

III.C.3 Woods Pond

Comment 616: GE estimates that EPA's proposed remedy for Woods Pond would require deep dredging and placement of an engineered cap throughout the Pond so as to achieve a minimum post-capping water depth of 6 feet (except in near-shore areas, where the slope from the shore to the 6-foot water depth must be as steep as possible).

Comment 617: GE asserts the following: EPA estimates that the deepening of Woods Pond would require removal of 285,000 cubic yards of sediment from Woods Pond. However, that estimated removal is based on achieving an *average* post-capping water depth of 6 feet; achieving a *minimum* post-capping water depth of 6 feet, as proposed, would require removal of approximately 340,000 cubic yards of sediment.

Comment 618: GE asserts the following: EPA claims that its proposed deep-dredging remedy for Woods Pond would reduce human health risks from fish consumption. However, projections using EPA's model show no discernible difference between the proposed remedy and an alternative involving shallow dredging and full capping in reducing fish PCB concentrations or attaining fish consumption IMPGs in Woods Pond itself or in the downstream impoundments. A comparison of model results for EPA's proposed Woods Pond remedy with an alternative remedy that would involve sediment removal to a depth of 9 inches in the shallower portions of the Pond (estimated at 44,400 cubic yards) and placement of a cap over the entire Pond, holding all other aspects of these alternatives constant, indicates no difference between these alternatives in fish fillet concentrations in Woods Pond or any of the downstream impoundments, because cap placement over the entire Pond would achieve the same reduction in fish PCB concentrations as deep removal over the entire Pond followed by capping [GE Attachment F, Figure F1 series and GE Attachment G]. This demonstrates that the substantial additional sediment removal under EPA's proposed remedy (nearly 300,000 cubic yards) would have no benefit in terms of reducing fish PCB concentrations.

Comment 619: GE asserts the following: EPA also asserts that its proposed remedy for Woods Pond would reduce direct contact risks and ecological risks. However, the less intrusive remedy, by installing a cap over the entire Pond, would result in a comparable reduction in any direct contact or ecological risks. For example, both of these alternatives are predicted to achieve a surface sediment PCB concentration of 0.4 mg/kg in Woods Pond, which is far below any threshold for direct contact or ecological risks.

Comments 534, 535, 536, 620: GE asserts the following: EPA claims that its proposed deep dredging remedy would increase the solids and PCB trapping efficiency of Woods Pond and thereby reduce downstream transport of PCBs. Solids trapping efficiency does not equate to PCB trapping efficiency, since some portion of the PCBs are present and pass the dam in dissolved form. Although EPA's proposed remedy would appear to result in some increase in solids trapping efficiency compared to smaller alternatives (estimated by EPA to increase from about 15% to 30%), the model results indicate the projected average annual PCB loads passing Woods Pond and Rising Pond Dams are 2.5 kg/year and 2.7 kg/year, respectively, under the proposed alternative and 2.6 kg/year and 2.9 kg/year under the smaller alternative. This modest increase in solids trapping efficiency resulting from the proposed remedy would not translate to any reduction in risk due to fish consumption or any other source compared to the smaller alternative. Thus, the difference in trapping efficiency would not result in an increase in the protectiveness of the remedy.

EPA also states that its proposed deep dredging remedy would reduce the potential for a release of PCBs from Woods Pond in the event of dam failure. However, dam failure is not a realistic risk, since GE owns Woods Pond Dam and conducts the necessary monitoring, maintenance, and repair of the dam to prevent dam failure, particularly in light of the fact that the Decree's covenants from the federal and state governments for natural resource damage do not apply in the case of a failure of Woods Pond Dam. Hence, that potential does not provide a justifiable basis for the proposed deep dredging.

In fact, it appears that the Region's actual purpose in proposing this Pond-deepening remedy is to improve Woods Pond as a recreational fishery, as desired by the State, not to reduce risks. Indeed, the Commonwealth proposed a deep dredging remedy for Woods Pond, citing the enhancement of recreational opportunities as one of the benefits ([GE] Attachment B). The improvement of recreation, of course, is not within EPA's authority under either CERCLA or RCRA, which is limited to prescribing such actions as are necessary to protect human health and the environment from identified risks due to releases. As shown above, any risks can be reduced to a comparable extent with a remedy that involves much less removal.

Comment 621: GE asserts the following: EPA's proposed remedy for Woods Pond would involve greater adverse impacts due to the extra contaminated sediment removal and much higher costs than the comparably protective smaller remedies. For example, due to the greater removal volume, the proposed remedy would require more truck trips (with their attendant community impacts) and produce greater GHG emissions than the smaller remedy. GE has estimated that the proposed Woods Pond remedy would require a total of approximately 39,000-46,000 truck trips to import the necessary remediation material (i.e., capping and staging/access material) and transport the dredged sediments from the Pond (with the range dependent on the size of trucks used to transport dredged sediments), while the alternative described above

involving shallow dredging (44,400 CY) and capping of the entire Pond would require a total of only approximately 10,000-11,000 such truck trips – approximately 30,000 fewer truck trips. Further, GE has estimated that the proposed remedy for Woods Pond would produce 51,000 tonnes of GHG emissions, compared to 7,800 tonnes for the smaller alternative (see Table 14) – a more than six-fold difference.

Comment 622: GE asserts the following: The proposed remedy for Woods Pond would be much more costly than the smaller alternative. GE has estimated that, assuming off-site disposal, the proposed deep dredging remedy would cost $164-188 million (depending on whether rail or truck transport is used), whereas the shallow dredging/full capping alternative would cost $34-39 million. As discussed above, the latter alternative would be equally protective of human health and the environment and would effectively reduce residual risks to a similar extent as the proposed remedy. Further, the smaller alternative would meet ARARs to the same extent as the proposed remedy. In these circumstances, the incremental costs of the proposed remedy, which would be at least $130 million, are not proportional to its incremental benefits (if any), and hence the proposed remedy would clearly not be cost-effective.

Comment 623: GE asserts the following: For the reasons above, adoption of EPA's proposed deep dredging remedy for Woods Pond would be arbitrary, capricious, and otherwise unlawful because it would require extensive unnecessary removal and would not have the risk-based benefits claimed by EPA, compared to a smaller remedy such as shallower sediment removal in shallower portions of the Pond and placement of a cap over the entire Pond surface.

EPA Response 534, 535, 536, 616, 617, 618, 619, 620, 621, 622, 623: GE provided a number of assertions, and its conclusion, about the appropriate remediation for Woods Pond. EPA disagrees as follows.

GE and EPA differ on the estimates of the volume of material required to be excavated from Woods Pond. EPA based its calculations of 285,000 CY on a minimum water depth of six feet (except along the shoreline), not an average depth of six feet as GE mistakenly claims. Comparative Analysis, Attachment 6. GE provided no support for its 340,000 CY figure so EPA is unable to comment upon its accuracy. Further, GE's "preferred remedy" as briefly described in these comments would likely involve the removal of approximately 100,000 CY or more. The 100,000 CY estimate is based on a 1.0 to 1.5 foot excavation (as opposed to 9 inches, which is a new GE assumption regarding cap thickness, which was not contemplated in GE's Revised CMS (see Table 6-1)) in both the shallow and deep portions of Woods Pond. Excavation in the deep part of Woods Pond may be necessary to avoid the loss of flood storage capacity in the Woods Pond area. With the additional volume of excavation needed to avoid the loss of flood storage capacity, then, the volume difference between EPA's remedy and GE's inferred remedy could be as small as 185,000 CY, a significantly smaller difference than portrayed by GE. But even if GE's figures were correct, EPA's analysis would not change for all the reasons set forth herein. GE's position in these comments was not included in the series of remedial options evaluated by GE in its Revised CMS, so GE's position has not been fully evaluated by EPA against the remedy selection criteria. Significantly, GE, in its Revised CMS, opined that the alternative known as SED 10 best met the permit criteria. For Woods Pond, SED 10 required the removal of 169,000 CY in the top 2.5 feet of sediment without the placement of an Engineered Cap.

In addition, EPA does not disagree with GE's assertion that sediment removal sufficient to place a properly designed, constructed, operated and maintained Engineered Cap in perpetuity might achieve the same reductions as the selected Woods Pond remedy for certain risks. However, this conclusion assumes that such a cap will be properly maintained and operated in perpetuity to resist floods and ice-scour and that there is no breach or failure of Woods Pond Dam. In making these arguments, GE discounts the benefits of more effective source control through the permanent reduction in the bioavailability of PCBs to human and ecological receptors through removal. Here the more extensive source control – removal – leads to the twin benefits of risk reduction, including reduction of the risk of downstream transport, and increased long-term effectiveness. In Woods Pond, there is a significant benefit to removal of the large amount of PCBs in the event of breach or failure of Woods Pond Dam. After all, even with the best intentions and significant resources, it is impossible to guarantee that there will never be a dam breach or failure in perpetuity, even if GE remains the dam owner in perpetuity, including unknowns or uncertainties associated with potential climate change. One relevant example is the release of PCBs caused by the 1992 partial breach of the Rising Pond Dam, described further in Section III.C.5 of this Response to Comments, which occurred even after GE worked in cooperation with Rising Paper Company to develop sufficient data on sediment quality to evaluate management options for the dam. In contrast, removing sediment from behind the dam and disposing of it in a secure landfill guarantees that such sediment cannot be reintroduced into the Housatonic environment and transported downstream in the event of cap or dam breach or failure. GE simply fails to account for the benefits provided by the finality in risk reductions and source control related to actually removing 285,000-340,000 CY of PCB-contaminated material from the River.

At issue here is the opportunity to permanently remove the risks posed by approximately 285,000-340,000 cubic yards (depending upon EPA's or GE's respective calculations as described above in this response) of PCB-contaminated sediment. Woods Pond sediment contains approximately 25% of the mass of PCBs present in the Housatonic River (GE's RCRA Facility Investigation Report for the Rest of River, 2003, Table 4-11), and does not provide priority habitat for state-listed species. (Commonwealth of Massachusetts' 2014 Comments on the Draft Permit Modification). Accordingly, EPA's remedy for Woods Pond represents the opportunity to remove a significant mass of PCBs from the river system, thereby reducing the potential for downstream transport of PCBs, and significantly reducing the bioavailability and exposure of PCBs to human and ecological receptors (including but not limited to the consumption of contaminated fish) with minimal short- or long-term impacts to the environment from the remediation itself. EPA's remedy selection for Woods Pond is supported by the Administrative Record, and falls within EPA's expertise in evaluating all the relevant factors in selecting a remedy for the Rest of River.

Additionally, EPA disagrees with GE's discounting of the benefits provided by a deeply dredged Woods Pond in its capacity to serve as a PCB trapping mechanism to prevent PCB transport downstream. GE acknowledges that the proposed deepening increases the PCB trapping efficiency compared to remedies that do not deepen the Pond. Accordingly, at issue is the significance of the increased trapping. GE's own modeling shows that as a result of the increase in trapping efficiency, the incremental reduction in downstream transport, or flux, over Woods Pond is 0.1 kg/year and over Rising Pond is 0.2 kg/yr. These are far more than "modest" benefits; these reductions in flux are significant relative to the Downstream Transport

Performance Standards. If these trapping-related reductions were not achieved it would decrease the likelihood of GE achieving the Downstream Transport Performance Standard. Furthermore, Woods Pond has historically been an effective trap as demonstrated by the significant amount of PCB mass that has been retained in the pond. Increased trapping combined with future periodic removal of PCB-contaminated sediment from the pond, as required by the Final Permit Modification, will logically reduce downstream flux of PCBs in two ways. Removing future sediment accumulation will eliminate the opportunity for those PCBs to dissolve off the solids and into the water column, and will prevent the PCBs attached to the solids from migrating downstream due to erosional forces and/or dam breaches or failure. Accordingly, the benefits of additional trapping efficiencies favor the selected remedy.

EPA disagrees with GE's unsupported contention that the actual purpose of the remedy for Woods Pond is to improve Woods Pond as a recreational fishery. Pursuant to the process set forth in the Decree, EPA considered all public comment on the proposal, including those from GE, Massachusetts, and Connecticut. As stated in its October 27, 2014 letter expressing support for the Proposed Cleanup Plan, the Commonwealth strongly favors the proposed remediation approach to Woods Pond for the reasons identified by EPA. Following that, while the Commonwealth noted, after summarizing the remediation objectives and benefits of the proposal, that it will also have the *secondary* benefit of enhancing the public's safe, recreational use of the Pond, the latter was not the basis for the Commonwealth's support or a factor in EPA's decision. As discussed in the comments above and in EPA's Comparative Analysis, not only will the selected remedy significantly reduce human health risks from fish (and other biota), but also it will remove a significant mass of PCBs, reducing the potential for release in the case of dam breach or dam failure, and increase the PCB trapping efficiency of Woods Pond, thus assisting in reducing downstream transport of PCBs. (See Comparative Analysis at pages 3 and 4.)

In addition, GE exaggerates the downsides of the EPA proposal for Woods Pond, by arguing that other remedies would be almost as good and cost far less. EPA believes that GE's cost discrepancies are inflated. While GE infers a cost difference of approximately $130 million, EPA believes a more accurate cost difference is likely to be approximately $80 million. Regardless of the exact figures, EPA considered the magnitude of any additional cost when evaluating all the relevant factors for remedy selection.[12] Similarly, GE cites additional truck traffic and greater greenhouse gas (GHG) emissions for deeper removal of PCB contamination from Woods Pond as a negative issue due, in part, to its impact on the community. In determining the best suited remedy for Rest of River, EPA evaluated nine Permit criteria; cost and short-term impacts were among, but were not the only criteria considered. EPA also evaluated the differences in criteria such as the general standard of Control of Sources of Releases, and the decision factor of long-term effectiveness, both of which favored a remedy with significant increase in trapping efficiency and source removal.

[12] Even if GE's cost figures and assumptions are accurate, EPA's proposal for Woods Pond would remain the preferred alternative based upon a full evaluation of all the relevant factors, including the objective of eliminating risks related to source control and downstream transport.

Finally, the remedy for Woods Pond cannot be considered in isolation from the other components of the Rest of River remedy selection. In evaluating all the relevant factors for all the relevant components of the Rest of River, including Floodplains, Vernal Pools, sediment and bank remediation for individual reaches, EPA considered the totality of the proposal from a holistic perspective. For example, EPA's initial proposal before the National Remedy Review Board (NRRB) included considerably more removal of contaminated PCBs from other portions of the River and floodplains, resulting in the total removal of approximately 1,080,000 cubic yards of contaminated sediment or soil with the approximate cost of $677 million. (EPA Region 1 June 2011 submittal to the NRRB). In contrast, the final remedy is somewhat less costly overall, and while it includes far less removal from other portions of the River and floodplains, especially Reach 5B, where the reduction is 88,000 CY, it does require the removal of additional PCB contaminated sediment from Woods Pond. The net change represented by the Final Permit Modification involves removal of approximately 90,000 CY less material than originally recommended to the NRRB and an estimated savings of over $50 million.

Overall, as the Comparative Analysis demonstrates, EPA considered all the relevant factors, and for Woods Pond, selected an alternative best suited to addressing these criteria based on all the information in the Administrative Record. EPA's decision to remove a significant portion of PCB contaminated sediment from Woods Pond and control the sources of PCB releases is a sound decision.

Comment 27: *National Remedy Review Board Recommendations* of October '11 (NRRB), for the CMS noted that model predictions for trapping efficiency may not have been consistent with historical data for the site and suggested that it be considered. As a result, a *US Army Corps of Engineers (USACE) Analysis* reported in Jan '12 of potential trapping efficiencies of up to 60% for PCB contaminated sediment if various alternatives were considered. The alternatives were omitted in the Regional Response to NRRB Recommendations of Aug '12. In addition to raising the trapping efficiency of the pond, the USACE analysis recommended work in Reach 5 be delayed until work on the trapping efficiency of Woods Pond was completed to minimize transport of PCBs downstream during corrective work. This recommendation was also omitted from the Regional Response of Aug '12.

EPA Response 27: EPA Region I considered all of the comments submitted by the NRRB in making its proposal and selecting the final remedy. In fact, part of the rationale for the selected remedy is the increased trapping efficiency resulting from the deepening of Woods Pond. However, to achieve even greater trapping efficiencies, the Corps of Engineers estimated that it would require installation of weirs, levees, and other alterations to the structure of Woods Pond. Such structures would have changed the natural course of the River flow into the Pond. Instead, EPA elected to pursue other options included in the Corps' January 2012 analysis in crafting the remedy, including the deeper excavation to enhance trapping. In addition, the Final Permit Modification allows for the remediation of Woods Pond to begin concurrent with the remediation of upstream reaches (e.g., Reach 5 and Backwaters). This will allow for the increased trapping efficiency generated by the deepening of Woods Pond to mitigate any releases resulting from the upstream remediation.

Comment 28: I had fundamental differences with the Charrette Presentation made at the Mini Workshop Two, in Lenox on April 6, 2011 and noted this in an email of April 28, 2011 to Jim

Comment 639: GE asserts the following: For the reasons discussed in Specific Comments 625 – 638, adoption of EPA's proposed remedy for the Reach 7 impoundments would be arbitrary, capricious, and otherwise unlawful.

EPA Response 639: For Reach 7 Impoundments, EPA properly analyzed the suitability of different alternatives (including requiring removal of contaminated sediment above 1 mg/kg) considering the risks posed by the high concentrations of PCBs in the Reach 7 sediment, and an evaluation of the relevant permit criteria, including the long-term reliability, and performance of different options. EPA considered the increase in greenhouse gases, truck traffic and cost of its proposed remedy compared to TLC (or MNR). In its evaluation of the Permit criteria, EPA concluded that the best suited remedy based on an evaluation of all of the remedy selection criteria is excavation sufficient to allow for Engineered Capping, along with flexibility for GE to propose different excavation approaches or to respond to proposals for dam removal.

Comment 112: We support the EPA's PCB contamination threshold of 1 mg/kg for dam impoundment sediment.

EPA Response 112: EPA acknowledges support for the 1 mg/kg threshold for dam impoundment sediment. EPA retained this threshold in the Final Permit Modification.

III.C.5 Rising Pond

Comment 640: GE asserts the following: This proposed remedy is arbitrary and capricious because it would not have significant risk-based benefits compared to a smaller remedy. In terms of reducing PCB concentrations in fish tissue, this is demonstrated by a comparison of the model results for the proposed remedy with those from smaller remedies. Specifically, we have compared the fish fillet PCB concentrations predicted (or extrapolated for Connecticut) to result at the end of the model period from the proposed Rising Pond remedy with those predicted (or extrapolated) to result from alternatives involving (a) MNR in Rising Pond, (b) implementation of thin-layer capping in Rising Pond, and (c) sediment removal to a depth of 6 inches in the shallow portions of that Pond (approximately 15,300 CY) and placement of a 6-inch engineered cap over the entire Pond, assuming the same remediation in the upstream reaches. (The last of these alternatives was discussed with EPA and the States during discussions in 2013. Again, to ensure comparability in these comparisons, these alternatives all assume the same remediation in the upstream reaches – specifically, the Reach 5 base case, deep dredging and shallow capping over all of Woods Pond, and MNR in the Reach 7 impoundments.) The results of this comparison are shown in the following table, which presents the predicted fish fillet concentrations under these alternatives for both Rising Pond itself and the Connecticut impoundments at the end of the 52-year projection period:

Scenario	Est. Fish Fillet Concentration (in mg/kg)				
	Rising Pond	Bulls Bridge Dam	Lake Lillinonah	Lake Zoar	Lake Housatonic
Current conditions (baseline)	6.3	0.39	0.28	0.20	0.19
MNR in Rising Pond	1.6	0.044	0.031	0.022	0.021
Thin-layer capping in Rising Pond	0.6	0.031	0.022	0.016	0.015
Partial shallow removal & full capping in Rising Pond	0.5	0.031	0.022	0.016	0.015
Region's removal/capping proposal for Rising Pond	0.9	0.033	0.024	0.017	0.016

As shown in the above table [and GE Attachment F, Figure F-3 Series], the proposed Rising Pond remedy would result in small incremental reductions in fish PCB concentrations compared to MNR in Rising Pond and ***no*** incremental reductions in such concentrations (indeed, slightly higher concentrations) compared to thin-layer capping or implementation of a smaller removal alternative with an engineered cap over the entire Pond. ([GE] Attachment H demonstrates that thin-layer capping can be appropriately used in Rising Pond as well as the Reach 7 impoundments.) In any event, the smaller removal alternative would rely on engineered capping of the entire Pond and thus would avoid the asserted concerns raised by the Region regarding thin-layer capping.

These comparisons demonstrate that neither reduction in fish PCB levels nor attainment of fish consumption standards provides a justifiable basis for the proposed dredging/removal remedy, since the same benefits could be achieved with much less removal.

EPA Response 640: EPA disagrees with GE.

The next set of comments on the Rising Pond remedy (comments 640-645) are from GE, and include individual critiques of EPA's evaluation of individual criteria or sub-criteria of the Permit remedy selection criteria. EPA addresses each comment individually below. However, it is important to note that EPA's evaluation is not simply the comparison of alternatives against one individual criterion or sub-criterion for Rising Pond. Rather, EPA's evaluation, pursuant to the Permit, has been to determine what combination of remedy components is best suited to meet the Permit's general standards in consideration of the Permit's decision factors, including a balancing of those factors against one another. EPA thoughtfully and thoroughly performed that evaluation and balancing in selecting the remedy in the Final Permit Modification.

That being said, with respect to the individual remedy component for Rising Pond, GE compares three other approaches to the selected remedy in terms of risk, or protectiveness. There are distinct risk-related benefits of the selected remedy when compared to GE's approaches.

As for the specific comparisons in the comment, GE apparently has made its comparison estimates without following the other elements of the proposed remedy. Specifically, GE's assumption includes a Monitored Natural Recovery (MNR) remedy for the Reach 7

Impoundments, where the proposed remedy included sediment removal and placement of an Engineered Cap in the Reach 7 Impoundments. An appropriate analysis of the performance of the remedy includes evaluation of the remedy in its entirety, not solely on a reach-by reach basis as GE has done. Differences in GE's results from EPA's results in the Comparative Analysis may be due to that discrepancy in GE's analysis.

GE's comment compares the selected remedy with the following: 1. MNR; 2. Thin-layer capping; and 3. sediment removal to a depth of 6 inches in the shallow portions of Rising Pond (approximately 15,300 CY) and placement of a 6-inch engineered cap over the entire Pond.

MNR in Rising Pond (coupled with MNR in the Reach 7 Impoundments as modelled by GE) would result in approximately 80% higher fish tissue concentrations than EPA's remedy in Rising Pond (1.6 mg/kg vs. 0.9 mg/kg). This is a significant difference, as are 30% to 35% increases in fish tissue concentrations as shown in the table for the Connecticut Impoundments. Also, note that with the sediment removal and Engineered Cap placement in Reach 7 (as opposed to MNR modeled by GE) as EPA's proposed and final remedies provide, EPA's model predictions presented in the Statement of Basis and Comparative Analysis predict fish tissue concentrations of 0.4 mg/kg in Rising Pond after implementation of the remedy in the Final Permit Modification. Thus, GE's proposed remedy of MNR in Reach 7 Impoundments and Rising Pond results in modeled fish tissue concentrations 4 times greater than EPA's remedy would achieve (i.e., 1.6 mg/kg vs. 0.4 mg/kg).

Additionally, using GE's analysis, EPA's remedy meets at least one additional IMPG for consumption of fish and is below the Massachusetts Department of Public Health (MassDPH) Fish Consumption advisory of 1 mg/kg, and, using EPA's predicted model output of 0.4 mg/kg, four additional IMPGs are achieved compared to MNR for Rising Pond. See Attachment 10 to the Comparative Analysis for modeled fish tissues concentrations and achievement of IMPGs resulting from simulation of the remedy described in the Final Permit Modification.

With respect to thin-layer capping in Rising Pond, note that EPA addressed GE's inappropriate evaluation of thin-layer capping in Section III.B.4 of this Response to Comments. As discussed in EPA's response, GE assumes that thin-layer capping performs the same as Engineered Capping and physically isolates the contaminated sediments from human or animal exposure, by chemically isolating the contaminated sediments from being transported up into the water column, and by stabilizing contaminated sediment to protect it from erosion, particularly in high-flow situations. This is incorrect. Thin-layer capping is not designed to provide long-term isolation of contaminants, but rather is a form of Enhanced Monitored Natural Recovery ("Enhanced MNR") in which a thin layer of clean material mixes with or dilutes the existing contaminated sediments to augment the natural sedimentation processes. As EPA's Contaminated Sediment Remediation Guidance notes, at Section 4.5 "Thin-layer placement is typically different than the isolation layer caps ... because it is not designed to provide long-term isolation of contaminants from benthic organisms."

GE appeared at one point to acknowledge this distinction. In its October 2010 Revised CMS, GE defines TLC as the "Placement of a thin-layer (e.g., 3 to 6 inches) of clean material over PCB containing sediment to provide an immediate reduction of PCB concentrations in the biologically active zone and to accelerate natural recovery." GE's Revised CMS, at 1-18.

Thus the effectiveness of thin-layer capping is overstated by GE and the reference in the table to achieving fish tissue concentrations of 0.6 mg/kg using thin-layer capping is not justified. See Section III.B.4 of this Response to Comments for a more thorough response on the effectiveness of thin-layer capping.

GE also proposes alternative (c), sediment removal to a depth of 6 inches in the shallow portions of Rising Pond (approximately 15,300CY) and placement of a 6-inch engineered cap over the entire Pond, assuming the same remediation in the upstream reaches with the exception of assuming MNR in the Reach 7 Impoundments. Note that this alternative was not evaluated by GE in its Revised CMS. However, EPA concurs that the alternative of partial dredging and installation of an Engineered Cap would likely perform similarly (with regard to model predictions of fish tissue concentrations and downstream flux) to EPA's proposed remedy of dredging sufficient sediment to place an Engineered Cap back to existing grade. This is because they are represented in the model as essentially the same remedy, with the only differences being that (1) GE wants to specify an Engineered Cap thickness of six inches in the Final Permit Modification, as opposed to determining the appropriate cap thickness in accordance with the Engineered Cap Performance Standards during design,[20] and (2) GE proposes no removal of sediment in deeper areas of the Pond prior to capping, which would decrease flood storage capacity.

EPA disagrees with both of these concepts. First, with regard to specifying Engineered Cap thicknesses as part of the Final Permit Modification, it is inadvisable as discussed in Section III.C.7 of this Response to Comments. Second, placing the Engineered Cap on top of the existing sediment bed could change the hydrodynamics of the system and would decrease flood storage capacity.

Comment 641: GE asserts the following: EPA claims that its proposed remedy is needed to reduce ecological risks and downstream transport likewise provide no risk-based justification for its proposal. EPA has made no showing that the smaller alternative remedies would result in any incremental increase in ecological risks in Rising Pond compared to the proposed removal/capping remedy. Further, since the smaller removal alternative would include capping the entire Pond, it would reduce exposure to ecological receptors to the same extent as the proposed remedy. With respect to downstream transport, the model runs do not show any incremental decrease in the PCB flux at Rising Pond Dam from the proposed remedy compared to the thin-layer capping or the partial removal/full capping alternatives. Assuming the same upstream remediation (as described above), the proposed remedy is predicted to result in an annual PCB flux past Rising Pond Dam of 2.7 kg/year, while both of the smaller alternatives are predicted to result in an annual PCB flux past that dam of 2.6 kg/year.

EPA Response 641: For purposes of this response, it is assumed that the "smaller alternative remedies" referred to by GE are 1. MNR; 2. Thin-layer capping; and 3. sediment removal to a depth of 6 inches in the shallow portions of Rising Pond (approximately 15,300 CY) and

[20] In estimating volumes and cost for its remedy, EPA estimated cap thicknesses, and associated sediment removal depths, of 1 foot low shear stress areas and 1.5 feet in high shear stress areas. (Attachment 6 of Comparative Analysis). However, as required by the Final Permit Modification, actual cap thicknesses will be determined during design. These were the assumptions used in GE's Revised CMS as well.

placement of a 6-inch engineered cap over the entire Pond. With respect to MNR, the remedy described in the Final Permit Modification will significantly reduce the concentrations and bioavailability of the PCBs in Rising Pond sediment beyond that associated with MNR. These reductions will, in turn, reduce risks to ecological receptors (i.e., benthic invertebrates, amphibians, trout, and piscivorous birds and mammals). Secondly, the performance of the thin-layer capping alternative is uncertain (see below; see also EPA's responses regarding thin-layer capping in III.C.4). For the alternative of six inches of sediment removal followed by the placement of a six-inch Engineered Cap, as noted in Response 640 and as further discussed in Section III.C.7 of this Response to Comments, specifying cap thicknesses at this stage, prior to performing remedial design activities, is not advisable.

GE also made comparisons with regard to downstream transport, or flux for TLC. With regard to the flux comparison, one would expect similar flux estimates because, as discussed above, GE inappropriately modeled thin-layer capping as though it were Engineered Capping. For the "smaller" Engineered Capping remedy, the modeling would be similar because the model was parametrized to assume all Engineered Caps function the same, regardless of actual performance. EPA's evaluation of downstream transport estimates under different alternatives is presented in Attachment 7 of the Comparative Analysis. Additionally, the estimates specified by GE in its comment are based on an inaccurate assumption of MNR in Reach 7 Impoundments, which has not been a component of EPA's proposed or final remedy for Rising Pond. Finally, note that GE did not provide a flux estimate for MNR, so no comparison is made to MNR and EPA's selected remedy.

Comment 642: GE asserts the following: As for Woods Pond Dam and the Reach 7 dams, dam failure is not a realistic risk at Rising Pond Dam because GE owns that dam and conducts the necessary monitoring, maintenance, and repair to prevent dam failure, particularly in light of the fact that the Consent Decree's covenants from the federal and state governments for natural resource damage do not apply in the case of a failure of Rising Pond Dam (CD ¶ 176). Hence, the theoretical potential for dam failure does not provide a justifiable basis for the proposed Rising Pond remedy.

EPA Response 642: GE downplays the potential for dam breach or failure due to its current ownership of Rising Pond.

GE was clearly concerned with a dam breach or failure at Rising Pond as early as 1989 - 91, when GE worked in cooperation with Rising Paper Company to develop sufficient data on sediment quality to determine the impacts on management options. Letter from David R. Baier (HARZA Engineering Company) to Ross Clark (GE), April 12, 1989, Re: Rising Pond Dam; Assessment of Planned Breaching of Dam. Letter (with attached report) from Mary B. Hall and William H. Hover (GZA GeoEnvironmental, Inc.) to Curt Reese (Rising Paper Company), May 30, 1991, Re: Sediment Sampling and Analysis Data Report; Rising Paper Company; Great Barrington, Massachusetts. In addition, shortly after those efforts by GE, as outlined in more detail in Response 626 above in this Section III.C.3., Rising Pond Dam had a significant release of PCBs downstream into Connecticut. In 1992, as outlined in more detail in Response 626 above in this Section III.C.3., releases of contaminated sediment occurred when water behind the Rising Pond Dam was released to facilitate repairs to the dam, and subsequent benthic and fish tissue sampling downstream of Rising Pond Dam showed an increase in PCB contamination.

This event demonstrates that dam breach or failure is a serious risk that EPA was correct to consider. While the dam was not under GE ownership at the time of the breach, it was subject to management under the terms of the Massachusetts dam regulations which GE has claimed prevent such an event. In fact, there have been subsequent issues regarding the integrity of the dam since GE became the owner. In 2003, GE identified issues with the gate assembly in the dam, however did not perform repairs until 2007 (Letter from Kevin G. Mooney (GE) to Dale C. Young (Commonwealth of Massachusetts Executive Office of Environmental Affairs) and Dean Tagliaferro (USEPA), December 7, 2006, Re: Repairs to Rising Pond Dam, Dam ID No. MA 00250, Housatonic River, Great Barrington, Massachusetts). In August 2008, a sinkhole was observed behind the right training wall on the downstream embankment at the top of the riprap toe. The sinkhole was monitored regularly until June 2009, when it was reported that the size of the sinkhole had increased substantially. At the end of June, a contractor excavated the sinkhole so that it could be evaluated by GE and GZA. The groundwater that collected in the bottom of the test pit was observed to be "surging," or alternately flowing towards then away from, the base of the training wall. No indications of active soil movement (e.g., siltation at the toe of slope or in the river) were observed. However, soil similar to the granular embankment fill was observed within the rip rap. This could indicate migration of the embankment fill into the riprap. It was not possible to determine if the migration occurred recently or during original construction. As an interim measure between the test pit excavation and performance of further studies, the excavation was generally backfilled with compacted granular fill and faced with a surficial layer of crushed stone. GZA, GE's contractor concluded, "While there are no known significant spillway or embankment stability issues beyond the ones reported above, it should be noted that dam stability depends on constantly changing internal and external conditions. It should not be assumed that the present condition of the dam will continue to exist in the future." (Right Embankment Sinkhole Investigations and Test Pit Explorations, prepared by GZA for GE, 2009)

Given the catastrophic and unexpected infrastructure failures observed during Hurricanes Katrina and Sandy as well as other concerns regarding climate change, dam failure or breach is not the unrealistic concern that GE claims.

Comments 643, 644: GE asserts the following: In the absence of any appreciable incremental benefits, EPA's proposed remedy for Rising Pond would have greater adverse impacts and costs than the smaller alternatives outlined in Comment 640. For example, GE has estimated that the proposed remedy would require a total of approximately 10,000-11,000 truck trips to import the necessary remediation material, transport the excavated sediments, and dispose of the staging/access material. Thin-layer capping would require only about 3,100 truck trips and the shallow partial removal/full capping alternative would require only 5,000-5,500 truck trips. Additionally, the proposed Rising Pond remedy is estimated to result in 9,600 tonnes of GHG emissions, compared to 1,400 tonnes and 8,800 tones for the thin-layer capping and smaller removal alternatives, respectively.

EPA's proposed Rising Pond remedy with off-site disposal is estimated to cost $30-31 million (depending on whether rail or truck transport is used), whereas thin-layer capping in Rising Pond is estimated to cost $10 million and the partial removal/full capping alternative is estimated to cost approximately $17 million with off-site disposal. The latter alternatives would be protective of human health and the environment and would be virtually as effective as the proposed remedy. In addition, they would also attain ARARs to at least a comparable extent as the

proposed remedy. Thus, the substantial incremental costs of the proposed remedy for Rising Pond (at least $13 million higher than the alternatives) are not proportional to or justified by the incremental benefits (if any).

EPA Response 643, 644: EPA acknowledges that short-term impacts of the proposed remedy (e.g., greenhouse gas emissions, truck traffic) and cost are higher for the remedy in the Final Permit Modification than other, less active alternatives. At the same time, those adverse effects and costs are even higher for other alternatives that EPA has analyzed and not proposed. With respect to ARARs, GE's proposed smaller remedies are not likely to meet the ARARs related to flood storage capacity and would result in potential increase in flooding. EPA evaluated these factors, and other relevant Permit criteria in proposing a remedy to address the risks of PCB contamination in Rising Pond. EPA's proposal includes significant reduction in PCB risks in Rising Pond and in the downstream transport of PCBs, in combination with flexibility for GE to propose an alternative approach to remediation, and without the drawbacks associated with locking in cap thicknesses prior to a design evaluation, and lack of accounting for flood storage capacity and potential increases in water surface elevation/flooding.

Comment 645: GE asserts the following: For the reasons discussed in Comments 640 – 644, adoption of EPA's proposed remedy for Rising Pond would be arbitrary, capricious, and otherwise unlawful.

EPA Response 645: EPA disagrees, as is specified in detail in Responses 640-644 above. Based on its evaluation of the Permit criteria, EPA continues to believe that the remedy in the Final Permit Modification is the best suited remedy based on an evaluation of all of the remedy selection criteria.

Comment 144: We question why Rising Pond is not being deepened in a manner similar to Woods pond. If the proposed cleanup activities at Woods pond will result in an improved trapping efficiency of 30%, would not a similar cleanup at Rising pond result in a greater solids trapping efficiency?

EPA Response 144: The increased solids trapping efficiency resulting from deepening Woods Pond is influenced by changes in circulation patterns within the pond. The pond entrance channels and Woods Pond Dam are separated by a short distance, whereas Rising Pond has a longer distance between the entrance channel and the dam. Under existing conditions, water entering Woods Pond during storms moves along a short path to the dam and does not fully circulate through the pond. Although storm events tend to deliver larger sediment loads, hydrodynamic short-circuiting during periods of high sediment delivery causes much of the incoming sediment to pass through the pond. The deepening of Woods Pond increases the surface area available for particle settling and reduces the short-circuiting effect. As described in Appendix F of the NRRB SIP, "the trapping efficiency of a waterbody depends on how transported solids (and associated contaminants) are removed from the water column by settling due to gravity (sedimentation)." Reducing the short-circuiting of Woods Pond by increasing the depth has the effect of increasing the effective surface area over which the water flows for settling to occur and therefore increases the trapping efficiency. The Rising Pond Impoundment is a run-of-the river system and therefore there is not an opportunity to increase the surface area available for particle settling in the same manner as in Woods Pond.

> The results of a bench-scale test of a representative chemical extraction process indicate that PCB concentrations in the treated sediment and soil would not be sufficiently low to allow reuse on-site; therefore, the treated sediment and soil resulting from TD 4 would have to be transported to a landfill for disposal. For TD 5, it is assumed that the thermal desorption process would reduce the concentrations of PCBs in the treated solid materials to levels (around 1 to 2 mg/kg) that could allow reuse in the floodplain and that it would not increase the leachability of metals from those materials so as to preclude such use. For reuse as backfill in the floodplain, only 50% of the volume is assumed to be the treated material because following thermal treatment the material would be sterile, requiring amendments to be suitable for floodplain restoration. However, due to uncertainties regarding the ultimate effectiveness of the treatment process (as well as issues relating to the reuse of the treated soil), TD 5 has also been evaluated based on the additional alternate assumption that all the treated material would be transported to an off-site landfill for disposal.

Comparative Analysis, Section 3.1, at 60.

Given the conclusions reached in the Comparative Analysis regarding the low potential for re-use of soil after treatment, no further discussion of this issue in the Comparative Analysis was necessary.

Comment 267: Need a further discussion of types of chemical desorption being considered to better evaluate their use on these contaminants.

EPA Response 267: Chemical desorption was not evaluated. Chemical extraction was evaluated as option TD 4. Section 9.4 of GE's Revised CMS provides a full description of the method evaluated.

Comment 485: The Commonwealth and the affected communities are seeking EPA's affirmation that off-site disposal will remain a legally binding requirement in the Final Cleanup Plan for Rest of River, as well as a more detailed explanation as to how it will be implemented in a manner that is most protective of our interests and concerns.

EPA Response 485: The Final Permit Modification requires off-site disposal at existing licensed facilities that are approved to receive such waste material and are in compliance with EPA's off-site rule. The details of how the remedy will be implemented will be determined as part of the remedial design process under the Final Permit Modification. Also note that the State and municipalities will have an opportunity to provide input during the design and implementation process, as discussed in Section VIII of this Response to Comments.

III.F.2 Comparative Analysis for Treatment/Disposition Remedy

GE provided comments regarding each of the nine remedy selection criteria in the Permit. Those comments and EPA's responses are immediately below, in Comments and EPA Responses 546-576. In addition, there were several non-GE comments that are directly related to the remedy selection criteria and they are also addressed immediately below. See also Section II.A of this Response to Comments for a discussion of the Permit criteria used for evaluation of alternatives.

III.F.2.a Overall Protection of Human Health and the Environment

Comment 546: GE asserts the following: EPA acknowledges that both TD 1 [Off-site Disposal] and TD 3 [On-site Disposal] would provide "high levels of protection to human health and the environment" (Stmt. Basis, p. 35). It explains that TD 1 and TD 1 RR would provide such protection by "providing for permanent disposal of PCB- contaminated sediment and soil in permitted off-site landfills," and that TD 3 would provide such protection by "permanently isolating the PCB-contaminated sediment and soil in an upland disposal facility, which would be constructed with an appropriate double liner, cover, and double leachate collection system" (Comp. Analysis, pp. 60-61). As shown in Table 1, EPA has long recognized that on-site disposal facilities are protective, particularly for sediment and soil containing PCBs, in selecting on-site disposal of such materials as a component of the remedy for numerous PCB sites throughout the country, including in Massachusetts.[30] Indeed, the EPA Region has already approved the use of on-site disposal facilities (the On-Plant Consolidation Areas [OPCAs]) at this very Site, based on determinations that such facilities are appropriate for PCB-containing sediment and soil and would not pose an unreasonable risk of injury to health or the environment. There is no justification for a different conclusion for the Rest of the River.

In an apparent attempt to distance itself from its own prior conclusions, the Region has inserted some qualifications into its discussion of the application of the overall protectiveness criterion in an effort to suggest that TD 3 would be less protective than TD 1 or TD 1 RR. Those qualifications do not withstand scrutiny and do not support the Region's conclusion.

EPA Response 546: EPA disagrees with GE's assertions, the characterization of EPA's analyses, and the conclusions of GE favoring on-site upland disposal of excavated material. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Overall Protectiveness of Human Health and the Environment, analyzing the key tradeoffs among different treatment/disposal alternatives. EPA's analysis is demonstrated in Section 3.2 of EPA's Comparative Analysis. In addition, EPA's analysis of the Overall Protectiveness of Human Health and the Environment is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. See Comparative Analysis, pages 60-62. Moreover, except as otherwise specified in the Responses to Comments, the comments, upon EPA evaluation, do not make a significant difference to the Comparative Analysis or EPA's determination.

GE's comment also include two specific assertions, which are addressed immediately below.

1. Protectiveness of on-site versus off-site permanent disposal: Pursuant to the Permit, EPA considered several factors in analyzing on-site vs. off-site permanent disposal. For example,

[30] [footnote from GE's comment] As noted in Table 1, for example, the EPA New England Region has approved the use of an on-site Confined Aquatic Disposal (CAD) cell for disposition of PCB-contaminated sediment in New Bedford Harbor (EPA, 2011). It is inconsistent for the Region to conclude that disposition of such material within that waterbody is acceptable, but that disposition of similar materials in a secure on-site upland disposal facility outside the floodplain in Berkshire County is not.

on-site disposal facilities may be less effective at containing waste than an off-site disposal facility because the locations identified in the Revised CMS do not meet TSCA's siting requirements for PCB landfills. See 40 C.F.R. § 761.75(b)(1). (Although it is possible for TSCA siting requirements to be waived, doing so would have to be based upon a determination by EPA that it is appropriate to do so, and EPA believes that it is not appropriate to do so here). GE's Revised CMS acknowledges that none of the three proposed landfill sites meet TSCA's requirements for soil characteristics including permeability. In addition, Woods Pond is located near a drinking water source and is located above a medium yield aquifer. The Revised CMS also notes that none of the three sites meet all of TSCA's requirements for a landfill site's hydrological characteristics and all three sites are located within close proximity to the Housatonic River. By contrast TSCA requires that the bottom of the landfill liner be more than 50 feet above the historical high water table, that groundwater recharge areas be avoided, and that there is no hydraulic connection between the site and a surface waterbody. See 40 C.F.R. § 761.75(b)(3). Similarly, as stated in the Revised CMS, the Forest Street Site would not meet the TSCA requirement that a landfill be located in a relatively flat area to minimize erosion or landslides.

These TSCA criteria are meant to be protective of human health and the environment in the event of leaks or failure in the landfill technology. As explained in EPA's Statement of Basis, "there is the potential for PCB releases to the Housatonic watershed if the landfills are not properly operated, monitored and maintained." Statement of Basis at 36. Moreover, the potential extended duration of the operation of the proposed on-site landfills, given the range of sediment and soil volumes at issue here and the length of remedy implementation, likely necessitates that the proposed on-site facilities operate for an extended period of time. Comparative Analysis at page 64. These factors increase the risks of potential future releases to the Housatonic watershed, compounded by the poor suitability of the proposed locations given such factors as soil permeability, proximity to the Housatonic watershed, and/or drinking water sources. Accordingly, use of on-site landfills would "rel[y] heavily on proper long-term operation, maintenance, and monitoring activities." Comparative Analysis at page 65.

In addition, GE's proposed on-site disposal sites are located within areas zoned for residential and/or conservation purposes and/or are within a designated Area of Critical Environmental Concern. By contrast, suitability and protectiveness of off-site facilities are not affected by such contrary zoning regulations or the ACEC designation, both of which call into question the protectiveness and suitability of on-site disposal locations. Indeed, an off-site disposal facility would pose no risk of release to the Housatonic watershed, and would be fully licensed and regulated under TSCA and/or other applicable federal and state requirements. Such facilities are generally constructed in the area best suited to that use considering the hydrology and soil characteristics. Here, no on-site locations have been identified that would meet the TSCA PCB landfill siting requirements. In addition, an off-site disposal landfill will already contain hazardous substances whereas none of the proposed locations identified in the Revised CMS are known to be contaminated, making them a less suitable alternative. These types of considerations are important when considering siting of a new land disposal facility (as opposed to the decision to consolidate or cap wastes in an already contaminated area).

2. EPA's past practice regarding on-site and off-site disposal: GE cites a Table (Table 1) with 24 sites where it asserts that PCB-contaminated sediments and soil were disposed on-site or at local landfills. More complete and accurate information for each of the sites listed in GE's table is provided in EPA's Table 1 to this Response to Comments. While it is true that EPA has successfully implemented on-site disposal of dredged sediments at several sites around the country, GE's table is misleading because it lumps local landfills together with true on-site disposal. For instance, GE's Table 1 cites 250,000 cubic yards of non-TSCA sediment locally disposed at the Ottawa River Site. These non-TSCA sediments were actually disposed at an off-site landfill owned and operated by the City of Toledo, while the TSCA-regulated sediments from that site were disposed out of state at a hazardous waste landfill. This "local disposal" at a fully-regulated municipal landfill is not comparable to on-site disposal, where regulations may be waived. GE's table also does not differentiate where wastes were consolidated in areas already impacted by contamination (much like the On-Plant Consolidation Areas at the Pittsfield facility, for which limited disposal was allowed under the Decree), versus construction of a new facilities in previously uncontaminated areas, as is contemplated by alternative TD-1.

   GE's Table 1 also stretches the term "on-site disposal" beyond its logical limits. For instance, Table 1 calls the disposal of roughly 100,000 cubic yards of less-contaminated sediment at the River Raisin Site "on-site disposal," but this sediment was actually disposed at an off-site pre-existing confined disposal facility two miles away operated by the US Army Corps of Engineers for disposal of contaminated sediments unearthed during navigational dredging. This disposal in a pre-existing federally-managed facility outside site borders cannot be considered "on-site disposal," and is not comparable to building a new upland disposal facility outside the area of contamination, adjacent to the Housatonic River site, where GE has argued that EPA should waive relevant and applicable regulatory requirements.

   For nearly half of the Sites listed in GE's Table 1, only a portion of the wastes was disposed on-site while the remainder was shipped off-site to a licensed and regulated landfill. For instance, at Lower Fox River more than 95% of the contaminated sediment and soils were disposed off-site at TSCA and municipal landfills, but Table 1 mentions only the small amount disposed at an off-site landfill owned by a PRP. Similarly, at the Fields Brook Site, the vast majority of contaminated sediment and soil was disposed off-site: roughly 700,000 cubic yards out of a total of roughly 750,000. But Table 1 mentions only the first Operable Unit, where 14,000 cubic yards of contaminated sediment and soils were treated on-site or disposed on-site.

   GE also cites the on-site disposal (On-Plant Consolidation Areas) of contaminated soil and sediment in the prior non-Rest of River Decree removal actions as its principal example of on-site disposal. The Decree allowed GE to dispose of dredged contaminated soil and sediment in two consolidation areas: the first on top of an existing landfill, the "Hill 78", and the second adjacent to the existing landfill, in an area called "Building 71." GE fails to mention that Hill 78 was a pre-existing landfill, not an area with no known contamination as contemplated in TD-3 (on-site disposal). Moreover, the Decree limited the footprint and height restriction for Hill 78 and Building 71 and required off-site disposal of remaining wastes. As a result, GE could only dispose approximately 245,000 cubic yards of soil,

sediment and building debris at these facilities, far less than the volume anticipated for Rest of River. GE and EPA have to date transported approximately 100,000 cubic yards of material from non-Rest of River areas off-site for disposal. Any additional material generated by GE in completing the non-Rest of River cleanups will also be transported off-site for disposal.

Comment 67: A citizen commented that there is a precedent [for] EPA allowing a landfill next to Allendale School [as part of the Consent Decree] (Hill 78 and Building 71). I think GE could go to before a judge and use this precedent to say on-site landfills were used before, so you should allow us to do it again. Furthermore, there are rumors that GE is purchasing land in the County and that indicates that GE does in fact plan to create landfills in Berkshire County for materials excavated from the river and floodplain.

EPA Response 67: See Response 546 above.

i. Potential Habitat Impacts

Comment 547, 562, 564, GE Attachment A: GE asserts the following: The Region notes that TD 3 (on-site disposal) would cause a long-term or permanent habitat change in the footprint of the upland disposal facility, although it recognizes that the capped disposal area would be replanted with grass and that the support areas would be restored (Comp. Analysis, p. 61). In addition, EPA claims that TD 3 would cause a permanent alteration of the existing habitat in the Woods Pond disposal facility, which is located within an ACEC. Contrary to the EPA's claims, any habitat impacts of TD-3 do not undermine the protectiveness because two of the potential on-site disposal facility locations are primarily forested and there would be no permanent impacts on wetlands, rare species, habitat, or other valuable or protected types of habitat and the third is currently a sand and gravel operation (the Woods Pond Site). Although the Woods Pond Site identified for a disposal facility is located within the boundaries of the ACEC, the facility would be located predominantly (over 90%) within disturbed land used for quarry operations and would not affect any outstanding resources of the ACEC. The landfills, if constructed, could be planted with native grasses to create grassland/open field habitats. This would be a habitat improvement for the Woods Pond Site. In addition, in its evaluation, EPA did not consider the habitat impacts of the rail loading facility necessary under Alternative TD 1.

EPA Response 547, 562, 564, GE Attachment A: EPA concurs that the footprint for two of the areas considered for on-site disposal (the Forest Street Site and the Rising Pond Site) are primarily forested. EPA also concurs that if these sites were to be used for disposal facilities, the habitat would change from forested to native grasslands. Note that these two facilities currently contain prime forest land as designated by the State. After tree removal and prior to final capping, which may take 15 years, the habitat value at these two locations, which are otherwise unimpacted by the site contamination, would be significantly decreased. EPA concurs that if the Woods Pond Site was selected for a disposal facility the habitat would be improved for a majority of the area after final capping was completed if the area is restored with a grassland community. However, note there is a small portion of the footprint located in prime forest habitat.

Furthermore, there are other potential adverse effects to habitat at these potential landfill locations. The Forest Street Site requires an access road that would have to be constructed over Goose Pond Brook. As stated in the Revised CMS, the access road would also be located within the 100-foot buffer zone of the brook and in addition, portions of the operational footprint would be within the 200-foot riverfront area of Goose Pond Brook (a jurisdictional resource area under the Massachusetts Wetland Protection Act). For the location referred to as the Rising Pond site, the proposed landfill operational area directly abuts 25 acres of Priority Habitat for the state-listed Wood Turtle. As a result, further confirmation would be needed to conclude if there are any effects on priority habitat of rare species in the operational area of the landfill, and depending on the significance of such effects, compliance with, or a waiver of, the Massachusetts Endangered Species Act would be required. In addition, the Woods Pond site would require a waiver of the ARAR related to permanent disposal locations within an ACEC. (See Section IV of this Response to Comments for additional responses on compliance with ARARs.)

The location of a potential rail transfer facility not been proposed or selected, so a delineation of specific habitat impacts necessarily has not been done. The Final Permit Modification requires that GE propose criteria and evaluate potential rail transfer locations using that criteria and submit this evaluation to EPA for review and approval. Final Permit Modification at II.H.1.d. (Work Plan for Siting of Temporary Centralized Contaminated Materials Processing/Transfer Locations). This process will be used to evaluate any potential effects on habitat. Based, in part, on this comment, EPA clarified Section II.H.1.d. to note that this plan covers a rail transfer facility as well.

Comment 269: One commenter asserts that each of the on-site T/D alternatives will result in a loss of habitat.

EPA Response 269: EPA concurs that some of the alternatives impact the habitat more than others. The response above, the Statement of Basis (page 37) and the Comparative Analysis (page 68) discuss the effects on habitat for various alternatives. In addition, see Response 547 *et al.* above.

ii. Risk of Leaks, GHGs

Comment 548: GE asserts as follows: EPA claims that Alternative TD 3 will have greater short-term impacts than Alternatives TD 1 and TD 1 RR due to the potential leaks during transport of leachate over public roads to GE's water treatment facility in Pittsfield. Yet EPA made no effort to quantify such risks. EPA states that, alternatively, GE would have to construct and operate a treatment facility at the upland disposal facility, and that if that facility was not operated properly, there could be releases of PCBs into the environment. EPA acknowledges that leaks during transport would occur only in the case of "malfunctioning equipment or an accident" (*id.*, p. 69) and that leaks from an on-site treatment plant would occur only if the plant "were not operated properly." Any trucks used to transport leachate would be water-tight and the total mass of PCBs transported over the life of the project would only be approximately 2 lbs. TD 1 RR would involve similar, if not greater, potential for the release of PCB-contaminated materials.

EPA Response 548: EPA's statement that there is the potential for spills of leachate (which is a liquid) during transport is accurate, even if one concludes the likelihood and environmental impact is low. Also, spills of liquid-contaminated material spread more quickly and may cause more environmental harm than spills of PCB solids that would be transported off-site via truck or rail. Similarly, if GE were to construct a water treatment facility at the location of the landfill, there is the possibility, despite best efforts to properly operate the treatment facility, to have releases of PCBs to the river.

Comments 549, 565: GE asserts as follows: TD 1 and TD 1 RR would each result in considerably more greenhouse gas (GHG) emissions than TD 3 and would have a larger carbon footprint. EPA compares the range of GHG emissions resulting from TD 1 to those resulting from TD 3, correctly noting that TD 3 would result in much lower emissions. EPA does not estimate the GHG emissions resulting from TD 1 RR, although it notes that those emissions would be "significantly lower" than under TD 1 due to the use of rail instead of truck transport. GE has estimated the total GHG emissions from each of these three TD alternatives for the removal volume represented by the proposed sediment/floodplain remedy. TD 1 would result in the greatest amount of emissions (approximately 165,000 tonnes), but TD 1 RR would result in a considerably greater amount of emissions (approximately 70,000 tonnes) than TD 3 (6,600 to 36,000 tonnes, depending on the disposal facility site used). Thus, TD 3 is much more compliant than either TD 1 or TD 1 RR with EPA's general and EPA's specific "green remediation" policies to minimize GHG generation.

EPA Response 549, 565: In the Comparative Analysis, the total GHG emissions estimated for the treatment/disposition alternatives were provided as ranges based on the potential volumes of sediment and soil that would require disposal or treatment. For TD 1 (off-site disposal to a licensed facility by truck) the GHG emission estimates ranged from 19,000 to 290,000 tonnes. GHG estimates for TD 1 RR (off-site disposal to a licensed facility by rail) were not presented in the Comparative Analysis.

GE's estimate of GHGs for TD 1 is within the ranges estimated by EPA in its Comparative Analysis. These GHG calculations are largely based on estimated roundtrip miles from the site to the off-site disposal facilities multiplied by vehicle and fuel emission factors, fuel economy values and other factors. Estimates of GHG emissions can vary extensively based on the assumptions (e.g., the assumed disposal facilities and associated roundtrip distance) used in the calculations.

EPA assumed different disposal facilities in its Comparative Analysis for off-site disposal via truck and via rail. In response to this and other comments (See Response 7, Section IX.E of this Response to Comments), EPA used GE's methods with EPA's assumed disposal facilities and conducted an additional analysis to refine the estimate of GHGs, including an estimate for GHGs for off-site disposal using rail. Based on EPA's assumptions and the estimated volume of the remedy, EPA calculates the GHGs for off-site disposal via trucks to be approximately 100,000 tonnes and for off-site disposal via rail to be 50,000 tonnes, both of which are below GE's estimates. For additional details, see Response 7. Although these estimates are greater than those for on-site disposal, they are less than estimated by GE, and are within the range of GHGs used in EPA's Comparative Analysis. Since both EPA's and GE's estimates are within the range

cited in the Comparative Analysis, neither of these estimates would change the overall evaluation of remedy selection criteria.

III.F.2.b Control Sources of Releases

Comment 550: GE asserts the following: The EPA Region recognizes that both off-site disposal and on-site disposal would control the potential for releases of PCB-containing materials into the environment through placement of those materials into engineered disposal facilities, but it then asserts that TD 1 and TD 1 RR would better meet this criterion than TD 3 (Comp. Analysis, p. 62). To support this claim, the Region states that while TD 3 would "most likely" isolate the removed material from being released into the environment, "the potential remains for releases to occur to the Housatonic River watershed both during operations and in the long term if the facility, including potentially a water treatment plant, was not properly operated and maintained."

This is not a supportable distinction. Given that all aspects of this remedial action, including the construction and operation of any on-site disposal facility, would be subject to EPA approval and under close EPA oversight, EPA could and would ensure that an on-site disposal facility is properly designed, operated, maintained, and monitored. As such, the facility would provide the same control of releases as an off-site disposal facility. The Region has provided no data on releases from either on-site or off-site disposal facilities, even though it admits that on-site disposal of PCB-containing material "has been used as part of a final remedy at a number of sites and is an effective and reliable means for permanently isolating such materials" (*id.*, p. 64). The fact that any potential releases from an on-site disposal facility, in the unlikely event that they should occur, would be within the Housatonic River watershed, whereas any potential releases from an out-of-state disposal facility would take place within the area of that facility, does not affect the ability of the facility to meet the standard of control of sources of releases. The fact that the Region raises the potential for improper operation and maintenance as a shortcoming of an on-site but not off-site disposal facility reveals its bias against on-site disposal.

EPA Response 550: EPA disagrees with GE's assertions, the characterization of EPA's analyses, and the conclusions of GE favoring on-site upland disposal of excavated material. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Overall Protectiveness of Human Health and the Environment, analyzing the key tradeoffs among different treatment/disposal alternatives. EPA's analysis is demonstrated in Section 3.3 of EPA's Comparative Analysis. In addition, EPA's analysis of the Control of Sources of Releases is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. See Comparative Analysis, pages 62-63. Moreover, except as otherwise specified in the Response to Comments, the comments, upon EPA evaluation, do not make a significant difference to the Comparative Analysis or EPA's determination.

In a comparison of Rest of River cleanup alternatives, it is fair to distinguish, as EPA did, the disposal of PCBs at a landfill in close proximity to the Housatonic River and its watershed from the disposal off-site far from the Housatonic River watershed. Even with close EPA oversight of GE's design, construction and operation of a landfill, there remains a non-zero potential for

issues in the ability long-term for a landfill next to the River to control the sources of PCBs. This concern is accentuated by the fact that the locations proposed by GE would not meet the substantive standards for a TSCA landfill, the proximity of the proposed Wood Pond and Rising Pond facilities to the Housatonic River, and the proposed location of the Woods Pond site within the ACEC. In addition, EPA provides a more detailed response at Response 546 above.

Comment 265.a: One commenter asserts the following: The Comparative Analysis of treatment/disposal should acknowledge the possibility of releases from CDFs, upland (on-site) disposal and even landfills (off-site disposal).

EPA Response 265.a: The Comparative Analysis evaluated these concerns. See Sections 3.3 and 3.5 of the Comparative Analysis, and the Response 546.

III.F.2.c Compliance with Federal and State ARARs (or Waivers of ARARs)

General Comments

Comment 551.a: GE asserts the following: With respect to the criterion of compliance with federal and state applicable or relevant and appropriate requirements (ARARs) (or the basis for a waiver of such ARARs), the Region asserts the following: (a) TD 1 and TD 1 RR have fewer ARARs and are the only TD alternatives that would attain all of them (The Region's Statement of Basis asserts in one place (p. 25) that the state requirements regarding disposal of removed sediment and soil would not constitute ARARs for TD 1 because ARARs apply only to on-site activities and, under TD 1, those materials would be disposed of off-site. However, as the Region acknowledges elsewhere, TD 1 and TD 1 RR would involve on-site staging of the removal materials and, for TD 1 RR, transfer of the materials to an on-site rail loading station, dewatering them there, and loading them into rail cars. Thus, as discussed further below, those alternatives would be subject to some of the same state requirements regarding the handling of waste as on site-disposal); (b) TD 3 "has ARARs associated with being a hazardous waste and solid waste disposal site, and possibly impacts on wetland areas"; (c) two of the three identified sites for an on-site upland disposal facility "are in, or in close proximity to, a state-designated Area of Critical Environmental Concern (ACEC)" and thus would not meet the requirements of the Massachusetts site assignment regulations for solid waste facilities (310 CMR 16.40(3)&(4)) or the Massachusetts hazardous waste regulations (310 CMR 30.708), which (the Region says) prohibit a solid waste facility and a hazardous waste facility within or adjacent to or in close proximity to an ACEC; and (d) certain of those sites would not meet the Massachusetts hazardous waste facility site safety council regulations (990 CMR 5.04), which provide criteria for evaluating such a facility, including that it is not within an ACEC. See Comp. Analysis, p. 63; Stmt. Basis, p. 36. These erroneous assertions are insufficient to support the Region's position.

Comment 493: The Commonwealth of Massachusetts asserts the following: On-site or near-site PCB disposal facility would not meet the requirements of several of the Commonwealth's regulations including, without limitation, the Massachusetts Water Quality Certification regulations (314 CMR 9.06), the Massachusetts Wetlands Protection Act regulations (310 CMR 10.59), the Massachusetts Hazardous Waste regulations (310 CMR 30.700), and the Massachusetts Site Assignment regulations (310 CMR 16.40).

EPA Response 551.a, 493: Except as discussed specifically below, EPA disagrees with GE's assertions, the characterization of EPA's analyses, and the conclusions of GE's favoring on-site upland disposal of excavated material. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Compliance with ARARs, analyzing the key tradeoffs among different treatment/disposal alternatives. EPA's analysis is demonstrated in Section 3.4 of EPA's Comparative Analysis. In addition, EPA's analysis of the Compliance with ARARs is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. See Comparative Analysis, page 63 and Attachment 13. Moreover, except as otherwise specified in the Response to Comments, the comments, upon EPA evaluation, do not make a significant difference to the Comparative Analysis or EPA's determination. See response to individual ARAR comments below and responses in Section IV of this Response to Comments. Specifically, with respect to any on-site temporary stockpiling of hazardous or solid waste, EPA has modified the discussion of the ARAR and the remedy's ability to attain the ARAR. See EPA Responses 727-728, 474-476, 497, 498, 499; 729-731, 500. With respect to TD 3 having ARARs associated with being a hazardous and solid waste disposal site, and possibly having impacts on wetland areas, that EPA statement remains accurate.

i. Massachusetts Solid Waste Facility Site Assignment Regulations

Comments 551, 552, 553, 554: GE asserts the following:

1. The Massachusetts solid waste facility site assignment regulations should not be considered as an ARAR for this site. These regulations do not apply to facilities that manage hazardous waste; therefore, EPA cannot rely on both the solid waste regulations and the hazardous waste regulations. If one set applies, the other does not.

2. In addition, EPA has not identified the solid waste regulations as an ARAR at this and other sites in Massachusetts where an on-site disposal facility was part of the remedy, and the State has not consistently applied them to such on-site disposal facilities. CERCLA and the National Contingency Plan (NCP) provide that a state ARAR should be waived where the State "has not consistently applied (or demonstrated the intention to consistently apply)" that requirement in similar circumstances at other sites.

3. The prohibition in the solid waste regulations on siting a solid waste management facility in an ACEC, even if applicable, would not bar the implementation of TD 3. Two of the three sites identified for an on-site upland disposal facility are not within or adjacent to the ACEC and thus they would not be affected by this prohibition even if it was applicable. Although the Woods Pond Site is located within the boundaries of the ACEC, the ACEC prohibition should not be applied because, as shown above, the disposal facility at that site would be located predominantly (over 90%) within previously disturbed land that has been used for long-term sand and gravel quarry operations and thus is of no environmental value.

4. Other state regulations contain ACEC prohibitions which EPA has ignored. Specifically, the Massachusetts Waterways Law regulations prohibit dredging in an ACEC (except for the sole purpose of fisheries or wildlife enhancement or as part of an Ecological Restoration

Project, neither of which is the case here); and regulations under the Massachusetts Wetlands Protection Act prohibit alteration of Bordering Vegetated Wetland in an ACEC. EPA has not cited any of these ACEC-based prohibitions as ARARs for the proposed remedy, let alone addressed whether they are properly waived. This selective memory about the Commonwealth's ACEC-based prohibitions is further evidence that EPA's reliance on such prohibitions to reject on-site disposal is arbitrary and capricious.

5. To the extent that the solid waste assignment regulations, including the ACEC prohibition, are applicable, they would likewise apply under TD 1 to the sediment/soil staging areas and under TD 1 RR to those staging areas and the rail loading facility. EPA does not mention these prohibitions, which further demonstrates its selective and arbitrary consideration of these regulations.

EPA Response 551, 552, 553, 554:

1. The Massachusetts solid waste facility regulations and the Massachusetts hazardous waste facility regulations are properly potential ARARs for the Site. See the Summary of ARARs table, which is Attachment C of the Final Permit Modification. The PCB-contaminated sediment and soil to be excavated as part of the remedy may be regulated under 40 C.F.R. Part 761, under the Massachusetts Hazardous Waste regulations at 310 CMR 30, or, if the remedy involves sediments and soils with PCB concentrations below 50 mg/kg, and such sediments and soils are not commingled with sediments and soils with PCB concentrations at or above 50 mg/kg or other hazardous wastes, the standards at 310 CMR 16 are potentially applicable (based on the conditions listed in the Summary of ARARs table). Conversely, if the sediments and soils have PCB concentrations at or above 50 mg/kg, or include commingling of sediments and soils with PCB concentrations below 50 mg/kg, and are not otherwise regulated under 40 C.F.R. 761, the Massachusetts Hazardous Waste regulations at 310 CMR 30 are potentially applicable (based on the conditions listed in the Summary of ARARs table).

2. The state solid waste landfill regulations are potentially applicable to the remedy, as described immediately above and in the Summary of ARARs table. Moreover, one provision of those regulations is the prohibition of permanent solid waste disposal within an ACEC. With respect to identification of the solid waste regulations as ARAR at other sites, EPA is unaware of other sites in which the permanent disposal will take place within an ACEC. Thus, EPA is unaware of any inconsistencies.

3. EPA agrees with GE that two of the three sites identified for an on-site upland disposal facility are not within or adjacent to the ACEC and thus they would not be affected by the 310 CMR 16 prohibition on permanent disposal facilities. However, the Woods Pond Site is located within the boundaries of the ACEC. The provision at 310 CMR 16.40(4) provides that no site is suitable where it would be located in an ACEC, or would fail to protect the outstanding resources of the ACEC if the solid waste management facility is to be located outside, but adjacent to the ACEC. Based on that provisions, the Woods Pond site is prohibited for permanent disposal under 310 CMR 16.

4. In response to this and other comments, EPA has revised its Summary of ARARs table to reflect the ACEC limitations on the selected remedy. See, for example, Response 721

regarding the Massachusetts Waterways Law regulations, and Response 722 *et al.* regarding the Massachusetts Wetlands Protection Act regulations, in Section IV of this Response to Comments.

5. In response to this comment and others, EPA has made clear in its Summary of ARARs table that to the extent that the solid waste regulations at 310 CMR 16 do potentially apply to the temporary stockpiling or storage of excavated PCB-contaminated sediment and soils, EPA is considering as waived the prohibition on temporary storage or stockpiling of material in an ACEC. See Summary of ARARs table.

ii. Federal and State Hazardous Waste Management regulations

Comments 555, 556, 557: GE asserts the following:

1. The Federal and state hazardous waste management regulations should not be considered as an ARAR. Based on prior experience at other portions of this Site, it is not anticipated that the excavated sediment or soil would constitute hazardous waste under RCRA, and thus would not be subject to the federal hazardous waste regulations. Further, in the unlikely event that future testing showed that some of those materials did constitute such hazardous waste, the upland disposal facility would be designed and operated to meet the substantive technical requirements for a RCRA hazardous waste landfill. In the further unlikely event that that facility were determined not to meet any requirements of the RCRA hazardous waste regulations, GE could arrange to transport those wastes off-site to a RCRA hazardous waste landfill for disposal.

   These same considerations would apply to the Massachusetts hazardous waste regulations insofar as those regulations apply to materials that would constitute hazardous waste under the RCRA criteria. In addition to using the RCRA criteria, the Massachusetts hazardous waste regulations also identify wastes with PCB concentrations at or above 50 ppm as hazardous waste. However, those regulations provide that, with the exception of the prohibition discussed in the next paragraph (and one other exception not pertinent here), their requirements do not apply to facilities that manage such wastes in compliance with EPA's regulations under TSCA, which the on-site upland disposal facility would do. See 310 CMR 30.501(3)(a).

2. One recently adopted provision of the state hazardous waste regulations was specifically developed to apply to waste with PCB concentrations at or above 50 ppm, and prohibits siting of a hazardous waste management facility within or in proximity to an ACEC if it would "fail to protect the outstanding resources" of the ACEC." This ACEC prohibition would clearly not apply to two of the three sites identified for an on-site disposal facility because neither is within or in proximity to the ACEC. With respect to the Woods Pond Site, this prohibition should not be identified as an ARAR or should be waived, because the facility would only affect previously disturbed quarry land and two small wooded areas that are not subject to any special protections.

3. The timing and context of the adoption of this provision, coupled with its vigorous opposition to on-site disposal for the Rest of River, indicate that MassDEP's adoption of this

provision was calculated to bolster its opposition to an on-site disposal facility at this site and to provide additional ammunition to assist EPA in rejecting that option. As such, waiver of this provision is warranted on the ground that the State has not "demonstrated the intention to consistently apply" this prohibition at other sites – which is a basis for waiver of a state ARAR under CERCLA and the NCP. Furthermore, EPA disregards and does not even mention the fact that this prohibition would also apply under TD 1 or TD 1 RR.

EPA Response 555, 556, 557:

1. The federal RCRA regulations and the Massachusetts hazardous waste facility regulations are properly potential ARARs for the Site. See the Summary of ARARs table at pages C-6, C-12 to C-13, C-20 to C-22. The PCB-contaminated sediment and soil to be excavated as part of the remedy, if the sediments and soils have PCB concentrations at or above 50 mg/kg, or include commingling of sediments and soils with PCB concentrations below 50 mg/kg, and are not otherwise regulated under 40 C.F.R. 761, the RCRA regulations and the Massachusetts Hazardous Waste regulations at 310 CMR 30 are potential ARARs (based on the conditions listed in the Summary of ARARs table). See also Section IV of the Response to Comments.

2. EPA agrees with GE that two of the three sites identified for an on-site upland disposal facility are not within or adjacent to the ACEC and thus they would not be affected by the 310 CMR 30 prohibition on permanent disposal facilities. However, the Woods Pond Site is located within the boundaries of the ACEC. The provision at 310 CMR 30.708 clearly prohibits permanent disposal within the boundary of an ACEC. 30.708: Areas of Critical Environmental Concern. Notwithstanding any other provision of 310 CMR 30.000, no facility shall be located where such location or any portion thereof:

    a. Would be within an Area of Critical Environmental Concern (ACEC), as designated by the Secretary of the Executive Office of Energy and Environmental Affairs; or
    b. Would fail to protect the outstanding resources of an ACEC as identified in the Secretary's designation if the facility is to be located outside, but adjacent to or in close proximity to, an ACEC.

3. EPA is unaware of any situation with a potential permanent facility for Massachusetts hazardous waste that is also in an ACEC where, subsequent to the promulgation of 30.708, Massachusetts has not identified the provision as an ARAR. That being the case, EPA sees no basis for determining that the State has not consistently applied the regulation.

iii. Massachusetts Hazardous Waste Facility Site Safety Council Regulations

Comment 558: GE asserts the following: These regulations set forth criteria for the Hazardous Waste Facility Site Safety Council to consider in determining whether a proposed project is feasible and eligible for certain state assistance and special permitting procedures for hazardous waste siting and licensing (990 CMR 5.04). These regulations do not establish substantive requirements or restrictions on disposal facilities, and GE would not seek the Commonwealth's assistance and special permitting procedures under these regulations. As such, these regulations are totally irrelevant to this project and thus to the ARARs evaluation here.

EPA Response 558: Based on this comment, EPA has deleted reference to 990 CMR 5.04 as a basis for an ARAR. Also, see EPA Response 727 *et al.*, Section IV of this Response to Comments.

iv. "Possible" Wetlands ARARs

Comment 559: GE asserts the following: EPA asserts that TD 3 has ARARs "possibly" associated with wetland impacts, but provides no further details as to what such ARARs might be. The operational footprints of the upland disposal facilities at the Woods Pond and Rising Pond Sites would not impact any wetlands, and thus would not be subject to ARARs associated with wetlands impacts.

At the Forest Street Site, shown on Figure 3, the operational footprint of the disposal facility would require construction of an access road that would involve the crossing of a small stream in the southern portion of the site; and the facility would be located, in part, within the 100-foot buffer zone and the 200-foot Riverfront Area of that stream, which are subject to the Massachusetts Wetlands Protection Act regulations. However, given the limited nature of this work, the Region could readily find, as it did in the discussion of these regulations in the ARARs tables relating to the proposed sediment/floodplain remedy (Draft Permit, Attachment C), that the work would be conducted in accordance with the substantive requirements of these regulations.

EPA Response 559: EPA concurs there are no currently identified wetland ARAR issues for the Woods Pond Site. For the Rising Pond Site, see Response 547 *et al.* above in this Section. For the Forest Street Site, the proposed landfill location is within a regulated wetland area and a waiver may also be required of regulations or requirements designed to protect such areas including: EPA's and the Corps of Engineers' regulations under Section 404 of the Clean Water Act (40 C.F.R. Part 230, 33 C.F.R. Parts 320-323); the federal Executive Order for Wetlands Protection (E.O. 11990); the Massachusetts water quality certification regulations for discharges of dredged or fill material into waters of the U.S. (314 CMR 9.06); and the Massachusetts Wetlands Protection Act regulations (310 CMR 10.53(3)(q)). EPA can only waive ARARs under specific circumstances, including where compliance is technically impracticable. Since there is a technically practicable alternative to constructing a landfill at the Forest Street Site, namely off-site disposal, there is no justification to granting a waiver to these ARARs. For the Rising Pond Site, and for further information on the Forest Street Site, see Response 547 *et al.* above in this Section.

III.F.2.d Long-Term Reliability and Effectiveness

Comments 560, 561: GE asserts the following: EPA states that both an off-site disposal facility and an on-site disposal facility would isolate the PCB-containing materials from direct contact with human and ecological receptors but claims, without providing any support or basis, that TD 3 would have "a greater potential" for exposure to such material and thus pose a greater "residual risk" than TD 1 and TD 1 RR. TD 3 involves no greater potential for exposure to the PCB-containing material than TD 1 and TD 1 RR.

The Region also claims that off-site disposal is more reliable than on-site disposal because "it does not rely on operation, monitoring, and maintenance requirements (except at the receiving

facility)" (Stmt. Basis, p. 36). This claim is disingenuous. Both an on-site disposal facility and an off-site disposal facility require long-term operation, maintenance, and monitoring. EPA has long recognized the reliability of on-site disposal facilities by including such facilities as the component of the remedies at numerous sites, as discussed above and shown in Table 1.

EPA Response 560, 561: In evaluating long-term reliability and effectiveness, it is entirely reasonable for EPA to draw a distinction between on-site landfilling along the Housatonic River, under the potential landfill facility conditions present, as opposed to disposal in an off-site disposal facility designed and sited for disposal of PCBs. For more detail, see Response 546. Similarly, in evaluating long-term reliability and effectiveness, EPA appropriately can draw a distinction with respect to operation, monitoring and maintenance. While the objective with any on-site facility would be to minimize any issues arising with long-term operation, monitoring and maintenance, if such issues arise with off-site disposal, the Housatonic watershed is unaffected. Conversely, if during long-term operation, monitoring and maintenance at a riverfront permanent disposal facility abutting the Housatonic River, the watershed will bear any negative impacts of any adverse circumstances in long-term operation, monitoring and maintenance. For more details, see EPA Responses 546 and 550 above.

III.F.2.e Reduction of Toxicity, Mobility, or Volume of Waste

Comment 563: GE asserts the following: EPA does not draw a distinction between the off-site and on-site disposal alternatives in terms of reduction of toxicity, mobility, or volume of waste; however, EPA does state in the Statement of Basis that off-site disposal "would reduce the volume of material that remains at the Site." That statement is disingenuous and not pertinent to this criterion. Neither off-site nor on-site disposal would reduce the volume of waste material, but would just affect where it is placed.

EPA Response 563: The language in the Statement of Basis is correct. However, even if the term "reduction of ... volume" in the Permit criterion were not meant to include the reduction of volume of waste on-site due to disposal offsite, it would not be significant enough to alter the conclusions EPA reached in it Comparative Analysis evaluation of T/D alternatives.

III.F.2.f Short-Term Effectiveness

Comment 268: In its comparative evaluation of the Short-Term Effectiveness, of the T/D alternative, EPA acknowledges that each of the alternatives has the potential for short-term impacts to the community. Given that be the case, long-term effectiveness should be the primary consideration.

EPA Response 268: EPA disagrees. The Permit states that Short-term Effectiveness and Long-term Reliability are both Selection Decision Factors. The Permit does not establish weighting factors to distinguish between these factors. See Section II.A of this Response to Comments for a further description the remedy selection process.

i. Habitat Impacts

Comment 564: GE asserts the following: EPA states that TD 1 would have the fewest habitat impacts, requiring only access roads and staging areas; that TD 1 RR would also require construction of a rail loading facility; and that TD 3 would cause a short-term loss of habitat and

loss or displacement of wildlife at the upland disposal facility and adjacent areas during construction and operation (Comparative Analysis, p. 68). In fact, both TD 1 RR and TD 3 would cause a loss of habitat and loss or displacement of the associated wildlife at the location of the facility involved – the rail loading facility for TD 1 RR and the disposal facility for TD 3. In both cases, the habitat impacts would be limited to the operational footprint of the facility.

EPA Response 564: As EPA stated, TD-1 RR would have habitat impacts at staging areas. Within that term EPA included any rail loading facility, which could have temporary habitat impacts during the temporary period the rail loading facility was used. The habitat impacts at a permanent landfill operation would include the temporary habitat impacts during implementation, and any impacts permanently from the use of that property for permanent disposal of contaminants. EPA discusses the habitat impacts of GE's different TD-3 locations in EPA Response 547 *et al.* above.

ii. Greenhouse Gas Emissions

Comment 565: GE asserts the following: EPA compares the range of GHG emissions resulting from TD 1 to those resulting from TD 3, correctly noting that TD 3 would result in much lower emissions. EPA does not estimate the GHG emissions resulting from TD 1 RR, although it notes that those emissions would be "significantly lower" than under TD 1 due to the use of rail instead of truck transport. GE has estimated the total GHG emissions from each of these three TD alternatives for the removal volume represented by the proposed sediment/floodplain remedy. TD 1 would result in the greatest amount of emissions (approximately 165,000 tonnes), but TD 1 RR would result in a considerably greater amount of emissions (approximately 70,000 tonnes) than TD 3 (6,600 to 36,000 tonnes, depending on the disposal facility site used). Thus, TD 3 is much more compliant than either TD 1 or TD 1 RR with EPA's general and EPA's specific "green remediation" policies to minimize GHG generation.

EPA Response 565: See Response 549, 565 above.

iii. Local Community Impacts

Comment 566: GE asserts the following: EPA erroneously concludes that ["d]epending on the location of the upland disposal facility under TD 3, TD 3 may have truck traffic comparable to TD-1" and that this truck traffic "may be greatly reduced by reliance on rail transportation" (Stmt. Basis, p 37).

The region correctly notes that TD-3 would involve far fewer off-site truck trips that TD-1; but it then states that TD 1 RR would greatly reduce the amount of off-site truck traffic associated with off-site disposal, erroneously claiming that that alternative would involve ***no*** off-site truck trips (Comp. Analysis, pp. 69-70). Similar to TD 3, TD 1 RR ***would*** involve off-site truck trips for importation of construction materials and equipment for construction and closure of the on-site facility (the rail loading facility for TD 1 RR and the upland disposal facility for TD 3). GE has estimated the number of off-site truck trips that would be required for TD 1, TD 1 RR, and TD 3 for the volume of materials required for disposal under the proposed remedy. Those estimates are summarized in Table 4. They show that TD 1 would require a total of approximately 83,000 off-site truck trips to transport excavated materials to the out-of-state disposal facilities, while TD 1

RR would require approximately 1,200 off-site truck trips to import materials and equipment for construction/closure of the rail loading facility and TD 3 would require approximately 2,400-2,600 off-site truck trips to import materials and equipment for construction/closure of the on-site disposal facility (except at the Forest Street Site, where, due to constructability issues, 68,000 trips would be necessary).

In addition, TD 1 RR would require ***on-site*** truck trips to transport the removed materials from their excavation location to the rail loading facility, just as TD 3 would require on-site truck trips to transport such materials to the upland disposal facility. Estimates of these on-site truck trips are provided in Table 5. As shown in that table, assuming the use of trucks for such transport, the number of such truck trips under these alternatives would be the same – approximately 103,000 (~ 8,000 per year).

EPA Response 566: EPA disagrees with GE's assertions and conclusions. First, GE ignores the term "impacts to nearby communities" taken directly from the Permit's description of the Short-Term Effectiveness criterion. That being the case, EPA's Comparative Analysis used as an appropriate metric the amount of truck miles travelled (both on-site and off-site) that affects the community, which would exclude truck traffic once vehicles are on major limited access highways such as the Massachusetts Turnpike. Using this metric, as summarized in the tables below, total truck traffic impacts for TD-1 are approximately 16% greater than for TD-3 (Woods Pond), whereas, truck traffic impacts from TD-3 (Forest Street) are almost 5 times greater than for TD-1, and truck traffic impacts from TD-3 (Rising Pond) are more than 3 times greater than for TD-1. (See table below). Clearly TD-3 has community impacts from trucking that are comparable to, and in fact in 2 of 3 scenarios, are significantly greater than, the impacts of TD-1.

Second, with respect to on-site truck trips required by TD 1 RR, EPA's Comparative Analysis in fact pointed out that it would require truck trips to transport materials to the rail loading facility. The complete sentence referenced by GE from the Comparative Analysis is: "The alternative with off-site disposal (TD 1/TD 1 RR) will have short term impacts during transport of the waste material; however the impacts of truck traffic may be greatly reduced by reliance on rail." Statement of Basis, at page 37. The comparison is between transport of waste to off-site facilities via rail or via truck. As shown in the tables below, transport of waste by rail would result in approximately 53% (72% using EPA estimates) of the truck miles needed to transport the waste by truck to the Massachusetts Turnpike. (See table below). Even accounting for the construction of a rail facility, transport by rail would be 58% (78% using EPA estimates) of the truck miles as opposed to that by truck. (See table below). Clearly, the truck traffic impact to the community for the transport of waste is reduced by using rail compared to the transport of waste to on-site facilities.

GE states correctly that EPA did not factor in the truck miles needed to construct the rail facility. Given the lack of detail supporting GE's estimate of the miles of truck traffic needed to construct the rail facility, EPA cannot comment on the accuracy of GE's estimates. However, accepting GE's assumptions for the number of truck miles needed to construct the rail facility and the three Upland Disposal Facilities, the amounts of truck traffic are considerably less for the rail facility than for any of the upland disposal facilities.

Estimated Vehicle Miles on Local Roads Required for Construction of Rail and Upland Disposal Facilities.

	TD 3- Upland Disposal Facility			TD -1 Off-site	TD-1RR
	Woods Pond	Forest Street	Rising Pond	N/A	Rail loading Facility
GE Estimate	118,100	3,399,200	131,200	0	61,700

From GE Table 4.

For an appropriate comparison of the traffic impact, EPA derived the estimated truck mileage that affect the community for the on-site and off-site transportation of waste material:

For TD 1 GE has estimated 82,599,200 vehicle miles would be required to transport materials to licensed disposal facilities (GE 2014, Table 4).[31] EPA estimates less than 1.5% or approximately 1,100,000 vehicle miles of the total TD 1 vehicle miles would be on local roads[32]. In Table 5 of its 2014 comments, GE provided estimates of vehicle miles required for TD 1 RR, and the three proposed TD 3 Upland Disposal Facilities. For the removal volume associated with SED 9/FP 4 MOD, GE has estimated a total of 835,000 vehicle miles, 1,584,800 miles, and 3,100,100 miles would be required to transport removed material on local roads to Woods Pond, Forest Street, and Rising Pond, respectively. In addition, EPA performed an independent calculation of GE's mileage calculations for the three Upland Disposal Facilities to ensure that EPA's calculations for truck mileage to the Massachusetts Turnpike were performed consistently with the calculations for estimates to the Upland Disposal Facilities. The following table provides the estimated vehicle miles on local roads required for transportation of soil and sediment removed for SED 9/FP 4 MOD. As is shown in the Table, EPA and GE's estimates are similar.

[31] These mileage estimates are for disposition of excavated sediment and soils only and do not include import of materials for backfill, capping, access roads and staging material and dispositions of staging area and access road material. For TD 1, GE has assumed non-TSCA material would be transported to Kersey, PA (roundtrip distance of 832 miles) and TSCA material would be transported to Belleville, MI (roundtrip distance of 1,362 miles).

[32] Assumes material is transported in 20-ton trucks from approximate midpoint of each Reach to the closest Massachusetts Turnpike entrance. Vehicle miles on local roads assume a round trip.

Estimated Vehicle Miles on Local Roads Required for SED 9/FP 4 MOD for Transport to Upland Disposal Facility, Rail Loading Facility or Entrance to Massachusetts Turnpike.

	TD 3- Upland Disposal Facility			TD -1 Off-site	TD-1RR[33]
	Woods Pond	Forest Street	Rising Pond	Massachusetts Turnpike	Rail loading Facility
EPA Estimate	837,250	1,469,500	3,016,600	1,110,200	799,250
GE estimate –Table 5	835,200	1,584,800	3,100,100	N/A	581,900

Notes:

Cubic yards removed is based on volumes from Table 1 of Attachment 6 to the Comparative Analysis with an assumed density factor of 1.62 tons per cubic yard.

Assume approximate midpoint of each Reach.

Assumes 16-ton trucks for transportation to TD 1 RR and TD 3 Upland Disposal Facilities and 20-ton trucks for disposal to TD 1 off-site facilities.

Combining the two tables above gives the following overall truck miles in the community associated with different disposal options.

Estimated Vehicle Miles on Local Roads Required for SED 9/FP 4 MOD for Construction of Facilities and Transport of Waste.

	TD 3- Upland Disposal Facility			TD -1 Off-site	TD-1RR
	Woods Pond	Forest Street	Rising Pond	Massachusetts Turnpike	Rail loading Facility
EPA Estimate	955,350	4,868,700	3,147,800	1,110,200	860,950
GE estimate – Table 5	953,300	4,984,000	3,231,300	N/A	643,600

Therefore, using these truck miles as a metric for the effect on the community of truck traffic related to disposal options, the option with the least impact is TD-1RR, followed by TD-3 (Woods Pond) and TD-1. TD-3 (Forest Street) and TD-3 Rising Pond have significantly greater impacts than the other options. Thus EPA's conclusions in the Statement of Basis are correct.

Comment 567: GE asserts the following: Moreover, if the Woods Pond Site were used for the on-site disposal facility, the number of such on-site truck trips could be reduced due to the capability for pumping of sediments from nearby areas (i.e., Reach 5C, Woods Pond, the nearby backwaters) to a disposal facility at that location, thus avoiding the need to truck those

[33] GE assumed a location immediately upstream of Woods Pond (GE 2014, Table 5). Although EPA does not know the exact location used in GE's estimate, to be comparable to GE's estimate, EPA also assumed a location immediately upstream of Woods Pond on the West side of the channel for this analysis. EPA mileage estimates for TD-1 RR do not consider temporary new construction roads, bridges, or river crossings, which may provide for reduced mileage estimates to the loading facility.

sediments. As shown in Table 5, the use of such a pumping approach would reduce the on-site truck trips for TD 3 by more than half – to approximately 40,000 trips (~ 3,000 per year).

EPA Response 567: EPA recognizes that pumping from Woods Pond would reduce truck traffic for TD 3. The same method could also be used for TD 1 RR, for which GE has assumed that the rail facility would be close to Woods Pond. Similarly, a reduction in off-site truck mileage for TD-1 could also be achieved by this method, since the pumping of sediment would move material closer to the Massachusetts Turnpike entrance prior to the placement into trucks.

EPA has estimated the use of a pumping approach for dredged materials removed from Reach 5C, Woods Pond and nearby Backwaters to the TD-1RR loading facility would reduce the on-site truck trips for TD-1 RR by more than half – to approximately 43,000 trips (~ 3,300 per year).

Comment 568: GE asserts the following: Overall, considering both off-site and on-site truck trips, TD 1 would involve the most truck traffic, and TD 1 RR would involve comparable truck traffic to TD 3 (or much more truck traffic if the Woods Pond Site were used for TD 3 and sediments were pumped to the Site from nearby areas). Thus, the Region's assertions in the Statement of Basis that "TD 3 may have truck traffic comparable to TD 1" and that this truck traffic "may be greatly reduced by reliance on rail transportation" are without foundation and another example of its bias against TD 3.

EPA Response 568: EPA disagrees with GE's conclusions. As described above in Response 566, EPA used an appropriate metric for evaluation of impact to local communities, and the comparisons in the Comparative Analysis are appropriate. In addition, EPA has responded to the comment on pumping from Woods Pond in Response 567.

Comment 569: GE has estimated the incidence of accident-related injuries and fatalities due to off-site truck traffic or, for TD 1 RR, off-site rail transport. These estimates indicate that a total of approximately 39 (truck) and 34 (rail) non-fatal injuries and 1.8 (truck) and 6.5 (rail) fatalities associated with off-site transport, while TD 3 would result in approximately 0.06 to 1.6 non-fatal injuries and 0.003 to 0.075 fatalities associated with such transport (depending on the disposal facility site) – more than 20 times lower.

EPA Response 569: EPA considered the estimated injuries/fatalities of different alternatives in EPA's Comparative Analysis (Section 3.8.3, Table 25, page 71). The Comparative Analysis provides a quantitative estimate of the range of injuries/fatalities for off-site disposal via trucks and for on-site disposal. With respect to off-site disposal via rail, the Comparative Analysis does not include a similar level of quantification, but EPA explains "no injuries or fatalities are associated with the alternative because it was assumed for purpose of this analysis that there would be zero off-site truck trips; however, it may be necessary to use trucks instead of rail under certain conditions." Comparative Analysis, Section 3.8.3, page 71.

EPA has not independently verified GE's estimates, but even assuming GE's estimates to be accurate, GE's estimates generally fall into the ranges of the EPA Comparative Analysis for TD 1 and TD 3.

	EPA Comparative Analysis	GE's estimates
TD 1 (Off-site disposal via truck)	4.34 - 67.03 non-fatal injuries and .2 - 3.14 fatal injuries	39 non-fatal injuries and 1.8 fatal injuries
TD 3 (On-site disposal)	0.03 – 1.6 non-fatal injuries and 0.002 - 0.07 fatal injuries	0.06 to 1.6 non-fatal injuries and 0.003 to 0.075 fatal injuries

iv. Risk to Remediation Workers

Comment 570: GE asserts the following: For TD 1 and TD 1 RR, EPA did not quantify risks to truck drivers and (for TD 1 RR) railroad employees and to the employees of the off-site disposal facilities, but did provide an estimate of risks to on-site remediation workers for TD 3. Even excluding risks to off-site workers, TD 1 RR would have risks to on-site remediation workers, just as TD 3 would, due to the need under TD 1 RR for local truck trips to the rail loading facility and for material processing and rail car loading operations at that facility. Moreover, the risks to off-site truck, railroad, and disposal facility workers under TD 1 and TD 1 RR cannot be ignored just because they occur outside of this Site (or outside Massachusetts). GE estimates the risk to on-site truck transport would be approximately 3 non-fatal injuries and 0.02 fatalities for off-site disposal via rail and approximately 4.8/0.04 for on-site disposal. As a result, worker risks do not provide a basis for selecting off-site disposal over on-site disposal.

EPA Response 570: EPA's Comparative Analysis is clear that EPA considered health and safety risks for all alternatives, including the off-site disposal alternatives (TD 1, and TD 1 RR):

> There would also be health and safety risks to site workers implementing each of these alternatives. For TD 1 and TD 1 RR, these risks would consist of risks to the truck drivers and, in the case of TD 1 RR, railroad employees, and to the employees of the off-site disposal facilities, rather than to on-site remediation workers, and thus, were not quantified. Comparative Analysis at 3.8.5.

While not quantified for all aspects of the remedy, EPA plainly did consider the risks to remediation workers from the selected remedy.

Additionally, GE's conclusion about worker risks not providing a remedy selection basis misses the point of the Permit's remedy selection process. Pursuant to the Permit, EPA performed a thorough comparative analysis that included each sub-criterion of a Permit criterion, and of each Permit criterion itself. Based on that and other information in the Administrative Record, EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. EPA's determination was not based on any individual sub-criterion such as worker risks, but by an analysis of all nine criteria (and their sub-criteria) pursuant to the Permit.

v. Summary of Short-Term Effectiveness

Comment 571: GE asserts the following: Overall, the short-term negative impacts from transport and disposal activities would be, depending on the types of impacts, either comparable among TD 1, TD 1 RR, and TD 3, or less for on-site disposal than for off-site disposal.

EPA Response 571: EPA has, through the 2014 Comparative Analysis and the Responses above, identified the short-term impacts from the relevant alternatives, and would not necessarily agree with GE's conclusion to the extent it differs with EPA's Comparative Analysis or the Responses above. In general, both TD 3 and TD 1 RR are preferable for certain components of this criterion, while less preferable for other components. TD 1 and TD 1 RR are have similar results except for, most notably, the truck-related impacts of TD 1. Overall, EPA's analysis of the Short-term Effectiveness is only one part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. Any clarifications or information presented in the comments on Short-term Effectiveness has not altered EPA's overall determination.

III.F.2.g Implementability

Comments 572, 573: GE asserts the following: The EPA Region concludes that TD 1 and TD 1 RR are more readily implementable than TD 3. This conclusion is based on several indefensible assertions.

First, the Region claims that on-site upland disposal would be "difficult, and potentially not feasible, to implement" (Stmt. Basis, p. 38; Comp. Analysis, p. 75) – or, in another place, "very difficult, if not impossible, to implement" (Comp. Analysis, p. 76). The basis for this claim is that TD 3 would require "extensive coordination with state and local officials," as well as with "the public," and would encounter substantial local and state opposition, which could render that alternative infeasible (Stmt. Basis, p. 38; Comp. Analysis, p. 75). These claims are unsupportable. Given the CERCLA and CD exemption from state and local permit requirements for on-site remedial work (CERCLA § 121(e)(1); CD ¶ 9.a), construction and operation of such a facility would not require any state or local permits or other approvals, including those relating to siting of the facility. As a result, there would be no need to seek approvals from the state or local governments, and there would be no need to "coordinate" with "the public." Thus, despite the opposition of some state and local officials and members of the public, TD 3 is plainly administratively implementable.

The Region is clearly attempting to use implementability as a surrogate for state and community acceptance, which are "modifying criteria" in the remedy selection process under the NCP (40 CFR § 300.430(f)(1)(i)(C)), but are *not* remedy selection criteria under the Permit. Since the Region cannot rely on these factors directly, it has attempted to incorporate those factors into the implementability criterion in an attempt to find support in the Permit criteria for its bias against on-site disposal. Even under the NCP, the state and local community acceptance factors are only "modifying criteria" to be considered, not criteria that should drive the decision or justify EPA's deference to the state. By contrast, the other criteria are either "threshold criteria" or "primary balancing criteria" (which include costs) (40 CFR § 300.430(f)(1)(i)), and are to be given greater weight than state and community acceptance.

EPA Response 572, 573: GE questions the support for EPA's analysis that TD 3 is difficult and potentially not feasible to implement. GE's own support for its assertion consists of the permit exemption from the Decree and CERCLA, and from that, its speculation that EPA's Implementability analysis places too much weight on State acceptance or community acceptance.

For the reasons cited below, EPA disagrees with GE's assertions, the characterization of EPA's analyses, and the conclusions of GE favoring on-site upland disposal of excavated material. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Implementability, analyzing the key tradeoffs among different treatment/disposal alternatives. EPA's analysis is demonstrated in Section 3.9 of EPA's Comparative Analysis. In addition, EPA's analysis of Implementability is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. See Comparative Analysis, pages 73-76. Moreover, except as otherwise specified in the Response to Comments, the comments, upon EPA evaluation, do not make a significant difference to the Comparative Analysis or EPA's determination.

First, EPA's analysis regarding the implementability of TD 3 has multiple lines of support taken directly from the Permit language on the Implementability criterion. The multiple sub-criteria of the Implementability criterion demonstrate the reasonableness of EPA's analysis of the implementability of TD 3. And while the statutory permit exemption has been and is relevant to EPA's analysis, the exemption does not negate the obligation under the Decree and Permit to evaluate all the Implementability sub-criteria set forth in the Permit. For example, if the statutory permit exemption negated consideration of zoning restrictions, zoning restrictions would not be listed for consideration as one of the Implementability sub-criteria. Indeed, this sub-criterion is consistent with EPA's 1988 Guidance, which provides that in addition to ARARs, "other federal and state criteria, advisories, and local ordinances should also be considered, as appropriate, in the development of remedial action alternatives." *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*. Overall, the Comparative Analysis clearly shows that EPA has not imported new criteria into the nine criteria analyzed.

Second, GE's desire to minimize the significance of Implementability among the Permit criteria is clearly inconsistent with the Permit and with EPA guidance. In fact, the 1994 EPA RCRA Corrective Action Plan guidance highlights the potential significance of the Implementability criterion as follows:

> Implementability will often be a determining variable in shaping remedies. Some technologies may require state or local approvals prior to construction, which may increase the time necessary to implement the remedy. In some cases, state or local restrictions or concerns may necessitate eliminating or deferring certain technologies or remedial approaches from consideration in remedy selection.

EPA, Final RCRA Corrective Action Plan, OSWER Directive 9902.3-2A, Office of Waste Programs Enforcement, Office of Solid Waste, May 1994.

Third, while not necessary for this analysis in light of the multiple lines of support, as described in Section II.A of this Response to Comments, EPA's decision-making process under the Permit includes "any other relevant information in the administrative record." For example, the Decree requires EPA to examine the views of the State and community by providing multiple opportunities for public comment and input.

A. Multiple Lines of Support for EPA's Implementability Determination are Squarely Within the Permit Criteria:

The Permit criterion of Implementability includes eight sub-criteria, including, relevant to this comment, the following:

- Coordination with other agencies,
- Regulatory and zoning restrictions; and
- Availability of suitable on-site and off-site treatment, storage and disposal facilities and specialists

1. Coordination with other agencies: This Permit provision requires an analysis of different alternatives on such coordination. It is eminently reasonable for EPA to consider the views of other state and local agencies in comparing off-site disposal and on-site disposal. The other agencies have very substantial support for off-site disposal and opposition for on-site disposal. For example, as discussed in more detail in Response 546, GE has stated that its proposed locations do not meet specific technical requirements for a TSCA landfill, including permeability and hydrogeology. Clearly GE would need to coordinate with state and local entities on the prospect of placing in their community a permanent PCB disposal facility at a location that would not meet the relevant PCB landfilling requirements. In fact, GE in its Revised CMS under the heading "Coordination with Agencies", states that "both prior to and during implementation of TD 3 at any of the three potential locations, GE would need to coordinate with EPA, as well as state and local agencies to provide support with public/community outreach programs."

   Additionally, given the proposed locations' potential deviations from local zoning (discussed below), and the Commonwealth's statutory prohibition on permanent disposal facilities in an ACEC, an evaluation of the "coordination with other agencies" sub-criterion can reasonably be seen to strongly favor off-site landfilling over on-site landfilling.

2. Regulatory and zoning restrictions: Similarly, an analysis of "regulatory and zoning restrictions" could easily yield a negative comparison for on-site disposal. For example, multiple TSCA landfilling requirements will not be satisfied, nor will local zoning restrictions, or Massachusetts' ACEC prohibition. All of these are regulatory and zoning restrictions to be considered under the Permit. As noted above, the statutory exemption set forth in CERCLA for obtaining permits does not override the Decree's and Permit's specific requirement that EPA consider "regulatory and zoning restrictions" in selecting a remedy for the Rest of River. Indeed, this sub-criterion is consistent with EPA's 1988 Guidance, which provides that in addition to ARARs, "other federal and state criteria, advisories, and local

ordinances should also be considered, as appropriate, in the development of remedial action alternatives." EPA, Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, OSWER Directive 9355.3-01, 1988.

The multiple TSCA requirements that would not be met, and that would require waiver for the onsite disposal locations, are discussed above at Response 546. In addition, it is very hard to interpret the ACEC prohibition in any way other than to eliminate permanent landfilling in areas of critical environmental concern. Moreover, the Massachusetts Executive Office of Energy and Environmental Affairs' designation of the ACEC, which triggers the prohibition on permanent disposal of hazardous or solid waste in the ACEC, makes that alternative infeasible to implement.

Similarly, the current zoning for the three on-site disposal locations reinforces the difficulty in implementing on-site disposal, which results in greater favorability of off-site disposal for implementability purposes. For example, the Forest Street Area of Lee is zoned primarily as Conservation – Residential, with a small part of the footprint zoned as industrial. Permitted zoning uses for Conservation – Residential are limited to one or two family houses, agriculture, horticulture, or floriculture and uses associated with these. Special permits from the Board of Selectman or Board of Appeals are required to use property in this area as a resort, private club, hospital, farm, livery. The town zoning requirements provide no indication that property in a Conservation – Residential zone can be used for permanent disposal of any waste material. Similarly, according to the May 2015 Zoning By-Laws of the Town of Great Barrington, the area between Van Deusenville Road and Rising Pond, where GE has proposed the Rising Pond landfill location, is zoned by Great Barrington as R-2 meaning residential property with land size of at least 1 acre. That zoning prohibits explicitly a number of less intrusive and likely less permanent uses than a permanent landfill, such as the following: Fuel storage and sales, Public Garage, Large Scale Commercial Development, Lumberyard, Motor Vehicle fuel station, Commercial parking lots, Freight terminals, truck or rail, Contractor's and Landscaper's yards, Light Manufacturing. For the Woods Pond location, a significant portion of the proposed operational area is currently zoned by the Town of Lenox as Conservation-Residential.

3. Availability of suitable on-site and off-site treatment, storage and disposal facilities and specialists. The "suitability" of a disposal facility includes consideration of a number of factors. For example, whether a disposal facility is "suitable" includes consideration of zoning and regulatory restrictions. After all, zoning and regulatory restrictions are often developed to protect public health and/or the environment. Therefore, in evaluating whether to locate a landfill within an area designated as an ACEC, for residential use, or for conservation purposes, EPA necessarily undertook an evaluation as to whether other locations off-site were more appropriate or suitable for disposal. These issues do arise at off-site disposal facilities and on-site locations where material was consolidated with existing waste. Similarly, Woods Pond may be unsuitable due to its location in a medium yield aquifer and proximity to a non-community groundwater source. All three proposed facilities may be considered unsuitable because they would be located in areas with no known contamination (unlike off-site disposal and the Decree's prior use of limited on-site disposal in the OPCAs). Moreover, as discussed in Response 547 above, there are engineering and topography issues at the Forest Street location. Furthermore, the Rising Pond and Woods

Pond facilities are located directly adjacent to the Housatonic River, thus any inadvertent releases would directly affect the remediate river. All of these factors make the proposed upland disposal facilities unsuitable compared to off-site disposal facilities. See also Response 546 for a discussion of TSCA site suitability criteria. Finally, as discussed further immediately below, the suitability of a disposal facility also depends to an extent on the likelihood of the facility eventually being constructed and operated, and that likelihood is greatly compromised by State, municipality and community members' resistance.

These three sub-criteria discussed above fit into the overall Implementability criterion and support consideration of factors that could affect the ability to carry out the remedy. GE argues that EPA is using implementability as a surrogate for state and community acceptance. But to implement means to "put into effect," or "to carry out." The public and legal opposition to on-site disposal is squarely within the plain meaning of the term "implementability" because it will jeopardize EPA and GE's ability to carry out the entire remedy.

For example, those who oppose on-site disposal have several mechanisms to severely delay or block implementation of the remedy. As discussed in more detail below in this Response, the opposition to on-site disposal at Rest of River has been persistent and vigorous. The Decree itself recognizes the Commonwealth's right to appeal the remedy pursuant to 40 C.F.R. § 124.19 before the EAB and Section 7006(b) of RCRA before the 1st Circuit. But the Commonwealth is not the only party with this right. In fact, any party that commented on the draft permit or participated in a public hearing on the draft permit may petition for review of the permit before the EAB. 40 C.F.R. § 124.19. Similarly, under Section 7006(b) of RCRA, "any interested person" may seek review of a permit modification under the Administrative Procedures Act in the relevant Circuit Court of Appeals.

With respect to GE's assertions on the CERCLA and Decree permit exemption, EPA has considered the exemption in the analysis, but the exemption does not negate the need to perform those Permit sub-criteria analyses. The parties to the Decree agreed to the Permit exemption provision (Decree, Paragraph 9.a.) at the same time as the parties agreed to the Permit provision that requires the analysis of those three sub-criteria within the Implementability criterion, including an analysis of regulatory and zoning restrictions.

Furthermore, the permit exemption outlined in the Decree and the NCP, 40 C.F.R. Part 300, while exempting the project from administrative approvals, does not eliminate the need to comply with substantive requirements. Implementation of an on-site disposal alternative clearly would require compliance with substantive requirements.

The off-site disposal alternatives (TD 1 and TD 1 RR) do not have these implementability issues, so on that basis alone, TD 1 and TD 1 RR are more readily implementable than TD 3.

Finally, with respect to GE's assertions as to the weight placed on state or community concerns, EPA had no cause to use anything as a surrogate for those concerns. EPA did a fair and reasonable analysis of the nine criteria, and within the analysis of the Permit criteria, the Implementability criterion included multiple specific sub-criteria that dictated EPA's consideration of State and community concerns. To do so was very appropriate on EPA's part and required by the Decree comment procedures.

EPA's interpretation of the nine permit criteria takes into account its CERCLA and RCRA guidance documents. These guidance documents call for EPA to consider state and local acceptance in remedy selection. The National Contingency Plan, which is the set of regulations governing Superfund cleanups, includes "state and community acceptance" as "modifying criteria that shall be considered in remedy selection." In accordance with this regulation, EPA's Superfund Community Involvement Handbook notes "The agency may alter the preferred alternative or shift from the preferred alternative to another if public comments or additional data indicate that these modifications are warranted."

As in CERCLA, EPA's regulations for issuing RCRA permits (along with other types of permits) require public comment and public hearing opportunities on draft permits, allowing EPA to alter the Final Permit Modification in response to public views. EPA's March 30, 2012 RCRA Public Participation Manual states, "Public participation plays an integral role in the RCRA permitting process." As this Response to Comments evidences, 40 C.F.R. Part 124 requires the solicitation of public comment on proposed decision and the Agency's response to those comments.

B. GE Overstates Potential Limit on Consideration of Community and State Concerns

As shown above, the Implementability criterion and its sub-criteria explicitly support the consideration of public and State views. EPA very reasonably included those within EPA's overall evaluation, and reached reasonable conclusions based on that evaluation. Therefore, one does not need to look further to conclude that EPA's evaluation is supportable and reasonable.

However, even if the Permit criteria did not do so, the Permit does not limit EPA to these criteria in selecting its remedy. When EPA is selecting the Corrective Measures and Performance Standards for the Rest of River, the Permit directs EPA to consider the submissions from GE, such as the nine criteria analysis in the Corrective Measures Study report, along with "any other relevant information in the Administrative Record for the modification of this Permit." Permit, Section II.J.

Public and governmental comments, minutes of the Citizens Coordinating Council, and other information relating to the many public engagement sessions sponsored by EPA are within the Administrative Record for the modification of the Permit. The Administrative Record also includes EPA regulations and guidance documents, including guidance documents for selection of CERCLA remedies and RCRA corrective actions. As explained below, these guidance documents call for consideration of community and state acceptance in remedy selection.

The Decree envisions active public and state participation in the remedy selection process. This public participation would be empty if, as GE asserts, EPA cannot consider the wishes of the community in remedy selection. For instance, Decree Paragraph 22.n calls for EPA to propose the Draft Permit Modification pursuant to EPA's RCRA regulations, "including the provisions requiring public notice and an opportunity for public comment . . ." Similarly, Paragraphs 22.j and 22.k require GE to submit a CMS Proposal and CMS Report to Massachusetts and Connecticut. Comment periods and opportunities for coordination with the states would be meaningless if public and state opinions were irrelevant to remedy selection. EPA's consideration of public or governmental comment is required by the Decree and Permit and the

procedures outlined within those documents encompass consideration of community, local government and state views.

Additional support for the need for state and community concerns to be considered comes from EPA's 1996 RCRA Advanced Notice of Preliminary Rulemaking ("Notice"). At that time, EPA's national RCRA corrective action program championed strong public participation at the same time as proposing use nationally of Corrective Action Permit criteria similar to those being used in the Rest of River permit. The 1996 Notice stated that "EPA is committed to providing meaningful public participation in all aspects of the RCRA program, including RCRA corrective action" and that among EPA's key goals and implementation strategies for corrective action was to "Continue to involve the public in all stages of the corrective action process." In that same Notice, EPA proposed to implement RCRA corrective action remedy selection through use of ten remedy selection criteria, none of which were Community Acceptance or State Acceptance.

Admittedly, the Permit does not explicitly list public and state acceptance as individual stand-alone remedy selection criteria. Nonetheless, the Permit's detailed description of the Implementability criterion, such as its specific subsections on coordination with other agencies, regulatory and zoning restrictions, and availability of suitable on-site or off-site treatment, storage, and disposal facilities and specialists, clearly is meant to accommodate public and State views. Moreover, to interpret the nine criteria otherwise leads to a result totally inconsistent with EPA guidance, the clear direction of the Decree, and RCRA and CERCLA desire for public participation. Moreover, it cannot be considered arbitrary for EPA to follow its own RCRA and CERCLA guidance in interpreting the permit criteria, and to follow the Permit direction to factor in any relevant information in the Administrative Record, in selecting the remedy. If GE intended for EPA to depart from this longstanding EPA practice codified in EPA's RCRA and CERCLA regulations, GE should have negotiated for an explicit prohibition in the Decree or Permit, but there is no prohibition in these documents. In short, far from being "arbitrary," EPA's decision to consider public and state views on the disposal alternatives was authorized by the text of the Decree, CERCLA's regulations, RCRA guidance, and overall EPA policy.

C. Persistent and Vigorous Opposition to a New Local PCB Landfill Affects Potential Implementability

GE stands alone in its advocacy of on-site disposal. Local communities and governments strongly oppose on-site disposal of PCB-contaminated material in Berkshire County. EPA has encountered this opposition from numerous Berkshire County residents, community groups, municipalities along the Housatonic, and from Massachusetts government agencies. Many residents worry about the risks posed by a PCB landfill in Berkshire County, and public opposition only intensified after GE's disposal of PCBs at the "Hill 78" landfill near a Pittsfield elementary school. Community groups have historically taken legal action to contest EPA's choices related to the cleanup. Citizens nominated, and the Commonwealth designated, the Upper Housatonic as a protected area, which activated a state prohibition on permanent landfills. Berkshire County residents have expressed their objections to siting a new PCB landfill in their community in hundreds of public comments, protests at public meetings, and letters to newspaper editors over the last decade. For example, residents submitted comments to EPA identifying this widespread sentiment, saying that creating a landfill in Berkshire County "is unacceptable to the people of this county," and "will not be tolerated by its populace."

A common theme among commenters has been a concern about the ongoing negative environmental effect of a dump or landfill in Berkshire County, which has already endured decades of impacts from GE's contamination.

Massachusetts has also declared vigorous disapproval of a new local landfill in public comments and meetings with EPA officials. From 2007 through 2014, EPA received comments from seven offices within the Commonwealth of Massachusetts, including the Departments of Fish and Game, Environmental Protection, Conservation and Recreation, and Public Health, advocating against disposal within Massachusetts. For example, the Commissioners of three Commonwealth offices wrote that "[t]he Commonwealth vigorously opposes two disposal options outlined in the Revised CMS that call for disposal of removed material to be sited within Berkshire County" because:

> Installation of a disposal facility in Berkshire County would also have extremely negative impacts to the communities surrounding the facility including economic aesthetic, recreational, and potential health impacts should the facility fail. Further, construction of yet another such facility just expands the number of locations that would be affected by PCB-contamination, requiring additional long-term monitoring, operation and management beyond what is already a long-term burden on the community, and which runs counter to the concept of the anti-degradation provisions incorporated into the Massachusetts site cleanup regulations.

MA EEA letter to EPA, January 31, 2011.

In addition, every Berkshire County city or town government along the Housatonic (Pittsfield, Lee, Lenox, Stockbridge, Great Barrington, and Sheffield) submitted at least one comment against any additional landfills. For instance, the chair of the Lenox Board of Selectmen wrote: "We find it unacceptable that there could be a new, permanent hazardous waste landfill constructed in our community. We wish to state in very clear terms that such a facility will be vigorously opposed." In 2008, Pittsfield's city council unanimously passed a resolution stating its opposition to any upland disposal facility for dredged sediments in the city of Pittsfield or Berkshire County.

In addition to voicing disapproval, the Commonwealth and public have taken action to protect the unique ecosystem of the Upper Housatonic. For example, 43 community members, including several members of the Massachusetts legislature, nominated the Upper Housatonic for designation as an ACEC, in 2008. Nearly 1000 area residents signed petitions supporting this nomination. In response, the Secretary of the Executive Office of Energy and Environmental Affairs designated the Upper Housatonic River as an ACEC in March 2009. This designation automatically activated State-wide environmental protections provided for ACECs to the 13-mile corridor of riverbed, riverbank, floodplain and riverfront land running from Pittsfield to Lee, including the prohibition of siting permanent Solid Waste facilities within or adjacent to ACECs. The Commonwealth later amended its statewide Hazardous Waste Facility Location Standards to prohibit permanent hazardous waste facilities in or adjacent to any ACEC in the Commonwealth.

Several advocacy groups have sought to shape the Housatonic River remedy, and have opposed on-site disposal. A Citizens Coordinating Council has been meeting since 1998, with

participation from groups including Mass Audubon, and the Berkshire Natural Resources Council. A community group called the Housatonic River Initiative has sponsored "No More Dumps" conferences and meetings for more than five years. Several of the groups have used legal action to oppose EPA's work at the Site. When EPA moved to enter the Decree in 2000, Housatonic River Initiative and Housatonic Environmental Action League, among other entities, moved to intervene to overturn the Decree, in part because they opposed the Hill 78 landfill.

EPA's experience at other sites lends credence to its fear that opposition to on-site disposal at the Housatonic will bar completion or timely completion of the remedy. In Bloomington, Indiana, a 1985 consent decree called for the construction of an incinerator to treat the PCB wastes from six area Superfund sites, all contaminated by Westinghouse industrial activities. The public opposed the consent decree but it was entered despite this opposition in 1985. At that point, the public successfully lobbied the Indiana legislature to pass laws that delayed construction of the incinerator, in part by forbidding local disposal of the incinerator ash. In 1994 the parties to the decree began to explore alternative remedies. Consent Decree amendments memorializing agreements for alternative remedies were entered in 1997, 1998, 1999, and 2008. In the end, cleanup was delayed for over a decade.

Similarly, in New Bedford, Massachusetts, a 1990 Record of Decision selected dredging, on-site incineration, and on-site disposal of incinerator ash for the PCB hotspot in New Bedford Harbor. In response to strong local opposition including a letter-writing campaign and other community activism, in 1993 New Bedford passed a city ordinance banning transportation of the incinerator within city limits in an attempt to prevent the cleanup. Congressional involvement from Representative Barney Frank, Senator John Kerry, and Senator Ted Kennedy, as well as the Massachusetts Department of Environmental Protection convinced EPA Region 1 to plan a new remedy with community support. The new remedy, selected in a 1999 ROD amendment, included dredging and off-site disposal of hot spot sediments without incineration. In the end, cleanup of this most contaminated area of New Bedford Harbor was delayed for nine years.

Having learned from these experiences, EPA takes community opposition seriously in its remedy selection process. In part due to strong public opposition, EPA has chosen off-site disposal at some of the nation's largest PCB-contaminated sediment sites, such as the Hudson River site. There, more than 2.7 million cubic yards of contaminated sediment have already been disposed off-site. EPA has proposed off-site disposal for the anticipated 4.3 million cubic yards of contaminated soil and sediment at the Passaic River Diamond Alkali Site after the public and state of New Jersey expressed opposition to on-site confined aquatic disposal. And at the Lower Fox River site, more than 3.6 million cubic yards of dredged sediments were disposed at off-site licensed and regulated landfills. Taken together, the volume of sediments disposed off-site at these three sites alone exceed the volume of sediments disposed on-site at other sites around the country.

Comment 574: GE asserts that EPA suggests that if additional remediation beyond the currently proposed remedy should be required later, the capacity of the on-site disposal facility would represent a constraint. This hypothetical constraint does not affect the implementability of TD 3. Off-site landfill capacity is also an issue for TD 1 and TD 1 RR. In any case, under TD 3, if additional removal were required later, that additional material could be transported to an off-site disposal facility at that time (assuming there is sufficient capacity). This possibility provides no

basis for not selecting an on-site disposal facility for the volume of the currently proposed remedy.

EPA Response 574: The language in the Comparative Analysis is correct in that the capacity of the on-site disposal facility would represent a constraint on the future placement of additional waste, beyond site capacity, if it is required later. While EPA understands GE's point that in both situations the future disposal location could be off-site disposal, it still is accurate that on-site landfilling would be subject to the capacity of that facility alone, where a choice of off-site disposal without specification of a particular individual facility could conceivably be limited only by the capacity of all appropriate locations.

Comment 494: The Commonwealth concurs with EPA's assessment in the Statement of Basis that the likely significant local and state opposition to the on-site disposal alternatives would render these alternative more difficult, and potentially not feasible to implement.

EPA Response 494: EPA acknowledges this comment.

III.F.2.h Cost

Comment 575: GE asserts that they developed cost estimates for TD 1, TD 1 RR, and TD 3 (for each site) for the volume of materials that would require disposal under EPA's proposed sediment/floodplain remedy – approximately 1 million cubic yards – using cost estimating methodologies that were previously discussed with EPA without its objection. These estimates confirm that on-site upland disposal (TD 3) would be far less costly than off-site disposal – by up to approximately $305 million compared to TD 1 and up to approximately $250 million compared to TD 1 RR.

GE's estimated costs are: $368 million for off-site disposal with trucking; $314 million for off-site disposal via rail; and $63 million to $127 million for on-site disposal (depending on the selected disposal site).

EPA Response 575: In the Comparative Analysis, EPA included one cost for on-site landfilling of $100 million, regardless of the landfill location. This estimate is within the range provided by GE. For disposal by rail, the primary difference between EPA's estimate of $287 million and GE's $314 million estimate appears to be the construction of the rail transfer facility, which GE estimates at between $20 and $30 million. EPA's estimate for a rail facility is approximately $300,000. All other costs appear to be in the same range. For off-site disposal via truck, EPA's estimate of $308 million was based on unit pricing provided in the 2008 CMS and 2010 Revised CMS developed by GE. GE apparently did not use that pricing to prepare its comments. However, disposal pricing via trucking is highly dependent on current fuel prices, and the availability and pricing from disposal facilities. As has been demonstrated in the last three years, the price of fuel has extremely large fluctuations. Thus, if one were to obtain overall disposal pricing today, they would likely be less than GE estimated. Also, it is not practical to continually revise cost estimates after a corrective measures study is conducted, and then continually conduct analysis comparisons. Therefore, EPA believes its cost estimates of $287 million for rail and $308 million for disposal via trucking is appropriate for comparison purposes. Thus, EPA estimates the difference in cost for off-site and on-site disposal ranges from $160 to $245 million, whereas GE's range is $250 to $305 million.

Regardless of the method used to estimate disposal costs, EPA acknowledges that the cost difference between on-site and off-site disposal is significant. Based in part on GE's evaluation in the Revised CMS, EPA performed a thorough comparative analysis of the alternatives with respect to Cost, analyzing the key tradeoffs among different treatment/disposal alternatives. EPA's analysis is demonstrated in Section 3.10 of EPA's Comparative Analysis. In addition, EPA's analysis of Cost is only part of EPA's overall evaluation of the Permit criteria, on which EPA based its determination of the selected remedy as best suited to meet the Permit's General Standards in consideration of the Permit's Selection Decision Factors, including a balancing of those factors against one another. See Comparative Analysis, pages 76-77. Moreover, except as otherwise specified in the Response to Comments, the comments, upon EPA evaluation, do not make a significant difference to the Comparative Analysis or EPA's determination. Any clarifications or information presented in the comments on Cost has not altered EPA's overall determination.

III.F.2.i Conclusion

Comment 576: GE asserts the following: As shown in the preceding sections, TD 1, TD 1 RR, and TD 3 would all meet the General Standards of the Permit, and the Selection Decision Factors clearly favor TD 3 since that alternative is at least comparable to, if not better than, TD 1 and TD 1 RR in terms of the Permit criteria other than cost and is much less costly. Accordingly, TD 3 best meets the General Standards of the Permit in consideration of the Selection Decision Factors. This conclusion is supported by EPA guidance on RCRA corrective action, which states:

> EPA believes that many potential remedies will meet all the threshold criteria. In that situation, cost becomes an important consideration in choosing the remedy which most appropriately addresses the circumstances at the facility and provides the most efficient use of Agency and facility owner/operator resources (emphases added).[34]

That is the situation here. Given the overall comparability of off-site disposal and on-site upland disposal in terms of the General Standards and the other Permit criteria, cost becomes a key factor; and given the substantially lower costs of on-site upland disposal, application of the Permit criteria compels selection of that alternative. The above quotation reflects a concept of cost-effectiveness similar to that in the NCP, which requires that a remedy be "cost-effective" and provides that a remedy "shall be cost-effective if its costs are proportional to its overall effectiveness" (40 CFR § 300.430(f)(1)(ii)(D)). The preamble to the NCP explained: "In comparing alternatives to one another, the decision-maker should examine incremental cost differences in relation to incremental differences in effectiveness. Thus, for example, if the difference in effectiveness is small but the difference in cost is very large, a proportional relationship does not exist" (55 Fed. Reg. 8666, 8728 (1990), emphasis added). In such a situation, the more costly alternative would not be cost-effective. Since on-site upland disposal

---

[34] Advance Notice of Proposed Rulemaking on Corrective Action, 61 Fed. Reg. 19432, 19449 (May 1, 1996), which EPA has stated is to be used as guidance for activities under RCRA corrective action permits (64 Fed. Reg., 54604, 54607, Oct, 7, 1999).

here satisfies the threshold criteria, is as effective as off-site disposal, and would cost much less, off-site disposal would not be cost-effective.

For the reasons given above, the Region's selection of out-of-state disposal over secure on-site upland disposal would be arbitrary and capricious and inconsistent with the Permit criteria.

EPA Response 576: EPA disagrees. EPA was well within its discretion to choose off-site disposal from the range of alternatives. EPA disagrees with GE's contention that the alternatives were comparable but for the cost criterion. EPA's Comparative Analysis and Statement of Basis, as further informed by the comments and responses herein, demonstrate clear distinctions between GE's favored approach and the selected remedy with respect to each of the Permit's threshold General Standards – Overall Protection of Human Health and the Environment, Control of Sources of Releases, and Compliance with ARARs. Moreover, as required by the Permit, EPA also evaluated all six of the Permit's Selection Decision Factors, including balancing of those factors against each other. Based on that evaluation, EPA has selected the alternative best suited to meet the Permit's General Standards, in consideration of the decision factors, including a balancing of those factors against each other. EPA's decision-making process under the Permit also includes consideration of "any other relevant information in the administrative record." In doing so, EPA follows the Decree, including the Permit criteria, and fulfills its duty to protect the public, and furthers the objectives of CERCLA and RCRA.

Comment 736: GE asserts that EPA's proposal includes, as Attachment D to the Draft Permit, a proposed determination by EPA under § 761.61(c) of the Agency's TSCA regulations that the sampling, storage, cleanup, and disposal of PCB-containing materials in accordance with the proposed requirements would meet the requirements for risk-based approval under TSCA – i.e., that they will not result in an unreasonable risk of injury to human health or the environment. That determination, however, would be based on the condition that "[a]ll contaminated sediment and floodplain soil that is removed will be disposed of off-site" at an existing approved disposal facility."

The TSCA risk-based determination should not be dependent on off-site disposal. As demonstrated in Section II of these comments [see comments above in this section], even with on-site upland disposal, the PCB handling and disposal activities would not result in an unreasonable risk of injury to human health or the environment. For the reasons given in Section II [see comments above in this section], GE submits that the Region is required to change its proposed disposal method to disposition in an on-site upland disposal facility; and it should issue a TSCA risk-based approval determination for that approach. Indeed, at both this Site and numerous other sites, EPA has issued risk-based determinations under the TSCA regulations that on-site disposal facilities will not result in an unreasonable risk of injury to human health or the environment or has otherwise waived specific TSCA requirements as not necessary to protect against an unreasonable risk of injury to human health or the environment.[35] The same should be done here.

---

[35] [footnote from GE comment] See, e.g., the TSCA risk-based determinations for the OPCAs at this Site (Decree Appendix D, pp. 41-43) and for the Confined Aquatic Disposal cell at the New Bedford Harbor Site (EPA, 2011) and the TSCA risk-based determinations or waivers issued by EPA for the on-site disposal facilities at the Norwood PCBs Site (EPA, 1996), the Sullivan's Ledge Site (EPA, 1989, 1991a), the Silresim Chemical Corporation Site (EPA, 1991b), the Allied Paper/Portage Creek/Kalamazoo River Site (EPA 1998, 2001b), and the Fields Brook Site (EPA, 1997c, 1997d).

EPA Response 736: EPA disagrees. Neither the Permit nor the Decree require EPA to make a risk-based determination pursuant to TSCA Section 761.61(c) for all the alternatives evaluated. That being the case, EPA appropriately has not made a risk-based determination for any of the alternatives not proposed or selected, which includes GE's favored approach for disposal.

III.F.3 New and Innovative Technologies

Comments 60, 75, 100, 155, 200, 201, 202, 203, 204, 210, 214, 222, 264, 267, 271, 362, 385, 414, 431, 514, 527: Several commenters encouraged the use of new and innovative technologies as part of the Rest of River remediation. Some recommended pilot programs to test new technologies that could then be incorporated into the cleanup. Some of the innovative technologies mentioned included bioremediation (including the vendor, Biotech), soil washing by Biogenesis, phytoremediation, ozonation, the use of fungi and activated carbon as a sediment amendment. One commenter mentioned that it was unlikely that any in situ treatment alternative will become viable during the life of the project and another stated that the river should not be remediated until a less invasive technology is found.

EPA Response 60, 75, 100, 155, 200, 201, 202, 203, 204, 210, 214, 222, 264, 267, 271, 362, 385, 414, 431, 514, 527:

i. Delay Cleanup until a Viable Less Invasive Technology is Found.

Due to the unacceptable threats to human health and environment posed by the PCBs and the need to control the sources of releases of PCBs, EPA believes that the cleanup cannot be indefinitely delayed until a less invasive technology is found that is appropriate for all components of the cleanup. Where appropriate, innovative and/or less invasive technologies have been incorporated into the Final Permit Modification. Specifically, the Final Permit Modification requires the use of an amendment such as activated carbon and/or other comparable amendment in lieu of excavation/dredging in Reach 5B sediment in certain Backwaters, and as an initial remediation measure in Vernal Pools.[36]

ii. Evaluation of New and Innovative Treatment Technologies

Prior to proposing the Draft Permit Modification, EPA required GE to investigate technologies to treat the PCB contaminated soil and sediment.

In GE's 2007 CMS Proposal, several alternative methods/innovative technologies were evaluated for further consideration in the CMS. In place, or *in-situ*, methods evaluated included

[36] In the Draft Permit Modification, the use of sediment amendments was required as the remediation method for sediment in Reach 5B and in certain Backwaters, and as one of three potential remediation methods for Vernal Pools. In the Final Permit Modification, as discussed in Section III.C., the approach to Vernal Pools was revised to require the use of sediment amendments as the preferred remedy, with excavation in the event the sediment amendment method was not effective.

not EPA's role under CERCLA or RCRA and is not an appropriate part of a remedial action or corrective measures under those statutes.

Comment 744: GE asserts the following: The proposed remedy would require that, in the event that a third party implements a project along the River that would require handling or disposition of sediments with PCB concentrations greater than 1 mg/kg, or in the event of a dam failure or unpermitted release from behind a non-GE-owned dam, GE must pay the costs associated with PCBs. In addition to other defects, since those requirements are contingent on future events, they have not been evaluated under the Permit criteria, and EPA has not provided for such an evaluation to be conducted in the future before this requirement would apply.

EPA Response 687, 688, 744: EPA, based in part on these GE comments, has modified GE's responsibilities regarding Legally Permissible Future Projects, Work, or Future Uses and is not relying on GE's payment to third parties of incremental costs due to GE's contamination. See Final Permit Modification Sections II.B.2.j., k. and l. and II.B.6.b. and c, and the inclusion of definitions for Legally Permissible Future Projects or Work, and Legally Permissible Future Use. The modified requirements, at Section II.B.2.j., k. and l. and II.B.6.b.and c., are clearly related to the risks posed by PCBs and the objective of controlling sources of releases of PCBs. The Final Permit Modification provisions provide that GE shall conduct response actions to allow such Legally Permissible Future Projects, Work, and Future Uses to be conducted in a manner that maintains Performance Standards and/or maintains the effectiveness of the Rest of River Remedial Action. Thus, these modified and limited provisions are tied to and support the remedy, address risks due to PCB releases, and do not exceed EPA's authority or usurp judicial authority.

EPA notes that responsible party cleanup obligations under CERCLA and RCRA are not invalid merely because they may benefit third-parties. Responsible parties are required to address risks posed by their contamination under these statutes, even if such contamination is located on third-party property and even if such response actions could benefit the third-party owner by addressing contamination on that party's property. Otherwise, a responsible party would never have to address their contamination located on third-party property.

With respect to responsibility for PCBs, Section I.P. of the Permit includes the following provision:

> For purposes of this Permit, [GE] agrees that, for hazardous waste and/or hazardous constituents in the Rest of River area which are also present both at the GE Facility and at the Former Oxbow Areas (as defined in the Consent Decree) and which could have migrated to the Rest of River area from either the GE Facility or the Former Oxbow Areas, [GE] will not contest that such waste and/or constituents did not migrate from the GE Facility.

With respect to GE's arguments that these requirements are a "contingent remedy" not evaluated under the Permit criteria, see EPA's Response 669, Section III.B.1.

Comments 689, 690, 691, 692: GE asserts the following: Contrary to the heading in the Draft Permit, EPA's proposed requirement for GE to pay PCB-related costs incurred by others in

Table 1. Disposal Sites in Table 1 of GE's October 27, 2014 Comments on EPA's 2014 Draft Permit Modification that had Off-site Disposal of PCB-Contaminated Sediment/Soils

Site	Information Cited in GE's Exhibit A (On-site Disposal Volume/Type of Disposal)	Actual Total Volume Sediment/Soils Disposed On-site	Actual Total Volume Sediment/Soils Disposed Off-site	Source/Basis
GE Housatonic, including Upper ½ Mile and 1 ½ mile reaches R1 / MA	245,000 yds^3 / Placement in two on-site consolidation areas at GE Plant – a new one for TSCA and RCRA regulated material and an existing one for other material.	245,000 yds^3 disposed on-site.	Approximately 125,000 to 135,000 yds^3 to be disposed off-site (excluding Rest of River).	CD (2000) Interview with Dean Tagliaferro, EPA RPM, January 2016
New Bedford R1 / MA	up to 550,000 yds^3 / Disposed in on-site CAD in Lower Harbor.	19,000 yds^3 disposed in on-site Pilot Study CDF. 300,000 yds^3 projected to be disposed in CAD cell in Lower Harbor.	As of 12/4/15, 384,421 yds^3 disposed off-site. 229,579 yds^3 projected additional to be disposed off-site.	OU 2: 1990 ROD 1992 ESD 1995 ESD 1999 Amended ROD OU 1: 1998 ROD 2001 ESD 2002 ESD 2010 ESD 2011 ESD 2015 ESD Interview with Elaine Stanley, EPA RPM 1/12/16-1/20/16
Norwood PCBs R1 / MA	20,000 yds^3 / Consolidation of soils and sediments into portion of site to be covered with TSCA-compliant multi-layer cap.	20,000 yds^3 consolidated and capped on-site.	Approximately 500 yds^3 disposed off-site (1983 removal action).	ROD Amended (1996) Interview with Dan Keefe, EPA RPM, 1/19/16
Grand Calumet River R5 / IN	~800,000 yds^3 / On-site disposal of sediments in a RCRA CAMU.	Approximately 800,000 yds^3 disposed on-site in RCRA CAMU as part of U.S. Steel site remediation.	150,000-200,000 yds^3 disposed off-site.	AOC under RCRA (1998) CD under CWA (1998) Interview with Dianna Mally, EPA Project Mgr 1/21/16

Table 1. Disposal Sites in Table 1 of GE's October 27, 2014 Comments on EPA's 2014 Draft Permit Modification that had Off-site Disposal of PCB-Contaminated Sediment/Soils (Continued)

Site	Information Cited in GE's Exhibit A (On-site Disposal Volume/Type of Disposal)	Actual Total Volume Sediment/Soils Disposed On-site	Actual Total Volume Sediment/Soils Disposed Off-site	Source/Basis
Lower Fox River R5 / WI	81,000 yds^3 /disposal at local industrial landfill owned by PRP located approximately 6 miles away.		3,694,000 yds^3 as of 8/1/15 disposed off-site. Volume includes 81,000 yds^3 from 2000 removal action disposed off-site in Green Bay, WI landfill owned by PRP Fort James Corp. The additional dredged volumes were disposed at facilities in Whitelaw, WI (TSCA), Chilton, WI (non-TSCA), and at two facilities in Michigan.	AOC (2000) see also final report on project (2000) NPL Fact Sheet (2015) Interview with Jim Hahnanberg, EPA RPM in August 2015 and with Susan Pastor, EPA Community Involvement Coordinator, January 2016
Ashtabula River R5 / OH	500,000 yds^3 /On-site disposal on PRP's property.		509,000 yds^3 sediment pumped through a 2.5 mile pipeline to a sediment confinement facility on the Fields Brook site in Ashtabula, OH (owned by a PRP).	Fact Sheet (May 2008) Interview with Owen Thompson, EPA Project Manager for Fields Brook site, 1/27/16
Ottawa River R5 / OH	250,000 yds^3 / disposal of sediments (except from limited hotspots) in nearby landfill.		239,877 yds^3 disposed off-site (includes 220,000 yds^3 non-TSCA regulated disposed at Hoffman Road Landfill, Toledo, OH; 19,877 yds^3 TSCA-regulated disposed out-of- state).	Ottawa River Legacy Act Cleanup (2010) Interview with Scott Cieniawski, EPA Project Mgr., August 2015

Table 1. Disposal Sites in Table 1 of GE's October 27, 2014 Comments on EPA's 2014 Draft Permit Modification that had Off-site Disposal of PCB-Contaminated Sediment/Soils (Continued)

Site	Information Cited in GE's Exhibit A (On-site Disposal Volume/Type of Disposal)	Actual Total Volume Sediment/Soils Disposed On-site	Actual Total Volume Sediment/Soils Disposed Off-site	Source/Basis
River Raisin R5 / MI	109,000 yds^3 / On-site disposal of less contaminated sediment (106,000 yds^3) at CDF 2 miles north of river mouth. Off-site disposal of the most contaminated sediment (3,000 yds^3).		72,250 yds^3 (includes 70,000 yds^3 non-TSCA regulated disposed at USACE Sterling State Park CDF approx. 2 miles north of River Raisin mouth; 2,250 yds^3 TSCA regulated disposed at Wayne Disposal, Belleville, MI).	River Raisin Legacy Project (2012) Interview with Scott Cieniawski, EPA Project Mgr., August 2015
Outboard Marine Corporation Site / Waukegan Harbor R5 / IL	OU 2: 124,000 yds^3 / On-site disposal at Outboard Marine Corporation Plant 2 property at newly constructed sediment consolidation facility.	126,000 yds^3 from Waukegan Harbor consolidated in on-site containment cells including approximately 12,000 yds^3 that were thermally treated prior to placement in cells, resulting in 30,000 gallons of removed PCBs, being disposed off-site.	Approximately 46,000 yds^3 from Outboard Marine Corp. Plant 2 property disposed off-site under 2006 removal action and 2007 ROD.	ROD (2009) ROD (2007) Fourth Five-Year Review (2012) ESD (2012) Interview with Timothy Drexler, EPA RPM, January 2016
Allied Paper / Portage Creek (including Bryant Mill Pond) / Kalamazoo River R5 / MI	OU3: 4,000 yds^3 / Consolidation of soil/sediment into existing on-site landfill to be capped. Bryant Mill Pond: ~150,000 yds^3 / Disposal in on-site former dewatering lagoons on PRP property.	154,000 yds^3 disposed on-site in Allied Landfill.	166,127 yds^3 disposed off-site from various removal actions. 30,800 yds^3 projected to be disposed off-site under 2015 ROD for Kalamazoo River.	Bryant Pond Time Critical Removal Action (1999) RODs (1998, 2015) Interview with Jim Saric, EPA RPM, January 2016

Table 1. Disposal Sites in Table 1 of GE's October 27, 2014 Comments on EPA's 2014 Draft Permit Modification that had Off-site Disposal of PCB-Contaminated Sediment/Soils (Continued)

Site	Information Cited in GE's Exhibit A (On-site Disposal Volume/Type of Disposal)	Actual Total Volume Sediment/Soils Disposed On-site	Actual Total Volume Sediment/Soils Disposed Off-site	Source/Basis
Fields Brook R5 / OH	14,000 yds^3 / Off-site thermal treatment of most contaminated sediment (3,000 cy). Disposal of other excavated sediments (11,000 cy) at on-site TSCA-equivalent landfill.	Approximately 41,514 yds^3 disposed on-site.	Over 729,079 yds^3 disposed off-site.	ROD (1986) ESDs (1997, 1999, 2001) Third Five-Year Review (2014) Interview with Owen Thompson, EPA Project Manager, 1/27/16
Twelve Mile Creek R4 / SC [Sangamo Weston / Twelve Mile Creek/Lake Hartwell)	Volume not specified / On-site disposal of sediments dredged from behind dams at upland SMU proximate to site.		450,000 yds^3 non-TSCA regulated disposed in off-site landfill constructed on parcel purchased by PRP located adjacent to the site.	ESD (2009) Interview with Craig Zeller, EPA RPM, 1/25/2016
Reynolds Metal / St. Lawrence River R2 / NY	77,600 yds^3 /On-site disposal of sediments with PCBs < 50 ppm at industrial landfill on PRP property with RCRA cap. Off-site disposal of sediments with PCBs > 50 ppm.	69,000 yds^3 non-TSCA regulated disposed on-site.	16,655 yds^3 TSCA- regulated disposed off-site.	Decision Document Amend (1998) Interview with Pam Tames, EPA RPM 1/20/16

Table 1. Disposal Sites in Table 1 of GE's October 27, 2014 Comments on EPA's 2014 Draft Permit Modification that had Off-site Disposal of PCB-Contaminated Sediment/Soils (Continued)

Site	Information Cited in GE's Exhibit A (On-site Disposal Volume/Type of Disposal)	Actual Total Volume Sediment/Soils Disposed On-site	Actual Total Volume Sediment/Soils Disposed Off-site	Source/Basis
Commencement Bay: Thea Foss/Wheeler-Osgood Waterways R10 / WA[41]	620,000 yds^3 / Disposal of contaminated sediments in on-site near-shore fill area (St. Paul near-shore fill area).	422,535 yds^3 disposed in a CDF at the head of the St. Paul Waterway.	Approximately 5,000 yds^3 from Thea Foss disposed in permitted off-site, upland facility located in Pierce County, WA.	ESD (2004) Five-Year Review (2004) Remedial Action Construction Report (2006) Third Five-Year Review (2009) Fourth Five-Year Review (2014) Interview with William Ryan, EPA RPM, February 2016
Commencement Bay / Hylebos Waterway R10 / WA	940,000 yds^3 / Disposal of contaminated sediments at local near-shore man-made slip (Blair Slip 1) converted to CDF and at upland regional landfill.	493,000 yds^3 disposed in the Blair Slip 1 Nearshore Confined Disposal Facility (NCDF) created by the Port of Tacoma, a PRP, as a dual purpose use: a shipping terminal has been constructed on top.	135,000 yds^3 less contaminated sediment disposed in Dredged Material Management Program (DMMP) which is located in open water in Commencement Bay, but manages material dredged to maintain navigational waterways and berth depths in the state of Washington. 405,000 yds^3 dredged from the head of the Hylebos disposed at Roosevelt Regional Subtitle D Landfill in central Washington (located over 200 miles from Commencement Bay).	Third Five-Year Review (2009) Fourth Five-Year Review (2014) Interview with Jonathan Williams, EPA RPM, 2/5/2016

[41] The Commencement Bay Superfund site has several operable units. Only those for which PCBs were a major constituent of dredged sediment were included in this table. The CDFs which received sediment from the operable units discussed above also received sediment from other operable units/projects.

Table 1. Disposal Sites in Table 1 of GE's October 27, 2014 Comments on EPA's 2014 Draft Permit Modification that had Off-site Disposal of PCB-Contaminated Sediment/Soils (Continued)

Site	Information Cited in GE's Exhibit A (On-site Disposal Volume/Type of Disposal)	Actual Total Volume Sediment/Soils Disposed On-site	Actual Total Volume Sediment/Soils Disposed Off-site	Source/Basis
Commencement Bay/ Olympic View Resource Area R10 / WA			2002 Non-Time Critical Removal Action: Approximately 11,000 yds^3 of contaminated sediment and debris were removed from the nearshore area and disposed of in an off-site upland landfill.	Third Five-Year Review (2009) Fourth Five-Year Review (2014)