Attachment 5

Excerpts from EPA's Statement of Basis for Proposed Remedial Action for the Housatonic River "Rest of River" (June 2014)

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Statement of Basis for EPA's Proposed Remedial Action for the Housatonic River "Rest of River"

THE RIVER *The Housatonic River is contaminated with polychlorinated biphenyls (PCBs) released from the General Electric Company (GE) facility in Pittsfield, MA. The entire site consists of the 254-acre GE facility; the Housatonic River and its banks and floodplains from Pittsfield, MA, to Long Island Sound; and other contaminated areas. Under a federal Consent Decree, GE is required to address contamination throughout the site, including in the River.*

YOUR OPINION COUNTS: OPPORTUNITIES TO COMMENT

EPA is accepting public comment on this proposal from June 25, 2014 through August 8, 2014. EPA's Proposed Remedial Action is based on current information and the cleanup plan could change in response to public comment or new information. The following two public informational meetings will include a presentation describing the Proposed Remedial Action, followed by a question and answer session. EPA will begin a formal public comment period on June 25, 2014. Near the end of the public comment period, EPA will schedule a Public Hearing where the public will have an opportunity to make oral comments during this Hearing for EPA to consider. You may also submit written comments – see page 43 to find out how.

For further information about these meetings, call Kelsey O'Neil of EPA's Community Affairs office at 617-918-1003, or toll-free at 1-888-372-7341.

<u>Public Informational Meeting</u>
Wednesday, June 18, 2014 at 6:00 pm at Lenox Memorial Middle/High School, Lenox, MA

<u>Public Informational Meeting</u>
Tuesday, June 24, 2014 at 6:00 pm at Kent Town Hall, Kent, CT

<u>Public Hearing</u>
date/time/location to be determined

SUMMARY:

After careful study of the impacts of PCBs released to the Housatonic River from the GE-Pittsfield/Housatonic River site in Pittsfield, MA, and in consideration of the contaminant reduction accomplished by cleanup activities at other parts of the site, EPA proposes the following cleanup actions, known as corrective measures, or remedial action, for the "Rest of River" component of the GE-Pittsfield/Housatonic River site. EPA's Proposed Remedial Action was developed after consultation with Massachusetts Departments of Environmental Protection (MassDEP) and Fish and Game (MassDFG) and the Connecticut Department of Energy and Environmental Protection (CT DEEP).This Statement of Basis, in conjunction with the Draft Modification to the Reissued RCRA Permit, constitute EPA's "Proposed Plan" or "Proposed Cleanup Plan," setting forth EPA's Proposed Remedial Action for the Rest of River and Operation and Maintenance (O&M) as prescribed by Paragraph 22.n. of the Consent Decree (termed the "Proposed Remedial Action" or "Proposed Cleanup Plan" throughout this document) to address polychlorinated biphenyl (PCB) contamination in river sediment, banks and floodplain soil, and biota which poses an unacceptable risk to human health and the environment.

In addition to addressing risks in the areas slated for cleanup, the Proposed Remedial Action also includes provisions to reduce downstream transport of PCBs, relax or remove fish consumption advisories, and to avoid, minimize and/or mitigate adverse impacts to state-listed species and their habitats regulated under the Massachusetts Endangered Species Act (MESA), and

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for public comment the Rest of River cleanup outlined below. EPA's preferred alternative or Proposed Remedial Action is Combination Alternative 9 (SED9/FP4 MOD with TD1). Combination Alternative 9 requires excavation and capping/ restoration of sediment, river banks and floodplain soil in certain areas to protect human health and the environment while seeking to avoid, minimize or mitigate unacceptable impacts to state-listed species and their habitats and the Area of Critical Environmental Concern ("ACEC"). The Proposed Remedial Action also includes disposal of all excavated contaminated soil and sediment off-site at existing licensed facilities approved to receive such soil and sediment, with a preference to maximize transport via rail. The proposed Performance Standards and corrective measures required to implement this cleanup are outlined in the Draft Permit. EPA's Proposed Remedial Action was developed in consultation with MassDEP, MassDFG, and CT DEEP.

River Sediment and Banks

The following corrective measures and performance standards for river sediment and banks are being proposed by EPA to: reduce risks to humans from consumption of fish and waterfowl; reduce risks from direct contact to sediments; reduce ecological risks; and to control the sources of releases to reduce downstream transport of PCBs. Specific Performance Standards and benchmarks for fish tissue and waterfowl concentrations, soil and sediment concentrations, and downstream transport, and the basis for these, have been included in the Draft Permit. EPA is specifically seeking comment on the appropriateness of these or alternative numerical standards. These Performance Standards and benchmarks apply throughout the Rest of River.

In this Proposed Remedial Action, removal of PCB-contaminated sediment is required in a number of areas followed by the placement of a cap. Specifically, an engineered cap will be designed to physically and chemically isolate the residual PCBs in sediment and provide habitat for aquatic plants and animals and reduce downstream transport of PCBs. A more detailed description of the design of the engineered caps is provided on page 8.

Reach 5A

In Reach 5A, the 5 miles from the confluence of the East and West Branches of the Housatonic (at Fred Garner Park in Pittsfield) to the Pittsfield wastewater treatment plant, the Proposed Cleanup Plan requires the removal of river bed sediment throughout Reach 5A and soil in eroding river banks contaminated with more than 5 mg/kg PCBs, capping of the river bed, and stabilization of contaminated erodible river banks. Additional data will be collected to better quantify the concentrations of PCBs in river banks and locations of erodible river banks and to determine the cap thickness and removal depth in the river.

A focus of the river bank work will be to reduce the mobilization of PCBs into the river from the erosion of contaminated banks while maintaining the dynamic nature of the River. For banks that need to be addressed, reconstruction and stabilization of remediated banks can be achieved in a number of different ways, including using the principles of bio-engineering and natural channel design. See the information outlined on page 5 of this document regarding these concepts. Activities in the banks will follow the hierarchy below of most preferred to least preferred methods:

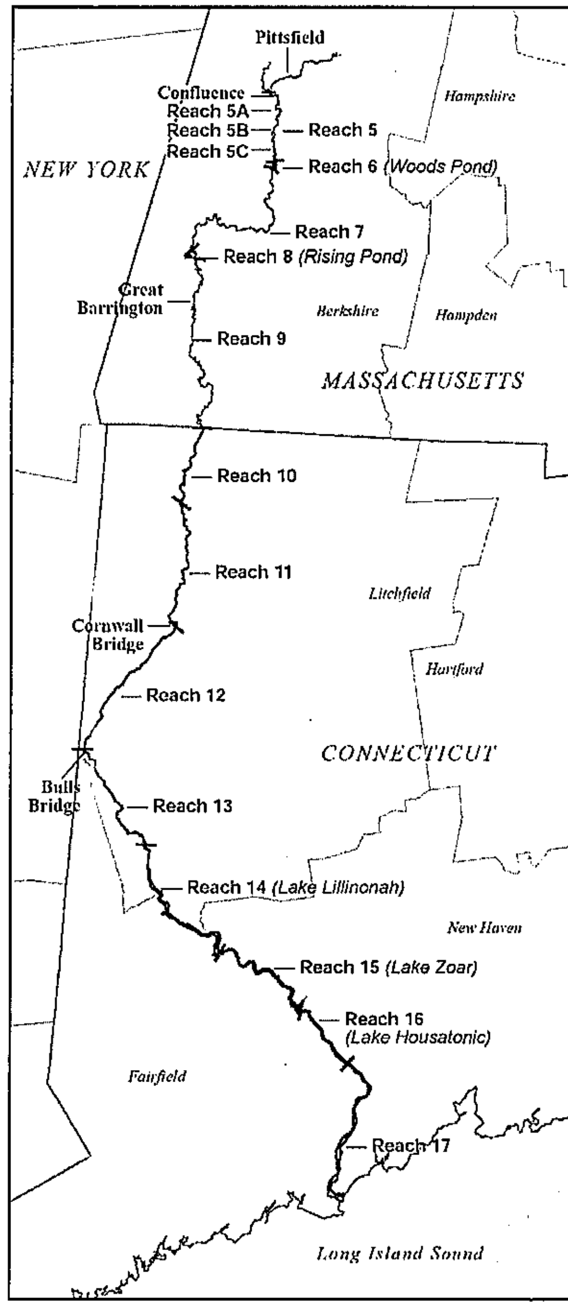

FIGURE 2 HOUSATONIC RIVER, REACHES 5 THROUGH 17

During remedial design, various measures will be evaluated and subsequently implemented to reduce these potential impacts on surrounding neighborhoods and communities. For example, instead of having all neighborhoods affected at once, the work would be done in phases working generally north to south, and temporary haul roads would be built to limit use of local roads and reduce construction traffic as much as possible.

To ensure careful coordination and enhanced safety for residents, GE will be required to work closely with EPA, and in consultation with the appropriate city and town officials, in developing management strategies and plans to guide the cleanup work.

General Implementation Schedule and Cost

In order to expeditiously and efficiently complete the proposed remediation, EPA expects that several phases of the remedy will be conducted concurrently to speed the overall completion of construction. Sediment and floodplain work, including vernal pools, will begin in Reach 5A and proceed downstream. Concurrently to starting work at Reach 5A, work will also begin at Woods Pond and proceed downstream to Rising Pond, however placement of the engineered caps (if necessary) in the downstream impoundments will not occur until all remediation has been completed upstream. See Figure 5. Additional data collection, baseline assessments, and pilot studies will begin as early in the process as practicable. It is also expected that, using an adaptive management approach, the work will be phased, with each phase designed and implemented individually. Under this approach, while construction work is proceeding in one stretch of the river, planning and design work, as well as review of activities conducted to date will be ongoing for subsequent phases of work.

Note, the provisions to coordinate any required cleanup work in the Reach 7 Impoundments with plans for dam use, removal, or maintenance activities could lead to a change in the timing of work in any of those impoundments.

Using the assumptions established in the Corrective Measures Study (CMS), construction is expected to take 13 years to complete. The estimated total cost for the preferred cleanup plan including sediment and floodplain remediation, off-site transportation and disposal at facilities approved to receive such soil and sediment, as well as operation, maintenance, and monitoring is approximately $613 million.

WHY EPA IS PROPOSING THIS CLEANUP PLAN

Based on the information in the Administrative Record, including the RCRA Facility Investigation (RFI) and Corrective Measures Study (CMS), EPA believes that the Proposed Remedial Action or the Proposed Cleanup Plan best suits the Permit evaluation criteria. The Draft Permit includes the Performance Standards and corrective measures necessary to meet the Performance Standards to address unacceptable risks to human health and the environment, and reduce the potential for downstream transport of PCBs, while minimizing adverse impacts to state-listed species and their habitats and being sensitive to the characteristics of the Rest of River and related biodiversity which formed the basis of the ACEC designation in a portion of the study area. Also based on this analysis, certain areas in the river and floodplain will be left undisturbed, including a large part of Reach 5B. The Proposed Remedial Action also removes and disposes off-site of large volumes of PCB-contaminated sediment and soil, from both the River itself, and the associated floodplain. The Proposed Cleanup Plan provides for the isolation of PCB contaminated sediments to reduce the risk to human health and the environment. Any remaining contamination will be monitored over the long term to evaluate the continued effectiveness of the remedy.

Based on information currently available, EPA believes the Proposed Remedial Action meets the General Standards for Corrective Measures and provides the best balance of tradeoffs among the other alternatives with respect to the relevant criteria. EPA also expects the Proposed Remedial Action to (1) control the sources of releases so as to reduce or eliminate, to the maximum extent practicable, further releases that may pose a threat to human health and the environment; (2) attain the Performance Standards; (3) comply with applicable standards for management of wastes; and (4) be protective of human health and the environment; (5) comply with ARARs (or justify a waiver); (6) be cost-effective; (7) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (8) satisfy the preference for treatment as a principal element, or explain why the preference for treatment will not be met.

EXPECTED OUTCOME OF THE PROPOSED REMEDIATION

The cleanup reduces unacceptable human health risks from direct contact with sediment and floodplain soil. In addition, the cleanup is expected to result in reductions in biota concentrations to allow 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.

The sediment and river bank cleanup will reduce risk to ecological receptors from exposure to PCBs by capping and removal

Table 2
Comparison of Combination Alternatives

Combination:	1 SED 1/ FP 1	2 SED 2/ FP 1	3 SED 3/ FP 3	4 SED 5/ FP 4	5 SED 6/ FP 4	6 SED 8/ FP 7	7 SED 9/ FP 8	8 SED 10/ FP 9	9 SED 9 MOD/ FP 4 MOD[1]
Sediment Removal Volume (cubic yards (cy))	0	0	134,000	377,000	521,000	2,252,000	886,000	235,000	890,000
Bank Soil Removal Volume (cy)	0	0	35,000	35,000	35,000	35,000	35,000	6,700	25,000
Sediment Capping after Removal (acres)	0	0	42	126	178	0	333	20	298
Sediment Backfill after Removal (acres)	0	0	0	0	0	351	0	0	0
Sediment Capping without Removal (acres)	0	0	0	60	45	0	3	0	0
Thin Layer Capping (acres)	0	0	97	102	112	0	0	0	0
Floodplain Soil Removal Volume (cy)	0	0	74,000	121,000	121,000	615,000	177,000	26,000	75,000
Floodplain Acres Excavated (acres)	0	0	44	72	72	377	108	14	45
Total Soil/Sediment Volume Removal (cy)	0	0	243,000	533,000	677,000	2,902,000	1,098,000	267,700	990,000
Estimated PCB Mass Removed (pounds)	0	0	21,700	33,300	37,300	94,100	53,100	13,900	46,970
Estimated Time to Implement (years)	0	0	10	18	21	52	14	5	13

Notes: Monitored Natural Recovery (MNR) is a component of all Combinations except Combination Alternative 1.

Volumes and areas specified in this table are approximate and are for volume/cost estimation and for comparison purposes only. Actual volumes and areas will be determined in accordance with the Modification of the Reissued RCRA Permit.

[1] Combination 9 sediment removal and capping estimates based upon capping of four Reach 7 impoundments, which is one possible outcome of the cleanup approach proposed for these impoundments.

to address Reach 7 impoundments and Rising Pond (Reach 8), as discussed above; and, MNR in all other River reaches (Reach 7 channel and Reaches 9 through 16).

EPA's May 2012 status report entitled "Potential Remediation Approaches to the GE-Pittsfield/Housatonic River Site 'Rest of River' PCB Contamination" (the Status Report) highlighted the objectives of addressing the unacceptable risks posed by PCBs and of minimizing the amount of bank excavation to preserve the dynamic character and related biodiversity and habitats of the river. To that end, the Status Report proposed a remedial approach that, based on data collected prior to the issuance of the permit, would result in an amount of bank excavation in Reach 5A of 3.5 miles, and an amount of bank excavation in Reach 5B of 0.2 miles. Under any alternative, the actual remediation amounts would be determined during remedial design. If the new data to be collected identified the need for greater bank excavation, then the foregoing amounts of bank excavation would change based on new data. Under Combination Alternative 9, the corrective measures for the river banks would be designed and implemented 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 and the diversity of their habitats that are supported by the existing river ecosystem.

This alternative is similar to Combination Alternative 7 and differs from the other sediment removal alternatives in that: (1) all sediment removal and capping work, including in Reaches 5A and 5B, would be performed in the "wet" by equipment operating in the river (either on the river bottom or on barges); and (2) removal of the sediment in the Backwaters and Reaches 6, 7, and 8 would be performed concurrently with removal activities in the Reach 5 channel. However, capping in those reaches would be delayed, where necessary, until after all the removal/capping activities in Reach 5 have been completed. It is important to note that the sediment removal depths outlined above, for the most part, were derived based upon certain assumptions on the estimated cap thicknesses in the various reaches of the river. As outlined in the section entitled "Engineered Cap Design" above, specific cap designs and thicknesses will be determined based upon additional evaluations in the future. Thus, the volume and cost estimates for this alternative outlined below could be reduced should a thinner cap be deemed appropriate.

For the floodplain, Combination Alternative 9 involves the removal of one foot of contaminated soil with subsequent backfilling to meet a human-health based cleanup target based on 10^{-5} cancer risk or non-cancer HI = 1 (whichever is lower) while providing for avoidance, minimization, or mitigation of impacts in priority habitat areas for state-listed species of concern by establishing a secondary remediation target to meet a human-health based cleanup target based on 10^{-4} cancer risk or non-cancer HI = 1 (whichever is lower) in high priority habitat areas. This alternative also includes additional cleanup to a depth of 3 feet in certain frequently used areas to achieve a human-health based cleanup target based on 10^{-5} cancer risk or non-cancer HI = 1 (whichever is lower). This alternative also includes vernal pool excavation to achieve the more stringent ecological risk-based cleanup target for amphibians.

This alternative also provides for a phased, adaptive management approach to all remediation activities. For vernal pool remediation, this also includes the pilot testing of non-excavation cleanup methods described previously.

Combination Alternative 9 involves the excavation of approximately 890,000 cubic yards of sediment, 25,000 cubic yards of bank soil and 75,000 cubic yards of floodplain soil. This alternative involves the excavation of approximately 45 acres of floodplain area and also includes the capping of approximately 298 acres of river bed after excavation to reduce the amount of PCBs transported downstream. Pilot studies, Institutional Controls, long-term operation, monitoring, and maintenance are also components of this alternative. Additionally, this alternative includes provisions for GE to maintain responsibility for the incremental costs incurred due to the potential impacts of PCBs on authorized activities within the Massachusetts and Connecticut portions of the river. This alternative is estimated to take 13 years to implement. The cost for this alternative is estimated at $326 million, excluding costs for transportation or disposal of excavated soil or sediment.

Treatment/Disposition Alternatives

Five alternatives were developed for treatment and/or disposition (TD) of removed sediment, riverbank soil, and floodplain soil from the Rest of River. These alternatives are as follows:

- TD 1: Off-Site Disposal in Existing Licensed Landfill(s) (EPA's Preferred Alternative)
- TD 2: Local Disposal in Confined Disposal Facility (CDF)
- TD 3: Local Disposal in an On-Site Upland Disposal Facility
- TD 4: Chemical Extraction
- TD 5: Thermal Desorption

Alternative TD 1, disposal in an existing off-site licensed landfill or landfills, would involve the transportation of removed sediment and floodplain soil to commercial solid waste and/or TSCA-licensed landfill(s) for disposal. In the CMS, GE evaluated transport of contaminated material by trucks. In its comments, EPA required that GE provide an evaluation of rail transport in the Revised CMS. GE provided a qualitative evaluation and concluded that rail transport would be technically feasible; therefore transportation could be conducted either by trucks or by rail. However GE did not provide cost information. EPA further evaluated the feasibility of rail and developed a cost estimate. This modification is also referred to in this document as TD 1 RR. The estimated cost for this alternative ranges from $55 to $832 million for disposal via truck and $52 to $787 million for disposal via rail, depending on which Combination Alternative it is paired with. For the preferred sediment/floodplain alternative, the estimated cost of disposal via truck is $308 million and via rail is $287 million.

Massachusetts' requirements regarding the disposal of contaminated soil and sediment have not been included as ARARs for Alternative TD 1 since ARARs apply only to on-site activities and the Proposed Remedial Action requires that all contaminated soil and sediment be disposed of off-site at existing licensed facilities approved to receive such soil and sediment.

Alternative TD 2, disposition in a local in-water Confined Disposal Facility/Facilities (CDF), would involve the placement of dredged sediments in a CDF or CDFs located within the river or backwater area. A CDF is an engineered structure consisting of dikes or other structures that extend above an adjacent water surface and enclose a disposal area for containment of dredged sediments. Disposal of material that exceeds the capacity of the CDFs would be disposed of in existing off-site licensed landfills. The potential locations evaluated as part of this alternative are shown in Figure 8. The estimated cost for this alternative ranges from $100 to $510 million, depending on which Combination Alternative it is paired with; with EPA's preferred Combination, this alternative is estimated to cost $317 million.

Alternative TD 3, disposition in a local on-site Upland Disposal Facility or Facilities, would involve the permanent disposition of removed sediment/soil at an Upland Disposal Facility constructed in close proximity to the River, but outside the 500-year floodplain. The removed sediment and soil would be loaded into trucks at the staging areas, covered, and transported over on-site and local roadways to a nearby Upland Disposal Facility. Three potential locations for an Upland Disposal Facility were identified and evaluated by GE in the CMS. These sites are located near Woods Pond, Forest Street in Lee, and Rising Pond (referred to, respectively, as the Woods Pond, Forest Street, and Rising Pond Sites). The potential locations evaluated as part of this alternative are shown in Figure 8. The estimated cost for this alternative ranges from $36 to $201 million, depending on which Combination Alternative it is paired with; with EPA's preferred Combination, this alternative is estimated to cost $100 million.

Alternative TD 4, chemical extraction of PCBs from removed sediment/soil, involves treatment of the removed sediments and soils by a technology known as chemical extraction. In general terms, chemical extraction is the process of mixing an extraction fluid/solvent with removed sediment and soil, so that PCBs in the sediment or soil are preferentially transferred into the extraction fluid. The resulting PCB-contaminated fluid is then treated or disposed of off-site along with treated sediments. The estimated cost for this alternative ranges from $89 to $999 million, depending on which Combination Alternative it is paired with; with EPA's preferred Combination, this alternative is estimated to cost $399 million.

Alternative TD 5, thermal desorption of PCBs from removed sediment/soil, would involve treatment of the removed sediments and soils by a technology known as thermal desorption. Thermal desorption removes contaminants by raising the temperature of the contaminated material to transfer the contaminants from the sediment or soil to a gas stream. The gas stream is then treated to remove particulates and the organic contaminants. The material that remains is then sent to an appropriate treatment/disposal facility. Treated sediments or soils may then be disposed of in an appropriate disposal facility or potentially reused, depending on its chemical concentrations and physical characteristics. The estimated cost for this alternative ranges from $103 million to $1.53 billion, depending on which Combination Alternative it is paired with and how much material is reused; with EPA's preferred Combination Alternative, this alternative is estimated to cost between $515 and $540 million.

HOW DOES EPA CHOOSE A FINAL CLEANUP PLAN?

Before making its recommendation, EPA coordinated with the Commonwealth of Massachusetts and the State of Connecticut regarding potential cleanup approaches. EPA worked closely with the States on the development of the Performance Standards, corrective measures and identification of ARARs prior to the issuance of this plan to the public.

EPA also held extensive discussions with GE, and solicited input from the community through workshops and public meetings. The timeline of these events is summarized elsewhere in this document and information exchanged in these discussions is also contained in the Administrative Record. The States, GE, and the public also have the opportunity to comment on the Proposed Remedial Action during the public comment period.

EPA used nine criteria that were established in the Permit to compare alternatives, and propose and select a final cleanup plan. Of the nine criteria, Overall Protection of Human Health

techniques reestablish the prior conditions and functions of the affected habitats.

None of the Combinations preclude the implementation of additional corrective measures if deemed necessary. Additional corrective actions, such as cap or bank repairs, if necessary, should provide the same implementation challenges for all active alternatives.

EPA anticipates a robust monitoring program to monitor the effectiveness of the remedy. Each of the components of the active remedy combinations (Combinations 3-9) can be monitored effectively. However, alternatives that have little or no active remediation are less reliable, therefore, they would require more extensive monitoring.

No regulatory and/or zoning restrictions are known that would affect the implementability of the sediment/floodplain Combinations. Implementation of all alternatives (except alternatives 1 and 2) would require GE to obtain access from all property owners. Issues associated with obtaining access would be similar for alternatives 3-9, except that alternative 9 avoids the large-scale use of sheet pile and large cranes, which may facilitate access negotiations.

-All of the combinations would require coordination with EPA and state agencies to ensure compliance with state ARARs. In addition, implementation of Institutional Controls, obtaining access to State and municipally-owned properties, conducting public/community outreach programs and implementing biota consumption advisories will require both state and local coordination. The alternatives that require a greater extent of remediation and a longer implementation time would likely require more extensive and prolonged coordination activities. However, implementation of Institutional Controls where less remediation is performed would require more extensive Institutional Controls.

Lastly, regulatory and zoning restrictions, state and local coordination related to treatment, storage and disposal facilities, and the availability of suitable of such facilities and specialists is discussed below in the evaluation of Treatment/Disposition alternatives.

Cost

Estimated total and present worth for all of the Combination Alternatives are presented in Table 6. In addition, costs associated with these Combinations coupled with the Treatment/Disposal Alternatives can be found in Table 7. The costs are based primarily on information available at the time of the estimate and are based on GE's unit cost estimates provided in GE's Revised CMS. As shown in Table 6, Combination 1 is the least costly alternative while Combination 6 is the most costly. For purposes of direct comparison of treatment and disposal costs associated with EPA's preferred sediment and floodplain alternative, total treatment/disposal costs for Combination Alternative 9 have also been included in Table 7.

COMPARATIVE ANALYSIS OF TREATMENT/ DISPOSITION ALTERNATIVES

This section presents a summary of a comparative evaluation of the five alternatives for treatment and/or disposal of excavated contaminated river sediment and floodplain soil using the same criteria that were used for the sediment/floodplain combination alternatives. All five alternatives would involve disposition of the sediment, riverbank soil, and floodplain soil in a disposal facility, either directly or after treatment. The three alternatives involving disposal only are TD 1/TD 1 RR (off-site disposal in permitted landfill(s)), TD 2 (on-site in a Confined Disposal Facility (CDF)), and TD 3 (on-site in upland disposal facility or facilities). The other two alternatives would involve treatment, either by a chemical extraction process (TD 4) or by thermal desorption (TD 5), followed by disposition of the byproducts of the treatment and the treated soil/sediment.

Overall Protection of Human Health and the Environment

TD 1, 3 and 5 would provide high levels of protection to human health and the environment because all excavated contaminated material would either be removed from the site (TD 1), contained in an upland disposal facility (TD 3), or treated to levels safe for off-site disposal or potential reuse (TD5). TD 2 could also provide human health protection as long as monitoring, maintenance and/or Institutional Controls are effective in the long term, in order to avoid negative impacts to the river system. Alternative TD 4 (chemical extraction) may not be able to effectively treat PCB contamination from the site, calling into question the protectiveness of this alternative.

Control of Sources of Releases

All the treatment/disposal alternatives would control the potential for PCB-contaminated sediment and soil to be released and transported within the river or onto the floodplain, although some alternatives would provide more effective control of such releases than others. TD 1 best meets this criterion, followed by TD 3.

Under TD 1, placement of the removed PCB-contaminated sediment and soil into a licensed off-site landfill or landfills would effectively isolate those materials from being released into the Housatonic River and associated floodplain. Under TD 2, there is a potential for releases of sediment into the river during the CDF construction process. TD 3 would address future releases through the placement of the materials in an upland disposal facility that will have a double liner and the implementation of a long-term monitoring and maintenance program. Placement of the PCB-contaminated sediment and soil into an upland disposal facility could effectively isolate the removed materials from being released into the environment. However, there is the potential for PCB releases to the Housatonic watershed if the landfills are not properly operated, monitored and maintained. Under TD 4 and TD 5, the potential for the PCB-contaminated sediment and soil to be released within the river or onto the floodplain during treatment operations would be minimal as long as these facilities are properly operated and maintained.

Compliance with Federal and State ARARs

The ARARs identified for the treatment/disposal alternatives are discussed in more detail in the Administrative Record. Each of the TD alternatives would involve moving the sediment, bank soil, and floodplain soil from the point of excavation to the treatment/disposition point. Of all the disposal alternatives (TD 1, TD 2, TD 3), only TD 1 complies with all State ARARs. TD 4 and TD 5 could potentially meet all ARARs. TD 2 will not meet, without limitation, wetland and floodplain requirements; and not all potential locations of TD 2 or TD 3 will meet the requirements of 310 CMR 30.700, 310 CMR 16.40(3)(4), and/or 990 CMR 5.04, which prohibit, without limitation, hazardous waste and solid waste facilities in an Area of Critical Environmental Concern ("ACEC") or adjacent to or in close proximity to an ACEC such that it would fail to protect the outstanding resources of an ACEC.

Long-Term Reliability and Effectiveness

TD 1, 4, and 5 result in the greatest reductions in residual risk. With TD 1, all material is removed from the site and sent to an offsite disposal facility; with TD 4 and TD 5, all material that was treated but did not reach safe PCB levels would be removed from the site and sent to an offsite disposal facility. Contamination remains on-site untreated under TD 2 and TD 3 and therefore the residual risk is greater under these alternatives. However, TD 3 would permanently isolate those materials from direct contact with human and ecological receptors in a secure location outside the floodplain. Under TD 4 and TD 5, residual risk is decreased because treatment reduces the levels of contaminants, however the reductions may not be to levels allowing for unrestricted reuse.

There are considerable differences in the adequacy and reliability of the five treatment/disposal alternatives. TD 1 is adequate and reliable because it does not rely on operation, monitoring, and maintenance requirements (except at the receiving facility) to adequately and reliably address the contamination. The other alternatives rely on operation, monitoring, and maintenance requirements to address the contamination remaining onsite to be effective in the long-term. Both TD 4 and TD 5 rely on these requirements to ensure that material is safely treated to acceptable concentrations. TD 2 and TD 3 rely particularly on monitoring and maintenance in the long

Table 6 Cost Summary for Combinations of Sediment and Floodplain Alternatives

Combination:	1	2	3	4	5	6	7	8	9
	SED 1/FP 1	**SED 2/ FP 1**	**SED 3/ FP 3**	**SED 5/ FP 4**	**SED 6/ FP 4**	**SED 8/ FP 7**	**SED 9/ FP 8**	**SED 10/ FP 9**	**SED 9 MOD/FP 4 MOD**
Total Capital Costs	0	0	$167 M	$307 M	$384 M	$900 M	$381 M	$84 M	$314 M
Total Operations Monitoring and Maintenance Costs	0	$5 M	$10 M	$12 M	$13 M	$17 M	$13 M	$10 M	$12 M
Total Cost for Alternative (excluding Transportation and Disposal)	**0**	**$5 M**	**$177 M**	**$319 M**	**$397 M**	**$917 M**	**$394 M**	**$94 M**	**$326 M**
Total Present Worth	0	$1.8 M	$133 M	$193 M	$219 M	$300 M	$251 M	$78 M	$228 M

Notes:

1. All costs are in 2010 dollars. $ M = million dollars.
2. Total capital costs are for engineering, labor, equipment, and materials associated with implementation.
3. Total OMM costs include cost for monitoring, post-construction inspections and repair activities (if necessary), long-term monitoring (fish, sediment, water column, visual), and for the maintenance of institutional controls and EREs.
4. Total present worth cost is based on using a discount factor of 7%, considering the length of the construction period and an OMM period of 100 years on a reach-specific basis.
5. Estimates do not include costs for treatment or disposition of any soil/sediment removed; those costs are outlined below (see Table 7).

term to ensure that material remains adequately contained, and TD3 may require long-term transport of leachate to the GE facility in Pittsfield or construction of a separate facility to treat leachate.

Labor and materials are available for operation, monitoring, and maintenance for all of these alternatives. While TD 1, 2, 3 have been used under similar conditions, TD 4 has not been demonstrated at full scale on sediment and soil representative of those in the Rest of River. TD 5 has been used to treat PCB-contaminated soil but only in limited cases for treatment of sediment, thereby creating some uncertainty regarding the adequacy and reliability of this alternative.

None of the alternatives are expected to have long-term adverse impacts on human health, however TD 2 will have significant long-term impacts on wetlands and floodplain areas. TD 3 may have long-term environmental impacts depending upon where the upland facility is located.

Attainment of IMPGs

Attainment of IMPGs is directly applicable to the sediment and floodplain remediation approaches outlined and evaluated for the various Combination Alternatives discussed earlier in this document. IMPG attainment is not directly applicable to the transportation and disposal alternatives, thus EPA did not conduct a comparative analysis for these alternatives for this criterion.

Reduction of Toxicity, Mobility, or Volume

Reduction of Toxicity: TD 1 through TD 3 would not include any treatment processes that would reduce the toxicity of, or directly affect, PCB concentrations in the removed sediment and soil. TD 4 and TD 5 would incorporate treatment processes that can, to varying degrees, reduce concentrations of PCBs. Under TD 4, the chemical treatment process would reduce the toxicity of the sediment and soil by permanently removing some PCBs from these materials but likely will not reduce concentrations to levels allowing reuse of the material, and as such would still require landfilling. Under TD 5, the thermal desorption system would reduce the toxicity of the PCB-contaminated sediment and soil by permanently removing PCBs from these materials. The PCBs in the liquid stream would be sent to a licensed off-site disposal facility for additional treatment. The degree of expected reduction in toxicity, and the amount of hazardous materials to be destroyed or treated are dependent on the sediment/floodplain alternatives selected, with Combinations 3 through 9 providing varying levels of expected removal of PCBs from the River and floodplain. For TD4 and TD5, the treatment process would be irreversible and the reduction in toxicity would be permanent.

Reduction of Mobility: All of the alternatives would reduce the mobility of PCBs in the sediment and soil. In TD 1, TD 2, and TD 3, these materials would be removed and disposed of in off-site permitted landfill(s) (TD 1) or contained within on-site CDF(s) (TD 2) or an on-site upland disposal facility (TD 3). TD 4 and TD 5 would reduce the mobility of PCBs present in the sediment/soil via ex-situ chemical extraction or thermal desorption.

Reduction of Volume: TD 1, TD 2, and TD 3 would not reduce the volume of PCB-contaminated material, although, TD 1 would reduce the volume of material that remains at the Site. For TD 4, treatment of sediment/soil would reduce the volume of PCBs present in those materials by transferring some of the PCBs to an aqueous waste stream for subsequent treatment. PCB-contaminated sludge would be generated from the wastewater treatment system and would be sent to a permitted off-site facility for disposal. For TD 5, treatment of sediment/soil in the thermal desorption system would reduce the volume of PCBs present in those materials, with the liquid condensate transported to an off-site facility for destruction.

Short-Term Effectiveness

Each of the alternatives has the potential for short-term impacts to the community. Alternatives that require on-site treatment (TD 4 and TD 5) require operation of a treatment facility, which would have air emissions albeit at very low levels, which could be treated prior to discharge if needed to meet regulatory levels. Alternatives that require on-site containment (TD 2 and TD 3) would also have additional short-term impacts to the areas and community surrounding the disposal sites. Construction of such facilities will temporarily increase community impacts during the time work is done in these areas. 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 transportation. The short-term impacts to workers are all relatively the same under all alternatives. All alternatives have the potential for accidental releases of various PCB-contaminated materials during transportation to off-site or local disposal or treatment facilities. However, actions will be taken to prevent these potential releases. All alternatives would require truck traffic. TD 1 and TD 4 require transportation of the most material, followed closely by TD 5, then TD 3. Depending on the location of the upland disposal facility under TD 3, TD 3 may have truck traffic comparable to TD 1. The impacts of truck traffic may be greatly reduced by reliance on rail transportation, consistent with EPA's intention to maximize use of rail.

There are also some differences in impacts to the environment under the different alternatives. TD 2 through TD 5 could cause permanent loss of habitat and loss or displacement of wildlife in the area depending upon where the disposal or treatment facility is located. TD 1 would have fewer impacts on the environment than the other alternatives.

Implementability

The implementability of TD1 through TD5 includes the following considerations:

All of the alternatives are readily able to be constructed and operated, with the acknowledgement that for off-site disposal via rail, some of the rail lines will need to be upgraded.
The reliability of technologies depends on the specific alternative. TD 1 and TD 3 are both reliable landfilling technologies. CDFs (TD 2) have been implemented at many locations and have been shown to be reliable when constructed and operated properly. For both TD 4 and TD 5, there are several uncertainties regarding the reliability of full-scale application of both chemical and thermal processes to sediment (e.g., moisture content), particularly with some of the volumes associated with the sediment alternatives.

Regarding regulatory and zoning requirements and coordination with other agencies, the existing licensed off-site facility in TD 1 would already have satisfied regulatory requirements. Coordination with state and local agencies would be required to site the rail loading facility. Both state and local communities have expressed a strong preference for rail, which should facilitate resolution of any remaining regulatory, zoning, access or facility siting issues.

TD 2 could raise issues in accounting for sufficient flood storage compensation at the appropriate elevations/areas to provide for construction of a CDF(s) large enough to hold the necessary sediment disposal volumes, and permanent access to the CDF(s) would be required for inspections and maintenance.
As discussed in the Compliance with Federal and State ARARs section above, TD 3 would have significant issues with the ACEC regulations, the Massachusetts Hazardous Waste Facility Site Safety Council Regulations, and the site suitability criteria in the Commonwealth's Site Assignment Regulations for Solid Waste Facilities. In addition, TD 2 and TD 3 would both require extensive coordination with state and local officials, increasing the period of time before these could be implemented, and both TD 2 and TD 3 would likely encounter significant local and state opposition that may render these alternatives more difficult, and potentially not feasible, to implement.

TD 4 and 5 would require access to large areas for the construction and operation of a treatment facility. Locating such a facility would require coordination would state and local agencies. Other access and zoning issues may also be present. Since state and local officials have expressed a strong preference for off-site disposal, these alternatives may encounter significant opposition, thus rendering these alternatives difficult to implement.

Regarding the availability of licensed off-site disposal facilities (TD 1) while the current universe of facilities is sufficient, there are uncertainties regarding the future availability of the necessary capacity in off-site landfills for the alternatives that have larger volumes and longer durations.

For TD 2 and TD 3, the availability of on-site disposal facilities may be limited by opposition from state and local officials and regulatory issues, as discussed above. However, if these obstacles are overcome, there is sufficient availability of facilities for TD 3. There may be limitations on the capacity of CDF(s) depending on the combination alternative selected.

Regarding the ease of undertaking additional corrective measures, if necessary, if additional wastes were generated as part of future actions, it is likely that the facilities constructed under TD 2 through TD 5 would no longer be available for additional treatment and/or disposal. While it may be technically feasible to expand an upland disposal facility after closure (TD 3), it would likely be administratively difficult and not cost-effective to implement this option. Thus, TD 1 is the most implementable in this regard.

TD 1 through TD 5 all can be monitored effectively. TD 1 would require the least amount of monitoring. TD 2 and TD 3 would require extensive long-term monitoring to ensure the integrity and effectiveness of the disposal facility(s). TD 4 and TD 5 would require extensive monitoring of the treatment facilities during treatment operations.

Cost

The estimated cost ranges for each treatment/disposal alternative, including total capital cost, estimated annual maintenance and monitoring cost, and total estimated present worth are summarized in Table 7. These costs are expressed as ranges since they account for treatment or disposal of a wide range of volumes depending on the sediment and floodplain remediation approach selected. As shown in Table 7. TD 3 is the least costly alternative while TD 4 and TD 5 are the most costly.
For purposes of direct comparison of treatment and disposal costs associated with EPA's preferred sediment and floodplain alternative, total and present worth treatment/disposal costs for Combination Alternative 9 are also included in Table 7.

Table 7 Cost Summary for Treatment/Disposition Alternatives

	TD 1	TD 1 RR	TD 2	TD 3	TD 4	TD 5 (with reuse)	TD 5 (without reuse)
Total Capital Costs	0	$300,000	$6 – 20 M	$10 – 67 M	$17 – 20 M	$20 – 232 M	$20 – 232 M
Total Disposal, Operations, Monitoring, and Maintenance Costs	$55 – 832 M	$52 – 787 M	$94 – 490 M	$26 – 134 M	$72 - 979 M	$83 – 1,216 M	$86 – 1,293 M
Total Cost for Alternative	**$55 – 832 M**	**$52 – 787 M**	**$100 – 510 M**	**$36 – 201 M**	**$89 – 999 M**	**$103 – 1,450 M**	**$106 – 1,530 M**
Total Present Worth	$40 – 220 M	$38 - 210 M	$46 – 131 M	$17 – 49 M	$70 – 286 M	$81 – 569 M	$83 – 590 M
Total TD Cost for Combination 9	**$308 M**	**$287 M**	**$317 M**	**$100 M**	**$399 M**	**$515 M**	**$540 M**
Total Present Worth for Combination 9 TD Cost	$196 M	$183 M	$85 M	$33 M	$170 M	$280 M	$295 M

Notes:

1. All costs are in 2010 dollars, except total present worth values. $ M = million dollars.
2. The fraction of TSCA material has been assumed to be 35%. A density of 1.62 tons per cubic yard was assumed.
3. The Massachusetts hazardous waste transport fee is not included in these estimates. The fee would potentially apply to TSCA material transported off-site via truck. This fee would potentially apply to TD-1, and portions of TD-2, TD-4 and TD-5. The fee is currently $56.25 per ton, including a vehicle identification fee. For TD 1 for Combination 9, the total fee is estimated to be $31.3 million. The fee is not applicable to off-site disposal via rail (TD 1 RR).
4. With the exception of TD 2, the ranges of costs presented are the minimum and maximum anticipated costs based on the potential range of volumes that would be potentially removed under the sediment and floodplain soil alternatives (191,000 cubic yards to 2.9 million cubic yards). For TD 2, the lower-bound costs are based on the combined volume of SED 6 and FP 2 and the upper-bound costs are based on the combined volume of SED 8 and FP 7, with material not placed in the CDF(s) assumed to be transported off-site for non-TSCA disposal. Thus, the upper-bound costs, but not the lower-bound costs, for TD 2 are comparable to the costs for the other alternatives.
5. Total capital costs are for engineering, labor, equipment, and materials associated with implementation.
6. Total operations costs consist of the total of the average annual costs for operation, placement, and/or treatment of sediment and/or soil, estimated for the range of durations for implementing the alternatives.
7. Total monitoring and maintenance costs are for performance of post-closure monitoring and maintenance programs of 100 years for TD 2 and TD 3 and 5 years for TD 4 and TD 5.
8. Total present worth cost is based on using a discount factor of 7%, considering the range of total potential durations for the alternative, and post-closure monitoring and maintenance periods of 100 years for TD 2 and TD 3 and 5 years for TD 4 and TD 5.
9. For TD 5 with reuse, it is assumed that approximately 50% of the floodplain soil treated by thermal desorption would be reused on-site and that all remaining materials would be transported off-site for disposal.
10. Costs for TD 3 do not include the very likely extensive costs associated with the approval process required for an on-site landfill.