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General Electric Company
Pittsfield, Massachusetts

2008 Annual Monitoring Report

Upper ½-Mile Reach of the Housatonic River

January 2009

Andrew T. Silfer

GE
319 Great Oaks Blvd.
Albany, NY 12203

T 518 862 2703
F 518 862 2731
andrew.silfer@corporate.ge.com

January 22, 2009

Mr. Dean Tagliaferro
EPA Project Coordinator
US Environmental Protection Agency
c/o Weston Solutions, Inc.
One Lyman Street
Pittsfield, MA 01201

Re: GE-Pittsfield/Housatonic River Site
Upper ½-Mile Reach of the Housatonic River (GECD800)
2008 Annual Monitoring Report

Dear Mr. Tagliaferro:

Enclosed is a report presenting the results of the 2008 annual monitoring activities associated with the Upper ½-Mile Reach of the Housatonic River in Pittsfield, Massachusetts.

Please call me with any questions.

Sincerely,

for

Andrew T. Silfer, P.E.
GE Project Coordinator

TLC/amm
Enclosure

cc:
Holly Inglis, USEPA
Tim Conway, USEPA
Rose Howell, USEPA*
K.C. Mitkevicius, USACE
Ray Goff, USACE
Linda Palmieri, Weston
Dale Young, MA EOEEA
Michael Gorski, MDEP
Susan Steenstrup, MDEP (2 copies)
Jane Rothchild, MDEP*
Nancy Harper, MA AG*
Mayor James Ruberto, City of Pittsfield
Kevin Mooney, GE
Michael Carroll, GE*
Rod McLaren, GE*
James Bieke, Goodwin Procter
Mark Gravelding, ARCADIS
Todd Cridge, ARCADIS
Chuck Harman, AMEC
Todd Chadwell, Stantec
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* *without enclosure*

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2008 Annual Monitoring Report

Upper ½-Mile Reach of the Housatonic River

Prepared for:
General Electric Company

Prepared by:
ARCADIS of New York, Inc.
6723 Towpath Road
Syracuse
New York 13214-0066
Tel 315.446.9120
Fax 315.449.0017

Our Ref.:
B0020197

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1. Introduction

1.1 Purpose and Scope

This *2008 Annual Monitoring Report* summarizes the results of various post-restoration monitoring activities conducted by the General Electric Company (GE) during 2008 for the Upper ½-Mile Reach of the Housatonic River in Pittsfield, Massachusetts, under the Consent Decree (CD) for the GE-Pittsfield/Housatonic River Site. This report was prepared on GE's behalf by ARCADIS and AMEC Earth & Environmental (AMEC). These monitoring activities were performed in accordance with the requirements of the *Removal Action Work Plan for the Upper ½-Mile Reach of the Housatonic River* (Work Plan) (BBL, 1999) (Appendix F to the CD).

During 2008, monitoring activities for the Upper ½-Mile Reach were performed for the restored bank and river areas addressing the following categories:

- Restored bank vegetation;
- Restored bank erosion;
- Aquatic habitat enhancement structures;
- Armor stone layer; and
- Water column.

This report describes the 2008 monitoring activities and associated response actions, where conducted, for the above components.

1.2 Report Organization

Following this introductory section, this report is organized into the following sections.

- Section 2 – Restored Bank Vegetation Monitoring. This section summarizes the restored bank vegetation inspection activities and associated response actions conducted during 2008. As detailed in the Work Plan, these activities were performed in those bank areas that were restored as part of the Upper ½-Mile Reach Removal Action – i.e., those areas where bank soils were excavated as part of that Removal Action and/or areas that were cleared to allow access for the removal activities.

- Section 3 – Restored Bank Erosion Monitoring. This section summarizes the restored bank erosion inspection activities during 2008, as well as the evaluation of the need for response actions, if any.

- Section 4 – Aquatic Habitat Enhancement Structures and Armor Stone Layer Monitoring. This section summarizes the inspection activities conducted in 2008 for the aquatic habitat enhancement structures and armor stone layer and presents the results of these activities.

- Section 5 – Water Column Monitoring. This section summarizes the water column sampling conducted in 2008 and presents relevant field parameters and related analytical results.

- Section 6 – Summary and Future Activities. This section summarizes the activities completed as part of the 2008 monitoring program and describes future monitoring activities.

- Section 7 – References. This section presents references cited throughout this report.

2. Restored Bank Vegetation Monitoring

2.1 General

Vegetative restoration activities were implemented in those areas where bank soils were excavated as part of the Upper ½-Mile Reach Removal Action and/or in areas cleared to allow access for the removal activities (see Figure 2-1). The restoration techniques outlined in the Work Plan were intended to restore the vegetative community in such disturbed riparian areas to a functional value consistent with the riparian habitat present prior to the Removal Action. The soil removal activities conducted in accordance with the Work Plan along the riverbank were completed in or before 2002 and the disturbed banks restored. As part of the restoration process, GE, in conjunction with representatives of the Natural Resource Trustees (Trustees), monitors those areas that were restored to verify the success and biological integrity of the intended vegetative community.

2.2 Monitoring Program

An annual summary monitoring report is required to document the results of that year's monitoring visits and the conditions of the restored areas within the Upper ½-Mile Reach. This section fulfills the annual summary monitoring report requirement for the calendar year 2008.

As outlined in the Work Plan, GE and the Trustees agreed to a monitoring methodology that was used in 2001 and revised for implementation in 2002 and beyond. The Standard Operating Procedure that was agreed upon at that time for conducting the restored banks vegetation monitoring is included as Appendix A.

In 2005, GE proposed certain modifications to the existing vegetation monitoring program in response to changing conditions and vegetative growth on the restored banks. The proposed modifications were submitted to the Trustees, with a copy to the U.S. Environmental Protection Agency (EPA) in a communication dated August 3, 2005. The proposed modifications were conditionally approved in a communication from the Trustees dated February 27, 2006. For reference, the modified monitoring approach is summarized in Appendix B. In general, the modified monitoring program includes the use of smaller sub-plots in older planting areas to allow for a more focused assessment of representative portions of those areas.

For each planting area, the Work Plan required that the vegetative monitoring program consist of two visits per year for the first 3 years after planting and an annual visit during the fifth and seventh years after planting. In each of the first 3 years after planting, visits were

required to be conducted in the late spring after the first leaf flush (May/June) and in the summer (July/August) to assess plant survival. The single visits in the fifth and seventh years after planting are to be conducted in the summer (July/August). At the end of the 7-year monitoring period, GE is required to propose a long-term monitoring program that will be implemented upon EPA approval. In the event of a significant loss of plantings (greater than ¼ acre), the schedule for monitoring must be restarted following actions to replant the lost trees or shrubs (except in the case where a third party is responsible for such losses).

Survival rates, based on stem counts of planted trees and shrubs and the extent of areal coverage for herbaceous cover, are the key components of measuring the success of planted areas. The following performance standards are used to assess the adequacy of the restoration efforts over the Upper ½-Mile Reach:

1. All planted trees, shrubs, and vines must meet an 80% survival rate of the amount originally planted. To confirm this survival rate, supplemental plantings of appropriate species must be made if a monitoring event indicates a loss greater than 20%. Any dead trees or shrubs in excess of 20% of the original planting are to be replaced in the year in which monitoring occurs.

2. Herbaceous coverage of 100% must be maintained outside the foliar extent of the trees. If necessary, supplemental seeding or other activities are to be used to maintain 100% herbaceous coverage.

3. No greater than 5% of the restoration area of either bank may be allowed to be covered by invasive plant species. Any invasive species in excess of the 5% coverage limit must be removed in accordance with the requirements of the *Invasives Control Plan* (BBL, 2001).

The survivability of the plants is to be determined by both mortality and apparent vigor. Monitoring also assesses whether supplemental activities, such as stem protection, fertilization, or watering, are necessary.

In accordance with the Work Plan, a certified arborist (selected in consultation with the Trustees) assists in the completion of the monitoring program. The arborist, Chris Frank of C.L. Frank & Company of Northampton, Massachusetts, uses best professional judgment to assess the apparent vigor of the planted specimens. To the extent practicable, Mr. Frank observes any supplemental plantings and is present for the restored bank vegetation monitoring visits.

During each of the monitoring visits, the restoration areas must also be inspected for the presence of the following invasive plant species:

- Asiatic Bittersweet — *Celastrus orbiculatus*
- Common Buckthorn — *Rhamnus cathartica*
- Norway Maple — *Acer platanoides*
- Staghorn Sumac — *Rhus typhina*
- Morrows Honeysuckle — *Lonicera morrowii*
- Amur Honeysuckle — *Lonicera maackii*
- Tatarian Honeysuckle — *Lonicera tatarica*
- Autumn-olive — *Elaeagnus umbellata*
- Russian-olive — *Elaeagnus angustifola*
- Black Locust — *Robinia pseudoacacia*
- Buckthorn — *Rhamnus frangula*
- Japanese Honeysuckle — *Lonicera japonica*
- Japanese Barberry — *Berberis thunbergii*
- European Barberry — *Berberis vulgaris*
- Porcelain Berry — *Ampelopsis brevipedunculosa*
- Black Swallow-wort — *Vincetoxicum nigrum*
- Garlic Mustard — *Allaria petiolata*
- Goutweed — *Aegopodium podagraria*
- Japanese Knotweed — *Polygonum cuspidatum*
- Multiflora Rose — *Rosa multiflora*
- Common Reed — *Phragmites australis*
- Purple Loosestrife — *Lythrum salicaria*
- Yellow Iris — *Iris pseudacorus*
- Winged Euonymus (or Burning Bush) — *Euonymus alata*

Each monitoring visit consists of a pedestrian survey of all areas on both banks where restoration activities have occurred. During the field visit, personnel conducting the inspection, supported by the certified arborist, perform a stem count of planted trees and shrubs to determine respective survival rates. The inspection team estimates groundcover

by herbaceous species to verify coverage outside the foliar extent of the canopy, and notes any indications of damage from trespassing or herbivory. The inspection team also makes observations related to the need for initiation of actions to address invasive species. The monitoring visits are documented through field notes and photographs. Based on the results of each visit, the inspection team recommends response actions, such as replanting, watering, and fertilization.

2.3 2008 Monitoring Activities

During 2008, there was one scheduled restored bank vegetation inspection – performed on August 21, 2008 (i.e., a late summer inspection). The bank vegetation monitoring visit was conducted by Charles Harman of AMEC as a representative of GE. Todd Chadwell of Stantec (formerly Woodlot Alternatives) was present on behalf of the Trustees, and Chris Frank of C.L. Frank accompanied the monitoring party as the certified arborist. During the 2008 bank inspection, flow in the river was approximately 37 cubic feet per second (cfs), as measured at U.S. Geological Survey (USGS) River Gauge Station No. 01197000 on the East Branch of the Housatonic River in Coltsville, MA. The associated water level in the channel was generally below the riprap at the toe of the bank. Planting areas 4B, 10 composite planting area 6, 6A, 7, & 8A, and composite planting area 8, 9, 9A, 11, & 11A were quantitatively monitored during this event. Additionally, planting area 13 was revisited to assess its performance with respect to recalculated area-specific performance standards presented in the *2007 Annual Monitoring Report.*

The 2008 monitoring visit constituted the final scheduled inspection in planting areas 4B, 10, and composite planting area 6, 6A, 7, & 8A. The 2008 visit also marked the Year 7 inspection for composite planting area 8, 9, 9A, 11, & 11A. However, as discussed in Section 6.1 of this report, additional monitoring will be conducted in composite planting area 6, 6A, 7, & 8A and composite planting area 8, 9, 9A, 11, & 11A (as well as certain other areas), at the Trustees' request, to evaluate certain plantings installed in 2007 and/or 2008. For planting area 13, the 2008 monitoring visit completed the Deferred Year 5 inspection. A discussion of future long-term monitoring activities for the restored bank vegetation is presented in Section 6.1. Table 2-1 presents a summary of recent planting quantities and activities completed in previous years. All planting areas are shown on Figure 2-1. A trip report summarizing the results of this monitoring visit was submitted to EPA on October 16, 2008, with a copy to the Trustees; a copy of that trip report is included in Appendix C.

Note that, as discussed in the *2007 Annual Monitoring Report,* planting area 13, composite planting area 6, 6A, 7, & 8A, and composite planting area 8, 9, 9A, 11, & 11A have been reduced in size relative to the originally established planting areas as a result of remedial activities associated with the Newell Street Area II engineered barrier and/or

restoration activities associated with areas of erosion identified within the Upper ½-Mile Reach in either 2006 or 2007. As such, the performance standards for these planting areas have been recalculated. As presented in the EPA-approved *2007 Annual Monitoring Report*, the following area-specific modifications to the performance standards were established for use in 2008:

	Canopy		Understory	
	Original	**Revised**	**Original**	**Revised**
Planting Area 13	56	51	58	52
Composite Planting Area 8, 9, 9A, 11, & 11A	76	60	58	46
Composite Planting Area 6, 6A, 7, & 8A	90	72	0	Not Applicable

In addition, the *2007 Annual Monitoring* Report stated that replanting activities would be performed in spring 2008 at planting areas 5 and 16, which did not meet their performance standards for canopy and/or understory species. However, seasonal constraints related to the timing of the completion of the remedial activities and riprap placement and the ensuing need for coordination with various contractors involved with the plantings delayed the planting schedule beyond the optimal planting season, resulting in the proposed replanting being postponed. As a result, at the time of the August 2008 monitoring visit, planting area 5 was still missing 4 canopy specimens and 36 shrub specimens, and planting area 16 was still missing 2 canopy specimens. Supplemental planting associated with these variances identified in the *2007 Annual Monitoring Report* were included for performance with the 2008 corrective measures discussed in Section 2.4.

The following describes the results of the 2008 vegetation inspection for those areas inspected in 2008. Tables 2-2 through 2-7 present a detailed summary with respect to each applicable performance standard.

Canopy Species

With the exception of the variances identified in 2007 (as discussed above), all planting areas scheduled to be monitored in 2008 met the required performance standards for canopy species. The results of the monitoring surveys for these species are summarized in Table 2-2.

Understory Species, Red-Osier Dogwoods, and Grapevines

With the exception of the variances identified in 2007 (as discussed above), most of the areas scheduled to be monitored in 2008 met the performance standard for understory species. Composite planting area 8, 9, 9A, 11, & 11A did not meet the performance standard, with a negative variance of 19 specimens, and appears to have lost understory species during remedial construction activities performed within or adjacent to this area. Understory species monitoring results are summarized in Table 2-3. All planting areas met the performance standard for red-osier dogwoods and grapevines; related results are summarized in Tables 2-4 and 2-5.

Herbaceous Cover and Invasive Species

All planting areas met the required performance standards for herbaceous cover and invasive species. The results of the monitoring surveys for these items are shown in Tables 2-6 and 2-7, respectively.

2.4 Response Actions

GE implemented corrective actions in October 2008 for the one planting area identified in 2008, as well as the two planting areas previously identified in 2007, where the performance standards for canopy and/or understory specimens were not met. To meet the respective performance standards in these areas, new canopy and/or shrub plantings were installed as summarized below:

Composite planting area 8, 9, 9A, 11, & 11A	19 shrub specimens
Planting area 5	8 canopy specimens, 36 shrub specimens
Planting area 16	4 canopy specimens

Canopy plantings consisted of four boxelder (*Acer negundo*), four eastern cottonwood (*Populus deltoids*), and four black willow (*Salix nigra*) species. Shrub plantings consisted of 18 northern arrowwoods (*Viburnum dentatum*), 19 silky dogwoods (*Cornus amomum*), and 18 winterberries (*Ilex verticillata*). In accordance with the Work Plan, canopy species were installed in open spaces in each respective planting area, while understory species were planted in open areas within the respective shrub plots in the affected planting areas.

In addition, in response to a request from the Trustees in a letter dated November 20, 2008, several canopy specimens in planting area 5 (i.e., northern arrowwood, silky dogwood) that

had been uprooted were re-installed, and tree cages were installed to protect these and certain other plantings that appeared to have been damaged by herbivorous activities.

3. Restored Bank Erosion Monitoring

3.1 General

In 2008, restored bank erosion monitoring activities were performed for those bank areas disturbed and restored as part of the Upper ½-Mile Reach Removal Action. Specifically, the cleared and restored bank areas of the Upper ½-Mile Reach (excluding those portions of the river included in the Building 68 Area Removal Action) are required to be inspected for significant areas of soil erosion or bank failure. In areas where a significant amount of erosion (e.g., ruts, gullies, washouts, or sloughing) is observed within the cleared and restored or riprap protective areas, GE is required to implement measures to replace/restore the eroded soil or riprap to the original restoration design conditions.

3.2 Monitoring Program

The Work Plan requires that the post-restoration monitoring program consist of a visual inspection of the cleared and restored bank areas for signs of erosion on a semi-annual basis during the first year after restoration of the herbaceous cover and annually in years 2 through 5. 2007 was the fifth year of the erosion monitoring for the restored banks, and in the *2007 Annual Monitoring Report*, GE proposed a long-term monitoring program for EPA approval. In the April 28, 2008 Conditional Approval of GE's *2007 Annual Monitoring Report*, EPA required GE to continue performance of annual inspections for restored bank erosion for an additional five years. At the end of that time (i.e., 2012), GE may propose modifications to the monitoring program, as discussed in Section 6.2.

3.3 2008 Monitoring Activities

The restored bank erosion monitoring visit was conducted on May 20, 2008. Todd Cridge of ARCADIS, representing GE, performed the inspection, and was accompanied by Tom Czlusniak of Weston Solutions, representing EPA. At the time of inspection, flow in the river was approximately 126 cfs, as recorded by the USGS gauge in Coltsville, MA. During the 2008 restored banks erosion inspection, no areas were noted that had either a visually observable loss of bank materials or movement of bank armoring on the banks of the river in the areas associated with the Upper ½-Mile Reach Removal Action. A trip report documenting the results of this inspection was submitted to EPA on June 2, 2008; a copy of that report is included in Appendix C.

4. Aquatic Habitat Enhancement Structures and Armor Stone Layer Monitoring

4.1 General

Periodic monitoring of the aquatic habitat enhancement structures is required to evaluate structural stability, effect on aquatic habitat, and potential for increased bank-side erosion. The armor stone layer placed over the isolation layer within the riverbed must also be monitored periodically to confirm that it effectively prevents erosion of the underlying sediment cap isolation layer.

4.2 Monitoring Program

The Work Plan required that the post-restoration monitoring program for both the aquatic habitat enhancement structures and the armor stone layer consist of annual visual inspections during low-flow conditions for 5 years following completion of remedial activities. The Work Plan further required that, at the end of the 5-year period, GE must propose a long-term monitoring program to be implemented upon EPA approval. 2007 was the fifth year of aquatic habitat enhancement structure and armor stone layer monitoring, and in the *2007 Annual Monitoring Report*, GE proposed a long-term monitoring program for EPA approval. In the April 28, 2008 Conditional Approval of GE's *2007 Annual Monitoring Report*, EPA required GE to continue performance of annual inspections of the aquatic enhancement structures and armor stone layer monitoring for an additional five years. At the end of that time (i.e., 2012), GE may propose modifications to the monitoring program, as discussed in Section 6.3 of this report.

4.3 2008 Monitoring Activities

Monitoring activities for the aquatic habitat enhancement structures and the armor stone layer were performed on August 20, 2008. Charles Harman of AMEC conducted the inspection as a representative of GE. Michael Chelminski of Stantec was present on behalf of the Trustees. The results of this monitoring event were presented in the October 16, 2008 trip report, which is included in Appendix C.

The inspection consisted of visual observation of the condition of each of the aquatic habitat structures and the armor stone layer. At the time of inspection, flow in the Upper ½-Mile Reach was approximately 37 cfs, as recorded by the USGS flow gauge located in Coltsville, MA. The associated water level in the channel was generally below the top of the rip-rap at the toe of the bank.

4.3.1 Aquatic Habitat Enhancement Structures

The aquatic habitat enhancement structures that were monitored during the 2008 survey included:

- Wing deflectors;
- Vortex weirs;
- Modified vortex weirs;
- W-weir; and
- Habitat enhancement boulders and boulder clusters.

As defined by the Work Plan, the general objectives of the placement of these aquatic habitat structures were to:

- Recreate riffle/pool structural variability in the in-stream habitat;
- Provide in-stream and bankside cover for aquatic organisms;
- Increase variability in water flow and depth;
- Increase bank stability; and
- Improve substrate conditions.

The approximate location of each habitat enhancement structure is presented on Figure 4-1.

In general, those aquatic structures that were visible appeared to be providing good cover and habitat. The aquatic structures appeared to be structurally stable and were creating variations in water velocity and flow, as evidenced by the presence of scour zones and depositional areas surrounding the structures. The development of these variations in sediment elevation and the creation of flow changes in the water column appeared to be providing good habitat for fish and aquatic invertebrates. More details related to the results of the aquatic habitat enhancement structures inspection (including photographs) are included in the October 16, 2008 trip report found in Appendix C.

4.3.2 Armor Stone Layer

As in past years, the armor stone layer appeared to be stable with no evidence of erosion or material movement observed. In many areas, the armor layer has been covered with

sediment deposits; a continuing indication of sedimentation processes within the Upper ½-Mile Reach. Additional details related to the results of the armor stone inspection (including photographs) are included in the October 16, 2008 trip report found in Appendix C.

5. Water Column Monitoring

5.1 General

As proposed in the *2007 Annual Monitoring Report,* the water monitoring program specific to the Upper ½-Mile Reach was terminated following the 2007 monitoring events. However, water column sampling has continued to be performed under the Housatonic River Monthly Water Column Sampling Program; and as directed by EPA in its conditional approval of the *2007 Annual Monitoring Report,* results from that program related to the Upper ½-Mile Reach are included herein.

5.2 Monitoring Program

For the Housatonic River Monthly Water Column Sampling Program, monthly water quality samples are collected at the Newell and Lyman Street Bridge locations and analyzed for polychlorinated biphenyls (PCBs) and for total suspended solids (TSS). Field data such as temperature, conductivity, and pH are also collected for each event.

5.3 2008 Monitoring Activities

For each monitoring event, the flow in the river was reported from data collected at the USGS flow gauge located in Coltsville, MA. Precipitation data were also compiled from daily National Oceanic and Atmospheric Administration's National Weather Service (NOAA/NWS) data reported for the Pittsfield, MA airport.

PCBs were detected in one sample collected on April 30, 2008 at the Newell Street Bridge at 0.107 micrograms per liter (µg/l) and in one sample collected on June 25, 2008 at the Lyman Street Bridge at 0.084 µg/L. All other samples collected in 2008 showed no detected PCBs. TSS results across the entire water column data set ranged from not detected to 10.2 parts per million (ppm). The complete results of the 2008 water column monitoring associated with the Upper ½-Mile Reach are summarized in Table 5-1.

6. Summary and Future Activities

6.1 Restored Bank Vegetation Monitoring

In 2009, vegetation monitoring will be conducted once during the late summer (July/August). As per the monitoring schedule, planting areas 12, 13, 14, 15, 16, and 17 will be inspected in 2009. In addition, as requested by the Trustees in their letter dated November 20, 2008, monitoring of plantings installed in 2007 and 2008 in a number of other planting areas will be conducted in 2009 and/or 2010. Specifically, the red-osier dogwoods installed in 2007 in composite planting area 6, 6A, 7, & 8A and in composite planting area 8, 9, 9A, 11, & 11A will be monitored again in 2009; and the canopy and/or understory species planted in November 2008 in planting areas 5 and 16 and in composite planting area 8, 9, 9A, 11, & 11A (as described in Section 2.4 above) will be monitored again in 2009 and 2010 to complete the two-year monitoring for those new plantings. A summary of the future restored bank vegetation monitoring activities is included in Table 6-1. Results of these monitoring events will be summarized and submitted to EPA in trip reports and in the respective Annual Monitoring Reports.

The 2009 monitoring visit will constitute the 7th and final scheduled year of monitoring for planting areas 12, 13, 14, 15, 16 and 17. Unless that or any of the supplemental monitoring events to be conducted in 2009 and 2010 for plantings installed in 2007 and 2008 indicates the need for further plantings, the monitoring events described above will represent the completion of the required monitoring of the restored bank vegetation and fulfillment of the monitoring requirements set forth in the Work Plan. In general, except for certain planting areas disturbed by remediation or bank erosion restoration activities, there have been no significant negative variances in the planting areas over the past several years. As such, GE proposes that following the additional inspections in 2009 and 2010 (as described above), and assuming that there is no need for additional planting, the restored banks vegetation monitoring program described in the Work Plan will be complete and no future or long-term monitoring will be necessary.

Basic maintenance activities to address the state of the wire tree cages and the stem protectors will be ongoing in 2009. GE will also continue to prune some of the more rapidly growing canopy species, as appropriate, allowing for a more extensive development of the tree trunk. The Trustees will be informed of the schedule for any such pruning activities.

GE anticipates performing the 2009 restored bank vegetation inspection in the late summer (July/August). GE will coordinate scheduling of the 2009 inspection visit with EPA and the Trustees' representative to avoid potential high-water events in the Upper ½-Mile Reach or other scheduling conflicts.

6.2 Restored Bank Erosion Monitoring

With the performance of the 2008 inspection, GE has completed the first year of the long-term restored bank erosion monitoring program outlined in the *2007 Annual Monitoring Report* and modified by EPA's conditional approval of GE's *2007 Annual Monitoring Report.* This long-term monitoring program is to be performed annually each year for five years in late April or May prior to the development of heavy vegetation that may obscure visual inspection. Similar to the program outlined in the Work Plan, these monitoring events consist of a visual inspection of the cleared and restored bank areas for signs of erosion. If any such areas are identified, GE will discuss with EPA the appropriate response measures, if necessary. GE will perform the next erosion inspection in the spring of 2009. A summary of the proposed future monitoring for restored bank erosion is included in Table 6-1. Following the fifth and final year of this program in 2012, GE will discuss with EPA the termination of the bank erosion monitoring program.

6.3 Monitoring of Aquatic Habitat Enhancement Structures and Armor Stone Layer

With the performance of the 2008 inspection, GE has completed the first year of the long-term aquatic habitat enhancement structures and armor stone layer monitoring program outlined in the *2007 Annual Monitoring Report* and modified by EPA's conditional approval of GE's 2007 Annual Monitoring Report. This long-term monitoring program is to be performed annually for five years in late April or May, prior to the development of heavy vegetation that may obscure visual inspection. Similar to the program outlined in the Work Plan, these monitoring events include a site visit and visual inspection of the aquatic habitat enhancement structures and armor stone layer. GE will perform the next inspection in the spring of 2009. A summary of the proposed future monitoring for the aquatic habitat enhancement structures and armor stone layer is included in Table 6-1. Following the fifth and final year of this program in 2012, GE will discuss with EPA the termination of the aquatic habitat enhancement structures and armor stone layer monitoring program.

6.4 Water Column Monitoring

The 2008 water column monitoring was performed monthly at the Newell and Lyman Street Bridge locations, and will continue to be performed as part of the ongoing monthly water column sampling efforts being performed under the Housatonic River Monthly Water Column Sampling Program.

6.5 Isolation Layer Sampling

As discussed in the *2007 Annual Monitoring Report*, isolation layer sampling was performed in 2007. Related PCB analytical results indicated that there is no apparent consistent pattern indicative of PCB transport from the underlying sediments. Further, the sampling and analytical results did not suggest any definitive conclusions regarding the performance of the isolation layer relative to the long-term predictions on which the isolation layer design was based, as it is generally too early to make any such conclusion.

As a result, GE proposed in the *2007 Annual Monitoring Report* to collect and analyze an additional round of isolation layer samples along with the "10-Year" deposited sediments sampling event discussed below (currently anticipated for 2012). EPA approved this approach in its April 28, 2008 conditional approval letter related to GE's 2007 Annual Monitoring Report. This future monitoring event is included in Table 6-1. Based on review of those results, GE will further evaluate the apparent effectiveness of the isolation layer, will evaluate the scope and frequency of further long-term monitoring of the isolation layer, and will make a proposal to EPA regarding such further monitoring.

6.6 Deposited Sediment Sampling

As discussed in the *2007 Annual Monitoring Report,* deposited sediment sampling was performed in 2007. This sampling satisfied the Work Plan's requirement for a 5-year post-remediation sampling event. Related PCB analytical results indicated the presence of low levels of PCBs in some materials that have been deposited on top of the armor stone since completion of the Upper ½-Mile sediment remediation and restoration activities. Overall, as discussed in the *2007 Annual Monitoring Report*, it cannot be concluded that the PCBs in the Upper ½-Mile surface sediments are attributable to sources other than those that have been or are being addressed by GE at the GE-Pittsfield/Housatonic River Site (as defined in the Work Plan). In these circumstances, in accordance with the Work Plan, GE concluded that no further response actions are required at this time to address the PCBs in the surface sediments within the Upper ½-Mile.

As required by the Work Plan, GE will conduct two additional rounds of deposited sediment sampling at 5-year intervals – i.e., the "10-Year" sampling event (currently anticipated for 2012) and the "15-Year" sampling event (currently anticipated for 2017). A summary of these future monitoring events is included in Table 6-1. Upon the conclusion of that program, GE will evaluate the scope and frequency of further long-term monitoring of the deposited sediment, and will make a proposal to EPA regarding such further monitoring.

6.7 Future Reporting

GE will continue to include the results from the long-term monitoring events described above in an annual report to be submitted to EPA. In addition, interim trip reports will continue to be submitted after the monitoring visits.

References

ARCADIS. 2008. *2007 Annual Monitoring Report – Upper ½-Mile Reach of the Housatonic River.* Prepared for GE, Pittsfield, MA.

ARCADIS BBL. 2007. *2006 Annual Monitoring Report – Upper ½-Mile Reach of the Housatonic River.* Prepared for GE, Pittsfield, MA.

BBL. 2006. *2005 Annual Monitoring Report – Upper ½-Mile Reach of the Housatonic River.* Prepared for GE, Pittsfield, MA.

BBL. 2005. *2004 Annual Monitoring Report – Upper ½-Mile Reach of the Housatonic River*. Prepared for GE, Pittsfield, MA.

BBL. 2004. *2003 Annual Monitoring Report – Upper ½-Mile Reach of the Housatonic River*. Prepared for GE, Pittsfield, MA.

BBL. 2001. *Invasives Control Plan*. Prepared for GE, Pittsfield, MA.

BBL. 1999. Removal Action Work Plan for Upper ½-Mile Reach of Housatonic River. Prepared for GE, Pittsfield, MA.

ARCADIS

Tables

TABLE 2-1
SUMMARY OF BANK PLANTING AREAS

2008 ANNUAL MONITORING REPORT
UPPER 1/2-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC COMPANY - PITTSFIELD, MASSACHUSETTS

					Vines	Understory				Dogwood Band	Canopy				
Area	Planting Date	Cell Area	Planting Area (ac)	Toe Planting Length (lf)	Woody Vines *Vitus riparia*	Serviceberry *Amelanchier canadensis* *Amelanchier arborea*	Northern Arrowwood *Viburnum dentatum*	Silky Dogwood *Cornus amomum*	Winterberry Holly *Ilex verticillata*	Red-Osier Dogwood *Cornus sericea*	Eastern Cottonwood *Populus deltoides*	Boxelder *Acer negundo*	Black Willow *Salix nigra*	Silver Maple *Acer saccharinum*	Total
1	May-00	A,C	0.30	328	0	0	37	37	36	82	79	79	26	26	**402**
1	Oct-00	A,C	--	--	0	36	0	0	0	0	0	0	0	0	**36**
1	Jun-01	A,C	--	--	22	0	1	1	0	0	0	0	0	0	**24**
1	Oct-01	A,C	--	--	0	10 *	10	9	10	8	10	10	24	21	**112**
1	Oct-02	A,C	--	--	0	6 *	5	6	6	6	0	0	0	0	**29**
1	Oct-03	A,C	--	--	0	0	0	36	0	9	0	0	0	0	**45**
2	May-00	D	0.17	NA	0	0	0	0	0	0	44	44	15	15	**118**
2	Oct-01	D	--	--	0	0	0	0	0	0	9	9	14	8	**40**
2	Oct-03	D	--	--	0	0	0	0	0	0	0	30	0	0	**30**
3	May-00	E	0.05	45	0	0	18	18	19	11	13	13	4	4	**100**
3	Oct-00	E	--	--	0	18	0	0	0	0	0	0	0	0	**18**
3	Jun-01	E	--	--	0	0	0	0	1	0	1	1	0	0	**3**
3	Oct-01	E	--	--	0	5 *	4	4	4	0	5	5	4	4	**35**
3	Oct-02	E	--	--	0	6 *	0	6	0	8	3	0	0	2	**25**
3	Oct-03	E	--	--	0	0	0	12	0	0	0	0	0	0	**12**
3	Nov-05	E	--	--	0	0	0	0	0	0	4	3	3	3	**13**
4A	Oct-00	G1,G2	0.16	395	0	19	18	18	18	74	64	63	5	10	**289**
4A	Oct-01	G1,G2	--	--	0	12 *	6	6	6	12	3	4	10	5	**64**
4A	Oct-02	G1,G2	--	--	0	8 *	4	4	10	8	30	10	0	0	**74**
4A	Oct-03	G1,G2	--	--	0	0	0	12	0	0	0	33	0	0	**45**
4A	Nov-05	G1,G2	--	--	0	4	4	4	4	0	5	4	4	4	**33**
4B	Jun-01	G2,G3	0.40	416	22	54	56	56	0	134	95	95	33	33	**578**
4B	Oct-01	G2,G3	--	--	0	0	0	0	53	0	0	0	0	0	**53**
4B	Oct-02	G2,G3	--	--	0	8 *	4	6	2	8	10	0	10	10	**58**
4B	Oct-03	G2,G3	--	--	0	0	0	34	0	0	0	0	0	0	**34**
4B	Oct-04	G2,G3	--	--	0	0	12	12	12	0	0	0	0	0	**36**
4B	Nov-06	G2,G3	--	--	0	3 *	4	3	3	0	0	0	0	0	**13**
5	Oct-00	F1,F2	0.10	NA	0	19	18	18	18	0	25	25	8	8	**139**
5	Oct-03	F1,F2	--	--	0	0 0	0	21	0	0	0	10	0	0	**31**
5	Nov-05	F1,F2	--	--	0	6	6	6	6	0	3	3	3	2	**35**
5	**Oct-08**	**F1,F3**	**--**	**--**	**0**	**0**	**12**	**12**	**12**	**0**	**3**	**2**	**3**	**0**	**44**
6	Jun-01	F3	0.07	226	0	0	0	0	0	57	21	21	7	7	**113**
6A	Jun-01	F3	0.05	NA	0	0	0	0	0	0	8	8	3	3	**22**
7	Jun-01	F3	0.01	NA	0	0	0	0	0	0	3	3	1	1	**8**
8	Oct-01	H1	0.02	32	0	0	0	0	0	6	6	4	2	2	**20**
8	Oct-02	H1	--	--	0	0	0	0	0	2	0	0	0	0	**2**
8[6]	**Oct-08**	**H1**	**--**	**--**	**0**	**0**	**6**	**7**	**6**	**0**	**0**	**0**	**0**	**0**	**19**
8A	Oct-01	H1	0.05	104	0	0	0	0	0	29	12	7	4	4	**56**
9	Oct-01	H1	0.01	NA	0	0	0	0	0	0	3	2	1	1	**7**
9A	Oct-01	H1,H2	0.06	187	0	0	0	0	0	31	12	7	4	4	**58**
9A	Oct-02	H1	--	--	0	0	0	0	0	2	0	0	0	0	**2**
10	Oct-01	B68	0.18	NA	0	18 *	18	19	18	0	47	47	16	16	**199**
10	Oct-04	B68	--	NA	0	0	3	3	2	0	0	0	0	0	**8**
10	Nov-06	B68	--	NA	0	0	1	0	0	0	0	0	0	0	**1**
11	Oct-01	H2	0.04	88	0	18 *	18	18	19	20	8	6	3	3	**113**
11	Oct-02	H2	--	--	0	0	0	0	0	2	0	0	0	0	**2**
11	Oct-03	H2	--	--	0	0	0	19	0	0	0	0	0	0	**19**
11A	Oct-01	H2	0.06	83	0	0	0	0	0	28	12	7	4	4	**55**
11A	Oct-02	H2	--	--	0	0	0	0	0	2	0	0	0	0	**2**
12	May-02	J1	0.19	269	0	18 *	0	19	18	67	50	50	0	17	**239**
12	Oct-02	J1	--	--	22	0	18	0	0	0	0	0	17	0	**57**
12	Oct-03	J1	--	--	0	0	0	12	0	13	0	0	0	0	**25**
12	Oct-04	J1	--	--	0	0	3	3	2	0	0	0	0	0	**8**
13	May-02	I1	0.10	234	0	18 *	0	18	19	41	26	26	0	9	**157**
13	Oct-02	I1	--	--	0	0	18	0	0	18	0	0	9	0	**45**
14	Oct-02	J3	0.21	192	22	37 *	37	36	36	48	56	56	19	19	**366**
15	May-02	I2	0.00	40	0	0	0	0	0	10	0	0	0	0	**10**
16	Oct-02	I2	0.01	72	0	0	0	0	0	18	3	3	1	1	**26**
16	Oct-08	I3	--	--	0	0	0	0	0	0	1	2	1	0	**4**
17	Oct-02	I3	0.04	108	0	0	0	0	0	27	10	10	3	3	**53**
Total			--	--	**88**	**323**	**341**	**495**	**340**	**781**	**684**	**702**	**261**	**249**	**4264**

Notes:
1. Woody vines planted at an approximate density of 40 vines/acre on 4' centers in a 15'x30' patch with a minimum of 150' between patches.
2. Understory planted at an approximate density of 730 shrubs/acre (including red-osier dogwood) on 4' centers in a 30'x50' patch with a minumum of 40' between patches.
3. Canopy planted in varying densities, clumps, or if necessary, sinuous lines.
4. Dogwood band planted on 4' centers in a single row along the toe of the bank.
5. * - In consultation with EPA and Trustees, Chokecherry (*prunus virg* iniana) was planted in substitution of Serviceberry for these areas.
6. The plantings noted for Area 8 in October 2008 represent the total plantings for Composite Area 8, 9, 9A, 11 and 11A.

TABLE 2-2
CANOPY MONITORING RESULTS

2008 ANNUAL MONITORING REPORT
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Planting Area	Date Initially Planted	Quantity Planted	Target Performance Standard	Monitoring Count - Live Specimens			Dead	Variance
					Non-stressed	Stressed	Total		
8/21/2008	4B[1]	June 01	256	205	272	0	272	0	+67
	10[2]	Oct 01	126	101	111	0	111	0	+10
	6, 6A, 7, 8A	June/Oct 01	113	72	78	0	78	0	+6
	8, 9, 9A, 11, 11A	Oct 01	95	60	65	2	65	0	+5
	13	May/Oct 02	70	51	52	0	52	0	+1

[1] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 22% of Area 4B.

[2] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 27% of Area 10.

TABLE 2-3
UNDERSTORY MONITORING RESULTS

2008 ANNUAL MONITORING REPORT
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Planting Area	Date Initially Planted	Quantity Planted	Target Performance Standard	Monitoring Count - Live Specimens			Dead	Variance
					Non-stressed	Stressed	Total		
8/21/2008	4B[1]	June 01	219	175	182	0	182	0	+7
	10[2]	Oct 01	73	58	63	0	63	0	+5
	6, 6A, 7, 8A	June/Oct 01	0	NA	--	--	--	--	--
	8, 9, 9A, 11, 11A	Oct 01	73	46	27	0	27	0	**-19**
	13	May/Oct 02	73	52	61	0	61	0	+9

[1] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 22% of Area 4B.

[2] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 27% of Area 10 and 50% of the shrub planting area.

TABLE 2-4
RED-OSIER DOGWOOD MONITORING RESULTS

2008 ANNUAL MONITORING REPORT
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Area	Date Initially Planted	Monitoring Count		Comments
			Gaps in Dogwood Line, Missing Plants	Meets Performance Standard (Yes/No)	
8/21/2008	4B	June 01	---	Yes	---
	10	Oct 01	---	Yes	---
	6, 6A, 7, 8A	June/Oct 01	---	Yes	New plantings installed November 2007; appear to have survived first winter
	8, 9, 9A, 11, 11A	Oct 01	---	Yes	New plantings installed November 2007; appear to have survived first winter
	13	May/Oct 02	---	Yes	---

TABLE 2-5
GRAPE VINE MONITORING RESULTS

2008 ANNUAL MONITORING REPORT
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Area	Date Initially Planted	Quantity Required	Target Performance Standard	Monitoring Count - Planted Live Specimens			Dead	Wild Grapes or Grape Patches	Comments
					Non-stressed	Stressed	Total Vines			
8/21/2008	4B	June 01	22	18	15	0	15	0	40+	The number of planted grapes plus the number of individual native grape plants noted in this planting area meets the performance criteria.
	8, 9, 9A, 11, 11A	--	22	18	0	0	0	0	40+	The number of individual native grape plants noted in this planting area meets the performance criteria, without the aid of supplemental planting.

TABLE 2-6
HERBACEOUS GROUNDCOVER MONITORING RESULTS

2008 ANNUAL MONITORING REPORT
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Area	Date Initially Planted	Target Performance Standard (Cover)	General Monitoring Results (Total Percent Herbaceous Coverage)	Meets Performance Standard (Yes/No)	Comments
8/21/2008	4B[1]	June 01	100%	Plot 1 ~100% coverage Plot 2 ~100% coverage Plot 3 ~100% coverage	Yes	Herbaceous cover has closed in, except to a minor extent under canopy specimens (which is allowed under Monitoring Plan). Meets performance standard. No areas outside of the monitoring plots were missing herbaceous cover.
	10[2]	Oct 01	100%	Plot 1 ~100% coverage Plot 2 ~100% coverage	Yes	Herbaceous cover has closed in, except to a minor extent under canopy specimens (which is allowed under Monitoring Plan). Meets performance standard. No areas outside of the monitoring plots were missing herbaceous cover.
	6, 6A, 7, 8A	June/ Oct 01	100%	First 100' ~90% coverage Second 100' ~95% coverage Third 100' ~95% coverage	Yes	Herbaceous cover has closed in, except to a minor extent under canopy specimens (which is allowed under Monitoring Plan). Meets performance standard.
	8, 9, 9A, 11, 11A	Oct 01	100%	First 100' ~95% coverage Second 100' ~90% coverage Third 100' ~95% coverage Fourth 100' ~95% coverage	Yes	Herbaceous cover has closed in, except to a minor extent under canopy specimens (which is allowed under Monitoring Plan). Meets performance standard.
	13	May/Oct 02	100%	~100% coverage	Yes	Herbaceous cover outside of canopy meets performance standard.

[1] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 22% of Area 4B.

[2] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 27% of Area 10.

TABLE 2-7
INVASIVE SPECIES MONITORING RESULTS

2008 ANNUAL MONITORING REPORT
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Area	Date Initially Planted	Target Performance Standard (Invasive Species)	Monitoring Results (Percent Invasive Species)	Meets Performance Objectives (Yes/No)	Primary Observed Invasive Species
8/21/2008	4B[1]	June 01	< 5%	Plot 1 <5% Plot 2 <5% Plot 3 <5%	Yes	Purple loosestrife; no significant invasive species presence outside of the monitoring plots
	10[2]	Oct 01	< 5%	Plot 1 <5% Plot 2 <5%	Yes	Purple loosestrife; no significant invasive species presence outside of the monitoring plots
	6, 6A, 7, 8A	June/ Oct 01	< 5%	First 100' <5% Second 100' <5% Third 100' <5%	Yes	Purple loosestrife, bittersweet
	8, 9, 9A, 11, 11A	Oct 01	< 5%	First 100' <5% Second 100' <5% Third 100' <5%	Yes	Purple loosestrife, bittersweet
	13	May/Oct 02	< 5%	<5%	Yes	Isolated specimens of purple loosestrife

[1] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 22% of Area 4B.

[2] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 27% of Area 10.

TABLE 5-1
WATER COLUMN MONITORING RESULTS

2008 ANNUAL MONITORING REPORT
UPPER 1/2-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC COMPANY - PITTSFIELD, MASSACHUSETTS
(Results are presented in parts per million, ppm)

Sample ID	Sample Location	Date Collected	Parameter								
			Total	Conventional Parameters			Field Measurements				
			PCBs	Particulate Organic Carbon	Total Suspended Solids	Chlorophyll	Conductivity (mS/cm)	pH (Standard Units)	Sample Depth (m)	Turbidity (ntu)	Water Temperature (°C)
LOCATION-2	Newell Street Bridge	01/29/08	ND(0.0000220)	0.40	5.40	0.00097	0.371	7.55	0.60	2	1.90
		02/29/08	ND(0.0000220)	0.30	5.45	0.00036	0.302	6.76	0.95	4	0.10
		03/26/08	ND(0.0000220)	0.13	10.2	ND(0.00015)	0.276	7.49	1.08	2	4.39
		04/30/08	0.000107	0.40	3.80	ND(0.00015)	0.173	7.65	1.28	4	8.43
		05/28/08	ND(0.0000220)	0.44	ND(1.18)	0.0010	0.475	7.77	0.48	4	18.59
		06/25/08	ND(0.0000220)	0.54	5.73	0.0011	0.249	7.62	0.93	4	19.96
		07/31/08	ND(0.0000220)	0.38	2.57	0.00093	0.350	7.56	0.63	2	22.97
		08/26/08	ND(0.0000220)	0.22	1.20	0.0017	0.808	8.52	0.37	3	19.42
		09/24/08	ND(0.0000220)	0.39	1.70	0.0017	0.572	8.15	0.35	6	16.89
		10/30/08	ND(0.0000220)	0.60	1.10	0.0013	0.168	7.05	1.35	3	5.38
		11/19/08	ND(0.0000220)	0.48	3.50	0.00094	0.279	7.59	0.73	5	2.55
		12/16/08	ND(0.0000220)	0.61	8.10	0.00057	0.130	6.77	1.53	6	1.37
LOCATION-4	Lyman Street Bridge	01/29/08	ND(0.0000220)	0.20	2.70	0.00076	0.381	7.44	0.68	2	1.95
		02/28/08	ND(0.0000220)	0.33	3.37	0.00045	0.388	7.47	1.40	3	0.20
		03/26/08	ND(0.0000220)	0.33	ND(1.00)	ND(0.00015)	0.287	7.43	0.95	2	4.72
		04/30/08	ND(0.0000220)	0.35	4.10	ND(0.00015)	0.178	7.63	1.42	3	8.47
		05/28/08	ND(0.0000220)	0.45	4.93	0.00092	0.480	7.75	0.50	3	18.64
		06/25/08	0.0000840	0.66	6.37	0.0010	0.258	7.66	0.80	4	20.06
		07/31/08	ND(0.0000220)	0.35	1.96	0.00095	0.363	7.58	0.55	2	23.18
		08/26/08	ND(0.0000220)	0.19	2.20	0.0023	0.817	8.55	0.38	3	19.46
		09/24/08	ND(0.0000220)	0.40	4.50	0.0025	0.584	8.17	0.47	7	16.70
		10/30/08	ND(0.0000220)	0.48	ND(1.00)	0.0013	0.173	6.97	1.40	4	5.24
		11/18/08	ND(0.0000220)	0.48	2.80	0.0011	0.269	7.68	0.63	2	4.37
		12/16/08	ND(0.0000220)	0.57	6.70	0.00054	0.140	7.06	1.90	7	1.78

Notes:

1. On 4/30/08, turbidity at Sample Location-2 was 4 NTU, flow at USGS Coltsville gaging station 293 cfs, no precipitation; however, over 1.5 inches of rain fell during the prior two days.
2. On 6/25/08, turbidity at Sample Location-4 was 4 NTU, flow at USGS Coltsville gaging station 166 cfs, over 1 inch rain during previous two days.
3. Sampling methods involved the collection of composite grab samples at each location, representative of three stations (25, 50, and 75 percent of the total river width at each location) at 50 percent of the total river depth at each station. Reported sample depth is the average of the three depths at the composite sample locations.
4. Samples were collected by ARCADIS, and submitted to Northeast Analytical, Inc. for analysis.
5. ND - Analyte was not detected. The number in parentheses is the associated detection limit.

TABLE 6-1
SUMMARY OF FUTURE POST-CONSTRUCTION MONITORING ACTIVITIES[1]

2008 ANNUAL MONITORING REPORT
UPPER 1/2-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC COMPANY - PITTSFIELD, MASSACHUSETTS

Monitoring Activity[2]	Year					Comments
	2009	2010	2011	2012	2017	
Sediment Cap Isolation Layer (CAP-MON-1 through CAP-MON-8)	---	---	---	Second Round	---	Consists of sampling of the isolation layer at select locations along the Upper 1/2-Mile Reach. To be conducted with the Second Round of Deposited Sediments sampling.
Armor Stone Layer[5]	Long-term 2-Year	Long-term 3-Year	Long-term 4-Year	Long-term 5-Year	---	Visual inspection to be performed for five years during low flow conditions following first ice-out and high water conditions (i.e., a flow of 440 cfs or greater).
Aquatic Habitat Enhancement Structures[5]	Long-term 2-Year	Long-term 3-Year	Long-term 4-Year	Long-term 5-Year	---	Visual inspection to be performed for five years during low flow conditions following first ice-out and high water conditions (i.e., a flow of 440 cfs or greater).
Deposited Sediments[4]	---	---	---	Second Round	Third Round	Sampling to consist of 39 grab samples, collected at the locations identified in the Upper 1/2-Mile Work Plan after five and ten additional years from the conclusion of the "5-Year" Monitoring Requirements.[3]
Erosion of Cleared and Restored Bank Soil Areas[5]	Long-term 2-Year	Long-term 3-Year	Long-term 4-Year	Long-term 5-Year	---	Visual inspection to be performed for five years during low flow conditions following first ice-out and high water conditions (i.e., a flow of 440 cfs or greater).
Restored Bank Vegetation						
Planting Areas 1, 2, 3, 4A, 4B, and 10	Completed					Consists of an annual visit during the seventh year after planting as well as revisiting certain replanted areas for two years following replanting activities.
Planting Area 5	Monitor 2008 Canopy & Understory Plantings[6]	Monitor 2008 Canopy & Understory Plantings[7]	---	---	---	
Planting Areas 6, 6A, 7, and 8A	Monitor Red-osier Dogwoods[6]	---	---	---	---	
Planting Areas 8, 9, 9A, 11, and 11A	Monitor Red-osier Dogwoods and 2008 Understory Plantings[6]	Monitor Red-osier Dogwoods and 2008 Understory Plantings[7]	---	---	---	
Planting Areas 12, 13, 14, 15, and 17	Year 7	---	---	---	---	
Planting Area 16	Year 7	Monitor 2008 Canopy Plantings[7]				

Notes:
1. Please refer to the *Removal Action Work Plan - Upper 1/2-Mile Reach of Housatonic River* (Upper 1/2-Mile Work Plan; BBL, August 1999) and subsequnt correspondence from EPA and Trustees for additional detai
2. EPA and EOEEA shall be notified at least one week prior to conducting monitoring activities.
   EPA contact is Dean Tagliaferro: (413) 236-0969
   EOEEA contact is Dale Young: (413) 447-9771
   GE contact is Andy Silfer: (518) 862-2703
3. To consolidate sampling efforts, GE proposed, and EPA concurred, that 5-year monitoring for all isolation layer locations would be performed in 2007, and 10- and 15- year events in 2012 and 2017 respectively.
4. GE is required to conduct three rounds of periodic sampling of the restored sediments at five-year intervals, beginning five-years after completion of construction on the sediment removal/replacement activities. The first sampling round occurred in 2007. The second and third round of sampling is anticipated to be performed in 2012 and 2017. Sampling shall be performed in accordance with the Upper 1/2-Mile Work Plan.
5. Long-term monitoring was initiated in 2008, and will be performed annually for five years (i.e., 2008 through 2012).
6. Area 5, Composite Area 6, 6A, 7, and 8A, and Composite Area 8, 9, 9A, 11, and 11A will be revisited in 2009 to monitor plantings installed in 2007 and/or 2008.
7. Area 5, Composite Area 8, 9, 9A, 11, and 11A, and Area 16 will be revisited in 2010 to monitor plantings installed in 2008.

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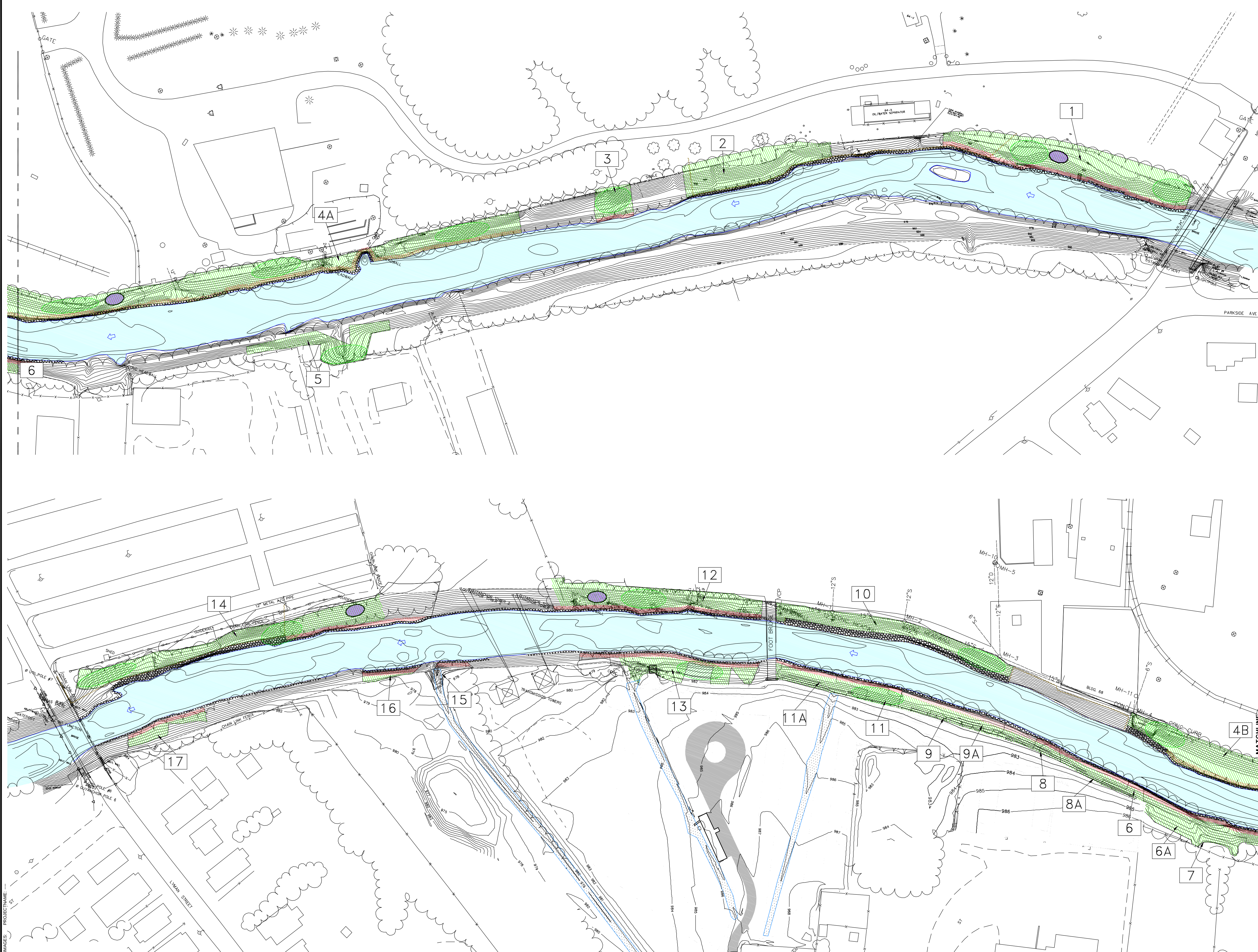
Figures



LEGEND:

- TOP OF BANK
- CLEARING LIMITS/PLANTING AREA
- CONTAINMENT BARRIER LOCATION
- UNDERSTORY SPECIES
- VINE PATCHES
- STONE/RIP-RAP
- RED-OSIER-DOGWOOD
- 4A — APPROXIMATE RESTORED BANKPLANTING AREA

NOTES:

1. ALL DIMENSIONS AND LOCATIONS ARE APPROXIMATE.

0 80' 160'

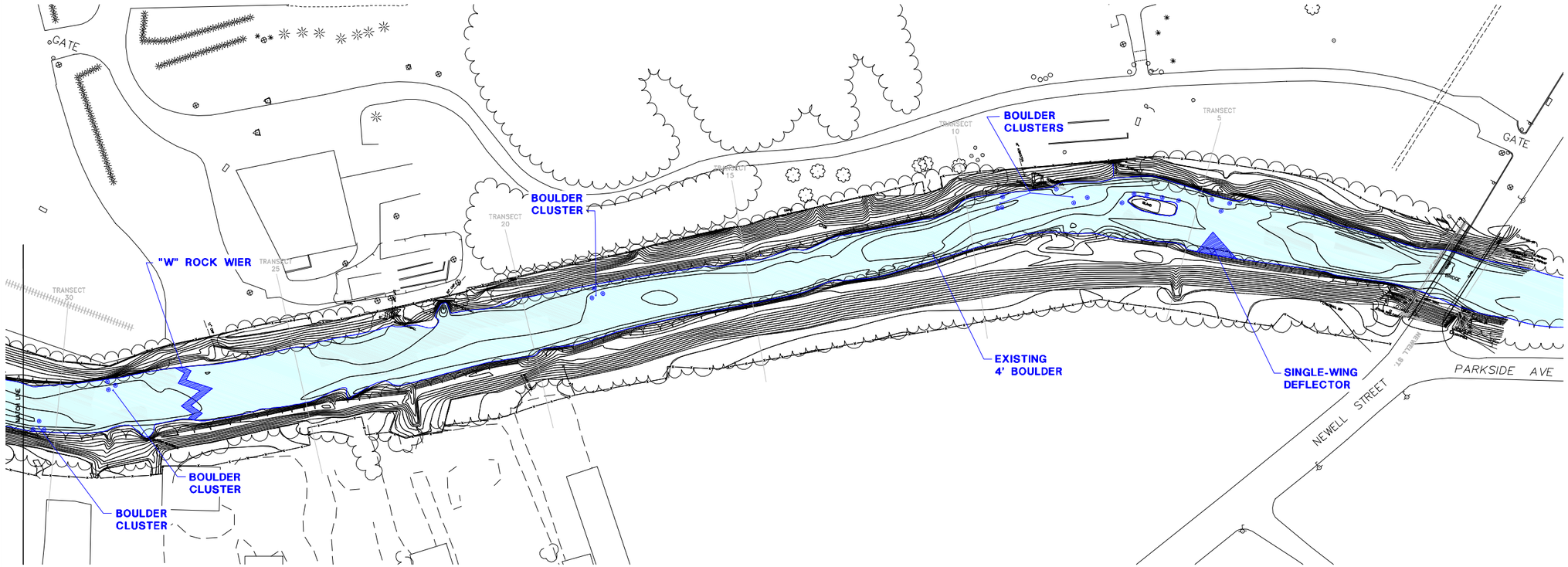
GRAPHIC SCALE

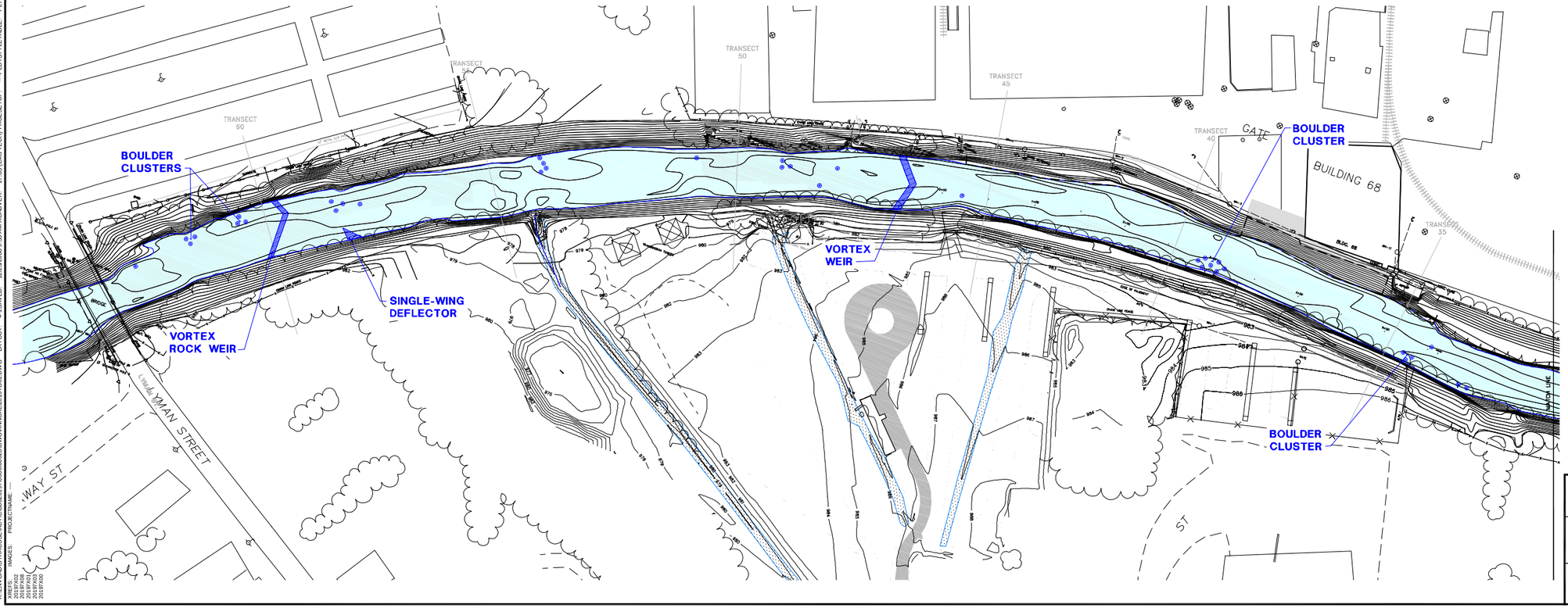
GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
2008 ANNUAL MONITORING REPORT
UPPER 1/2-MILE REACH OF THE HOUSATONIC RIVER

RESTORED BANK PLANTING AREAS

ARCADIS

FIGURE **2-1**





LEGEND:

- AQUATIC ENHANCEMENT STRUCTURES
- HABITAT ENHANCEMENT BOULDERS

NOTES:

1. ALL LOCATIONS AND DISTANCES ARE APPROXIMATE.

0 80' 160'

GRAPHIC SCALE

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
2008 ANNUAL MONITORING REPORT
UPPER 1/2-MILE REACH OF THE HOUSATONIC RIVER

HABITAT ENHANCEMENT STRUCTURE LOCATIONS

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FIGURE
4-1

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Appendices

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Appendix A

Standard Operating Procedure for Restored Bank Vegetation Monitoring

Appendix A –
Standard Operating Procedure for Riverbank Vegetation Monitoring Program

The General Electric Company (GE) and the Massachusetts NRD Trustees (NRD Trustees) agreed to an approach to the restored bank vegetation monitoring methodology for the Upper ½–Mile Reach of the Housatonic River that was utilized in 2001 and refined in 2002. From these earlier monitoring methodologies a detailed approach to the monitoring program was created and has been utilized since 2003 as described below.

1. The monitoring team is to include representatives of GE and representatives of NRD Trustees. The team will assemble at the onsite construction trailer, or similar central location, on the day of the inspection in order to coordinate activities and cover any issues.

2. The stem count is to be performed; and data recorded, by GE. The representative for the NRD Trustees will observe to ensure the accuracy of the count. Specifically, the NRD's Trustees representative will: ensure agreement over species identification, assist with the determination of stressed species, assist with the identification of invasive plant species, assist with the determination of percent herbaceous and invasive cover, and advise on other technical issues as required. The certified arborist will assist in the assessment of the apparent health and vigor of installed plants. Copies of all data sheets will be provided to the NRD Trustee's representative at the conclusion of the monitoring event. The identification of all parties involved in an inspection event will be made in the results section of the report.

3. In general, the planting areas will be inspected beginning with the furthest upstream on the north side of the Housatonic River (planting area 1) and will proceed downstream. Once the north side of the river has been inspected, the monitoring team will move to the most upstream planting area on the south side of the Housatonic River (planting area 5) and proceed downstream.

4. If the inspection is being held in the spring, only planting areas planted up to the fall of the previous year will be inspected. Similarly, if the inspection is being held in the summer, only the planting areas planted up to the fall of the previous year will be inspected.

5. As a means of streamlining the inspection process, an agreement was made between GE and the NRD Trustee's representative concluding that planting areas 6, 6A, 7, and 8A would be inspected as a single unit and planting areas 8, 9, 9A, 11, and 11A would be inspected as a single unit. An easily identifiable landmark was noted as the boundary between these two composite areas. An easily identifiable landmark was also noted as the boundary between planting areas 4A and 4B.

6. Where the linear distance of the planting area exceeds 100 feet, the planting area will be divided into sections of 100 feet or shorter to increase the accuracy of the count. As of this date, that includes planting areas 1, 4A, 4B, composite planting area 6, 6A, 7, and 8A, and composite planting area 8, 9, 9A, 10, 11, and 11A.

7. Where the riverbank width (slope length) is greater than 25 feet, and/or the density and height of vegetation obscures the observer's vision to clearly see the entire riverbank slope, a line or tape will be used to divide the bank into upper and lower bank areas to increase the accuracy of the count.

8. The areas of planting will be monitored by slowly walking from one end of a specific planting area to the other. As the team walks through an area, the counter will visually note the number of planted trees, shrubs, and vines based on observation of stems, as well as the number of resprouts of species consistent with those planted species. After the woody plants have been inspected in an area, the team will stop and estimate herbaceous cover and percent coverage of invasive species. The recorder will take down the inspection information as the team proceeds through a given planting area.

9. The recorder will keep the tally of results on a field datasheet developed by GE for the monitoring program. On the tally sheet, woody vegetation will be listed as either live (either stressed or unstressed) or dead. Any additional general observations of the planting area will also be reported on the tally sheet.

10. The decision as to whether some specimens are stressed will be based on visual observation of the plant and the agreed judgment of the two observers (representatives of GE and the NRD Trustees); however, to meet performance criteria, replanting needs are to be based on the number of dead specimens or those missing from the final count for a particular species. Stressed plants are still alive, but physical indicators such as leaf wilt, nutrient deficiency, bug infestation, die back, herbicide injury, and animal damage (e.g., woodchuck) may represent evidence of diminished vigor. Plants are also to be considered stressed if they are reduced in height (less than four feet for trees, though the plant may be a stump sprout following topping of the planted specimen from

herbivorous activity or other action). Non-stressed plants show very limited signs of these stress indicators (<5%) and are growing vigorously as determined by the certified arborist based on such characteristic as annual growth, leaf color, stem integrity, and fruit and flower production.

11. For the Red-osier dogwood band, it was determined that the ability to count individual stems was made problematic by the multiple-stem nature of the developing plant. Therefore, it has been decided that performance determination for the band would be made by visually determining, based on best professional judgment of the observers, whether the band in a planting area appears to meet the 4-foot on-center planting scheme. Areas of the band that were noted as not meeting the 4-foot on-center planting scheme were measured, and identified as to location, then noted on the tally sheets.

12. Stump resprouts from trees and shrubs cut during clearing or cut by herbivorous actions are counted in the live-but-stressed column. If the stump has multiple resprouts, it is still counted as a single specimen.

13. Canopy and understory stump resprouts from specimens cut during clearing activities are only to be counted as part of the tally if the stump was one of the species that was listed in the planting plan. However, if the specimen is a different species, it will be noted on the tally sheets for information purposes.

14. Aerial herbaceous cover will be determined by walking through each planting area (or 100-foot section) and visually estimating the total cover to the nearest 5%. For riverbank areas that are predominately covered by vegetation, estimating the percentage of bare ground first, and then subtracting that from 100% most accurately determines herbaceous cover. Litter is considered to be bare ground. Minor gaps between herbaceous plant branches and the bare soil (mulch) beneath trees and shrubs are not counted as bare ground. Determination of the percentage of open/bare ground in a planting area will be made based on visual observation using best professional judgment of the two observers; agreement on the percentage is to be reached before the value is noted on the tally sheet.

15. In addition to herbaceous coverage, an estimation of the percentage of significant areas of bare soil will be included in the tally. This is a qualitative assessment based on best professional judgment of those significant areas of bare soil in which there is no plant growth of any kind. This is not intended to assess bare ground between individual plant stems, but large (>15-20 square feet) areas where herbaceous growth does not occur.

16. A determination of the percentage of invasive species will be made based on visual observation using the best professional judgment of the two observers, with agreement of the percentage to be reached before the value is noted on the tally sheet. Identification of the dominant invasive species in a given area will also be noted on the tally sheets. Areas of invasive species will be flagged if necessary to facilitate remediation.

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Appendix B

Modifications to Restored Bank Vegetation Monitoring Program

Appendix B –
Proposed Modifications to Restored Bank Vegetation Monitoring Program

As outlined in Section 9.2 of the *Removal Action Work Plan – Upper ½ Mile Reach of Housatonic River* (BBL, 1999), habitat restoration activities were implemented in sections of the riparian area bordering the Housatonic River where bank soils were excavated as part of remedial activities implemented by GE, and in areas that were cleared to allow access for the removal activities. As part of the habitat restoration process and as specified in Section 11.6.2 of the *Removal Action Work Plan – Upper ½ Mile Reach of Housatonic River* (Work Plan; BBL, 1999), GE agreed to monitor those areas that were restored to ensure the success and biological integrity of the intended vegetative community.

Based on the state of vegetative development in planting areas that were planted in 2000 and 2001; in 2005, GE requested approval of a modification to the existing vegetative monitoring program as described in the Work Plan. The proposed modifications were conditionally approved in a communication from the Trustees dated February 27, 2006. The proposed alteration in the monitoring methodology changed how the planting areas are monitored in their later years of development, but did not change the monitoring period or frequency, reporting requirements for monitoring, or the performance standards. The following sections summarize the existing monitoring program and outline the proposed changes to the vegetative monitoring program.

1.1 Existing Vegetation Monitoring Program Overview

As detailed in the Work Plan, for each planting area, the current vegetative monitoring program consists of two visits per year for the first 3 years after planting, and an annual visit to be conducted during the fifth and seventh years after planting. In each of the first 3 years after planting, visits were scheduled to be conducted in the late spring after the first leaf flush (May/June) and in the summer (July/August), while the single visits in the fifth and seventh years after planting were scheduled to be conducted in the summer (July/August). In the event of a significant loss of plantings (greater than 1/4 acre) being noted in any vegetation monitoring visit, the existing monitoring plan calls for the timing for monitoring to be restarted following appropriate actions to replant the lost trees or shrubs (except in the case where a third party is responsible for growth failure). Table 1 summarizes the monitoring schedule for the Upper ½ Mile Reach as specified in the Work Plan.

Under the existing monitoring plan, survival rates, based on stem counts of trees and shrubs and percent of herbaceous cover, are the key components of measuring the success of planted areas. The following performance standards are currently used to assess the adequacy of the restoration efforts over the Upper ½-Mile Reach:

1. All planted trees, shrubs, and vines must meet an 80% survival rate of the amount originally planted. To confirm this survival rate, supplemental plantings of appropriate species will be made if a monitoring event indicates a loss greater than 20%. Any dead trees or shrubs in excess of 20% of the original planting will be replaced in the fall of the year in which monitoring occurs.

2. Herbaceous coverage of 100% will be maintained outside the foliar extent of the trees. Supplemental seeding or other activities will be utilized to maintain 100% herbaceous coverage.

3. No greater than 5% of the restoration area of either bank will be allowed to be covered by invasive plant species. Any invasive species in excess of the 5% coverage limit will be removed in accordance with the requirements of the *Invasives Control Plan* (BBL, 2001).

The survivability of the plants is to be determined both by mortality and by apparent vigor. Monitoring also assesses whether supplemental activities, such as additional fertilizing or watering, may be necessary.

Each monitoring visit is to consist of a pedestrian survey of all areas on both banks where restoration activities have occurred. During the field visit, personnel conducting the inspection, supported by the certified arborist, are to perform a stem count of planted trees and shrubs to determine survival rates. The inspection team is to estimate groundcover by herbaceous species to verify aerial coverage, and note any indications of damage from trespassing or herbivory. Additionally, the inspection team is to note signs of erosion and initiate any actions to address invasive species. The monitoring visits are to be documented through field notes and photographs. Based on the results of each visit, the inspection team is able to recommend remedial actions, such as replanting, watering, repairing areas impacted by erosion, and implementing measures to reduce herbivory.

1.2 Rationale for Methodology Change

In older planting areas, significant growth has made the ability to count individual stems difficult to complete. While it is accepted that stem counts are an appropriate means of determining vegetative success in newly planted areas, in areas that are more mature and established, such as many of those on the Upper ½-Mile Reach, stem counts over the entire planting area are not necessarily the most appropriate means of documenting the development of the vegetative community. For purposes of meeting the overall objective of the stream bank restoration (i.e., a plant community that affords increased habitat function

relative to the pre-existing system), GE requested the opportunity to modify the monitoring methodology approach, in those planting areas where it is appropriate and feasible, to one that is more appropriate for a mature planted community.

1.3 Proposed Methodology

GE proposed to modify the vegetative monitoring program to include the integration of quantitative and qualitative activities to evaluate the vegetative success of certain older planting areas. The proposed approach is modeled after the restoration monitoring program used by the U.S. Environmental Protection Agency (EPA) on the 1½-Mile Reach of the Housatonic River.

Instead of conducting stem counts for the entire planting area, GE proposed to conduct stem counts in monitoring plots to be established within those individual planting areas larger than 2,500 ft^2. Planting areas less than 2,500 ft^2 in size will continue to be evaluated as in previous monitoring visits. The use of such monitoring plots allows for a more focused assessment of select representative portions of the planting areas, under the assumption that environmental conditions and vegetative growth are generally uniform across the planting areas – an assumption that has been shown to be accurate based on monitoring that has occurred at the site to date. Additionally, the use of monitoring plots will allow for the continued use of existing performance standards and the comparison to data from previous monitoring events. Plant survey techniques such as the line intercept method or point-centered-quarter technique that generally provide data more specific to density, frequency, and dominance were initially considered, then discounted in favor of monitoring plots because of the difficulties in correlating that information to existing performance standards and to historical survivability data.

The monitoring plots will be fixed in place at select locations within the planting areas in order to evaluate both canopy and understory species. Each plot will measure approximately 50 feet by 25 feet (1,250 square feet). In each planting area where such monitoring plots are appropriate, at least one plot will be located such that it encompasses approximately ½ (lengthwise) of an understory plot (oval shapes measuring approximately 50 feet long by 30 feet wide), should one exist in that planting area. Additionally, a sufficient number of plots will be placed in each planting area to cover a minimum of 20% of the planting area.

In addition to the stem counts within the monitoring plots, GE will conduct a random pedestrian survey of each of the planting areas with the objective of providing a qualitative assessment of the overall condition of the plant growth within the planting area. The focus

of this survey will be to determine whether there are any large areas of plant loss outside of the planting plots, or any areas outside the plots that might raise some level of concern with vegetative vigor.

GE will continue to monitor the red-osier dogwood band, grape vines, invasive species and herbaceous coverage in the same manner as is currently performed.

1.4 Performance Standards

As part of the modified monitoring program, the performance standard for planted trees and shrubs within the monitoring plot will continue to be an 80% survival rate of the amount originally planted. Stem counts of canopy species and understory species within the monitoring plot will be used to confirm that performance standards are being met. Under the assumption that plant growth and development is uniform across the planting areas, stem counts from the monitoring plots will then be extrapolated across the entire planting area to assess area-wide survival.

In the event that the calculated survival rate for trees and shrubs shows a significant negative variance from the performance standard in comparison to the last full monitoring event, GE reserves the right to resurvey the entire planting area to verify the planting results.

1.5 References

BBL. 1999. Removal Action Work Plan for Upper ½-Mile Reach of Housatonic River. Prepared for GE, Pittsfield, MA.

APPENDIX B
TABLE 1
UPPER ½-MILE VEGETATIVE MONITORING PROGRAM
MONITORING SCHEDULE

2008 ANNUAL MONITORING REPORT
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC COMPANY – PITTSFIELD, MASSACHUSETTS

Planting Areas	2001		2002		2003		2004		2005		2006		2007		2008		2009	
	sp	s	sp	s	sp	s	sp	s	sp	s	sp	s	sp	s	sp	s	sp	s
1	X	X	X	X	X	X				X				X				
2	X	X	X	X	X	X				X				X				
3	X	X	X	X	X	X				X				X				
4A	X	X	X	X	X	X				X				X				
4B			X	X	X	X	X	X				X				X		
10			X	X	X	X	X	X				X				X		
5	X	X	X	X	X	X				X				X				X
6, 6A, 7, 8A			X	X	X	X	X	X				X				X		
8, 9, 9A, 11, 11A			X	X	X	X	X	X				X				X		X
12					X	X	X	X	X	X				X				X
13					X	X	X	X	X	X				X		X		X
14					X	X	X	X	X	X				X				X
15					X	X	X	X	X	X				X				X
16					X	X	X	X	X	X				X				X
17					X	X	X	X	X	X				X				X

Notes: sp. = spring
s. = summer

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Appendix C

Previously Submitted Trip Reports

GE
159 Plastics Avenue
Pittsfield, MA 01201
USA

June 2, 2008

Dean Tagliaferro
Project Coordinator
U.S. Environmental Protection Agency
c/o Weston Environmental Engineering
One Lyman St.
Pittsfield, MA 01201

Re: 2008 Bank Erosion Inspection
GE Pittsfield/Housatonic River Site
Upper ½-Mile Reach Removal Action (GECD800)

Dear Mr. Tagliaferro:

Consistent with requirements set forth in the *Removal Action Work Plan – Upper ½ Mile Reach of Housatonic River* (Work Plan) (Blasland, Bouck & Lee, Inc. [BBL], August 1999), GE has recently performed monitoring activities for the banks of the Upper ½-Mile Reach of the Housatonic River (½-Mile) to assess the cleared and restored areas within the ½-Mile for evidence of erosion. This trip report has been prepared to describe the findings of the 2008 restored bank erosion inspection.

The 2008 restored banks erosion inspection was performed on May 20, 2008 by Todd Cridge of ARCADIS (for GE) and Tom Czlusniak of Weston, Inc. (for EPA). On the day of the inspection, flow in the river was approximately 126 cubic feet per second (cfs), as measured at USGS River Gauge Station No. 01197000 on the East Branch of the Housatonic River in Coltsville, MA. Although flow in the ½-Mile was near 100 cfs (i.e., the low-flow threshold for the ½-Mile) at the time of inspection, it should be noted that, as reported by the Coltsville gauge, there were multiple high-flow events (i.e., estimated flow greater than 440 cfs) since the performance of the 2007 restored banks erosion inspection (September 13, 2007), including a maximum flow of 965 cfs on March 9, 2008, and three separate occasions during which daily mean flows exceeded 440 cfs for three or more consecutive days.

During the 2008 restored banks erosion inspection, there were no areas noted that had either a visually observable loss of bank materials or movement of bank armoring on the banks of the river in the areas associated with the Upper ½-Mile Reach Removal Action.

With the performance of the Spring 2008 inspection, GE has completed the first year of the long-term restored bank erosion monitoring program as outlined in the 2007 Annual Report (ARCADIS, January 2008). GE will perform the next erosion inspection in the spring of 2009. The 2008 Annual Report will also include a summary of the results of this erosion inspection as well as a schedule for future erosion inspections.

Please contact me if you have any questions.

Sincerely,

Andrew T. Silfer/dmn

Andrew T. Silfer, P.E.
GE Project Coordinator

ATS/dmn

Enclosure

cc: Holly Inglis, USEPA
Tim Conway, USEPA
Rose Howell, USEPA
K.C. Mitkevicius, USACE
R. Goff, USACE
Linda Palmieri, Weston
Dale Young MA EOEA
Susan Steenstrup, MDEP (2 copies)
Jane Rothchild, MDEP
Anna Symington, MDEP
Nancy Harper, MA AG
Mayor James Ruberto, City of Pittsfield
Michael Carroll, GE
Rod McLaren, GE
Mark Gravelding, ARCADIS
Todd Cridge, ARCADIS
Mike Chelminski, Stantec
James Bieke, Goodwin Procter
Public Information Repositories
GE Internal Repositories

GE
159 Plastics Avenue
Pittsfield, MA 01201
USA

Transmitted via Overnight Courier

October 16, 2008

Mr. Dean Tagliaferro
EPA Project Coordinator
US Environmental Protection Agency
c/o Weston Solutions, Inc.
One Lyman Street
Pittsfield, MA 01201

Re: GE-Pittsfield/Housatonic River Site
Upper ½-Mile Reach of the Housatonic River (GECD800)
2008 Inspection of Restored Bank Vegetation and Aquatic Habitat Enhancement Structures

Dear Mr. Tagliaferro:

Enclosed is a memorandum presenting the results of the 2008 inspection of the restored banks vegetation and aquatic habitat enhancement structures associated with the Upper ½-Mile Reach of the Housatonic River in Pittsfield, Massachusetts.

Please call me with any questions.

Very truly yours,

RMG /for

Andrew T. Silfer, P.E.
GE Project Coordinator

Attachment

cc: Holly Inglis, USEPA
Tim Conway, USEPA
Rose Howell, USEPA
K.C. Mitkevicius, USACE
Linda Palmieri, Weston
Dale Young, MA EOEEA
Michael Gorski, MDEP (2 copies)
Susan Steenstrup, MDEP
Jane Rothchild, MDEP*
Anna Symington, MDEP*
Nancy Harper, MA AG*
Mayor James Ruberto, City of Pittsfield
Michael Carroll, GE*
Rod McLaren, GE*
James Bieke, Goodwin Procter
Mark Gravelding, ARCADIS
Todd Cridge, ARCADIS
Charles Harman, AMEC
Todd Chadwell, Stantec
Public Information Repositories
GE Internal Repositories

* *without attachments*

MEMORANDUM

TO: Andrew T. Silfer, P.E.
General Electric

FROM: Charles R. Harman, P.W.S.
AMEC Earth & Environmental

CC: Mark Gravelding, P.E.
Todd Cridge
ARCADIS

SUBJ: 2008 Monitoring Visit Trip Report
Restored Bank Vegetation and Aquatic Habitat Enhancement Structures
Upper ½-Mile Reach of the Housatonic River

DATE: October 16, 2008

This document reports the results of the 2008 inspection of the restored bank vegetation in select areas of the Upper ½-Mile Reach of the Housatonic River (½-Mile) as well as the results of the 2008 inspection of the aquatic habitat enhancement structures and armor stone within the ½-Mile. These inspections were performed on August 21 and August 20, 2008, respectively.

As outlined in *Removal Action Work Plan – Upper ½ Mile Reach of Housatonic River* (Work Plan; BBL, 1999), vegetative restoration/enhancement activities were implemented in those riverbank areas where bank soils were excavated as part of the Upper ½-Mile Reach Removal Action and in areas that were cleared to allow access for the removal activities. The Work Plan provided that GE would monitor the restored areas to ensure the success and biological integrity of the intended vegetative community. For each specific planting area, the monitoring program was required to consist of two visits during each of the first three years after planting (one in the late spring and one in the summer), and an annual visit during the fifth year and seventh year after planting (to be conducted in summer). Complete details of the monitoring program can be found in the Work Plan. As discussed further below, the inspection of the restored bank vegetation conducted on August 21, 2008 constituted the 7th-year required planting inspection for some planting areas and a re-inspection of other areas.

In addition to the vegetation monitoring, the Work Plan provided that visual inspections would be performed annually to assess the condition of the aquatic habitat enhancement structures that were placed within the ½-Mile and to evaluate the armor stone layer for evidence of erosion. The inspection of the aquatic habitat enhancement structures consists of the physical observation of the condition of each of the structures from a canoe. The monitoring also includes visual observations of the armor stone layer for evidence of erosion. As discussed in the *2007 Annual Monitoring Report – Upper ½-Mile Reach of the Housatonic River* (2007 Annual Report), 2007 was the final year of the initial 5-year monitoring program required by the Work Plan. In that report, GE proposed an extension of that monitoring program, which was modified by the U.S. Environmental Protection Agency (EPA) in its April 28, 2008 conditional approval letter. That modified program involves continued annual performance of the same monitoring activities for an additional five years. The inspection of the aquatic habitat enhancement structures conducted on August 20, 2008 constituted the first year of the additional 5-year monitoring program.

I. RESTORED BANK VEGETATION

2008 INSPECTION RESULTS

Charles Harman of AMEC conducted the vegetative inspection on behalf of GE on August 21, 2008. Todd Chadwell of Stantec was present on behalf of the Natural Resource Trustees, and Chris Frank of C. L. Frank & Associates accompanied the streambank monitoring party as the certified arborist. The planting areas evaluated during this event were planting area 4B; planting area 10; composite planting area 6, 6A, 7, & 8A; and composite planting area 8, 9, 9A, 11, & 11A. Additionally, planting area 13 was revisited to assess its performance with respect to recalculated area-specific performance standards presented in the 2007 Annual Report, and planting areas 5 and 16 were revisited to assess the success of corrective actions that had been planned for implementation in spring 2008.

The weather during the monitoring visit was partly cloudy and warm with the temperature at approximately 80^{o} F at the beginning of the inspection. Water in the river was at a seasonably low level, and was generally below the top of the rip-rap at the toe of the bank.

Note that planting area 13, as well as composite planting area 6, 6A, 7, & 8A and composite planting area 8, 9, 9A, 11, & 11A, were slightly reduced in size relative to the originally established planting areas as a result of remedial activities associated with the Newell Street Area II engineered barrier and/or restoration activities associated with areas of erosion identified within the ½-Mile in either 2006 or 2007. Following discussions with EPA, it was determined that, due to the modifications in planting area size, the original performance standards are no longer applicable in these areas, as there would not be sufficient space to support the planting frequencies described in the Work Plan. As such, it was agreed that following the completion of those remedial/restoration activities, the performance standards for the affected planting areas would be recalculated, considering only the remaining available space (i.e., the available planting area between the lower extent of the Newell Street Area II engineered barrier and the upper extent of the newly restored areas on the south bank of the ½-Mile). As presented in the EPA-approved 2007 Annual Report, the following area-specific modifications to the performance standards were agreed to:

	Canopy		Understory	
	Original	**Revised**	**Original**	**Revised**
Planting Area 13	56	51	58	52
Composite Planting Area 8, 9, 9A, 11, & 11A	76	60	58	46
Composite Planting Area 6, 6A, 7, & 8A	90	72	0	Not Applicable

The results of the inspection for the planting areas inspected during this monitoring event are described below and summarized in Tables 1 through 6 in terms of achievement of the applicable performance standards for the vegetative restoration.

1. Planting area 4B showed excellent vegetative growth for all components of the restoration. Vegetative growth was robust and all strata of the community were well developed. In particular, the eastern cottonwood and the box elder specimens showed excellent growth with some diameter at breast height (DBH) measurements exceeding seven inches. All components of the vegetative community in this planting area, including canopy, understory, red-osier dogwood, grape vines, herbaceous cover, and invasive species, met their performance standards. This inspection constituted the 7th-year visit and is the last scheduled vegetation inspection for this planting area.

2. Planting Area 10 showed good growth in each of the vegetative strata. All components of the vegetative community in this planting area, including canopy, understory, herbaceous coverage, and invasive species, met their respective performance standards (no red-osier dogwood specimens were planted in this area). This inspection constituted the 7th-year visit and is the last scheduled vegetative vegetation inspection for this planting area.

3. Composite Planting Area 6, 6A, 7, & 8A met the modified performance standards for the following components of the vegetative community: canopy, herbaceous coverage, and invasive species. With respect to the red-osier dogwood community, in response to the apparent erosion of bank materials identified in this area, additional armor stone has been installed in the upper bank area, resulting in the removal of much of the red-osier dogwood band that had previously been installed. However, following the completion of the remedial activities associated with this area in October/November 2007, and based on discussions with EPA, a replacement band of red-osier dogwoods was installed along the top of the new armor stone in the remaining space between the top of the newly restored area and the bottom of the adjacent Newell Street Area II engineered barrier. The 2008 inspection indicated that the new red-osier dogwoods appear to have survived the first winter following installation and to meet their performance standard. This inspection constituted the 7th-year visit and is the last scheduled vegetative vegetation inspection for this planting area.

4. Composite Planting Area 8, 9, 9A, 11, & 11A met the modified performance standards for the following components of the vegetative community: canopy, grape vines, herbaceous coverage, and invasive species. With respect to the understory community, this planting area had a variance of 19 specimens, a likely result of disturbance associated with the Newell Street Area II remedial activities discussed above. These specimens will be replanted, as described below. With respect to the red-osier dogwood community, additional armor stone has been installed in the upper bank area in response to the apparent erosion of bank materials identified in this area, resulting in the removal of much of the red-osier dogwood band that had previously been installed. However, following the completion of the remedial activities associated with this area in October/November 2007, and based on discussions with EPA, a replacement band of red-osier dogwoods was installed along the top of the new armor stone in the remaining space between the top of the newly restored area and the bottom of the adjacent Newell Street Area II engineered barrier. The 2008 inspection indicated that the new red-osier dogwoods appear to have survived the first winter following installation and to meet their performance standard. Although this inspection constituted the 7th-year visit and was the last regularly scheduled vegetation inspection for this planting area, GE proposes to visit this area again in 2009 to assess the survivorship of the understory species to be planted in the fall of 2008.

5. Planting area 13 was revisited in 2008 to evaluate replanting activities that occurred following the completion of the remedial activities associated with Newell Street Area II. All components of the vegetative community in this planting area, including canopy, understory, red-osier dogwoods, herbaceous coverage, and invasive species, met their respective performance standards. This area will be inspected one final time in August 2009 to satisfy the normally scheduled 7th-year visit.

6. Protective screens had been placed around the canopy specimens in the fall of 2001. These screens continue to provide good protection from herbivorous animals.

Area-specific results of the monitoring visit are summarized in the attached tables. Photographs of the vegetative communities observed during the monitoring visit are included in Attachment A.

CORRECTIVE ACTIONS

As noted above, composite planting area 8, 9, 9A, 11, & 11A did not meet the performance standard for understory specimens, with a variance of 19 specimens. In addition, the 2007 Annual Report stated that replanting activities would be performed in spring 2008 at planting areas 5 and 16, which were found in the 2007 inspection not to meet their performance standards for canopy and/or understory species. However, seasonal constraints related to the timing of the completion of the remedial activities and riprap placement and the ensuing need for coordination with various contractors involved with the plantings delayed the planting schedule beyond the optimal planting season, resulting in the proposed replanting being postponed. As a result, planting area 5 is still missing 4 canopy specimens and 36 shrub specimens, and planting area 16 is still missing 2 canopy specimens. Supplemental planting associated with these previously identified variances – anticipated to include planting of 8 additional canopy specimens and 36 shrub specimens at planting area 5 and 4 additional canopy specimens at planting area 16 – will be included for performance with the proposed 2008 corrective measures.

To ensure that the performance standards are met, the total number of plants planned for installation is as follows:

Composite Planting Area 8, 9, 9A, 11, & 11A	19 shrub specimens
Planting Area 5	36 shrub specimens 8 canopy specimens
Planting Area 16	4 canopy specimens

The canopy plantings will be divided equally among the four species used at this site: box elder (*Acer negundo*), eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), and black willow (*Salix nigra*), depending upon species availability. The shrub/understory plantings will be divided equally among the four shrub species used at this site: northern arrowwood (*Viburnum recognitum*), silky dogwood (*Cornus amomum*), winterberry (*Ilex verticillata*), and choke-cherry (*Prunus virginiana*) depending upon species availability. Canopy species will be installed in open spaces in each respective planting area, while understory species will be planted in open areas within the respective shrub plots in

the affected planting areas. Plantings will be conducted in accordance with the Work Plan, and are tentatively planned for November 2008.

2009 INSPECTION ACTIVITIES

The next monitoring visit is scheduled for August 2009. Planting areas to be monitored at that time will include 12, 13, 14, 15, 16, and 17. Additionally, GE will revisit planting area 5 and composite planting area 8, 9, 9A, 11, & 11A to assess the performance of the canopy and understory specimens that are scheduled to be planted in November 2008. The August 2009 monitoring visit will constitute the 7th and final year of monitoring for planting areas 12, 13, 14, 15, 16, and 17 and the completion of the vegetation monitoring program described in the Work Plan.

II. AQUATIC HABITAT ENHANCEMENT STRUCTURES AND ARMOR STONE

2008 INSPECTION RESULTS

The aquatic habitat enhancement structures inspection was conducted on August 20, 2008 by Charles Harman of AMEC on behalf of GE and Michael Chelminski of Stantec, who was present on behalf of the Natural Resource Trustees. The following observations were made during this visit:

1. Water in the river was at a level that allowed for observations of the aquatic habitat structures.

2. In general, those aquatic structures that were visible appeared to be providing good cover and habitat. The aquatic structures appeared to be structurally stable and were creating variations in water velocity and flow, as evidenced by the presence of scour zones and depositional areas in the sediment surrounding the structures. The development of these variations in sediment elevation and the creation of flow changes in the water column appear to be providing good habitat for fish and aquatic invertebrates.

3. As in previous years, the armor stone layer appears to be stable with no areas of erosion or loss of armor materials noted.

Photographs of and observations related to the condition of the aquatic habitat enhancement structures and armor stone are presented in Attachment B.

2009 INSPECTION ACTIVITIES

The next monitoring visit is scheduled for August 2009.

Tables

TABLE 1
CANOPY MONITORING RESULTS

2008 INSPECTION OF RESTORED BANK VEGETATION
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Planting Area	Date Initially Planted	Quantity Planted	Target Performance Standard	Monitoring Count - Live Specimens			Dead	Variance
					Non-stressed	Stressed	Total		
8/21/2008	4B[1]	June 01	256	205	272	0	272	0	+67
	10[2]	Oct 01	126	101	111	0	111	0	+10
	6, 6A, 7, 8A	June/Oct 01	113	72	78	0	78	0	+6
	8, 9, 9A, 11, 11A	Oct 01	95	60	65	2	65	0	+5
	13	May/Oct 02	70	51	52	0	52	0	+1

[1] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 22% of Area 4B.

[2] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 27% of Area 10.

TABLE 2
UNDERSTORY MONITORING RESULTS

2008 INSPECTION OF RESTORED BANK VEGETATION
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Planting Area	Date Initially Planted	Quantity Planted	Target Performance Standard	Monitoring Count - Live Specimens			Dead	Variance
					Non-stressed	Stressed	Total		
8/21/2008	4B[1]	June 01	219	175	182	0	182	0	+7
	10[2]	Oct 01	73	58	63	0	63	0	+5
	6, 6A, 7, 8A	June/Oct 01	0	NA	--	--	--	--	--
	8, 9, 9A, 11, 11A	Oct 01	73	46	27	0	27	0	**-19**
	13	May/Oct 02	73	52	61	0	61	0	+9

[1] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 22% of Area 4B.

[2] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 27% of Area 10 and 50% of the shrub planting area.

TABLE 3
RED-OSIER DOGWOOD MONITORING RESULTS

2008 INSPECTION OF RESTORED BANK VEGETATION
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Area	Date Initially Planted	Monitoring Count		Comments
			Gaps in Dogwood Line, Missing Plants	Meets Performance Standard (Yes/No)	
8/21/2008	4B	June 01	---	Yes	---
	10	Oct 01	---	Yes	---
	6, 6A, 7, 8A	June/Oct 01	---	Yes	New plantings installed November 2007; appear to have survived first winter
	8, 9, 9A, 11, 11A	Oct 01	---	Yes	New plantings installed November 2007; appear to have survived first winter
	13	May/Oct 02	---	Yes	---

TABLE 4
GRAPE VINE MONITORING RESULTS

2008 INSPECTION OF RESTORED BANK VEGETATION
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Area	Date Initially Planted	Quantity Required	Target Performance Standard	Monitoring Count - Planted Live Specimens			Dead	Wild Grapes or Grape Patches	Comments
					Non-stressed	Stressed	Total Vines			
8/21/2008	4B	June 01	22	18	15	0	15	0	40+	The number of planted grapes plus the number of individual native grape plants noted in this planting area meets the performance criteria.
	8, 9, 9A, 11, 11A	--	22	18	0	0	0	0	40+	The number of individual native grape plants noted in this planting area meets the performance criteria, without the aid of supplemental planting.

TABLE 5
HERBACEOUS GROUNDCOVER MONITORING RESULTS

2008 INSPECTION OF RESTORED BANK VEGETATION
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Area	Date Initially Planted	Target Performance Standard (Cover)	General Monitoring Results (Total Percent Herbaceous Coverage)	Meets Performance Standard (Yes/No)	Comments
8/21/2008	4B[1]	June 01	100%	Plot 1 ~100% coverage Plot 2 ~100% coverage Plot 3 ~100% coverage	Yes	Herbaceous cover has closed in, except to a minor extent under canopy specimens (which is allowed under Monitoring Plan). Meets performance standard. No areas outside of the monitoring plots were missing herbaceous cover.
	10[2]	Oct 01	100%	Plot 1 ~100% coverage Plot 2 ~100% coverage	Yes	Herbaceous cover has closed in, except to a minor extent under canopy specimens (which is allowed under Monitoring Plan). Meets performance standard. No areas outside of the monitoring plots were missing herbaceous cover.
	6, 6A, 7, 8A	June/ Oct 01	100%	First 100' ~90% coverage Second 100' ~95% coverage Third 100' ~95% coverage	Yes	Herbaceous cover has closed in, except to a minor extent under canopy specimens (which is allowed under Monitoring Plan). Meets performance standard.
	8, 9, 9A, 11, 11A	Oct 01	100%	First 100' ~95% coverage Second 100' ~90% coverage Third 100' ~95% coverage Fourth 100' ~95% coverage	Yes	Herbaceous cover has closed in, except to a minor extent under canopy specimens (which is allowed under Monitoring Plan). Meets performance standard.
	13	May/Oct 02	100%	~100% coverage	Yes	Herbaceous cover outside of canopy meets performance standard.

[1] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 22% of Area 4B.

[2] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 27% of Area 10.

TABLE 6
INVASIVE SPECIES MONITORING RESULTS

2008 INSPECTION OF RESTORED BANK VEGETATION
UPPER ½-MILE REACH OF THE HOUSTONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Date	Area	Date Initially Planted	Target Performance Standard (Invasive Species)	Monitoring Results (Percent Invasive Species)	Meets Performance Objectives (Yes/No)	Primary Observed Invasive Species
8/21/2008	4B[1]	June 01	< 5%	Plot 1 <5% Plot 2 <5% Plot 3 <5%	Yes	Purple loosestrife; no significant invasive species presence outside of the monitoring plots
	10[2]	Oct 01	< 5%	Plot 1 <5% Plot 2 <5%	Yes	Purple loosestrife; no significant invasive species presence outside of the monitoring plots
	6, 6A, 7, 8A	June/ Oct 01	< 5%	First 100' <5% Second 100' <5% Third 100' <5%	Yes	Purple loosestrife, bittersweet
	8, 9, 9A, 11, 11A	Oct 01	< 5%	First 100' <5% Second 100' <5% Third 100' <5%	Yes	Purple loosestrife, bittersweet
	13	May/Oct 02	< 5%	<5%	Yes	Isolated specimens of purple loosestrife

[1] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 22% of Area 4B.

[2] Monitoring was conducted using the modified protocol and was based on sampling of three representative monitoring plots; monitoring plots accounted for 27% of Area 10.

ARCADIS

Attachment A

Photographic Log

ATTACHMENT A
PHOTOGRAPHIC LOG

2008 INSPECTION OF RESTORED BANK VEGETATION
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Photograph 1: Planting Area 4B

Photograph 2: Planting Area 4B

Photograph 3: Planting Area 10

Photograph 4: Planting Area 5

Photograph 5: Planting Area 6, 6A, 7, 8A

Photograph 6: Planting Area 6, 6A, 7, 8A

Photograph 7: Planting Area 8, 9, 9A, 11, and 11A

Photograph 8: Planting Area 8, 9, 9A, 11, and 11A

Photograph 9: Planting Area 13

Photograph 10: Planting Area 16

ARCADIS

Attachment B

Aquatic Structures/Armor Stone
Monitoring Data Sheets

ATTACHMENT B
AQUATIC STRUCTURES/ARMOR STONE MONITORING DATA SHEETS

2008 INSPECTION OF AQUATIC HABITAT ENHANCEMENT STRUCTURES
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Monitoring Date: 8/20/2008

Persons Conducting the Monitoring: Chuck Harman (AMEC) and Mike Chelminski (Woodlot Alternatives)

Daily Stream Flow at Time of Monitoring (Based on USGS Station Coltsville, MA): 37 cfs

General River Stage/Depth Observations: River was very low, the majority of the structures were exposed for observation

General Weather Observations: Skies were clear/partly-cloudy with temps in the 80's

Cell	Aquatic Structures	Armor Stone Condition/General Biological Observations
B	1. Single wing deflector	 1. Structures appear stable 2. Structure induced variations observed in areas immediately downstream of the deflector

ATTACHMENT B
AQUATIC STRUCTURES/ARMOR STONE MONITORING DATA SHEETS

2008 INSPECTION OF AQUATIC HABITAT ENHANCEMENT STRUCTURES
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Cell	Aquatic Structures	Armor Stone Condition/General Biological Observations
C	1. Boulders 2. Island	  1. Structures appear stable 2. Structure induced variations observed in areas immediately downstream of the island 3. The island appears to be well vegetated with wetland herbaceous species 4. Boulders near island appear to be causing scour in the immediate area; good cover

ATTACHMENT B
AQUATIC STRUCTURES/ARMOR STONE MONITORING DATA SHEETS

2008 INSPECTION OF AQUATIC HABITAT ENHANCEMENT STRUCTURES
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Cell	Aquatic Structures	Armor Stone Condition/General Biological Observations	
D	1. Boulders		1. Structures appear to be functional and providing variation in habitat
G1	1. Boulder Cluster		1. Structures appear to be functional and providing variation in habitat

ATTACHMENT B
AQUATIC STRUCTURES/ARMOR STONE MONITORING DATA SHEETS

2008 INSPECTION OF AQUATIC HABITAT ENHANCEMENT STRUCTURES
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Cell	Aquatic Structures	Armor Stone Condition/General Biological Observations
G2/F2	1. W-weir	 1. Much of the weir is buried in soft silt/sand; portion that is present appears to offer good cover for aquatic organisms
G3	1. Three-boulder cluster	 1. Structure appears stable, no issue or concern 2. Structure appears to be functional and providing variation in habitat

ATTACHMENT B
AQUATIC STRUCTURES/ARMOR STONE MONITORING DATA SHEETS

2008 INSPECTION OF AQUATIC HABITAT ENHANCEMENT STRUCTURES
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Cell	Aquatic Structures	Armor Stone Condition/General Biological Observations
F3	1. Three-boulder cluster 2. Two-boulder cluster 3. Three-boulder cluster	 1. All structures in this cell appear stable. 2. Structures appear to be providing diversity in habitat
H1	1. Boulder cluster	1. Structure appears to be stable and providing diversity in habitat 2. Good habitat, variations in velocity around structure and related variations in stream bottom topography

ATTACHMENT B
AQUATIC STRUCTURES/ARMOR STONE MONITORING DATA SHEETS

2008 INSPECTION OF AQUATIC HABITAT ENHANCEMENT STRUCTURES
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Cell	Aquatic Structures	Armor Stone Condition/General Biological Observations
I1/J1	1. Vortex weir	 1. Much of the weir is buried in soft silt/sand 2. Structure appears to be stable and providing diversity in habitat 3. Good habitat, variations in velocity around structure and related variations in stream bottom
H2	1. Single boulder	1. Structure appears to be stable and providing diversity in habitat 2. Good habitat, variations in velocity around structure and related variations in stream bottom topography

ATTACHMENT B
AQUATIC STRUCTURES/ARMOR STONE MONITORING DATA SHEETS

2008 INSPECTION OF AQUATIC HABITAT ENHANCEMENT STRUCTURES
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Cell	Aquatic Structures	Armor Stone Condition/General Biological Observations
J1	1. Two-boulder cluster 2. Three-boulder cluster 3. Single-boulder	 1. Structures appear to be stable and providing diversity in habitat 2. Good habitat, variations in velocity around structures and related variations in stream bottom topography 3. Boulders observed to be being used as perches for feeding birds
J2	1. "J"- boulder formation	 1. Structure appears to be stable and providing diversity in habitat 2. Good habitat, variations in velocity around structure and related variations in stream bottom topography

ATTACHMENT B
AQUATIC STRUCTURES/ARMOR STONE MONITORING DATA SHEETS

2008 INSPECTION OF AQUATIC HABITAT ENHANCEMENT STRUCTURES
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Cell	Aquatic Structures	Armor Stone Condition/General Biological Observations
I3	1. Single-wing deflector	 1. Structure appears to be stable and providing diversity in habitat 2. Good habitat, variations in velocity around structure and related variations in stream bottom topography
I3/J3	1. Vortex rock weir	 1. Structure appears to be stable and providing diversity in habitat 2. Good habitat, variations in velocity around structure and related variations in stream bottom topography

ATTACHMENT B
AQUATIC STRUCTURES/ARMOR STONE MONITORING DATA SHEETS

2008 INSPECTION OF AQUATIC HABITAT ENHANCEMENT STRUCTURES
UPPER ½-MILE REACH OF THE HOUSATONIC RIVER
GENERAL ELECTRIC CORPORATION – PITTSFIELD, MASSACHUSETTS

Cell	Aquatic Structures	Armor Stone Condition/General Biological Observations	
J3	1. Boulder cluster 2. Three-boulder cluster 3. Three-boulder cluster		1. Structures appear to be stable and providing diversity in habitat 2. Good habitat, variations in velocity around structures and related variations in stream bottom topography