UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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DATE: April 27, 2010

SUBJ: GE-Pittsfield/Housatonic River Site: EPA Response to GE Statement of Position in Dispute Resolution Proceedings

FROM: Susan Svirsky, Remedial Project Manager
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THRU: Rich Cavagnero, Deputy Director
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TO: James T. Owens, III, Director
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On January 15, 2010, the U.S. Environmental Protection Agency ("EPA") issued to General Electric Company ("GE") a Conditional Approval letter on GE's August 31, 2009 submittal of a Work Plan for Evaluation of Additional Remedial Alternatives ("Work Plan"). In response, on January 29, 2010, GE invoked dispute resolution with respect to Conditions 20 and 22 set forth in EPA's Conditional Approval letter. The invocation of dispute resolution is pursuant to the Consent Decree entered into on October 27, 2000, by the United States, Connecticut, Massachusetts, the City of Pittsfield, the Pittsfield Economic Development Authority and GE (the "Decree").

Pursuant to the Decree, the "Rest of River" portion of the GE-Housatonic Site has been investigated under the terms of a RCRA Corrective Action Permit, which is Appendix G to the Decree (the "Permit", which was reissued in October 2000, and further reissued in December 2007). GE's Work Plan is an interim submittal under the Permit; accordingly, disputes on such interim submittals are governed by Section II.N of the Permit, Dispute Resolution on Interim Submittals.

Pursuant to Section II.N, GE and EPA conducted initial attempts to resolve the dispute, but were not able to reach agreement in the time period for the initial dispute resolution. That being the case, GE, pursuant to Section II.N.3 of the Permit submitted to you a written statement of its position on March 4, 2010. Enclosed is EPA's response for the record to GE's statement of position.

Under the Permit, you are to issue a written decision, based on the record, which responds to GE's arguments. The record for this dispute includes GE's submittal, EPA's submittal herein, and any additional documents you consider or rely on in making your decision. GE is then to comply with the terms and conditions of your decision on the dispute pending and subject to the final outcome of any appeals of the Permit modification described in Special Condition II.J of this Permit pursuant to Paragraphs 22 and 141.b of the Decree.

EPA has attached to its response specific documents supporting EPA's response. In addition, other documents referenced would be too large and unwieldy, in our estimation, for attaching to this response. For such documents, EPA has included a reference internet link to the document. However, if you would like us to provide you with a copy of such documents, or if you have other questions on this submittal, please notify either of us.

Following conclusion of this dispute resolution proceeding, GE is scheduled to submit a revised Corrective Measures Study Report on July 19, 2010.

Attachment

EPA's RESPONSE TO GE'S STATEMENT OF POSITION ON DISPUTED CONDITIONS 20 AND 22 OF EPA'S JANUARY 15, 2010 CONDITIONAL APPROVAL LETTER

Introduction

GE disputed two conditions in EPA's January 15, 2010 Conditional Approval letter (CAL) of GE's Work Plan for the Revised Corrective Measures Study (CMS). Both conditions pertain to a portion of the evaluation of the sediment alternative that EPA directed GE to evaluate, SED 9. The two aspects of the Work Plan being disputed are the production rates for Reach 5A and 5B and the resuspension rate for Reach 5A. Both of these assumptions directly affect the computer modeling of the effectiveness and duration of the implementation of alternatives under consideration in the CMS.

Summary of Recommendations

As discussed more fully below, EPA recommends the following for resolution of the dispute regarding SED 9:

1. Use of an average daily production rate for wet excavation of 250 cubic yards per day ("cy/day") for Reach 5A and 275 cy/day for Reach 5B;
2. Use of the agreed-upon 2 % resuspension rate in Reach 5A; and
3. Use of an assumption of an 8-hour day/198-day season for both Reaches 5A and 5B.[1]

Background

During Work Plan development, in April of 2009 EPA directed GE to assume that remediation of Reach 5A and 5B sediment and bank soil be performed using wet mechanical excavation for an additional alternative now referred to as SED 9 (April 1,

[1] GE also claimed as unjustified EPA's suggestion to consider an assumption of working more than 198 days/yr and/or more than 8 hrs/day. For the purpose of evaluating the alternatives in the CMS, EPA agrees to retain the assumption of a 198 eight hour days/year. EPA reserves the right to revise all assumptions to reflect the specific conditions of any proposed remedy during remedy selection and/or design and implementation.

2009, Rest of River Corrective Measures Study, at 2 (Attachment A)). All of the other previous active alternatives had the work performed in Reach 5A "in the dry", using the same technique applied in both the ½-Mile and 1 ½ -Mile Reach cleanup, so the inclusion of a different technique provides a broader scope of alternatives for consideration in the Revised CMS. In the April 1, 2009 letter, EPA directed GE to evaluate this alternative on an equal footing with other alternatives. (Attachment A, at 2.)

EPA's position historically regarding such direction to GE has been to provide broad direction regarding methods of performing work or of approaching an issue, allowing GE the opportunity to propose the specific methods for implementing such direction. EPA, during the review and approval process, then has the ability to direct GE to alter its approach if necessary.

In response to the April 1, 2009 letter, GE submitted a draft Work Plan in May 2009. EPA reviewed the GE draft Work Plan and provided further direction to GE on July 8, 2009 to assume that the work would be conducted from the river channel and not from the top of the river banks as GE had initially proposed in its draft Work Plan (July 8, 2009 email, Description of SED 9/10 and FP 8/9, at 1) (Attachment B).

GE then submitted, on August 31, 2009, a Work Plan for EPA review.[2] In response, EPA imposed particular conditions in EPA's January 15, 2010 Conditional Approval of GE's Work Plan for Evaluation of Additional Remedial Alternatives ("CAL") (Attachment C). Of the conditions imposed by EPA in the January 15, 2010 CAL, GE notified EPA on January 29, 2010 that it was contesting two conditions (Dispute Resolution on Certain Conditions in EPA's Conditional Approval Letter for GE's Work Plan for Evaluation of Additional Remedial Alternatives, Attachment D). During the informal negotiating period called for under the Consent Decree regarding the disputed items, the parties were not able to reach agreement. Following that, on March 4, 2010, GE submitted its current Statement of Position (Dispute Resolution on Certain

[2] GE's Work Plan can be found at http://www.epa.gov/ne/ge/thesite/restofriver/reports/gereportsndocs/457493.pdf.

Conditions in EPA's Conditional Approval Letter for GE's Work Plan for Evaluation of Additional Remedial Alternatives, Attachment E).

PRODUCTION RATE

Summary of GE Arguments

GE makes several assertions relating to its opposition to the production rate EPA directed GE to use (Attachment C, at 12). Specifically, GE claims that production rates for SED 9 should be reduced from 275 cy/day (the rate used for wet excavation in Reach 5C and downstream) to 165 cy/day in Reach 5A, and to 255 cy/day in Reach 5B. GE makes this claim allegedly to account for "difficulties and risks" in operating from the riverbed and greater water depths in Reach 5A and for higher water velocities in Reaches 5A and 5B. GE further claims that EPA had not adequately supported its rejection of GE's proposed reductions. Also, GE claims as unjustified the alternative suggestion by EPA to examine working more than 198 days/year and/or working longer than 8-hour days. GE claims this would be inconsistent with the work schedule assumptions for all alternatives.

GE's starting point for deriving the production rate of 165 cy/day proposed in its Work Plan is the average daily production rate of 275 cy/day (Work Plan, at C-1). GE previously proposed this rate for barge-mounted wet excavation (March 6, 2009, Response to EPA's Interim Comments on the Corrective Measures Study Report, Attachment F, at 203). GE states that this equates to an annual production rate of 54,450 cubic yards per year[3] (Attachment D, at 3 and Attachment E, at 4, ftnt 7). GE did not provide the calculations by which it reduces the rate of 275 cy/day to 165 cy/day in its Work Plan. EPA infers, based upon the text provided by GE in the Work Plan and GE's letters regarding the dispute, that GE deducts 30%[4] for "difficulties and risks" associated

[3] It should be noted that GE apparently did not truly apply these average annual production rates as stated on page 3 of its January 29, 2010 letter and in Footnote 7 of the March 4, 2010 letter, but used a significantly lower annual production rate in developing the durations for the alternatives under evaluation, in particular SED 9. This is a major reason for the ongoing disagreement regarding production/backfill rates. See Summary of Calculation of Annual Production Rates and Durations, Attachment G.

[4] GE says in Attachment D, at 4, and in Attachment E, at 5, that GE assumed a reduction in productivity of approximately 30 to 35 %. However EPA's back-calculation from 275 cy/day to 165 cy/day suggests that GE used 30%. See Table 1.

with working within the river channel. In addition to this deduction, EPA assumes that GE reduces the excavation rate an additional 15%[5] for high flow events when GE claims no work can be performed. These calculations result in an average annual production rate of 165 cy/day for Reach 5A. For Reach 5B, GE proposed a reduction in the excavation rate to 255 cy/day for wet mechanical excavation from a barge solely due to increased downtime due to high water velocities. (Attachment D, at 4, and Attachment E, at 6). Also, see Table 1 for a summary of the assumed derivation of the production rates.

EPA's Response

GE's proposal to decrease the average daily production rate for wet excavation from 275 cy/day as was proposed for wet mechanical excavation to 165 cy/day in Reach 5A and to 255 cy/day in Reach 5B is unjustified.

In the development of the CMS, EPA and GE have had ongoing disagreements regarding the derivation of effective, average daily, and annual production rates.[6] GE, for the purpose of modeling the alternatives in the CMS, applied a set of assumptions to be used in evaluating alternatives. For wet mechanical excavation, GE assumed an average daily production rate of 275 cy/day over a duration of 198-eight hour working days per year (March 2008, GE Corrective Measures Study Report[7] at 3-10 to 3-13, and Attachment F, at 202 to 206). EPA regards these assumptions, in light of definitions that EPA had earlier provided as clarification to GE (Attachment I, at 6), as resulting in an annual production rate of 54,450 cy (Attachment G). However, EPA reserves the right to revise these rates to reflect the specific conditions associated with the proposed remedy during remedy selection and/or design and implementation.

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[5] As noted above, GE does not provide its calculations. However, GE states in its August 31, 2009 Work Plan at C-3, that it assumed 30 days downtime for flow, which EPA calculates as 15%.

[6] Previously, beginning during the development of the CMS Proposal (CMS-P), EPA provided conditions and comments regarding definitions, terminology and assumptions made by GE on production/backfill rates in EPA's Conditional Approval Letter on April 13, 2007, in its Conditional Approval letter on the CMS-P Supplement on July 11, 2007 and in EPA comments on GE's CMS dated September 9, 2008 (EPA's Conditional Approval of the Corrective Measures Study Proposal, Attachment H, at 12-13; EPA's Conditional Approval of the CMS Proposal Supplement, and Model Code Proposal, and Approval of the Addendum to Supplement, Attachment I, at 5 to 8; and, EPA Comments on GE's March 2008 Corrective Measures Study Report, Attachment J, at 20, respectively).

[7] GE's March 2008 CMS report can be found at
http://www.epa.gov/ne/ge/thesite/restofriver/reports/cms/283374_CMS_Report.pdf

EPA disagrees with GE on four main points regarding the derivation of the average daily production rate for SED 9: 1) GE initiated its derivation of the production rate from the wrong starting point; 2) GE unjustifiably overstates reductions for “difficulties and risks” in Reach 5A; 3) GE unjustifiably “double counts” downtime for high flow events; and 4) GE unreasonably discounts production rates in Reach 5B due to high water velocities. The apparent derivation of the various production rates being discussed is summarized in Table 1.

1. **GE’s use of the average daily production rate as the starting point for derivation of its proposed production rate for SED 9 is incorrect and inconsistent with previous approaches.**

   GE starts from the assumption of the average daily production rate (275 cy/day). This is incorrect. GE should have started from the effective production rate.

   The average daily production rate of 275 cy/day was previously derived from GE’s assumption of an effective production rate of 350 cy/day for wet excavation when excavation activities are actually conducted (Attachment F, at 202-203; see also Table 1). While GE did not provide any calculations, it appears that in deriving the 275 cy/day rate, GE discounted the 350 cy/day by 13% for non-excavation work-related activities, resulting in an average production rate of 305 cy/day.[8] The non-excavation activities cited by GE (e.g. mobilization, sheetpile installation, restoration) (Attachment F, at 202-203) are not specific to any excavation method. Some of the cited examples by GE are not relevant for a particular alternative; rather they will be replaced with items specific to the alternative in question. For example, the construction of sheetpile cells cited by GE is not relevant for wet excavation. In addition, some of the examples cited by GE (mobilization, construction of infrastructure, restoration) may not be on the

[8] The 305 cy/day does not appear in any GE document. EPA calculated it by adjusting the 275 upward by the 10% assumed by GE for “downtime” (Attachment F, at 203) which equates to 305 cy/day. The difference between 305 cy/day and 350 cy/day is 13% for the GE assumption of “non-excavation” activities (Attachment F, at 202-203). See Table 1.

critical path for achieving daily production rates except at the very beginning or end of the project.

In its original derivation of the daily production rate, GE states that it further discounted the 350 cy/day an additional 10% for “downtime” resulting in an average daily production rate of 275 cy/day for wet mechanical excavation, but GE did not define “downtime” (Attachment F, at 203). However, it is clear from previous EPA correspondence that “downtime” included high flow events (See, e.g., Attachment I, at 6). Further discussion of an appropriate production rate reflecting downtime for high flow events is provided in Section 3 below.

Therefore, GE should have started all discounts from the effective production rate of 350 cy/day, not the average daily production rate of 275 cy/day.

2. **GE’s rationale for a deduction of 30% to 35% percent for “difficulties and risks” in Reach 5A is unsubstantiated and unjustified.**

   As shown in Table 1, the average daily production rate of 275 cy/day already includes significant adjustments of 13% for “non-excavation work-related activities” and 10% for “downtime” in addition to a work season of 198 days/yr. GE then seeks an additional 30% reduction for alleged “difficulties and risks” in Reach 5A (see footnote 4 of this document). In doing so, GE did not consider any engineering alternatives to reduce and/or mitigate for alleged difficulties or risks associated with working from the River.

   EPA believes GE’s additional reduction of 30% is unjustified for the following reasons:

   a. The “difficulties and risks” cited as examples by GE to support the addition of a 30% reduction to the 13% reduction can be readily mitigated. In its example, GE claims that the number of truckloads possible per day would be reduced by the use of a temporary road in the river channel, which could potentially result in limiting travel to one truck at a time, working in flowing water, without turnouts allowing only one-way traffic, and the equipment operating in reverse for one leg of the roundtrip. (Attachment D, at 4-6 and Attachment E, at 4-5). In EPA's view, these issues could be mitigated by the following:

i. Installing turnarounds and passing bump-outs on access roads at periodic distances within the channel to allow two-way traffic, and/or sizing the equipment to allow passage on the road itself. Either of these approaches would allow more than one transport vehicle to operate at a given time.
ii. Installing an elevated roadway which could consist of backfill material. This would eliminate or minimize the effects of operating transport vehicles in flowing water.
iii. Using equipment that is commonly available that has a rotating cab so that traveling in reverse is not necessary.

b. Moreover, the claimed difficulties and risks do not differ significantly between this alternative and the other wet excavation alternatives being evaluated. GE's claim that overall progress would be slowed significantly, reducing the overall loads per day relative to mechanical excavation from a barge, is unsupported. For example, the construction of access roads/staging areas are also required for wet excavation by barge. Accordingly, any issues with production rates or durations based on the construction of access roads/support areas would therefore be similar. Also, there are significant logistical issues associated with operating from barges that would also be encountered. GE did not quantify whether the difficulties in working from a barge would be greater, equal to, or less than the difficulties that would be encountered working on the river bottom. In addition, GE proposed no measures to mitigate for the difficulties described in its example.

Therefore, GE's reduction of 30% to 35% in addition to the 13% reduction is unjustified.

3. **GE's deduction of an additional 15% (30 days in GE's original January 29, 2010 dispute notification, increased to 36 days in the March 4, 2010 Statement of Position, Attachment D, at 4 and Attachment E, at 7 respectively) for high flow events includes faulty assumptions and "double counts" lost work days.**

   a. **GE's statements on the use, suitability, and impact of silt curtains with regard to productivity in Reaches 5A and 5B for SED 9 are incorrect.** GE attempts to lend support for its reduced production rates by asserting that silt curtains have diminished effectiveness in high water velocities (Attachment E, at 5, footnote 9). First, it has not been determined that a silt curtain or similar engineering controls are or are not necessary in Reach 5A or 5B. Second, if the parties agree during the design phase that silt curtains are needed, there are site-specific designs that can be used with higher river flows and alternate engineering controls such as Jersey barriers. EPA's Condition 21 in its January 15, 2010 CAL (Attachment C, at 13) provides additional details on the use of silt curtains to address resuspension. Third, GE's interpretation of the reference Francigues and Palermo, 2005 regarding the use of silt curtains and associated issues at velocities greater than 1.5 feet per second (fps) is incorrect, and contrary to the intent of the authors, according to one author of the reference (Attachment K, March 24, 2010 Memorandum from Michael Palermo to Susan Svirsky, EPA, et al.). Dr. Palermo states, "[n]on-conventional, i.e., anchored curtain configurations and specialized designs, have been developed and successfully deployed at multiple sites subject to currents higher than 1.5 fps." (Attachment K, at 1).

b. **There is already downtime for high flows accounted for in the average daily production rate of 275 cy/day and the impact of high flow on the average daily production rate is exaggerated.**

As discussed above, GE already factored 10% downtime into the 275 cy/day rate. GE did not explain at the time how much of that 10% was related to high flow events. EPA reasonably assumed a portion or all of the 10% downtime was due to high flow events. For example, in its January 29, 2010 dispute letter, GE claims that the "198 working days per year for more downstream reaches assumed no *or a lesser number* [than around 30 days in Reach 5A or 15 days in Reach 5B] of flow-related shutdown days." (Attachment D, at 4, emphasis added). Thus, GE clearly factored in "flow-related" downtime into the average daily production rate of 275 cy/day for mechanical excavation via a barge-mounted excavator. Also, as discussed above, EPA assumed that the average daily production rate of 275 cy/day *did* include consideration of anticipated flow shutdowns. (Attachment I, at 6).

Alternatively, if GE did not incorporate flow-related downtime in its calculation of average daily and average annual production rates for wet excavation off a barge, but is now proposing to factor in flow-related downtime for wet excavation performed within the river channel, then GE was inconsistent and was not proposing to evaluate all alternatives on an equal footing.

Nonetheless, regarding Reach 5A, EPA acknowledges that there may be additional down time or reduced productivity due to high flow (and the resulting increase in water depth) for wet excavation within the river channel as opposed to wet excavation using barge-mounted equipment. EPA's assumption is that all or a portion of the 10% downtime in GE's estimate is flow-related. Based on a 198-day production season, 10% downtime equates to 20 days. For Reach 5A, using GE's assumptions of 36 days of lost time due to high flows and the ability to work in water depths of 3 feet or less as stated in its Statement of Position (Attachment E, at 7), the percent reduction of the production rate would be 18%, based on a 198-day production season.[9] Moreover, even if one did not assume that some of the original 10% downtime was flow-related, GE could still perform non-excavation related activities to mitigate the effect of flow-related downtime on schedule. Thus, starting from 275 cy/day (which EPA assumes already includes 10% flow-related downtime), a further 8% reduction to acknowledge the 36 days of high flow proposed by GE (Attachment E, at 6), equates to an average daily production rate of approximately 250 cy/day.

Further, an average daily production of 250 cy/day is an appropriate assumption because some excavation work could be performed in river depths between 3 and 4 feet, with the installation of a one- to three-foot-thick access road built on top of existing sediment grade and/or with alternate equipment. (Note that while in its Statement of Position, GE assumed an access road thickness of zero (Attachment E, at 7) GE appears to acknowledge that an access road would have a thickness greater than zero, with its statement that this would allow for operation in deeper water (Work Plan, at 2-12) and that the temporary road would consist of gravel, swamp mats, or modular platforms placed directly on the riverbed. (Attachment E, at 4, footnote 8). However, for this purpose, EPA is assuming no production in water depths of three feet or greater for 36 days in this analysis, as assumed by GE in its Statement of Position (Attachment E, at 7).

Therefore, the average daily production rate should be 250 cy/day for Reach 5A.

4. **For Reach 5B, GE should use the average production rate of 275 cy/day as there is no supportable justification for decreasing the rate to 255 cy/day**.

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[9] GE changed the number of days assumed to be downtime for high flow from their Work Plan and January 31, 2010 letter from 30 days to 36 days in their Statement of Position (Attachment E, at 7). EPA calculates that the 36 days will result in an 18% reduction in the production rate due to flow.

Wet excavation in Reach 5B is assumed by both EPA and GE to be performed via barge-mounted excavation equipment, as has been assumed in other downstream reaches for particular alternatives. Therefore, GE's argument of a reduced production rate is solely a result of a reduction of an additional 15 days due to high velocities and associated issues with silt curtains. This argument is flawed for several reasons: the velocities in Reach 5B are not significantly different than Reach 5C (Frequency of River Velocity in Reaches 5B and 5C, Attachment L) for which the original assumption was made; and, as noted above in Section 3.a., there has been no agreement on the necessity of silt curtains, and other types of silt curtains can be deployed in higher flow regimes. **Therefore these velocities would not preclude excavation off a barge as claimed by GE. Accordingly, the record does not support a reduction in the average production rate of 275 cy/day for Reach 5B.**

RESUSPENSION RATE

<u>Summary of GE Arguments</u>

To support its proposal to increase the assumed resuspension rate from the agreed-upon percentage of 2%, GE assumed that work would take place with the equipment moving over roads/mats/platforms placed on top of contaminated sediment, and equipment would be left in the river under conditions of rapidly rising flow and flow constrictions. Based on those assumptions, GE states that there would be more resuspension than assumed when working off a barge. Barge-mounted excavation was the basis for the previously agreed-to assumption of a 2% release of PCB during mechanical excavation. Because of GE's uncertainty in the SED 9 approach, GE proposed a range of 5 to 9% for Reach 5A based primarily upon one study conducted in 1978 and an assumption that the work would use equipment on the river bottom.

<u>EPA's Response</u>

GE's proposal to increase the resuspension rate to 5 to 9% in Reach 5A from the agreed upon 2% of PCB mass is not justified, and the study referenced by GE is not

applicable to modern environmental (rather than historical navigational) wet mechanical excavation and reflects release of sediment, not PCB mass.

EPA and GE had agreed on a resuspension rate of 2% of the PCB mass in the excavated sediment for wet mechanical excavation for the purpose of the evaluation of the alternatives (Corrective Measures Study Proposal, page 5-27) [10]. While that agreement was reached before development of the SED 9 wet excavation alternative, the agreed-upon 2% rate is appropriate for SED 9 because of the similarities between the excavation envisioned for SED 9 and the excavation approach for which EPA agreed on for that rate. The following points demonstrate that GE's proposed assumptions regarding resuspension are invalid:

- GE cites a 2001 National Research Council ("NRC") Report, which in turn references a 1978 study (Nakai 1978) in quoting a range of 2.5 to 9% for resuspension of sediment during mechanical excavation. In the intervening years since this 1978 study, there has been a substantial increase in the amount of resuspension data, in the capabilities to monitor dredging operations, and in the designs and capability of dredging equipment with respect to potential reductions in resuspension. Also, in relying on the results of one older study, the very definition of resuspension is called into question, since the resuspension data for older studies is often based on navigation projects alone and often includes resuspension due to barge overflow, work boat prop wash, etc. This is the case for the Nakai study.

  The 2008 Technical Guidelines for Environmental Dredging of Contaminated Sediments Report (Palermo et al 2008) (cited as "Technical Guidelines"), developed by USACE for the USEPA Superfund program, provides guidelines on the evaluation of all technical aspects of environmental dredging, including evaluation of sediment resuspension. As stated in the Technical Guidelines,[11]

[10] The Corrective Measures Study Proposal can be found at http://www.epa.gov/ne/ge/thesite/restofriver/reports/260320.pdf

[11] The Technical Guidelines can be found at http://el.erdc.usace.army.mil/elpubs/pdf/trel08-29.pdf

"Nakai (1978) monitored seven mechanical clamshell and bucket navigation maintenance dredging operations, but only three or four of the seven operations were likely without overflow from the barge. The mean resuspension factor without overflow was about 0.2 percent to 0.6 percent, while with overflow the mean was about 8.6 percent to 10.9 percent" (Technical Guidelines, at 159). So, the high-end resuspension values from Nakai are generally not applicable to modern environmental dredging projects, since overflow of sediment from a barge is not allowed.

- The procedure for evaluation of resuspension source strength provided in the Technical Guidelines includes consideration of characteristic resuspension factors as well as potential adjustments to the characteristic factors for various sediment properties and site conditions. The recommended characteristic resuspension factors are 0.5% for hydraulic dredging, and 1% for mechanical dredging (without overflow). These resuspension factors are applied to the fine fraction (silt/clay) of the sediment, not the total sediment mass, since sands and gravels would not be transported from the site as suspended load. Actual resuspension would deviate from the characteristic resuspension as actual site, sediment, and operating parameters deviate from characteristic conditions. Sediment liquidity, current regime, water depth, presence of debris or hardpan, and operational requirements can be considered in adjusting the characteristic factors for the specific site and sediment (Technical Guidelines, at 160). As noted below, the sediment in Reach 5A is predominantly sand, with less likelihood for resuspension than would occur with finer-grained sediment.

- The 2008 Report, "4Rs of Environmental Dredging: Resuspension, Release, Residual and Risk," (Bridges et al 2008)(cited as "4Rs Report") reflects the consensus view of a large representation of experts (agencies, potentially responsible parties, consulting firms) on the 4Rs and technically defined processes related to environmental dredging, including sediment resuspension. The 4Rs Report states, "[d]ata from the most comprehensive studies show resuspension rates for cutterhead dredges are generally less than 0.5 percent and less than 1 percent for bucket dredges without barge overflow (Hayes and Wu 2001). These rates are for suspended sediment flux from the dredging zone and exclude fall-back and fluid mud/density flows. While these rates include the impact of debris where encountered, most of these projects were navigational dredging projects with only sparse, and typically light, debris present."[12] (4Rs Report, at 6). In modern environmental dredging, debris removal is typically performed preceding excavation of sediment.

- The agreed upon resuspension rate of 2% represents the mass of PCBs resuspended, not the amount of sediment resuspended as was reported in the NRC study cited by GE.

- GE's assumptions for this alternative involve equipment operating on access roads/mats/platforms, disturbing contaminated sediment and bank soil as they operate. Based upon GE's March 4, 2010, Statement of Position regarding construction of roads/mats/platforms and EPA's assumption of working on clean material that could be subsequently used as capping material, resuspension of PCBs would not be associated with vehicle movement and would be expected to be minimal from other operations performed using best management practices. As GE states in its Work Plan at 2-12, "… as necessary to minimize disturbance to the channel bottom … temporary roads would be constructed along the channel bottom." Any disturbance of bed sediment associated with placement of roads/mats/platforms or access points should be no different than placement of capping material under any wet excavation alternative.

- The materials to be removed in Reach 5A are PCBs associated with predominantly sand with a low percentage of fines (Figure 4-7, RCRA Facility Investigation Report (RFI)[13]) with a much faster settling velocity and less

[12] The 4Rs Report can be found at http://el.erdc.usace.army.mil/elpubs/pdf/trel08-4.pdf
[13] The RFI report can be found at http://www.epa.gov/ne/ge/thesite/restofriver/reports/rcra_fir/200656.pdf

likelihood for resuspension beyond the excavation cut than would occur with finer-grained sediment, even under conditions of higher water velocities observed in Reach 5A.

Finer-grained sediment exists in downstream reaches which served as the basis of the original agreed-to assumption of 2%. As stated in the Technical Guidelines, "[v]ery soupy sediments resuspend more easily. Liquidity may have the single largest effect on resuspension. Liquidity incorporates numerous sediment properties. Liquidity increases with a decrease in the density of the sediment or an increase in the water content, porosity, or void ratio of the sediment. Liquidity also increases with the grain size for fine-grained sediments or a decrease in clay content. Silts are more liquid than clays at the same water content. Sands are neither liquid nor plastic because liquidity and plasticity are only measures of fine-grained materials." (Technical Guidelines, at 161). GE acknowledges this point in its Work Plan at C-4: "…it is anticipated that the higher water velocities in Reach 5A could increase resuspension rates, although this may be offset by the larger-grained sediments typical of that reach, which could reduce resuspension (e.g. NRC 2001)." Thus, overall resuspension rates in Reach 5A would be low because the sediment bed is dominated by large-grained sediment (i.e., sand).

- Equipment should not be "left in the river" during rapidly rising flows. Even if equipment was left in the river channel, it would be sitting on clean road material, mats or platforms, and any resulting "resuspended" material caused by this equipment would therefore be clean.

- Regarding roads in the river "constricting" flow resulting in increased sediment erosion, this issue was not addressed in any of the other alternatives where flow constrictions would be created by blocking off half the width of the river with sheetpiling in Reach 5A and 5B. Resuspension in those alternatives for Reach 5A was agreed to be 0 %.

- GE alludes to the presence of a “dissolved phase” of PCBs yet, in a joint study conducted between EPA and GE at the Housatonic River, the dissolved phase was determined to be negligible (<0.0002 %) in Reach 5A (derived from the data presented in GE’s September 2003 RFI Report).

- GE’s Footnote 15 introduces new data from the Hudson River as well as data from other dredging projects. These data should not be used without evaluating the conditions and construction techniques in Reach 5A for SED 9 in the context of the conditions and construction techniques at the other sites. For instance, in the estimation of resuspension rates provided in the Technical Guidelines, it states, “[t]he range in resuspension factors shows that there is no such thing as a typical resuspension factor. … Actual resuspension would deviate from the characteristic resuspension as actual site, sediment, and operating parameters deviate from characteristic conditions.” (Technical Guidelines, at 160). Moreover, as stated in the 4Rs Report, “[t]he multi-factorial nature of dredging operations and site conditions complicates the translation of resuspension data from one site to another.” (4Rs Report, at 6.) Therefore, these data presented by GE should not affect the agreed-upon resuspension rate of 2% for wet excavation for the Housatonic River.

- GE’s footnote 17 states that backhoe excavators had resuspension rates 2-3 times those of clamshell dredges. Note that there are clamshell attachments available for long-reach excavators, as GE assumed in the Corrective Measures Study Proposal (at 4-11) and in GE’s Corrective Measures Study Report (at 4-98). In the event a clamshell bucket is used, a higher resuspension rate for backhoe excavators would not be relevant. In addition, one of the reports cited above from the 4Rs Report, Hayes and Wu (2001), states that resuspension rates of less than 1 percent should be expected for bucket dredges without barge overflow (4Rs Report, at 6).

- The depth of water through which the excavator bucket is expected to move is less than in Reach 5C (less than 4 feet rather than 5 to 15 feet), reducing the travel time through the water column available for resuspension.

In summary, EPA and GE agreed to a 2% resuspension rate of PCB mass excavated for wet excavation from a barge for evaluation of all other wet excavation alternatives. The only difference between SED 9 and the other wet excavation alternatives is that instead of an excavator sitting on a barge to perform excavation through the water column, an excavator would be sitting on clean material on a river bottom, and performing the exact same type of excavation through a shorter water column.

Therefore GE should use the agreed-upon resuspension rate of 2%.

DESCRIPTION OF ALTERNATIVE ASSUMPTIONS AND FACTORS FOR SED 9

Summary of GE Arguments

GE states that EPA's description of alternative methods of implementing the SED 9 alternative provided as part of the attempt to informally resolve the dispute is a *post hoc* rationalization of EPA's position on the production rates and resuspension rates. In addition, GE states that EPA's description of the alternative approach has severe limitations that would appear to prevent attainment of the production and resuspension rates proposed by EPA.

EPA's Response

EPA has acted properly during the dispute resolution period.

Holding discussions on alternative assumptions and factors during the initial dispute resolution period is legally proper, and is consistent with the Permit and Consent

Decree.[14] In addition, any disagreement on specific components of SED 9 need not be resolved in this dispute, because a sufficient basis for EPA's production and resuspension assumptions has been demonstrated even without considering such components. Finally, there has been no EPA approval of GE's wet excavation assumptions and factors for SED 9.

1. As is demonstrated above, EPA has more than sufficient support for its position with respect to the production and resuspension rates for SED 9. The discussions held by GE and EPA during the informal dispute resolution period do not negate that. The provision for discussions under the RCRA Corrective Action Permit (Appendix G to the U.S., et al v. General Electric Co., Consent Decree, (MAP-99-30225, 30226, 30227, October 27, 2000, at 27)[15] affords an opportunity to discuss, and potentially resolve, disputes. In implementing that provision for the current dispute, EPA discussed the areas of dispute with GE in an attempt to resolve the dispute. EPA suggested alternative methods and assumptions to implementing SED 9 as part of the discussion, not as a justification for a decision already made. EPA cannot be considered at fault for taking seriously the informal discussion provisions and having a discussion between project managers as a way of reaching agreement.[16]

   Additionally, any topic discussed in the initial dispute resolution discussions would not be a post hoc rationalization, as claimed by GE. EPA has not yet reached a final administrative decision. The Region I Director of the Office of Site Remediation and Restoration will make a determination on the areas in dispute. Following that, additional steps will lead to EPA modifying the RCRA Corrective Action Permit to select an appropriate response action for the Rest of River. Because there has been

[14] It should be noted that EPA agreed with the approach proposed by GE, however during informal dispute resolution, EPA discussed alternative assumptions and factors that could be used in implementing the approach.
[15] Appendix G can be found at http://www.epa.gov/ne/ge/cleanup/cd_app_g.pdf
[16] In the cover letter accompanying GE's January 29, 2010 Statement of Position, GE states as follows: "[a]s you know, the first stage of dispute resolution under the Permit involves discussions between the parties to attempt to resolve the disputes. GE looks forward to having such discussions with EPA during the next two weeks in an effort to reach a mutually agreeable resolution of the disputed issues identified in the [Statement of Position]." Attachment D, at 2.

no administrative decision on final assumptions for dredging production and resuspension rates, no *post hoc* rationalizations can have occurred.

2. GE's arguments regarding the "severe limitations" of alternative assumptions and factors are premature, and with respect to the disputed assumptions, unnecessary. Discussion of the level of design detail that GE is challenging is, in most cases, not necessary in resolving the assumptions used in modeling the alternatives. In addition, EPA's points above have demonstrated a sufficient basis for each of the EPA assumptions in dispute.

3. Within its Statement of Position regarding the informal dispute resolution discussion, GE asserted that EPA had approved the excavation approaches described in the Work Plan for Reaches 5A and 5B (Attachment E, at 12). EPA agrees that the excavation approach envisioned for Reach 5A and 5B for SED 9 is wet excavation performed from the river channel. EPA, in its January 2010 Conditional Approval letter, noted that modification of the GE-proposed assumptions and factors regarding implementation of this approach results in EPA's conclusion that an average daily production rate of 275 cy/day is achievable. Note the following two statements from EPA's January 2010 CAL: first, "[t]here are a number of assumptions/factors that GE has made when determining these productivities, factors, including the selection of equipment, staging areas, and access points to be used when excavating, the nine-month construction schedule, and the number of non-work days due to high water or other adverse weather conditions…"; and second, "[b]ased on EPA's analysis of the work, and by modifying the factors listed above, a production rate of 275 cy/day (equivalent to 54,450 cy/year based upon 198 working days per year) is achievable for both reaches." (Attachment C, at 12).

EPA'S RECOMMENDATION

Based on the above discussion, EPA recommends that GE be directed to:

- use the average daily production rate for wet excavation of 250 cy/day for Reach 5A and 275 cy/day for Reach 5B;
- use the agreed upon 2 % resuspension rate for Reach 5A for SED 9; and
- use the assumption of an 8-hr day/198-day season.

TABLE 1 – Summary of the Assumed Derivation of the Various Production Rates

REACH	RATE	REPRESENTING:	SOURCE:
		PRODUCTION RATES	
N/A	350 cy/day	GE's Effective Daily Production Rate for wet excavation alternatives	GE's March 2009 Response to Comments
N/A	305 cy/day	13% reduction from 350 cy/day, discounted for "non excavation work-related activities" for wet excavation alternatives	EPA calculated from GE's March 2009 Response to Comments
N/A	275 cy/day	GE's Average Daily Production Rate for wet excavation alternatives – Additional 10% deduction from 305 cy/day for "downtime." *(GE states that this is equivalent to an annual production rate of 54,450 cy/yr for a 198 day work season)*	From GE's March 2009 Response to Comments, GE's March 4, 2010 Statement of Position.
5A	165 cy/day	GE proposed Average Daily Production Rate for SED 9 – Additional 30% reduction for "difficulties and risks" and 15% reduction for high flow events *(deductions taken from 275 cy/day, not 350 cy/day original basis)*	GE's August 2009 Work Plan for Evaluation of new alternatives (this change was rejected by EPA in January 2010; subsequently disputed by GE).
5A	250 cy/day	EPA proposed corrected Average Daily Production Rate for SED 9 – assuming start at 350 cy/d with the original 13% reduction for non-excavation activities and an increase in the down time from 10% to 18% accepting GE's claim of 36 days due to flow.	As discussed in EPA's response to GE's dispute.
5B	255 cy/day	GE proposed Average Daily Production Rate for SED 9 – Additional 15 days/year reduction (8%) for high flow events *(deductions taken from 275 cy/day)*	GE's August 2009 Work Plan for Evaluation of new alternatives (this change was rejected by EPA in January 2010; subsequently disputed by GE).
5B	275 cy/day	EPA proposed Average Daily Production Rate for SED 9 – Based upon GE's original average daily production rate for wet excavation of 275 cy/day	As discussed in EPA's response to GE's dispute.
		WORK SEASON	
5A and 5B	198 days	8 hr days, five days/week, 9 months	GE's CMS

LIST OF ATTACHMENTS

A, April 1, 2009 - EPA letter to GE. Rest of River Corrective Measures Study.

B. July 8, 2009 - EPA email to GE. Description of SED 9/10 and FP 8/9.

C. January 15, 2010 - EPA letter to GE. Rest of River Corrective Measures Study Proposal – Conditional Approval of GE's Work Plan for Evaluation of Additional Remedial Measures.

D. January 29, 2010 - GE letter to EPA. Dispute Resolution on Certain Conditions in EPA's Conditional Approval Letter for GE's Work Plan for Evaluation of Additional Remedial Alternatives.

E. March 4, 2010 - GE letter to EPA. Dispute Resolution on Certain Conditions in EPA's Conditional Approval Letter for GE's Work Plan for Evaluation of Additional Remedial Alternatives.

F. March 6, 2009 - GE letter to EPA. Response to EPA's Interim Comments on Corrective Measures Study Report (excerpt pages 202 through 206 of 287 pages).
The entire report can be found at
http://www.epa.gov/ne/ge/thesite/restofriver/reports/cms/447141.pdf

G. Summary of Calculation of Annual Production Rates and Durations.

H. April 13, 2007 - EPA letter to GE. EPA's Conditional Approval of the Corrective Measures Study Proposal (excerpt page 12 and 13 of 20 pages).
The entire letter can be found at
http://www.epa.gov/ne/ge/thesite/restofriver/reports/gereportsndocs/268525.pdf

I. July 11, 2007 - EPA letter to GE. EPA's Conditional Approval of the CMS Proposal Supplement, and Model Code Proposal, and Approval of the Addendum to Supplement. (excerpt pages 5 through 8 of 16 pages).
The entire letter can be found at
http://www.epa.gov/ne/ge/thesite/restofriver/reports/gereportsndocs/274224.pdf

J. September 9, 2008 - EPA letter to GE. EPA Comments on GE's March 2008 Corrective Measures Study Report (excerpt page 20 of 42 pages).
The entire letter can be found at
http://www.epa.gov/ne/ge/thesite/restofriver/reports/cms/447141.pdf

K. March 24, 2010, Memorandum from Michael Palermo to Susan Svirsky, EPA, et al.

L. Frequency of River Velocity in Reaches 5B and 5C.

Attachment A

April 1, 2009 – EPA Letter to GE

Rest of River Corrective Measures Study

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
New England Office – Region I
One Congress Street, Suite 1100
Boston, Massachusetts 02114-2023

April 1, 2009

Mr. Andrew T. Silfer, P.E.
General Electric Company
159 Plastics Avenue
Pittsfield, Massachusetts 01201

Sent via US Mail and Electronic Mail

Re: GE-Pittsfield/Housatonic River Site: Rest of River Corrective Measures Study

Dear Mr. Silfer:

This letter addresses the upcoming submittal by the General Electric Company ("GE") of an addendum to the Corrective Measures Study ("CMS") Proposal ("Work Plan") for the GE-Pittsfield/Housatonic River Site ("Site") and the subsequent submittal of a Revised CMS. On January 16, 2009, GE submitted a request to provide an evaluation of an additional set of alternatives for remediation of river sediment and river bank and floodplain soil in the Rest of River portion of the Site.

At a meeting with you on March 12, 2009 to discuss these alternatives, the government parties (EPA, MassDEP, Massachusetts Fish and Game, CT DEP, the Connecticut Attorney General's Office, U.S. Fish and Wildlife, and the National Oceanic and Atmospheric Administration) indicated that they may request additional information in that April 24, 2009 draft Work Plan submittal. EPA, following consultation with the government parties, verbally notified GE on March 25, 2009 of the information to be included in the draft Work Plan. In this letter, EPA reiterates that notification. Items to be included in GE's draft Work Plan are the following:

1. GE shall analyze additional sediment remediation alternative(s) applying wet excavation techniques (as described in the CMS Proposal, however utilizing equipment and methods appropriate to the river conditions) to remove the PCBs from sediment and river bank soil in Reaches 5A and 5B. GE shall propose the remediation techniques that this would be paired with in the other reaches in the draft Work Plan for discussion with the agencies. GE shall analyze this/these alternative(s) on an equal footing with the other sediment alternatives in the Revised CMS.

2. GE may conduct the analysis of the additional sediment alternative which you presented to the government parties on December 19, 2008 and subsequently discussed with the government parties on March 12, 2009. GE shall describe this sediment alternative in detail in the draft Work Plan, including references to all supporting information relied on in developing the basis for this alternative, and analyze this alternative on an equal footing with the other sediment alternatives in the Revised CMS.

It appears to EPA that the floodplain alternative that GE presented to the government parties on December 19, 2008 is the same as FP 2; however GE's implementation of the alternative is conducted in a different manner. If GE is proposing a floodplain alternative that is defined differently than those already analyzed in the CMS, GE may correct EPA's assumption in the draft Work Plan. If this is the case, GE shall provide a detailed description of the floodplain alternative and how it differs from the definition of FP 2, and add it as an additional floodplain alternative in the draft Work Plan.

3. When analyzing the alternatives on an equal footing in the Revised CMS, GE shall perform all analyses using the criteria in the Revised RCRA Permit and addressing the concerns expressed in EPA's General Comments and Specific Comments of September 9, 2008, (e.g. Comment 10 regarding the need for avoidance, minimization, and mitigation of the impact of remediation to environmental resources).

GE shall either evaluate each sediment and floodplain alternative separately and perform the comparative analyses across the sediment and floodplain alternatives as was done in the CMS submittal of March 2008, or evaluate all possible combinations of the sediment and floodplain alternatives and perform comparative analyses across all combinations, with the exception of the No Action alternatives. GE shall describe the approach to this and the issue described in the preceding paragraph in the draft Work Plan.

4. GE shall respond fully to General Comment 42 of EPA's September 9, 2008 comments on GE's March 8, 2008 proposed Corrective Measures Study (as further defined in EPA's October 30, 2008 letter) in an interim deliverable to be submitted in summer of 2009. GE failed to provide a response to General Comment 42 in GE's March 9, 2009 CMS Supplement. GE shall propose a submittal date in the Work Plan for consideration and response from EPA.

5. GE shall consider the implications of the Commonwealth's March 30, 2009 Designation of the Upper Housatonic River Area of Critical Environmental Concern, in its evaluation of ARARs.

Pursuant to EPA's February 5, 2009 letter to GE in this regard and EPA's email correspondence to GE on March 17, 2009, GE is required to submit the draft Work Plan by April 24, 2009.

As you know, GE's March 9, 2009 Response to EPA's Interim Comments on the CMS is currently undergoing an informal public input period. EPA reserves all of its rights with respect to GE's March 9, 2009 submittal. EPA also reserves its rights to require additional information in the final Work Plan. Please be advised that by not identifying in this letter particular concerns with GE's March 9, 2009 submittal, EPA is not agreeing with or accepting GE analyses, proposals or arguments in this regard.

If you have any questions, please contact me at 617.918.1434.

Sincerely,

Susan C. Svirsky

Susan C. Svirsky, Project Manager
Rest of River

cc: Mike Carroll, GE
Rod McLaren, GE
Thomas Hill, GE
Jeff Porter, Mintz Levin
James Bieke, Goodwin Procter
Mike Gorski, MADEP
Susan Steenstrup, MADEP
Eva Tor, MADEP
Jane Rothchild, MADEP
Rich Lehan, Mass F & G
Dale Young, MAEOEEA
Jack Looney, CT AG
Susan Peterson, CTDEP
Kenneth Munney, USFWS
Ken Finkelstein, NOAA
Holly Inglis, EPA
James Owens, III, EPA
Tim Conway, EPA
Dean Tagliaferro, EPA
James Woolford, EPA
Steve Ells, EPA
K.C. Mitkevicius, USACE
William Hines Sr., PEDA
Mayor James Ruberto, City of Pittsfield
Scott Campbell, Weston Solutions
Linda Palmieri, Weston Solutions
Public Information Repositories

Attachment B

July 8, 2009 – EPA email to GE

Description of SED 9/10 and FP 8/9

Susan Svirsky/R1/USEPA/US
07/08/2009 02:20 PM

To andrew.silfer@corporate.ge.com

cc Bob Cianciarulo/R1/USEPA/US@EPA, Dean Tagliaferro/R1/USEPA/US@EPA, Jim Murphy/R1/USEPA/US@EPA, Kenneth_Munney@fws.gov,

bcc

Subject Description of SED9/10 and FP8/9

Andy

As mentioned in our meeting today, here is the description of the new alternatives and their designations. If you have any questions please give me a call. Otherwise I expect we will here tomorrow what your proposed date is for submittal of the revised Supplement to the CMS-P.

Susan

SED 9 Description

Reach 5A - Excavation in the wet from the river (as the primary methodology) of 2 ft of sediment with engineered cap to grade. Creatively treat all eroding banks as per comment on bank restoration, avoiding hard engineering to the maximum extent possible.
Reach 5B - Excavation in the wet from the river (as the primary methodology) of 2 ft of sediment with engineered cap to grade. Creatively treat all eroding banks as per comment on bank restoration, avoiding hard engineering to the maximum extent possible.
Reach 5C - Wet Hydraulic (or mechanical) removal of 2 ft of sediment in shallow area, 1.5 ft of sediment in deeper area with engineered cap to grade.
Reach 5D (backwaters) - In areas greater than 1 mg/kg, if water depth is greater than 4 ft, cap without removal, in areas where water depth is less than 4 ft, remove 1 ft of sediment (wet hydraulic or mechanical) and place an engineered cap. Cap shall consist of 6 inch active layer (e.g. AquaBlok®) and a 6 inch habitat/bioturbation layer for the purpose of this evaluation.
Reach 6 - Perform removal (wet hydraulic or mechanical) in shallow areas of the pond such that an increase in water depth of 2.5 ft is achieved after the placement of an engineered cap. In deep areas of the pond, place an engineered cap after 1 ft removal. Cap shall consist of 6 inch active layer (e.g. AquaBlok®) and a 6 inch habitat/bioturbation layer for the purpose of this evaluation.
Reach 7 Flowing Reaches - MNR
Reach 7 Impoundments (Reaches 7B, 7C, 7E, 7G) - Depending on shear stress, remove 1.5 ft of sediment (wet mechanical or hydraulic) and place an engineered cap, or remove 1 ft of sediment and place an engineered cap (6/6).
Reach 8 - Depending on bottom shear stress, remove 1.5 ft of sediment (wet mechanical or hydraulic) and place an engineered cap, or remove 1 ft of sediment and place an engineered cap (6/6).

SED 10 = Sediment component of GE's proposed alternative

FP 8 Description

Remove floodplain soil to achieve 10^{-5} and a hazard index of 1 for Human Health Direct Contact and Agriculture and 3 feet in high-use areas (equivalent to FP4). In addition, remove sediment (top 1 ft) in vernal pools to achieve the amphibian Maximum Acceptable Threshold Concentration ("lower-bound") and remove the additional floodplain soil (top 1 ft) greater than 50 mg/kg that remains after steps 1 and 2.

FP 9 = Floodplain component of GE's proposed alternative

Attachment C

January 15, 2010 – EPA Letter to GE

Rest of River Corrective Measures Study Proposal – Conditional Approval of GE's Work Plan for Evaluation of Additional Remedial Measures

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
New England Office – Region I
5 Post Office Square, Suite 100
Boston, Massachusetts 02109-3912

January 15, 2010

Mr. Andrew T. Silfer, P.E.
General Electric
319 Great Oaks Boulevard
Albany, NY 12203

Sent via US Mail and Electronic Mail

Re: Rest of River Corrective Measures Study Proposal - Conditional Approval of GE's Work Plan for Evaluation of Additional Remedial Alternatives

Dear Mr. Silfer:

EPA has completed its review of GE's report entitled *Housatonic River - Rest of River/Work Plan for Evaluation of Additional Alternatives* (hereinafter "Work Plan") submitted August 31, 2009. GE submitted the Work Plan as an addendum to the Corrective Measures Study Proposal submitted in February 2007. On January 16, 2009, GE submitted a request to provide an evaluation of an additional set of alternatives for remediation of river sediment and river bank and floodplain soil in the Rest of River portion of the Site. On February 5, 2009, EPA agreed to allow GE to consider the additional set of remedial alternatives for Rest of River requested by GE, and at the same time required GE to also consider a second additional set of remedial alternatives in addition to those evaluated in the Corrective Measures Study submitted in March 2008. GE then submitted, on May 1, 2009, a draft Work Plan for the Evaluation of Additional Remedial Alternatives. In response to comments from EPA, and the States of Massachusetts and Connecticut, GE submitted its August 31, 2009 Work Plan.

Additionally, in March 2009, GE submitted a Response to EPA's Comments on the CMS; this response is cited numerous times in the Work Plan as providing greater detail on how the Work Plan will be implemented by GE to produce a Revised CMS. Because of this, EPA has provided a number of conditions to the Response to Comments as they apply to execution of the Work Plan. However, such conditions do not constitute approval, conditional approval, or disapproval of GE's March 2009, Response to Comments, and EPA reserves all of its rights with respect to review of the March 2009 Response to Comments. In addition, the Revised CMS to be submitted does not supersede, and is in addition to the other submissions related to the Corrective Measures Study.

GE's Work Plan includes numerous assertions, statements and conclusions with which EPA does not agree. Please be advised that by not identifying in this letter or previous correspondence particular concerns with GE's March 9, 2009 submittal or other correspondence from GE including but not limited to the August 31, 2009 Work Plan, EPA is not agreeing with or accepting GE analyses, proposals or arguments in this regard.

Pursuant to Paragraph 73 of the Consent Decree, EPA, after consultation with the Massachusetts Department of Environmental Protection (MassDEP) and the Connecticut Department of Environmental Protection (CTDEP), and after review of public input, approves the Work Plan subject to the following conditions:

Conditions Regarding GE's Application of the March 9, 2009 Response to Comments to Execution of the Work Plan

1. It has been documented, notably in Appendix A to EPA's Ecological Risk Assessment, that the riverine and floodplain areas of the ROR contain varied and valuable habitat. It is also recognized that active remediation would likely have some short-term impacts in these areas, as pointed out in GE's March 2008 CMS submittal. However, EPA fundamentally disagrees with GE's repeated assertions in this document and the Work Plan regarding "serious and irreversible harm" that would occur to the Housatonic River and floodplain with the implementation of an active remedy in the Rest of River accompanied by a carefully considered and well-executed restoration program. GE has not made a scientifically supportable argument to substantiate such a conclusion of serious and irreversible harm.

   Ongoing serious unacceptable risk to the health of the ecosystem and humans from exposure to PCBs has occurred since the release of PCBs into the river system began in the 1930s by GE. Such risk will continue to exist well into the future under some alternatives, including no action, but can be addressed with implementation of some active alternatives. The risks are described in detail in EPA's peer-reviewed Human Health and Ecological Risk Assessments. GE shall fully and fairly evaluate both the short-term and long-term effects, including a balanced evaluation of risks from both remediation and contamination of PCBs, in the Revised CMS.

2. GE shall provide responses to all comments included in EPA's September 9, 2008 letter that were not addressed in GE's March 2009 submittal.

3. In preparing the Revised CMS, GE shall address EPA's General Comments 7, 14 and 23 regarding institutional controls presented in the September 9, 2008 letter.

4. Appendix A. GE's response did not adequately support and document the basis for its negative conclusions about the likelihood of avoiding, minimizing and mitigating impacts, particularly to state-listed species, or of achieving restoration when impacts cannot be avoided. Although EPA recognizes that ecological restoration, particularly in the early years of its implementation, has had some documented failures, it has also had many documented successes (e.g. Doody, et. al., 2009, Land and Water, Volume 53, Number 5, pgs 14-18), and EPA disagrees with GE's overall conclusion that ecological restoration is not possible. As GE states that the information in Appendix A will be used in preparing the Revised CMS, GE shall adequately document the scientific basis for any information used in the Revised CMS.

5. Appendix B. Summary of Key MESA Comments and Concerns. EPA notes that GE's evaluations of the Massachusetts Endangered Species Act (MESA) provided to date are incomplete. All MESA analyses conducted in conjunction with the CMS Supplement shall be conducted completely and objectively and in conformance with Massachusetts Natural Heritage Endangered Species Program (NHESP) guidelines and comments summarized below.

- GE's analysis of whether there is an insignificant impact to the local population is based on an overly narrow definition of the "local population" in many cases. This potentially leads to an overstatement of the number of cases where this MESA performance standard could not be met.

- It is assumed in GE's MESA Assessment that a given state-listed species is equally distributed throughout the "Priority Habitat of Subject Species." As the actual distribution of a species may be clumped and habitat quality can vary considerably across the landscape, this assumption leads to potentially inaccurate conclusions regarding whether there is an insignificant impact and the feasibility of minimizing impacts as remediation is implemented.

- It is assumed in GE's MESA Assessment that impacts of >20% of the acreage of Priority Habitat of Subject Species would necessarily result in a significant impact to affected local populations. This assumption is likely to be flawed for the reasons listed above, and therefore likely overstates the number of species for which the insignificant impact threshold could not be met.

- GE's analysis of the potential to provide net-benefit mitigation does not consider a wide variety of options for habitat management, conservation planning/research, and habitat protection both within and outside of the Primary Study Area ("PSA"). "Off-site" mitigation is an available option under the MESA regulations, and many of the species to be affected are known to occur within the Commonwealth but outside of the PSA. Therefore, net-benefit mitigation may be achievable more broadly than suggested in GE's MESA Assessment. Furthermore, many species were not evaluated for the potential to achieve "Net Benefit" because it was assumed that the insignificant impact standard could not be met.

- The insignificant impact on local population and the net-benefit performance standards in 321 CMR 10.23(2)(b) and (c) respectively are interrelated, in that certain forms of mitigation are designed to enhance the local population, thereby lessening the overall impact of a project. For this reason, MA DFW typically requires an applicant to evaluate whether a net benefit can be provided, even in cases where there is a preliminary assessment that the activity will impact a significant portion of the local population. This approach is appropriate because after-the-fact habitat management and habitat restoration could off-set remediation impacts in certain cases, which should be considered in evaluating the level of impact on the local population resulting from a particular remedial alternative in site-specific locations.

- In order to authorize a take, 321 CMR 10.23(2)(b) requires that there be an "insignificant impact" to the *local* population of the affected state-listed species. In comparison, 321 CMR 10.23(2)(c) requires that a "net-benefit" be provided to the affected state-listed species *as a whole* (i.e., beyond the geographic location of the local population of that species). Even in cases

> where there is no dispute that there will be an impact on a significant portion of the local population, GE shall determine whether a Net Benefit can be provided to the conservation of the affected state-listed species, as a means of ensuring compliance with the MESA performance standards to the maximum extent possible.

At a minimum, GE shall address the above points in determining the scope of the impact of all of the alternatives on state-listed species and habitats, and analyzing each alternative's compliance with MESA as an ARAR, including how the MESA regulatory standards of "insignificant impact on the local population of the affected state-listed species" and "long-term net benefit for the conservation of the state-listed species" will be achieved.

<u>Conditions Regarding the Work Plan</u>

1. EPA has reminded GE on several occasions (on February 5, 2009, April 1, 2009, and April 14, 2009), that the evaluation of potential remedial alternatives in the Corrective Measures Study and related documents must be conducted fairly and objectively, and that all remedial alternatives must be evaluated "on an equal footing." In describing the alternatives to be evaluated in the CMS Supplement, the discussion in GE's Work Plan could be construed as biased in favor of the SED 10/FP 9 alternative (termed by GE the "Ecologically Sensitive Alternative" or "ESA"). EPA believes that any active remedial alternative must be undertaken in a manner which is sensitive to the ecology of the watershed. By extension, the label of ESA could be read to imply that GE would not implement other alternatives in a manner to reduce, to the maximum extent practicable, the impact of remediation activities on the environment or to restore the affected areas after remediation. All alternatives can and shall be evaluated and implemented in an environmentally sensitive manner, and such a label is not acceptable preceding the analysis to be conducted in the Revised CMS, nor should it prejudice the selection of a suitable clean up plan. Therefore, GE shall discontinue the use of the term "Ecologically Sensitive Alternative" and refer to this combined alterative as the SED 10/FP 9 alternative. GE

shall evaluate all of the seven combinations of alternatives, not solely SED 10 and FP 9, on an equal footing and in an ecologically sensitive manner.

2. In the Work Plan, as in previous documents, GE fails to acknowledge the significant risks posed by PCBs currently present in the floodplain and river, thereby prematurely concluding that the short-term impacts caused by remediation outweighs the potential long-term risk reduction. As discussed above, the risk assessments are the project documents of record with respect to existing risks, and GE shall explicitly recognize these existing risks in any evaluations of alternatives in the Revised CMS, and as part of the "balancing" of the impacts and risk reduction of each alternative and achieving the General Standard of Protection of Human Health and the Environment.

3. In the July 8, 2009 meeting, the Agencies specifically requested that GE provide additional discussion of how the "balancing" of the impacts and benefits of each alternative would be conducted. Such detail was not included in the Work Plan. EPA hereby reiterates the comment here, and reserves its rights with respect to future compliance steps in this respect. . GE shall include this detailed discussion in the Revised CMS.

4. EPA has carefully reviewed the citations used by GE in the Work Plan to support various statements made by GE regarding the principles used in defining SED 10 and FP 9 and the feasibility of restoration. In many of the cases, the citations do not provide technical support for GE's claims. Some examples of this are provided below and are detailed in the Attachment. GE shall provide a more accurate and appropriate use of citations in the Revised CMS.

    - The claim that remediation activities would preclude the ability of various species to return to these habitats is at best a gross overstatement and is not supported by the references cited. The Brooks (2005) paper is primarily a comparison of the structure and function of wetlands and degraded wetlands and does not directly address the issue of whether remediation or disruption in general will have the claimed effects. Cushman (2006) discusses the issue of habitat loss and fragmentation generally without reference to remediation and/or restoration. Kihslinger (2008) is not a technical article and deals with the statutory compliance of compensatory mitigation under the Clean Water Act §404 regulations. It is not applicable to remediation/restoration of contaminated floodplain habitats.

- EPA categorically disagrees with the statement that restoration of habitats affected by remediation is "not practicable." Numerous studies and documented examples of successful restoration are available. The references cited do not support the claim made by GE – at best, the references point out issues and potential specific problems with ecological restoration, but in the context of providing useful information to guide future restoration efforts as to "lessons learned", not to make the case that restoration is "not practicable." Questionable sweeping statements of this sort will not be acceptable in the Revised CMS and GE shall not make such unsupported statements.

5. In considering remediation and restoration alternatives, it is important to set realistic expectations regarding the time frame for evaluating restoration success. EPA has prepared the attached GIS map, similar to the map prepared by Mass Audubon and included with their comments on the Work Plan, showing changes in the Upper Housatonic River over the past 100 years (see Figure 1). First, relative to the timeframe associated with the persistence of PCBs in the environment without remediation, the timeframe for active restoration of even forest communities is relatively short. The very slight negative slope of the line in Figure GC19-2a in the GE Response to Comments for Reach 5A, for example, indicates that, if left in place, PCBs will remain at concentrations similar to those currently measured for many times longer than 50 years (which is the duration represented on the figure). Forest patches affected by remediation could regenerate several times over in this long period.

   Also, in the past, the Housatonic floodplain was mostly deforested for agricultural or industrial purposes before the middle of the 19th century (Harvard Forest 1830's Map Project: Hall, B., G. Motzkin, D. R. Foster, M. Syfert, and J. Burk. 2002. Three hundred years of forest and land-use change in Massachusetts, USA. Journal of Biogeography 129:1319-1135). Extensive land clearing in the floodplain and throughout the watershed contributed to rapid river channel migration and the formation of many of the floodplain landforms, including the meanders, oxbows, vernal pools, and terraces that exist today. Without any human design or oversight, forests and wetlands along the Housatonic have returned through the 20th century and the river is seeking its equilibrium. While the remedial alternatives under consideration are different from historic activities in the area, the recovery of the area's diverse natural communities over the past 100 years indicates that the system is resilient to dramatic changes. In this case, any active remediation will be enhanced by careful attention to a restoration process that insures that underlying ecological processes are maintained.

GE shall acknowledge these important points regarding historical land use, floodplain and river alteration, and natural resiliency of the ecosystem in any discussion of the condition of the forested riparian corridor, river, and/or floodplain in the Revised CMS. In addition, GE shall modify its discussion of the effects of riverbank remediation to recognize that the current geomorphic processes in the river and banks have not yet reached a state of equilibrium, and shall also discuss the potential for stabilization of riverbanks and/or other remedial strategies and/or restoration methods to promote and work with such processes.

6. Many of the principles describing the underlying elements of SED 10/FP 9 are notable but are not a substitute for Selection Decision Factors in the Reissued RCRA Permit. In addition, while some of these statements in the guiding principles used by GE in developing SED 10/FP 9 are accurate and applicable to all alternatives, there are significant concerns and the need for clarification on others. Although avoidance and minimization of impacts to important habitats are preferred where possible, a detailed analysis of where the long-term adverse ecological effects of PCBs may outweigh the short-term disturbance of habitat requires that GE shall conduct a careful and balanced assessment in the Revised CMS using the Selection Decision Factors outlined in the Reissued RCRA permit.

7. It is unclear in the description of SED 10 and FP 9 exactly why some areas were proposed for remediation, yet others were not, both from the standpoint of complying with ARARs, and also with regard to achieving both human health (for fish and waterfowl consumption) and ecological IMPGs. GE shall provide a rationale for their selection of areas proposed for remediation.

8. It is unclear how FP 9 differs from FP 2 in the original CMS. GE shall provide a full explanation of all of the differences between FP 9 and FP 2, including the criteria that resulted in the increase of soils to be excavated from 17,000 cy to 26,000 cy. This explanation shall exclude differences in how the alternatives will be implemented, because EPA requires that all alternatives be analyzed in an ecologically sensitive manner.

9. EPA notes that the type of "piecemeal" remediation proposed for SED 10/FP 9 and shown in Figures 2-1a, b, and c, could lead to further geomorphic instabilities (e.g. shifting the energy of the river away from remediated banks to banks that have not been remediated, changes in bottom substrate between remediated and unremediated sediment altering near-bottom shear stress) of the river, bank, and floodplain, as well as recontamination from upstream or adjacent unremediated sub-reaches, banks, and floodplain, and therefore prove to be counterproductive. GE shall include a discussion of the implications of these issues in the Revised CMS.

10. GE states that the areas in Woods Pond with PCBs greater that 13 mg/kg in the top six inches will be removed to a depth of 2.5 feet, without backfilling or capping. GE shall provide the expected surficial post-excavation PCB sediment concentration in these areas.

11. With the dredging of Woods Pond without capping and the partial remediation of contaminated sediment and bank soil under SED 10, the surface sediment in Woods Pond will remain contaminated with PCBs in most areas, and will receive PCBs transported downstream from unremediated portions of the upstream reaches for the foreseeable future. If a goal of this alternative is to permanently improve conditions in Woods Pond, it would appear to require recurrent dredging of Woods Pond at various or set intervals to deal with the contaminant transport. If this is the case, GE shall provide calculations for how often it would have to redredge Woods Pond, what action level would trigger redredging and how long contamination would exist in upstream areas along with levels of residual risk for all areas, including Woods Pond.

If this is not a goal of this alternative, GE shall explain the implications of these factors on the long-term efficacy of this approach.

12. In GE's discussion of the remedial alternatives in the Work Plan, EPA perceives a bias in favor of emphasizing short-term impacts of remediation while long-term benefits are ignored or discounted. GE shall provide a comprehensive analysis and fair balancing of these two issues for each alternative evaluated in the Revised CMS.

13. The statement that none of the alternatives to be evaluated would achieve PCB levels that would allow unrestricted consumption of Housatonic River fish in Massachusetts serves only to obscure potential differences between the alternatives and, as such, prevents a full and fair evaluation of them. While it is likely that no alternative would allow unrestricted consumption immediately upon the conclusion of the remediation in MA, the different alternatives would achieve different residual PCB concentrations in fish tissue in both MA and CT, with some alternatives achieving fish tissue concentrations that fall within EPA's risk range and allow for the potential to relax fish advisories and would also accelerate the rate of recovery of the fishery over time following remediation. Unrestricted fish consumption is not a criterion specified in the Permit; therefore, GE shall not use unrestricted fish consumption as a criterion for the evaluation of alternatives in the Revised CMS, but shall fairly evaluate the alternatives against all IMPGs as required in the Reissued RCRA Permit.

14. EPA disagrees with GE's assertion that any settlement with the Trustees for natural resource damages relieves GE from the requirement to restore areas and habitats that are damaged or altered in the course of remediation activities as required by ARARs. GE shall identify restoration requirements and evaluate restoration as per the Permit criteria and ARARs.

15. Regardless of the information presented in Section 4 of the Work Plan, GE is reminded that the response to EPA's September 9, 2008 Specific Comment 42 must

include a thorough discussion of all topic areas included in EPA's General Comments 10 and 16, without exception.

16. GE shall evaluate all alternatives with respect to their potential impacts and benefits on human and ecological receptors (including threatened and endangered species) in the State of Connecticut, and specifically with regard to downstream transport of contaminants into the State of Connecticut, particularly as it relates to risk to human health from consumption of contaminated fish. The evaluation shall also include discussion of the effect of the alternative(s) on the current listing of the Housatonic River in Connecticut as an impaired water body under §303(d) of the federal Clean Water Act and the effect on the current listing of the Housatonic River in Massachusetts as well.

17. With respect to the 5-year duration of post-construction monitoring mentioned in the Work Plan as being in accordance with General Comment 11 of EPA's September 9, 2008 Interim Comments on the CMS Report, EPA notes and reiterates that the 5-year duration is for comparison purposes only and should not be interpreted as EPA's final recommended duration for the post-construction monitoring program.

18. GE shall submit updated metrics to those which were included in GE's March 9, 2009 submittal as required by EPA's letter of September 9, 2008 regarding General Condition 13 which will reflect the performance of the new alternatives and any modifications to other alternatives.

Conditions Regarding Appendix B

19. In GE's proposed parameterization of the SED10 alternative, the average sediment PCB concentration for the portion of the Pond designated for sediment removal is calculated from the model results at the end of the validation period, but the average PCB concentration for the portion of the Pond proposed for MNR is calculated from the data, which results in a much lower average sediment concentration both for the MNR portion and for the Pond overall. This procedure will result in an anomalous

drop in average sediment PCB concentration at the initiation of the simulation period and, more importantly, will have the effect of making PCB concentrations in fish tissue appear to have decreased more as a result of SED10 than would be the case if either the validation results or the data were used consistently to parameterize the sediment PCB concentrations in the Pond.

EPA will accept GE's use of the data rather than the validation results to parameterize the simulation of the SED10 alternative; however, GE must be consistent in its application of the data and therefore shall calculate average sediment PCB concentrations from the data for both the removal and MNR areas of the Pond. The same approach shall be used to calculate average carbon-normalized sediment PCB concentrations, from which the nominal TOC for partitioning (FMD, Appendix B3, page 8) shall be calculated

Conditions Regarding Appendix C

20. Page C-1. EPA disagrees with GE's selection of 165 cy/day and 255 cy/day for wet excavation in Reaches 5A and 5B, respectively. There are a number of assumptions/factors that GE has made when determining these productivities, factors, including the selection of equipment, staging areas, and access points to be used when excavating, the nine-month construction schedule, and the number of non-work days due to high water or other adverse weather conditions. Using the assumption of 198 working days per year, these average daily rates result in annual production rates of 32,670 cy for Reach 5A and 50,490 cy for Reach 5B. Based on EPA's analysis of the work, and by modifying the factors listed above, a production rate of 275 cy/day (equivalent to 54,450 cy per year based upon 198 working days per year) is achievable for both reaches. In addition, while EPA recognizes the challenges of working on the river during the winter months (December through February), 66 additional work days can be gained by working during this period when conditions allow, and additional days can be gained by working weekends during periods of good weather. Combining all these factors, EPA believes that a long-term average annual production rate of 54,450 cy (275 cy/day for a minimum of 198 days, or some average productivity somewhat less than 275 cy/day for a total of 264 work days per entire calendar year) is

achievable for both reaches. Therefore, GE shall use this annual production rate in its evaluation of the SED 9 alternative

21. Page C-2. GE states that silt curtains are not recommended for use in water velocities greater than 1.5 feet/sec, citing Francingues and Palermo (2005). This reference does not state that silt curtains are not recommended for velocities higher than 1.5 ft/sec. Rather, the reference states that currents greater than 1 to 1-1/2 knots are problematic, and lead to difficult, and often expensive curtain designs, and this current velocity is the accepted industry standard for a conventional silt curtain deployment, effectively limiting deployments, except on a case-by-case basis. It further states that silt curtains should not be used in higher current velocities (> 3-5 knots) unless there are unusual circumstances and special designs are developed. It should be noted that these recommendations result from problems related to stability of conventional curtain deployments, where curtains have ripped or have been lifted when velocities are too high. Anchored curtain deployments (e.g. using spaced piles) have been successfully used in currents exceeding 1.5 feet/sec. In the case of Reach 5A, the water depths of 3 to 4 feet are amenable to silt curtains and/or other options should the need for resuspension controls be established. For example, a simple deployment of Jersey Barriers may be suitable to partially isolate the work area from currents and control resuspension to the needed degree. GE shall reconsider the use of silt curtains or other means to manage resuspension.

22. p. C3 and C4 – GE proposes that the mass of sediment released by mechanical dredging operations for purposes of ERDC input should be increased from the earlier approved value of 2% to a range of 5% to 9% for the SED 9 alternative. This proposed increase is justified by GE with values for mass resuspension of 2.5 to 9% for mechanical dredging cited from NRC (2001).

    The NRC (2001) report references a study by Nakai (1978) in quoting the range of 2.5 to 9% for mechanical dredging. In the intervening years since this 1978 study, there has been a substantial increase in the amount of resuspension data, in the capabilities to monitor dredging operations, and in the designs and capability of dredging equipment with respect to potential reductions in resuspension. Also, in relying on the results of one older study, the very definition of resuspension is called into question, since the resuspension data for older studies is often based on navigation projects alone and often includes resuspension due to barge overflow, work boat prop wash, etc. This is the case for the Nakai study. As stated in Palermo et al (2008), "Nakai (1978) monitored seven mechanical clamshell and bucket navigation maintenance dredging operations, but only three or four of the seven operations were likely without overflow from the barge. The mean resuspension factor without overflow was about 0.2 percent to 0.6 percent, while with overflow the mean was about 8.6 percent to 10.9 percent." So, the high-end resuspension values from Nakai are generally not applicable to environmental dredging projects, since overflow would presumably not be allowed.

GE is undoubtedly aware of more recent work addressing this issue, specifically Bridges et al (2008), and Palermo et al (2008). These documents represent the current state of the art with respect to the "4Rs" of environmental dredging – Resuspension, Release, Residuals, and Risk.

The "4Rs Report" (Bridges et al 2008) reflects the consensus view of a large representation of experts (agencies, RPs, consulting firms) on the 4Rs and served to technically define processes related to environmental dredging, including sediment resuspension. The 4Rs Report definition for sediment resuspension is "***Resuspension*** is the process whereby bedded sediments are dislodged and dispersed in the water column by the dredging operation. The resuspended sediment particles may settle in the dredging area or be transported downstream." The 4Rs Report further states, "[d]ata from the most comprehensive studies show resuspension rates for cutterhead dredges are generally less than 0.5 percent and less than 1 percent for bucket dredges without barge overflow (Hayes and Wu 2001). These rates are for suspended sediment flux from the dredging zone and exclude fall-back and fluid mud/density flows. While these rates include the impact of debris where encountered, most of these projects were navigational dredging projects with only sparse, and typically light, debris present." It is important to note the 4Rs definition of resuspension does not include what is commonly referred to as "fall-back", the sediment that is dislodged by the dredge but falls back to the bottom without being dispersed to the water column and transported as a plume by currents. Many of the statements found in early literature on mass release refer to higher numbers that include fall-back.

The Technical Guidelines report (Palermo et al 2008) was developed by USACE for the USEPA Superfund program and provides guidelines on evaluation of all technical aspects of environmental dredging, including evaluation of sediment resuspension. The procedure for evaluation of resuspension source strength in the Technical Guidelines includes consideration of characteristic resuspension factors as well as potential adjustments to the characteristic factors for various sediment properties and site conditions. Characteristic resuspension factors recommended in the Technical Guidelines reflect the central tendency (average and median) of the empirical data and represent resuspension for characteristic site, sediment, and operating parameters. The recommended characteristic resuspension factors are 0.5% for hydraulic dredging, and 1% for mechanical dredging (without overflow). These resuspension factors are applied to the fine fraction (silt/clay) of the sediment, not the total sediment mass, since sands and gravels would not be transported from the site as suspended load. Actual resuspension would deviate from the characteristic resuspension as actual site, sediment, and operating parameters deviate from characteristic conditions. Sediment liquidity, current regime, water depth, presence of debris or hardpan, and operational requirements can be considered in adjusting the characteristic factors for the specific site and sediment. Therefore, based on the discussion above, GE shall use a sediment resuspension rate of 2 % as was previously approved in its evaluation of SED 9.

23. Page C-3. Based on the information provided in the Work Plan, EPA is not able to confirm the accuracy of GE's estimate that SED 9 will require 27 years to complete. EPA's estimates are significantly shorter than 27 years. GE shall provide sufficient additional detailed information in the Revised CMS to demonstrate how this duration was calculated as revised by the Conditions presented here which will affect the estimated duration for the alternative. Futhermore, using the production rates specified in Condition 19 and performing the removal of contaminated sediment in

backwaters and Woods Pond (and continuing downstream) concurrent with remediation in upstream areas as described below in Condition 23 will significantly reduce the estimated time to complete this alternative.

24. Page C-3. GE shall, for the purpose of this evaluation, modify SED 9 to include removal of contaminated sediment as described in the Work Plan in the backwaters and Woods Pond (and continuing sequentially downstream in Reach 7 and 8 impoundments) concurrently with removal of contaminated sediment in the upstream Reaches. The placement of the cap in these areas shall not be performed until completion of removal of all contaminated sediment as described in the SED 9 alternative. Removal depth in these impoundments shall be modified to account for estimated sedimentation during implementation of the remedy (e.g. sedimentation of 1 cm/yr over 10 years of construction would require overdredging of 10 cm) to achieve the final grades specified in the Work Plan after capping.

Conditions Regarding Figures 2-3a, b and c, 2-4 a, b and c and 2-5 a, b and c

25. These figures identify the use of small neighborhood roads as major haul roads and also show potential locations of staging areas. In the Revised CMS, GE shall implement their response to EPA's General Comment 16 of the September 9, 2008 letter including "Further, in order to decrease the impact of transport/disposition operations, vehicles would be properly maintained and would avoid (to the extent practical) travel through densely populated areas assumption to minimize or eliminate the use of small neighborhood roads as haul roads, and instead, use existing infrastructure such as easements, utility roads, and non-residential property, barge crossings and other means to avoid the impact on residential neighborhoods."

With respect to any other work plans or submittals related to Rest of River, nothing in this conditional approval shall be interpreted to supersede the approval, the conditions in a conditional approval, or the disapproval of such GE submittals, unless expressly stated as such by EPA. EPA reserves all of its review and compliance/enforcement rights under the Consent Decree (CD) regarding such GE submittals including but not limited to, the right to perform and/or require additional sampling or response actions, if necessary, to meet the requirements of the Consent Decree.

GE shall submit the revised Corrective Measures Study as described in the Work Plan, modified by the conditions in this letter (which exception of any conditions which may arise from the Specific Comment 42 submittal) within 6 months of receipt of this letter.

If you have any questions, please contact me at 617.918.1434.

Sincerely,

Susan C. Svirsky

Susan C. Svirsky, Project Manager
Rest of River

Attachments

cc: Mike Carroll, GE
Rod McLaren, GE
Thomas Hill, GE
Jeff Porter, Mintz Levin
James Bieke, Goodwin Procter
Mike Gorski, MassDEP
Eva Tor, MassDEP
John Ziegler, MassDEP
Jane Rothchild, MassDEP
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Tim Conway, EPA
Dean Tagliaferro, EPA
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Ms. Brona Simon, Executive Director, MSHPO
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Ms. Kathleen Knowles, THPO, Mashantucket Pequot Tribe
Ms. Sherry White, THPO, Stockbridge-Munsee Community
Scott Campbell, Weston Solutions
Linda Palmieri, Weston Solutions
Public Information Repositories

Attachment – Review of GE's Work Plan Citations Regarding Principles

Association of State Floodplain Managers **(ASFM) (2008)**. This paper is cited on p. 2-2 to support the claim that (1) natural hydrologic processes are responsible for creating the diversity of stream, floodplain and wetland features important to flora and fauna, and (2) remediation and stabilization of the banks would end these critical processes. On p. 2-3 it is cited to support the argument that disturbance of vertical riverbanks with subsequent stabilization should be minimized.

The ASFM paper supports the first part of this argument (i.e., that natural hydrologic processes create different wetland habitats), which is a statement that is commonly supported. The bulk of the discussion in the ASFM paper, however, deals with flooding and particularly the detrimental effects to the function of natural systems as a result of engineering measures that have been taken to control flooding, also a statement that would not result in any serious disagreement. One small section deals with bank stabilization and the problems that improper stabilization can cause by diverting erosional energy to other (downstream) locations; it does not discuss remediation of contaminated banks in any context. Nowhere does the paper make the claim that such detrimental effects are an **unavoidable** result of bank stabilization, only that such problems can arise if the stabilization is conducted without a more comprehensive and integrated analysis of ecosystem functions. As a result, the citation does not support the second part of the GE argument, but rather only that such problems **can** arise if bank stabilization projects do not consider larger issues in its design, a point that EPA has made to GE. With regard to the statement on p. 2-3 that disturbance and consequent stabilization of banks should be minimized, there again is little disagreement with the overall concept, however it raises the question of how "minimized" should be defined in the context of the PSA, the PCB contamination present in the banks, and its contribution to continuing risks in the river, floodplain, and downstream areas. Those are issues on which the ASFM paper provides no guidance.

Bennett (2003). This 262-page book is cited on p. 2-2 to support the argument that the spatial integrity of the forested riparian corridor in the PSA should not be impacted, and again on p. 2-3 to support the design consideration for SED 10/FP 9 that habitat fragmentation due to roads and staging areas should be avoided to the "maximum extent practicable."

With regard to the latter claim, there is presumably no argument that habitat fragmentation should be avoided, although there may be disagreement on the definition of "maximum extent practicable" in the context of the Rest of River site.

On the issue of corridors, Bennett remarks that the importance of continuous linear strips of habitat is debatable, noting that the issue is one of connectivity between habitats rather than corridors. And, as will be noted several times with regard to other cited references, the alternative to corridors and connectivity is assumed by implication in the Bennett document to be permanent development, which is not the case with remediation in the Housatonic River floodplain. Accordingly, while at one level this overview document does provide some support for the argument that, in general, it is better to maintain habitat corridors than it is to fragment them via development, it provides little specific support for GE's argument that any temporary disruption of the forested riparian corridor in the Housatonic River floodplain will have significant deleterious effects.

Bierregaard (1992). This paper is cited on p. 2-3 to support one of the conceptual design criteria for SED 10/FP 9, that a forested riparian corridor of at least 1,000 ft in width should be maintained to the maximum extent practicable.

Bierregaard makes the argument that overall species diversity in a rain forest is decreased for a group of forest fragments of a given total area as compared to species diversity in a single large block comprising the same total area. Implicit in the argument is that the fragmentation is permanent, and there is no discussion of temporary disruption via fragmentation and subsequent recovery from that fragmentation. There is no mention anywhere of riparian corridors or the 1,000-ft minimum width cited. Accordingly, the paper provides only the most tangential and limited support for the GE argument.

Brooks and Davis (1987). The paper is cited to support the claim on p. 2-2 that vertical riverbanks are "relied upon" by species "such as" belted kingfisher, bank swallow, and wood turtle.

It is well known that belted kingfishers nest in vertical riverbanks; however, the paper cited does not make that claim. Also, it makes no reference to either bank swallows or wood turtles.

Brooks et al. (2005). The paper is cited to support the claim on p. 2-1 that remediation of vernal pools, riverbanks, and marshes would disrupt the return to and use of these habitats by species with strong site fidelities for them. Later in the same section (p. 2-2), it is cited to support the claim that replacement (interpreted in the context of the site to mean restoration, as opposed to mitigation via construction of new wetlands) of vernal pools and other habitats disrupted by remediation activities is "not practicable." On p. 2-3 it is cited to support the statement that SED 10/FP 9 should avoid [disturbance of] areas with high density of floral and faunal species of concern.

The citation of the Brooks et al. paper to support the first claim is questionable. The paper is primarily a comparison of the structure and function of created (as opposed to remediated/restored, see below) wetlands, degraded wetlands, and similar unimpacted reference areas, and does not directly address the issue of whether remediation of these habitats leads to permanent disruption of their use by species with strong site fidelities. Most of these concepts are not discussed in the paper at all.

A major goal of the work documented in the paper was to provide guidance on how wetlands should be created and evaluated to ensure that mitigation activities are successful, not to argue that such mitigation should not be undertaken. The paper notes that high-value habitats should not be degraded in the first place, referring principally to degradation resulting from development activities. The authors note, however, that "Once degraded . . . wetlands offer abundant opportunities for restoration provided that the stressors causing the degradation can be reduced or eliminated" and further argues that even **creation** of wetlands as a means of mitigation can be achieved if done properly using the characteristics of reference wetlands as a guide. Taken in total, the paper arguably provides more support for the position that restoration can be, and has been, successful (if done carefully and correctly using reference wetlands as a guide) than as it was used to support GE's position that restoration is not practicable.

As noted above, the paper does argue for "greater protection of existing wetlands of relatively high ecological integrity" but otherwise provides no support for GE's position concerning the scope of SED 10/FP 9. As was demonstrated in the Ecological Risk Assessment, the existing wetlands on the site are greatly compromised in various ways by the existing PCB contamination and therefore can not be considered to have high ecological integrity.

Brown and Jung (2005). This lengthy (100 p.) EPA document is cited to support the statement on p. 2-1 that vernal pools are "relied upon" by various amphibian species. Because that claim is not in dispute, the cited reference was not reviewed but was assumed to provide sufficient support for the statement.

Croonquist and Brooks (1991). This paper is cited on p. 2-2 in partial support of GE's argument that "it is critical to avoid materially impacting the spatial integrity of the forested riparian corridor" at the site because such impacts would adversely affect wide-ranging species dependent upon the corridor.

The applicability of the Croonquist and Brooks study to the issue of maintaining a forested riparian corridor is highly questionable. The paper presents a comparison between a comparatively undisturbed riparian/forested area and an area with similar habitat characteristics which is disturbed by various types of **ongoing** human activity (both agricultural and residential). Neither of the two areas studies would be classified as a "corridor." The results of the work indicate that the use of the disturbed area by some birds species with high sensitivity to human-related disturbance (so-called "high-response" guilds) was decreased in the disturbed area, but found no such differences for mammalian species.

Limited mention is made of the concept of a "riparian corridor" and then only to note that "riparian corridors, even if partially disturbed, are vital travel corridors for uncommon, sensitive species." This statement was made regarding the results for Little Fishing Creek, which was the "disturbed" habitat studied. A later statement, also with regard to LFC, noted that ". . . restoring these small and partially degraded riparian wetland areas could provide adequate breeding habitat for area-sensitive species and not just serve as migration corridors."

Croonquist and Brooks (1993). Along with the 1991 Croonquist and Brooks paper (above), this paper is cited on p. 2-2 in partial support of GE's argument regarding the integrity of the forested riparian corridor. It is cited again on p. 2-3 to support the position that a forested riparian corridor of at least 1,000 ft in width should be maintained.

The paper deals with the same two study areas used in the 1991 paper and therefore suffers from the same limitations noted above with respect to its support for GE's position regarding maintaining the integrity of the forested riparian corridor. Interestingly, not only does the paper provide no support for the 1,000-ft corridor width, it indicates that the actual width necessary to maintain a riparian corridor is far less, concluding that riparian corridors of only

125 m (410 ft) "were needed to support the full complement of bird communities" and that "protecting at least 25 m (82 ft) of riparian habitat provided both dispersal and breeding opportunities." The paper concludes by noting that minimum widths should be developed for specific "landscape types" but with regard to how this could be done, says only that the response guild approach can be used for avian species.

Cushman (2006). This reference is cited on p. 2-1 in support of GE's position that remediation activities would prevent species with strong site fidelities from returning to and using wetlands and other significant habitats, and is cited again on p. 2-3 regarding avoidance of areas with high densities of species of concern.

The Cushman paper makes the argument that habitat loss and fragmentation are problems for plant and animal species generally, and particularly problematical for amphibians due to their unique life history. That claim is not at issue. However, the paper makes no reference to remediation activities and their relationship and/or similarity, if any, to permanent effects of habitat loss and fragmentation. It also notes (very briefly) that degradation of habitats can have effects that are similar to loss and fragmentation. Accordingly, the paper does not support GE's argument regarding the effects of remediation activities with subsequent habitat restoration and provides only the most limited support for the argument that certain habitats should be avoided during remediation.

deMaynadier and Houlahan (2008). This reference is cited on p. 2-1 to support the statement that the PSA is used by various species of concern, as well as the claim that the PSA includes vernal pools that are relied upon by various amphibian species such as the wood frog, spotted salamander, and Jefferson salamander.

EPA acknowledges that vernal pools and other habitats in the floodplain are used by some T&E species and has thoroughly documented the use of vernal pools by such species in Appendix A of the Ecological Risk Assessment (ERA). The ERA also documents the significant effects of PCBs on the amphibians at this site on maturation and sex changes. The cited reference is a chapter in a book on vernal pools in the Northeast and deals specifically with conserving vernal pool amphibians. It indicates generally that amphibians depend on vernal pools for reproduction, and that some species exhibit high site fidelity, but otherwise offers no site-specific information.

Environmental Law Institute (2003). Cited on p. 2-3 to support the argument of maintaining a forested riparian corridor of at least 1,000 ft in width and also avoiding habitat fragmentation by soil removal, access roads, or staging areas in currently intact floodplain areas.

This document provides an overview for land use planners of issues related to habitat fragmentation due to development. With regard to the 1,000-ft corridor width, the ELI document notes in its introductory sections that "specific guidance on corridor size was not feasible given inadequate available information within the scientific literature." In Appendix E, there is a listing of the minimum riparian buffer width recommended for various ecosystem functions and species/species groups as culled from the scientific literature. Of the nearly 200 specific recommendations listed, ranging from recommendations for such concepts as noise control to minimum widths to protect individual species, the vast majority of recommendations are for a minimum width of 30 m (approx. 100 ft) or less, and even in the cases of more wide-ranging species such as large mammals the recommendation is generally less than 100 m (328 ft). Only in a very few instances does the recommended range approach 1,000 ft.

With regard to the latter statement regarding habitat fragmentation, the ELI document does provide support for this position, which is not at issue with regard to permanent disturbance. However, the ELI document does not deal with contaminated, remediated, or restored habitats, other than to note briefly that degraded habitats may not serve to reduce the effects of habitat loss and/or fragmentation.

Fahrig (2003). Cited on p. 2-3 to support the argument that the design of SED 10/FP 9 should avoid disruption of areas with a high density of species of concern.

Fahrig's review paper on the effect of habitat fragmentation on biodiversity does not deal directly with issues related to habitat degradation, contamination, remediation, or restoration. It does make the argument, which is not at issue, that habitat loss does result in decreased biodiversity, which in a limited way could be interpreted to support GE's statement regarding SED 10/FP 9. However, in order to do so it becomes necessary to first assume that the potentially impacted habitats are functioning normally (questionable given the widespread high levels of contamination and the results of the ERA), and because Fahrig's paper deals with permanent habitat loss/fragmentation, that restoration to reasonably normal function following remediation is not likely or even possible.

Interestingly, with regard to claims made elsewhere by GE in the Work Plan, Fahrig makes the point that ". . . the breaking apart of habitat, independent of habitat loss, has rather weak effects on biodiversity, which are as likely to be positive as negative" and ". . . the effects of fragmentation per se are absent or too small to be detected in most empirical tests to date." Fahrig concludes that "The fact that effects of fragmentation per se are usually small and at least as likely to be positive as negative suggests that conservation actions that attempt to minimize fragmentation (for a given habitat amount) may often be ineffectual." These statements are contrary to much of GE's arguments concerning forested riparian corridors and generally limiting remediation to avoid fragmentation of habitat.

Forman (1995): Cited on p. 2-2 of the Work Plan to support the statement(s) that the forested riparian corridor in the PSA is well preserved and that it is critical to avoid impacting the corridor, which would adversely affect wide ranging species that are dependent upon it. Also cited on p. 2-3 to support SED 10/FP 9 design criterion of avoiding soil removal and placement of access roads and staging areas in intact floodplain areas.

Approximately 240 pages of this 632-page book are devoted to a discussion of the structure and function of corridors, with about 45 pages dealing specifically with riparian corridors. The reference unquestionably underscores the importance of riparian corridors and outlines how their function can be disrupted by human activity. As with other similar references, however, all discussion is focused on permanent alteration (e.g., dams, channelization, agriculture) and nowhere is the effect of temporary disruption followed by restoration discussed. There is considerable discussion of the value of the floodplain portion of riparian corridors as compared the terrestrial portion, pointing out the general instability and patchiness of floodplains, which tend to favor the presence of rare species, but also noting that “Several aspects of floodplains mitigate against their use as conduits for mammals.”

Overall, this reference does provide support for the argument that riparian corridors are valuable habitat for a variety of reasons, but provides only limited support for the conclusion that remedial activities in the corridor will destroy its value and should be avoided.

Hadda (sic) **et al. (2003)**. This citation is actually Haddad et al. It is cited on p. 2-2 to support the argument regarding maintenance of the spatial integrity of the forested riparian corridor, and again on p. 2-3 to support the design of SED 10/FP 9 to avoid areas with high density of species of concern.

The Haddad paper investigated the effectiveness of narrow corridors of similar habitat connecting isolated habitat patches in directing the movement of species between those patches. The habitats and corridors in the study were open patches created by harvesting in a pine forest. The results of the study indicated that corridors can increase the movement of species between otherwise unconnected habitat patches but that this effect did not necessarily occur for all species studied. The authors acknowledged that they selected their study species to include those that would be most likely affected by corridors and note that the effectiveness of corridors would be determined by site-specific factors. It is also clear from their data that a lack of corridors would decrease, but not necessarily eliminate, movement of species between patches and the authors note specifically that corridors direct, but do not necessarily enhance, movement between patches.

At best, this study provides only very limited support for GE’s arguments concerning maintenance of some forested riparian corridor and could in some ways be used to argue against it. It provides no support concerning the design of SED 10/FP 9 to avoid areas with high densities of species of concern.

Homan et al. (2004). GE cites Homan on p. 2-1 to support the statement that some species rely on vernal pools. Although there is no disagreement with the statement, the Homan study only supports it in the most general terms and is really dealing with quantifying the amount of upland habitat loss surrounding vernal pools that is necessary to produce significant population level effects in amphibians. The study is worth examining in greater detail outside of the context of the Work Plan because it was conducted in eastern Massachusetts, deals with local species (spotted salamander and wood frog), and addresses the extent of forested upland outside the actual vernal pool that amphibian populations depend upon.

Julian, Snyder and Young (in review). This paper is not yet available for outside review.

Kihslinger (2008). The Kihslinger paper was cited to support GE’s claim on p. 2-1 that remediation activities would disrupt the ability of species with strong site fidelities to return to and use these habitats and also to support the claim on p. 2-2 that replacement [presumed to mean **restoration,** as discussed above] of vernal pools, riverbanks, wetlands, and mature forests is not practicable. It is also cited to support the design of SED 10/FP 9 to avoid habitats that support high densities of species of concern (p. 2-3).

Kihslinger (2008) is not a technical paper in a peer-reviewed journal. Kihslinger is an environmental policy analyst with the Environment Law Institute and this review article is published in the National Wetlands Newsletter, which is an ELI publication. The paper deals primarily with compensatory mitigation under the Clean Water Act §404 regulations and much of the discussion deals with whether the wetlands created in compensation under §404 meet the regulatory requirements. There is also some discussion of whether wetland and bank function is successfully replicated in these compensatory projects. The author concludes that the program has failed to achieve its stated (in 1989) goal of achieving "no overall net loss" of wetland acreage and provides some suggestions for how it can be improved.

The key point in all of this is that the discussion is centered on the construction of new wetlands under the compensatory mitigation program, and not the restoration of wetlands that have already been impacted by contamination. Accordingly, it provides only limited indirect support for GE's claims that wetland function, and that of other habitat types, can not be achieved via "replacement." The distinction between replacement and restoration is important, because Kihslinger does provide support for the argument that replacement (in the sense of compensatory mitigation) in some cases does not work, but provides no information related to restoration as it is discussed for the river and floodplain.

Lichko and Calhoun (2003). This paper is cited on p. 2-3 to support the claim that vernal pools, wetlands, and other habitats can not be "replaced" (see discussion above).

As noted for the Kihslinger citation (above) and other citations in the Work Plan purportedly supporting the claim that wetlands and vernal pools can not be restored, the Lichko and Calhoun paper deals with the structure and function of wetlands **created** for compensatory mitigation as compared to similar unimpacted habitats and does not address the question of restoration of wetlands degraded by contamination. Accordingly, it suffers from all the same problems discussed above with respect to Kihslinger, which will not be repeated here. It is worth noting, however, that Lichko and Calhoun, along with other authors addressing the issue of compensatory mitigation, provide suggestions for improving the success of such efforts; no authors suggest that the basic concept is not practicable, or is fundamentally flawed and should be abandoned.

National Research Council (NRC) (2002): GE cites this 428 p. book on page 2-2 of the Work Plan to support the statement that natural hydrologic processes in the upper reaches of the PSA are responsible for creating the variety of habitats present in the area, and perhaps also to support the claim that remediation and stabilization of river banks would end these processes and lead to a reduction in habitat diversity.

With regard to the first point, which is not in question, the book contains a chapter dealing with fluvial processes and, although a statement that parallels the GE summary about processes in the upper reaches was not found, there is sufficient information that could be used to conclude that the statement is substantially correct.

The larger issue is whether the reference provides information to support the statement regarding the effects of bank stabilization. The NRC book includes a chapter on “Bank-Stabilizing Structures,” which discusses a wide variety of bank stabilization techniques and points out that bank-stabilization (they specifically discuss placement of rip-rap) can lead to decreased faunal diversity in the rip-rapped area. There does not appear to be any discussion that deals with the effect of bank stabilization on downstream areas, however, and no statement that would lead to the conclusion that decreased habitat diversity is a necessary result of bank stabilization conducted in upstream areas. (Note that this reference was not read in the entirety for purposes of this response.)

Note also that this reference includes a section on restoration of riparian areas which clearly indicates that the NRC believes that restoration of impacted riparian areas is not only possible but is one of the important goals of proper management of riparian areas.

Prosser and Brooks (1998). This reference is cited on p. 2-2 in support of the argument that the spatial integrity of the forested riparian corridor in the PSA must not be disturbed.

This study is exclusively focused on developing a habitat suitability index (HSI) for the Louisiana Waterthrush, and on evaluating the ability of the index to predict habitat suitability using data on the presence of the species in various habitats. The HSI model that was developed apparently was consistent with the field data, which showed that the Louisiana Waterthrush was “absent in highly fragmented landscapes.” No statement is made regarding forested riparian corridors, either with regard to the Louisiana Waterthrush or more generally. The applicability of this observation to the question of spatial integrity of the forested riparian corridor along the Housatonic River is questionable.

Semlitsch and Bodie (2003). Cited on p. 2-3 to support the argument for maintaining a forested riparian corridor with a minimum width of 1000 ft as part of SED 10/FP 9.

This paper deals with the extent of terrestrial habitats surrounding wetlands that should be protected to “fully protect” the “core habitats.” For amphibians and reptiles, the authors argue, using information from the literature, that these terrestrial areas could extend up to 400 m (1,312 ft). The assumption, however, is that the alternative for these terrestrial areas is permanent development, not a remediation/restoration activity with a finite time horizon and subsequent recovery, and the authors expressly state that they do not believe that “all terrestrial land-use activities around wetlands must be excluded.”

Turner (2005). Cited in support of the argument on p. 2-2 regarding maintenance of the spatial integrity of the forested riparian corridor.

This lengthy review paper deals with the subject of spatial heterogeneity in landscape ecology. Turner notes “the persistent influence of land-use history and natural disturbance on contemporary ecosystems” and the importance of patterns in the landscape for many taxa. She recommends that the knowledge of the importance of spatial heterogeneity continue to be refined and that a more definitive understanding of the relationship between spatial patterns and ecosystem processes needs to be developed.

The Turner paper provides no direct support for GE's arguments in the Work Plan regarding the forested riparian corridor, particularly since the issue is not with permanent development in the corridor but rather temporary remediation activities.

Zedler (2000). Cited on p. 2-2 to support the claim that "replacement" of vernal pools, wetlands, and other habitat types is "not practicable."

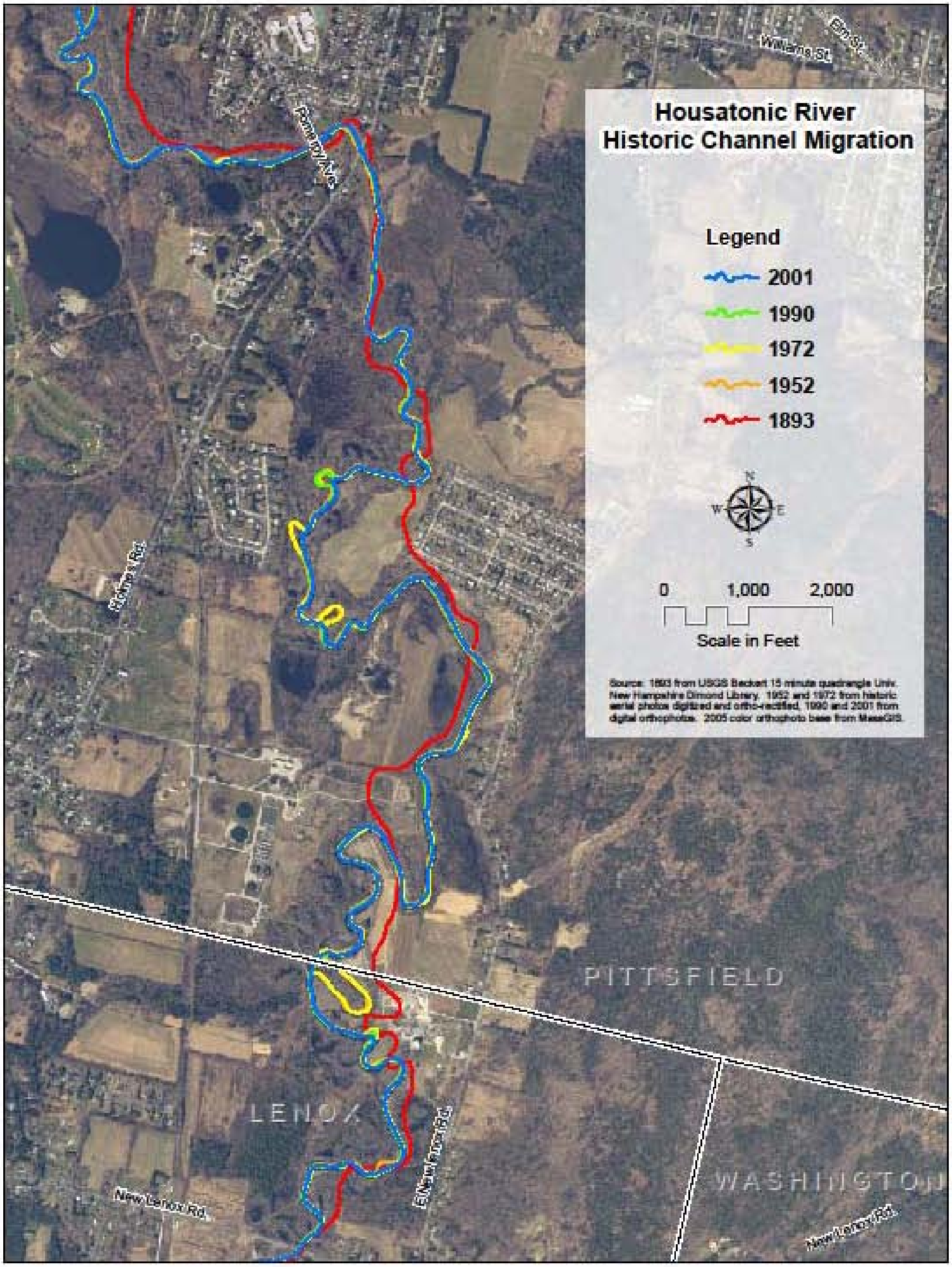
Nowhere does Zedler make a definitive statement that restoration of wetlands is not possible or practicable. She notes several difficulties in restoring wetlands and makes some recommendations regarding how these issues should be approached. She does note that recent research indicates that some wetland types can not be restored, citing work on drained fens in the Netherlands and diked salt marshes. She notes further that there is no consensus on these issues and that more research is needed. She does not advocate that wetland restoration should be abandoned or is not practicable, but rather suggests that approaches to restoration should be improved.

Note: In a more extensive recent article not cited by GE, Zedler (2005) takes a more positive position regarding ecosystem and wetland restoration. Although she notes that such restoration is not always fully successful, she recognizes the importance of developing new techniques for conducting and monitoring the success of restoration efforts and proposed "adaptive restoration" as a means of learning from ongoing efforts and shaping future directions for ongoing restoration projects. This discussion is clearly inconsistent with GE's statement that restoration of wetlands is "not practicable." It is also worth noting that Zedler is widely published on the topic of wetland restoration and is the editor of the CRC Press Handbook for Restoring Tidal Wetlands (2001).

References

Zedler, J.B. [editor] 2001. Handbook for Restoring Tidal Wetlands. CRC Press. Boca Raton, FL.

Zedler, J.B. 2005. Ecological restoration: guidance from theory. San Francisco Estuary and Watershed Science. 31 p.



Housatonic River
Historic Channel Migration
Legend
2001
1990
1972
1952
1893
N
S
W
E
0
1,000
2,000
Scale in Feet
Williams St.
Pomeroy Ave.
Holmes Rd.
PITTSFIELD
LENOX
WASHINGTON
New Lenox Rd.
E New Lenox Rd.
New Lenox Rd.

Attachment D

January 29, 2010 – GE Letter to EPA

Dispute Resolution on Certain Conditions in EPA's Conditional Approval Letter for GE's Work Plan for Evaluation of Additional Remedial Alternatives

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January 29, 2010

Ms. Susan C. Svirsky
U.S. Environmental Protection Agency
c/o Weston Solutions, Inc.
10 Lyman Street
Pittsfield, MA 01201

Re: GE-Pittsfield/Housatonic River Site
Rest of River (GECD850)
Dispute Resolution on Certain Conditions in EPA's Conditional Approval Letter for GE's Work Plan for Evaluation of Additional Remedial Alternatives

Dear Ms. Svirsky:

Pursuant to Special Condition II.N.1 of the Reissued RCRA Corrective Action Permit (the Permit) issued by the U.S. Environmental Protection Agency (EPA) to the General Electric Company (GE) in 2000 (and reissued in December 2007), GE hereby notifies EPA of GE's objections to certain conditions and directives set forth in EPA's letter of January 15, 2010, providing conditional approval of GE's August 31, 2009 *Work Plan for Evaluation of Additional Remedial Alternatives* (Work Plan) for the Rest of River portion of the Housatonic River.

Specifically, by this notice, GE is invoking dispute resolution under Special Condition II.N.1 of the Permit with respect to Conditions 20 and 22 in EPA's January 15, 2010 letter, which relate to Appendix C of the Work Plan and contain directives for GE's evaluation of an additional sediment remedial alternative identified by EPA, known as alternative SED 9. Those conditions and directives, as well as GE's objections to them and the bases for GE's position, are set forth in the attached Statement of Position.

In addition to the specific conditions as to which GE is invoking dispute resolution at this time, GE disagrees with a number of the other conditions and statements in EPA's January 15, 2010 letter. GE expressly reserves all its rights to contest any of the conditions, directives, and statements in EPA's January 15, 2010 letter – including GE's right, pursuant to Special Condition II.N.5 of the Permit, to raise any of its objections in a challenge to EPA's modification of the Permit to select corrective measures for the Rest of River, as well as any other rights that GE has under the Permit, the Consent Decree, or applicable law to raise such objections in the future.

As you know, the first stage of dispute resolution under the Permit involves discussions between the parties to attempt to resolve the disputes. GE looks forward to having such discussions with EPA during the next two weeks in an effort to reach a mutually agreeable resolution of the disputed issues identified in the attached Statement.

Very truly yours,

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

Attachment

cc: Dean Tagliaferro, EPA
Timothy Conway, EPA
Holly Inglis, EPA
Rose Howell, EPA (without attachment)
Michael Gorski, MDEP
Eva Tor, MDEP
Jane Rothchild, MDEP
John Ziegler, MDEP
Dale Young, MA EOEEA
Susan Peterson, CDEP
Thomas Hill, GE
Michael Carroll, GE
Roderic McLaren, GE
Kevin Mooney, GE
James Bieke, Goodwin Procter
Jeffrey Porter, Mintz Levin
Public Information Repositories

GENERAL ELECTRIC'S STATEMENT OF POSITION ON OBJECTIONS TO CERTAIN CONDITIONS IN EPA'S CONDITIONAL APPROVAL LETTER FOR GE'S WORK PLAN FOR EVALUATION OF ADDITIONAL REMEDIAL ALTERNATIVES

January 29, 2010

INTRODUCTION

On August 31, 2009, the General Electric Company (GE) submitted to the U.S. Environmental Protection Agency (EPA) a *Work Plan for Evaluation of Additional Remedial Alternatives* (Work Plan) as an addendum to GE's February 2007 Corrective Measures Study (CMS) Proposal for the Rest of River area of the Housatonic River, which was submitted pursuant to the Resource Conservation and Recovery Act (RCRA) Corrective Action Permit issued by EPA to GE on July 18, 2000 and reissued on December 5, 2007 (the Permit). That Work Plan called for the evaluation of certain additional remedial alternatives that were not evaluated in GE's March 2008 CMS Report. Those additional alternatives were: (a) a combination of additional sediment and floodplain remediation alternatives referred to jointly in the Work Plan as the Ecologically Sensitive Alternative and separately as alternatives SED 10 and FP 9; and (b) additional sediment and floodplain remediation alternatives that EPA had requested GE to evaluate, referred to in the Work Plan as alternatives SED 9 and FP 8, respectively.

EPA had agreed to the evaluation of the alternative combination now known as SED 10/FP 9 in correspondence dated February 5, 2009, but did not initially request GE to evaluate the new sediment alternative developed by EPA until a letter to GE dated April 1, 2009, where it explained that that alternative would use "wet excavation" techniques (i.e., removal through the water column) to remove PCB-containing sediments and riverbank soils in approximately the first seven miles of the Rest of River (Reaches 5A and 5B). GE subsequently submitted a draft work plan on May 1, 2009, presenting its proposal to evaluate the alternative combination now known as SED 10/FP 9 and the new sediment alternative requested by EPA. In July 2009, EPA provided further details regarding the new sediment alternative that it wanted GE to evaluate, including the assumption that, in Reaches 5A and 5B, that alternative would involve wet excavation by equipment operating within the river channel (either on the river bottom itself or from barges, depending on river conditions). At the same time, EPA also identified (for the first time) and described the new floodplain alternative that it wanted GE to evaluate.

GE's Work Plan described the additional alternatives and GE's proposed methodology for evaluating them; and it explained that that evaluation, together with a revised evaluation of the previously identified alternatives, would be presented in a revised CMS Report. The Work Plan noted that, to assess EPA's new alternative SED 9 using EPA's model, it would be necessary to revise certain inputs – notably, dredging production rates and PCB release rates during dredging (resuspension rates) – to reflect the remedial scenario and assumed dredging methods specified by EPA for Reaches 5A and 5B. Specifically, GE explained that, since SED 9 would involve sediment excavation in Reach 5A using heavy equipment operating in the river channel while the river water was flowing, the resulting production rates would be slower and the PCB resuspension rates would be higher than those that had previously been agreed upon for mechanical dredging from barges in Reach 5C and other downstream areas. In addition, GE explained that the production rate in both Reaches 5A and 5B should be reduced to account for higher velocity flows in those reaches. GE's proposed revised inputs for these parameters were presented in Appendix C to the Work Plan.

On January 15, 2010, EPA issued its conditional approval letter for the Work Plan. That letter included, among other conditions, conditions relating to Appendix C of the Work Plan. In Condition #20, EPA rejected GE's proposal to use lower production rates for implementation of SED 9 in Reaches 5A and 5B and directed GE to use the same production rate used for mechanical dredging in further downstream reaches. In Condition #22, EPA rejected GE's proposal to use higher PCB resuspension rates for implementation of SED 9 in Reach 5A and directed GE to use the same resuspension rate used for mechanical dredging from barges.

Pursuant to Special Condition II.N.1 of the Permit, GE is invoking dispute resolution on these conditions in EPA's letter. For the reasons set forth below, those requirements are arbitrary and unjustified.

GE expressly reserves all of its arguments and all of its rights to contest these or any of the other conditions, directives, and statements in EPA's January 15, 2010 letter – including its right, pursuant to Special Condition II.N.5 of the Permit, to raise any of its objections in a challenge to EPA's modification of the Permit to select corrective measures for the Rest of River, as well as any other rights that GE has under the Permit, the CD, or applicable law to raise such objections in the future.

GE POSITION

1. EPA's Directive To Use the Same Production Rate for SED 9 in Reaches 5A and 5B as Is Used for Mechanical Dredging Further Downstream Is Unsupported, Arbitrary, and Unrealistic.

As stated in the CMS Report, an average per-crew production rate of 275 cubic yards per day (cy/d) was selected for mechanical dredging performed "in the wet." This average daily rate is equivalent to 54,450 cy per year, based on an assumed schedule of 198 working days per year (i.e., 22 days per month between March and November). This rate was based on dredging from a barge in Reach 5C and downstream, with a series of barges used to ferry excavated and backfill materials to and from the associated staging areas. Such an approach was selected for these reaches for purposes of the evaluations in the CMS, because the relatively deep water (i.e., greater than 5 feet during normal flow conditions), improved channel access, few channel constrictions/obstructions, and increased barge mobility in those reaches make dredging using barges feasible.

However, as discussed in Appendix C to the Work Plan, average water depths in Reach 5A (i.e., typically less than 3 to 4 feet) make the use of barges infeasible in that reach. Therefore, consistent with EPA's instructions for SED 9, GE assumed that sediment excavation in Reach 5A would be performed with heavy conventional equipment (e.g., excavators, off-road trucks) operating on the bottom of the river channel while the river was flowing. To facilitate such operations, access ramps providing entry to the channel would be constructed (along with access roads to tie into existing roadways) and temporary roads would be constructed along the channel bottom.

Because of the difficulties and risks associated with operating heavy equipment in the river with the river water flowing, vehicle speeds and overall progress would be slowed significantly, and the cycle time required for the removal of individual truck loads of material would be increased compared to movement on access roads on the top of the banks. For example, the use of temporary roads would limit the number of transport vehicles in the river channel to just one truck at a time, with additional vehicles staged and waiting for passage through the channel to be clear. Further, without the construction of additional access roads and/or turnarounds, each truck would have to travel in reverse for one leg of the round trip along the bottom of the river. Combined, these limiting factors would increase the handling/transport time associated with each truck load, thereby reducing the overall number of loads of excavated/backfill materials (per day) relative to mechanical dredging from a barge floating on the river surface. In light of these and other factors, GE estimated that the overall average production rate of mechanical dredging in the wet from the channel bottom in Reach 5A (including the time necessary for construction and removal of the supporting temporary roads) would be approximately 30-35% slower than the estimated production rate of mechanical dredging in the wet from barges in the downstream reaches.

In addition, GE explained that Reach 5A, as well as Reach 5B (where GE assumed that mechanical removal would be performed using barge-mounted equipment), would be expected to have higher water velocities than further downstream reaches, which would lead to additional downtime. Specifically, GE noted that silt curtains, which would be anticipated to be used to help control resuspension under SED 9, have diminished effectiveness and stability in higher water velocities and are not recommended for use in water velocities greater than 1.5 feet per second (fps) (Francingues and Palermo, 2005). Thus, during such conditions, dredging operations may have to shut down to avoid uncontrolled resuspension. Further, GE determined the average number of days between March and November with anticipated high flows that could lead to suspension of wet excavation (either because of flows greater than 1.5 fps and/or because of flows at or above the 2-year flood) (Figure C-1 of Appendix C), and estimated that on an overall reach-wide basis, there would be around 30 such days in Reach 5A and around 15 in Reach 5B. By contrast, the assumed schedule of 198 working days per year for more downstream reaches assumed no or a lesser number of flow-related shutdown days.

Based on these factors, GE proposed to use the following average daily production rates for implementation of SED 9: 165 cy/d for Reach 5A (considering both the reduced efficiency in performing the mechanical dredging from within the channel and the likely increased downtime due to high water velocities); and 255 cy/d for Reach 5B (considering the likely increased downtime due to high water velocities).

EPA rejected these proposals. In Condition #20 of its January 15, 2010 letter, EPA stated that a production rate of 275 cy/d (equivalent to 54,450 cy per year) is achievable for both Reaches 5A and 5B. EPA failed to provide any information, rationale, or details supporting this conclusion or selection of this production rate for these reaches. In particular, it provided no response whatsoever to GE's demonstration in Appendix C that, due to the different river conditions in Reach 5A and the resulting difference in the dredging method (i.e., construction and use of temporary roads in the river channel and excavation using conventional equipment operating on the channel bottom while the river is flowing), production rates in Reach 5A would necessarily be slower than that assumed for mechanical dredging from barges in the downstream reaches. Instead, EPA simply asserted, without providing any support, that the same production rate used for the latter could be achieved in Reach 5A for SED 9, and it directed GE to use that rate. That directive was entirely arbitrary.

In addition, EPA did not provide a supportable rationale for rejecting GE's further proposal to slightly reduce the production rates in both Reaches 5A and 5B (compared to Reach 5C and downstream) to account for the likely increased downtime due to higher water velocities. EPA did assert, in Condition #21, that the Francingues and Palermo (2005) reference cited by GE with reference to silt curtains "does not state that silt curtains are not recommended for velocities higher than 1.5 ft/sec," but "states that currents greater than 1 to 1-½ knots are problematic, . . . and this current velocity is the accepted industry standard for conventional silt curtain deployment, effectively limiting deployment, except on a case-by-case basis." Since 1 knot equals 1.688 ft/sec (which is close to 1.5 ft/sec) and since this paper concludes that "the 1 to 1-½ knot value appears to be an industry standard," this reference generally supports GE's conclusion about the limitations on the use of silt curtains under high velocity flows. In any event, GE's point went beyond the precise number recommended as a limiting condition for silt curtain use. GE's more general point was that Reaches 5A and 5B have higher flow velocities than downstream reaches and that these conditions are likely to limit silt curtain use and the ability to work in the river on some days, thus requiring a modification in the production rate. EPA ignored that more general point without providing any reason for rejecting GE's proposed flow-based adjustments to the production rates.

EPA also stated in Condition #20 that, in the alternative, GE may consider a lower average production rate for SED 9 but only if the construction schedule is increased from 198 to 264 days (66 additional days), with work assumed to occur on weekends and throughout the winter months, so that the annual production rate still reaches 54,450 cy per year. However, making such an assumption for SED 9 would be inconsistent with the EPA-approved schedule assumption of 198 days/year for all of the other sediment remedial alternatives, and in direct conflict with EPA's often-stated mandate requirement that all of the alternatives be evaluated objectively on an equal footing. In any event, it is unreasonable to assume for purposes of the CMS that a multi-year "in the wet" dredging project could be performed consistently during the winter months.

For these reasons, EPA's directive to use the same annual production rate for implementation of SED 9 in Reaches 5A and 5B as is used for dredging from barges in further downstream reaches was arbitrary and unjustified. GE's proposed revised rates are reasonable and should have been approved.

2. EPA's Directive To Use the Same PCB Resuspension Rate for Excavation Using Conventional Equipment on the Bottom of the Flowing River as Is Used for Mechanical Dredging from a Barge Is Unsupported, Arbitrary, and Unrealistic.

The rate of resuspension of PCBs during dredging is generally related to the type of equipment used, including both dredging and containment equipment. In consideration of the range of resuspension estimates provided in the literature and professional judgment based on experience at other sites, resuspension rates of 1% of the dredged sediment PCB mass for hydraulic dredging and 2% for mechanical dredging were selected and approved by EPA for the model simulations of dredging presented in the CMS Report. The latter estimate was based on cases studies where work was performed from barge-mounted mechanical dredging equipment.

In Appendix C to the Work Plan, GE proposed the use of higher PCB resuspension rates for simulation of sediment removal in Reach 5A under SED 9. The primary reason for proposing such higher resuspension rates was that, to meet EPA's specifications for SED 9, it was assumed that sediment removal in Reach 5A would be performed using heavy conventional equipment (e.g., excavators, trucks) operating on the bottom of the channel while the river is flowing. Because of the potential disturbances of the river channel bottom associated with such heavy excavation equipment and trucks operating in a flowing river, GE concluded that the PCB resuspension rate would be higher than the previously approved release rate of 2% for mechanical dredging in the wet from barges.

In Appendix C, GE recognized that there is uncertainty associated with estimating the resuspension rate associated with sediment excavation where the equipment is directly placed on and operated from the river bottom. Indeed, to our knowledge, there are no data from sites where such removal techniques were used. Thus, GE proposed specifying the resuspension rate in the model for SED 9 in Reach 5A as a range to capture this uncertainty. Specifically, GE proposed a range of 5% to 9%, based on values from NRC (2001) (cited by EPA, 2005), which are from past experience in dredging projects (both navigational and environmental).

In Condition #22 of its January 15, 2009 letter, EPA rejected GE's proposal and directed GE to use, in the evaluation of SED 9, the same resuspension rate previously approved for mechanical dredging from a barge. EPA noted that the higher release rates quoted by GE came from studies that included navigational dredging projects (which included things like barge overflow and "fall-back," which would not be allowed during environmental dredging), and it cited more recent papers on environmental dredging. However, EPA did not address GE's main point – i.e., that excavation performed by heavy excavation equipment and trucks operating on the bottom of a flowing river would cause a higher resuspension rate than barge-mounted equipment.

EPA's conclusion was arbitrary and unrealistic. Although there are no data on the resuspension that would occur using a technique such as that assumed for sediment excavation in Reach 5A under SED 9, it is clear that that method would result in a higher resuspension rate than the dredging from a barge. For example, the movement of trucks and other equipment into and out of the flowing river and along the river bottom would result in mobilization of sediment beyond that which would occur during the excavation process itself, and the combined effects of such equipment movement and the excavation activities within the flowing river channel would result in resuspension well beyond that which would occur during use of barge-mounted equipment. Moreover, situations where river flows rise rapidly (as is the case for the Housatonic) and equipment is located within the river channel and exposed to increased current velocities can result in flow constrictions and increased sediment erosion due to locally elevated velocities beneath and adjacent to the equipment. These types of increased sediment mobilization due to operation of heavy equipment on the river bottom may be considered analogous to processes such as barge overflow and "fall-back," which were mentioned by EPA as associated with navigational dredging using barge-mounted equipment.

In short, it was arbitrary and unreasonable for EPA to ignore the differences between environmental mechanical dredging from a barge and the type of dredging from the riverbed that EPA has required for SED 9 in Reach 5A, and to simply direct use of the same resuspension rate set for the former without addressing those differences. Given the high probability that the PCB resuspension resulting from the excavation activities and the movement of excavators and trucks in the bottom of a flowing river channel would exceed that resulting from use of barge-mounted equipment, and given the absence of data on exactly how much greater that resuspension would be, GE believes that the most reasonable approach would be to use a range of values as a sensitivity analysis in the model, as it proposed.

CONCLUSION

For the reasons given above, EPA should withdraw Comments #20 and #22.*

* In addition to these conditions, EPA directed GE, in Condition #24 of its January 15, 2010 letter, to assume that, for SED 9, the removal of sediments from the backwaters, Woods Pond, and the Reach 7 and 8 impoundments would be performed concurrently with removal activities in Reach 5, that the capping activities in those downstream reaches would be deferred until after all sediment removal activities are completed, and that the removal depth in those downstream reaches must be increased to account for the estimated sedimentation during that interim period. Although EPA had reviewed GE's proposed approach for evaluating this alternative in GE's May 1, 2009 draft work plan and provided GE with further explanation of the details and assumptions for this alternative in July 2009, EPA never specified this unusual construction sequencing until its January 15, 2010 letter. The model remediation code previously developed by GE (and approved by EPA) as a modification to EPA's model was not designed to simulate this unusual sequencing of removal and cap placement. As a result, additional model code testing and development of model input files will be necessary, which will take additional

REFERENCES

EPA. 2005. *Contaminated Sediment Remediation Guidance for Hazardous Waste Sites.* U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. Washington, DC. EPA-540-R-05-012. December 2005.

Francingues, N.R., and Palermo, M. R. 2005. "Silt Curtains As a Dredging Project Management Practice." DOER Technical Notes Collection (ERDC TN-DOER-E21). U.S. Army Engineer Research and Development Center. Vicksburg, MS.

National Research Council (NRC). 2001. *A Risk-Management Strategy for PCB-Contaminated Sediments.* The National Academies Press., Washington, D.C.

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time. Following completion of these activities, GE will advise EPA if the requirement to model SED 9 under this modified sequencing approach would affect the timing for submittal of the revised CMS Report.

Attachment E

March 4, 2010 – GE Letter to EPA

Dispute Resolution on Certain Conditions in EPA’s Conditional Approval Letter for GE’s Work Plan for Evaluation of Additional Remedial Alternatives

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March 4, 2010

James T. Owens, III
Director, Office of Site Remediation and Restoration
U.S. Environmental Protection Agency. Region I
5 Post Office Square, Suite 100
Boston, MA 02101-3912

Re: GE-Pittsfield/Housatonic River Site
Rest of River (GECD850)
Dispute Resolution on Certain Conditions in EPA's Conditional Approval Letter for GE's Work Plan for Evaluation of Additional Remedial Alternatives

Dear Mr. Owens:

On January 29, 2010, pursuant to Special Condition II.N.1 of the Reissued RCRA Corrective Action Permit (the Permit) issued by the U.S. Environmental Protection Agency (EPA) to the General Electric Company (GE) in 2000 (and reissued in December 2007), GE invoked dispute resolution with respect to certain conditions (Conditions 20 and 22) set forth in EPA's letter of January 15, 2010, providing conditional approval of GE's August 31, 2009 *Work Plan for Evaluation of Additional Remedial Alternatives* (Work Plan) for the Rest of River portion of the Housatonic River. Subsequently, in accordance with Special Condition II.N.2 of the Permit, GE and EPA engaged in discussions at the staff level in an effort to resolve the dispute. GE and EPA extended the period for those discussions until February 22, 2010. However, GE and EPA were not able to resolve the dispute through those discussions.

Pursuant to Special Condition II.N.3 of the Permit, GE requests that you resolve this dispute. In accordance with that provision, I am enclosing GE's Statement of Position, which sets forth GE's objections to Conditions 20 and 22 in EPA's January 15, 2010 letter and the bases for GE's position.

In addition to the specific conditions involved in this dispute, GE disagrees with a number of the other conditions and statements in EPA's January 15, 2010 letter. GE expressly reserves all its rights to contest any of the conditions, directives, and statements in that letter – including GE's right, pursuant to Special Condition II.N.5 of the Permit, to raise any of its objections in a challenge to EPA's modification of the Permit to select corrective measures for the Rest of River, as well as any other rights that GE has under the Permit, the Consent Decree, or applicable law to raise such objections in the future.

Please let me know if you have any questions about our position or would like any further information.

Very truly yours,

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

Enclosure

cc: Richard Cavagnero, EPA
Robert Cianciarulo, EPA
Dean Tagliaferro, EPA
Timothy Conway, EPA
Susan Svirsky, EPA
Holly Inglis, EPA
Rose Howell, EPA (w/o enclosure)
Kenneth Kimmell, MA EOEEA
Laurie Burt, MDEP
Michael Gorski, MDEP
Eva Tor, MDEP
John Ziegler, MDEP
Mary Griffin, MDFG
Dale Young, MA EOEEA
Susan Peterson, CDEP
Thomas Hill, GE
Michael Carroll, GE
Roderic McLaren, GE
Kevin Mooney, GE
James Bieke, Goodwin Procter
Jeffrey Porter, Mintz Levin
Public Information Repositories

GENERAL ELECTRIC'S STATEMENT OF POSITION ON DISPUTED CONDITIONS 20 AND 22 OF EPA'S CONDITIONAL APPROVAL OF GE'S WORK PLAN FOR EVALUATION OF ADDITIONAL REMEDIAL ALTERNATIVES

March 4, 2010

INTRODUCTION

On August 31, 2009, the General Electric Company (GE) submitted to the U.S. Environmental Protection Agency (EPA) a *Work Plan for Evaluation of Additional Remedial Alternatives* (Work Plan) for the Rest of River area of the Housatonic River.[1] That Work Plan provided for the evaluation of certain additional remedial alternatives that were not evaluated in GE's March 2008 Corrective Measures Study (CMS) Report. Those additional alternatives were: (a) a combination of additional sediment and floodplain remediation alternatives referred to jointly in the Work Plan as the Ecologically Sensitive Alternative and separately as SED 10 and FP 9; and (b) additional sediment and floodplain remediation alternatives that EPA had developed and requested GE to evaluate, referred to in the Work Plan as SED 9 and FP 8, respectively.

EPA had initially requested GE to evaluate the new sediment alternative now known as SED 9 in a letter to GE dated April 1, 2009, in which EPA explained that that alternative would use "wet excavation" techniques (i.e., removal through the water column) to remove PCB-containing sediments and riverbank soils in approximately the first seven miles of the Rest of River (Reaches 5A and 5B). On May 1, 2009, GE submitted a draft work plan for the evaluation of that alternative, as well as the alternative combination now known as SED 10/FP 9. The draft work plan assumed that sediment removal in Reaches 5A and 5B under SED 9 would be performed in the wet by excavation equipment operating from the top of the riverbank. At a meeting to discuss the draft work plan on July 8, 2009, EPA indicated that it wanted SED 9 to use a different sediment removal technique in Reaches 5A and 5B – wet

[1] This Work Plan was submitted as an addendum to GE's February 2007 Corrective Measures Study Proposal for the Rest of River, which was submitted pursuant to the Resource Conservation and Recovery Act (RCRA) Corrective Action Permit issued by EPA to GE on July 18, 2000 and reissued on December 5, 2007 (the Permit).

excavation by equipment operating within the river channel itself. However, EPA refused to provide details regarding this technique.[2]

GE's Work Plan described the additional alternatives and GE's proposed methodology for evaluating them. For SED 9, consistent with the Agency's direction that excavation be performed from within the river channel in Reaches 5A and 5B, the Work Plan proposed that: (a) for Reach 5A (where the water depths make use of barges infeasible), sediment excavation would be assumed to be performed using conventional equipment (e.g., excavators, off-road trucks) operating on the channel bottom, using a gravel road or swamp mats or platforms placed directly on the riverbed; and (b) for Reach 5B, excavation would be assumed to be performed using barge-mounted conventional equipment. The Work Plan further noted that, in order to assess SED 9 using EPA's model, it would be necessary to revise the dredging production rates and PCB resuspension rates to reflect these dredging methods. GE explained that, since SED 9 would involve sediment excavation in Reach 5A using equipment operating in the river channel while the river water was flowing, the resulting production rates would be lower and the PCB resuspension rates would be higher than those previously approved for a different dredging method, mechanical dredging from barges, in Reach 5C and other downstream areas. In addition, GE proposed to reduce the production rate in both Reaches 5A and 5B to account for higher water current velocities in those reaches. GE's proposed production rates and PCB resuspension rates were presented in Appendix C to the Work Plan.

On January 15, 2010, EPA conditionally approved the Work Plan.[3] Its conditional approval letter included conditions relating to Appendix C of the Work Plan. In Condition #20, EPA rejected GE's lower production rates for implementation of SED 9 in Reaches 5A and 5B and directed GE to use the same production rate assumed for mechanical dredging in further downstream reaches. In Condition #22, EPA rejected GE's higher PCB resuspension rates for

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[2] At this meeting, EPA also indicated that it also wanted GE to evaluate a new floodplain alternative (now known as FP 8). As promised at the meeting, EPA sent a follow-up e-mail to GE on the same day providing a general description of both SED 9 and FP 8, but it provided no specifics regarding how wet excavation by equipment operating within the river could be accomplished under SED 9.

[3] EPA's conditional approval letter did not comment on and thus approved the specific dredging techniques included in the Work Plan for SED 9 – namely, use of conventional excavation and transport equipment operating on the channel bottom in Reach 5A and use of barge-mounted excavators in Reach 5B.

implementation of SED 9 in Reach 5A and directed GE to use the same resuspension rate used for mechanical dredging from barges.

On January 29, 2010, pursuant to Special Condition II.N.1 of the Permit, GE invoked dispute resolution regarding these conditions of EPA's approval of the Work Plan, and submitted a Statement of Position showing that those conditions were arbitrary and unsupported. Subsequently, in accordance with the dispute resolution provisions of the Permit, GE and EPA engaged in discussions in an attempt to resolve the disputes.[4] During those discussions, EPA indicated that the production and resuspension rates that it had directed GE to use could be met through the use of a different and novel dredging approach in Reach 5A that EPA had not previously mentioned to GE.[5] EPA did not agree to any change in its required production and resuspension rates for SED 9, and its suggested approach does not resolve GE's disagreement with those rates.

Since GE and EPA were not able to resolve these disputes through informal discussions, GE is submitting this Statement of Position pursuant to Special Condition II.N.3 of the Permit to seek resolution of these disputes by the Region I Director of the Office of Site Remediation and Restoration. Sections 1 and 2 of this Statement show that EPA's directives regarding the production and resuspension rates for SED 9, as set forth in its January 15, 2010 conditional approval letter, were unsupported and arbitrary. Section 3 shows that EPA's recent verbal description of an alternate approach to dredging in Reach 5A is a *post hoc* rationalization for those directives that does not justify the rates required by EPA.[6]

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[4] EPA and GE agreed to extend the initial 14-day discussion period provided for in Special Condition II.N.2 of the Permit until February 22, 2010.

[5] This approach is described in Section 3 and note 16 below.

[6] GE expressly reserves all of its arguments and all of its rights to contest these or any of the other conditions, directives, and statements in EPA's January 15, 2010 letter – including its right, pursuant to Special Condition II.N.5 of the Permit, to raise any of its objections in a challenge to EPA's modification of the Permit to select corrective measures for the Rest of River, as well as any other rights that GE has under the Permit, the Consent Decree, or applicable law to raise such objections in the future.

GE POSITION

1. EPA's Directive To Use the Same Dredging Production Rate for SED 9 in Reaches 5A and 5B as Is Used for Mechanical Dredging Further Downstream Was Unsupported and Arbitrary.

a. GE Properly Proposed Lower Production Rates for SED 9 To Account for Operating from the Riverbed in Reach 5A and for Higher Water Velocities in Reaches 5A and 5B.

As stated in the CMS Report, an average production rate (over the construction season) of 275 cubic yards per day (cy/d) was selected for mechanical dredging performed "in the wet."[7] This daily average rate was based on the assumption that dredging would occur from a barge in Reach 5C and downstream, where relatively deep water would make dredging using barges feasible.

However, as discussed in Appendix C to the Work Plan, average water depths in Reach 5A (i.e., typically less than 3 to 4 feet) make the use of barges for "wet excavation" infeasible in that reach. Therefore, consistent with EPA's general description of SED 9, GE assumed that sediment excavation in Reach 5A would be performed with conventional equipment (e.g., excavators, off-road trucks) operating on the bottom of the river channel while the river was flowing. To facilitate such operations, access ramps providing entry to the channel would be constructed, and temporary roads would be constructed along the channel bottom.[8]

Because of the difficulties and risks associated with operating equipment in the river with the river water flowing, vehicle speeds and overall progress would be slowed significantly, and the

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[7] As explained further in GE's March 2009 Response to EPA's Interim Comments on CMS Report (Response to Specific Comment 49), this average rate was estimated by assuming an excavation rate of 350 cy/d for full-scale production dredging and then subtracting from this rate the number of days estimated for the performance of necessary non-excavation activities (e.g., mobilization/demobilization, construction of temporary sediment staging areas and access roads, capping/backfilling, bank stabilization/restoration) plus 10% construction "downtime" (e.g., time related to equipment breakdowns, obstructions, extreme weather, etc.), so as to arrive at an ***average*** daily rate for the construction season. The resulting average rate of 275 cy/d is equivalent to 54,450 cy per year, based on an assumed schedule of 198 working days per year (i.e., 22 days per month for nine months – then assumed to be March through November). For comparison, EPA's implementation of the sediment/bank soil excavation project in the 1½ Mile Reach of the Housatonic River, using dry excavation techniques, had an average annual production rate of approximately 25,500 cy per year.

[8] The temporary roads in the river were assumed to consist of gravel or a series of swamp mats or modular platforms placed directly on the riverbed, over which heavy equipment could travel.

cycle time required for the removal of individual truck loads of material would be increased relative to the use of access roads on the top of the riverbanks. For example, the use of temporary roads in the river would limit the number of transport vehicles in the river channel to just one truck at a time, with additional vehicles staged and waiting for passage over the road in the river. Further, without the construction of additional access roads and/or turnarounds, each truck would have to travel in reverse for one leg of the round trip along the bottom of the river. Combined, these limiting factors would increase the handling/transport time associated with each truck load, thereby reducing the overall number of loads of excavated/capping materials (per day) relative to mechanical dredging from a barge floating on the river surface. In light of these and other factors, GE estimated that the overall average production rate of mechanical dredging in the wet from the channel bottom in Reach 5A would be approximately 30-35% slower than the estimated production rate of mechanical dredging in the wet from barges in the downstream reaches. This reduction would be in addition to the reductions due to non-excavation activities and general downtime (described in note 7 above), which would be associated with any mechanical dredging.

In addition, GE explained that Reach 5A, as well as Reach 5B (where GE assumed that mechanical removal would be performed using barge-mounted equipment), have higher water velocities than further downstream reaches, which would lead to additional downtime beyond the general downtime estimated for mechanical dredging in any reach.[9]

Based on these factors, GE proposed to use the following average daily production rates for implementation of SED 9: 165 cy/d for Reach 5A (considering both the reduced efficiency of performing mechanical dredging from within the channel and the likely increased downtime

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[9] Specifically, GE noted that silt curtains, which would be anticipated to be used to help control resuspension under SED 9, have diminished effectiveness and stability in higher water velocities and are not recommended for use in water velocities greater than 1.5 feet per second (fps) (Francingues and Palermo, 2005). Thus, during such conditions, dredging operations might have to shut down to avoid uncontrolled resuspension. Further, GE determined the average number of days between March and November with anticipated high flows that could lead to temporary cessation of wet excavation (either because of water current velocities greater than 1.5 fps and/or because of flows at or above the 2-year flood level) (Figure C-1 of Appendix C), and estimated that on an overall reach-wide basis, there would be approximately 30 such days in Reach 5A and approximately 15 in Reach 5B. By contrast, the assumed schedule of 198 working days per year for more downstream reaches did not include such a specific reduction in productivity for flow-related shutdowns.

due to high water velocities); and 255 cy/d for Reach 5B (considering the likely increased downtime due to high water velocities).

b. EPA's Rejection of a Lower Production Rate for Operating from the Riverbed Was Unsupported.

EPA rejected these proposals. In Condition #20 of its January 15, 2010 conditional approval letter, EPA stated that an average production rate of 275 cy/d (equivalent to 54,450 cy per year) is achievable for both Reaches 5A and 5B. EPA failed to provide any information, rationale, or details supporting this conclusion or selection of this production rate for these reaches. In particular, it provided no response whatsoever to GE's demonstration in Appendix C that, due to the different river conditions in Reach 5A and the resulting difference in the dredging method (i.e., construction and use of temporary roads in the river channel and excavation using conventional equipment operating on the channel bottom while the river is flowing), the production rate in Reach 5A would necessarily be lower than that assumed for mechanical dredging from barges in the downstream reaches. Instead, EPA simply asserted, without providing any support, that the same production rate used for the latter could be achieved in Reach 5A for SED 9, and it directed GE to use that rate. That directive was entirely arbitrary.

c. EPA's Rejection of a Lower Production Rate Due to River Flow Conditions in Reaches 5A and 5B Had No Supportable Rationale.

In addition, EPA did not provide a supportable rationale for disapproving GE's proposal to reduce the production rates in both Reaches 5A and 5B (compared to Reach 5C and downstream) to account for the likely increased downtime due to higher water current velocities. It gave no reason at all for rejecting the point that the higher velocities in those reaches will limit the ability to work in the river on some days, thus requiring a modification in the production rate (in addition to the general downtime modification for any mechanical dredging, which was based on many other factors besides flow).[10]

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[10] EPA did assert, in Condition #21, that the Francingues and Palermo (2005) reference cited by GE with reference to silt curtains "does not state that silt curtains are not recommended for velocities higher than 1.5 ft/sec," but "states that currents greater than 1 to 1-½ knots are problematic, . . . and this current velocity is the accepted industry standard for conventional silt curtain deployment, effectively limiting deployment, except on a

GE's conclusion that river conditions in Reaches 5A and 5B would limit the ability to work in the river and thus warrant a further reduction in the production rate is supported by review of the number of days when water depth would prevent safe operation of equipment within the river channel in Reach 5A. For purposes of this analysis, it is assumed that conventional equipment could not operate safely in water depths greater than 3 feet, so if a substantial portion of the river (e.g., more than 75%) had water depths over 3 feet, work within the river channel would not be able to be performed. GE has estimated that this would occur, on average, on approximately 36 days over the assumed annual 198-day construction season.[11] This estimate was based on use of the hydrodynamic model developed by EPA. The graph below shows the percentage of area in Reach 5A having model-predicted water depths greater than 3 feet during the assumed construction season, corresponding to various ranges of flow (at Pomeroy Avenue Bridge near the upstream end of Reach 5A).[12]

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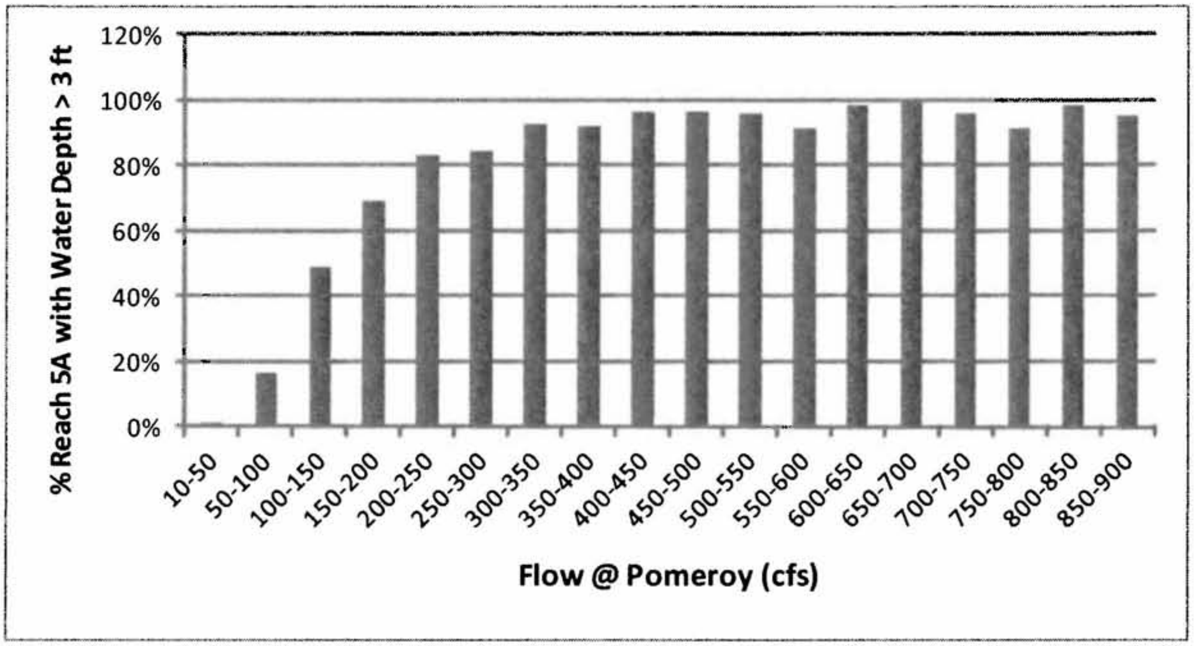
case-by-case basis." Since 1 knot equals 1.688 ft/sec (which is close to 1.5 ft/sec) and since this paper concludes that "the 1 to 1-½ knot value appears to be an industry standard," this reference generally supports GE's conclusion about the limitations on the use of silt curtains under high water velocities. In any event, GE's point went beyond the precise water velocity recommended as a limiting condition for silt curtain use. GE's more general point was that Reaches 5A and 5B have higher velocities than downstream reaches and that these conditions are likely to limit the ability to work in the river on some occasions, requiring an additional modification in the production rate beyond the estimated 10% downtime for any mechanical dredging. As noted in the text, EPA provided no reason for rejecting that more general point.

[11] Although GE originally assumed a 9-month construction season of March through November (consistent with all of the alternatives evaluated in the CMS), EPA stated during the recent discussions on this dispute that use of a 9-month construction season of May though January would better avoid high-flow events. Hence, in this illustrative analysis, GE has used the latter construction season.

[12] This plot was developed based on the model predictions of water depth over the full range of flow events simulated in EPA's 26-year validation period. The percentages shown correspond to the area of grid cells within Reach 5A that are predicted to have a water depth greater than 3 feet at the given flow range.



The above figure shows that more than 75% of Reach 5A will have water depths greater than 3 feet during the assumed construction season[13] when flow in the river at Pomeroy Avenue exceeds 200 cubic feet per second (cfs). Review of the flows in EPA's model during that season over the 26-year model validation period indicates that the average number of days per construction season in which flow exceeds 200 cfs is approximately 36 (which represents 18% of the assumed 198-day construction season). This illustrative analysis supports GE's additional adjustment for flow-related downtime in Reach 5A (beyond the general adjustment for downtime).

d. EPA's Alternate Suggestion of Working Year-Round Was Also Unjustified.

EPA also stated in Condition #20 that, in the alternative, GE may consider a lower daily average production rate for SED 9 but only if the construction schedule is increased from 198 to 264 days (66 additional days), with work assumed to occur on some weekends and throughout the winter months, so that the annual production rate still reaches 54,450 cy per year. However, making such an assumption for SED 9 would be inconsistent with the EPA-approved schedule assumption of 198 days/year for all of the other sediment remedial

[13] As noted above, that season has been assumed for this analysis to be May through January.

alternatives, and in direct conflict with EPA's often-stated mandate requirement that all of the alternatives be evaluated objectively on an equal footing. In any event, it is unreasonable to assume for purposes of the CMS that a multi-year "in the wet" dredging project could be performed consistently year-round, including during the winter and the early spring high-flow months.

2. EPA's Directive To Use the Same PCB Resuspension Rate for Excavation Using Conventional Equipment on the Bottom of the Flowing River as Is Used for Mechanical Dredging from a Barge Was Unsupported and Arbitrary.

a. GE Properly Increased the Resuspension Rates for Dredging in Reach 5A under SED 9 To Reflect Working on the River Bottom with Water Flowing.

The rate of resuspension of PCBs during dredging is generally related to the type of equipment used, including both dredging equipment and potential containment measures. In consideration of the range of resuspension estimates provided in the literature and professional judgment based on experience at other sites, resuspension rates of 1% of the dredged sediment PCB mass for hydraulic dredging and 2% for mechanical dredging were selected and approved by EPA for the model simulations of dredging presented in the CMS Report. The latter estimate was based on cases studies where work was performed with barge-mounted mechanical dredging equipment.

In Appendix C to the Work Plan, GE proposed the use of higher PCB resuspension rates for simulation of sediment removal in Reach 5A under SED 9. The reasons for proposing such higher resuspension rates were that: (1) the higher water velocities in Reach 5A would be expected to increase resuspension rates; and (2) the performance of sediment removal in Reach 5A using conventional equipment (e.g., excavators, trucks) operating on the bottom of the channel while the river is flowing would cause disturbances of the river channel bottom and associated PCBs that would increase the resuspension rates relative to those resulting from dredging from barges.

In Appendix C, GE recognized that there is uncertainty in estimating the resuspension rate associated with sediment excavation using equipment operating on the river bottom. Indeed, to our knowledge, there are no data from sites where such removal techniques were used. Thus, GE proposed specifying the resuspension rate in the model for SED 9 in Reach 5A as a range to capture this uncertainty. Specifically, GE proposed a range of 5% to 9% for resuspension at the excavator, based on values from NRC (2001) (cited by EPA, 2005).

b. EPA's Rejection of GE's Resuspension Rates for SED 9 Was Arbitrary.

In Condition #22 of its January 15, 2010 letter, EPA rejected GE's proposal and directed GE to use, in the evaluation of SED 9, the same resuspension rate previously approved for mechanical dredging from a barge. EPA's conclusion was arbitrary and unrealistic. Although there are no data on the resuspension that would occur with a dredging technique involving operation of excavators and trucks on the bottom of a flowing river, it is clear that that method would result in a higher resuspension rate than dredging from a barge.[14] For example, the movement of trucks and other equipment into and out of the flowing river on access roads built on PCB-containing riverbanks and along the existing river bottom on roads constructed of gravel (or swamp mats or modular platforms) placed directly on top of sediments containing PCBs would result in mobilization of those PCB-containing sediments and bank soils beyond that which would occur during the excavation process itself. The construction of those roads themselves would further disturb and mobilize the PCB-containing sediments and bank soils. The combined effects of these activities and the excavation activities within the flowing river channel would result in resuspension at the excavation point well beyond that which would occur during use of barge-mounted equipment.

In addition, the increased water velocities in Reach 5A compared to downstream reaches (as discussed in Section 1 above) would contribute to the likelihood of increased resuspension in that reach. Further, situations where river flows rise rapidly (as is the case for the Housatonic) and equipment and/or roads are located within the river channel and exposed to increased

[14] EPA's Condition #22 cited various papers on environmental dredging that reported average resuspension rates of around 1% for mechanical dredging. However, EPA did not address GE's main point – i.e., that excavation performed by excavation equipment and trucks operating on the bottom of a flowing river would cause a higher resuspension rate than barge-mounted equipment.

current velocities can result in flow constrictions and increased sediment erosion due to locally elevated velocities beneath and adjacent to the equipment.[15]

It was arbitrary for EPA to ignore these differences between mechanical dredging from a barge in the slower downstream portions of the river and the type of dredging from the river bottom that EPA has required for SED 9 in Reach 5A, and to simply direct use of the same resuspension rate for both. Moreover, EPA did not address GE's proposal that, given the absence of data on the extent of the increase in resuspension resulting from excavation activities and the movement of excavators and trucks on the bottom of a flowing river channel, a range of resuspension rates should be used as a sensitivity analysis in the model.

3. EPA's Post-Decision Description of an Alternate Dredging Method for SED 9 Is an Unwarranted *Post Hoc* Rationalization That Does Not Justify the Required Rates.

During the discussions between GE and EPA staff following GE's notice of this dispute, EPA indicated that the production and resuspension rates that it required for SED 9 could be met in Reach 5A through the use of a dredging approach different from that specified in the Work Plan. Based on EPA's verbal description (which is the only description that has been provided to GE), that approach would involve the concurrent performance of (a) excavation activities for the sediments and adjacent riverbank soils and (b) riverbed capping/bank stabilization activities, operating in both cases from a road in the river that would be incrementally excavated and capped as operations proceed, and using separate sets of equipment and crews

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[15] Apart from these factors, several points should be noted about the papers cited by EPA for estimates of around 1% resuspension for mechanical dredging (Bridges et al., 2008; Hayes and Wu, 2001; Palermo et al., 2008). Those papers not only did not involve dredging with equipment operating from the channel bottom, but also mostly involved navigable portions of estuaries, lakes, embayments, harbors, ship channels/terminals, or larger and deeper river systems – all of which are significantly different from Reach 5A. Moreover, the resuspension values reported in those papers were generally measurements of ***sediment*** resuspension rates (based on the mass of solids), rather than ***contaminant*** resuspension rates (based on the mass of PCBs dredged). The release of dissolved-phase PCBs in addition to the release of sediments containing PCBs can increase the ***PCB*** resuspension rates.

The recent experience of mechanical dredging of the Hudson River from barges showed an overall PCB resuspension rate of 3% at least a mile downstream of the dredging operations, with a rate of approximately 4% outside areas with resuspension controls (Anchor QEA and ARCADIS, 2010). This is similar to the resuspension rates of 3% during hydraulic dredging in the Grasse River (Connolly et al., 2007), 2.2% during pilot hydraulic dredging in the Fox River (USGS, 2000), and 1.3% to 5.8% of solids during pilot clamshell dredging in the Passaic River (Lower Passaic River Restoration Project Environmental Dredging Pilot Study Work Group, 2009). The experience at these sites indicates that even the 2% resuspension rate assumed for mechanical dredging from a barge on the Housatonic River is conservative.

for excavation and capping/stabilization, including specialized transport vehicles known as "crawler carriers."[16]

a. EPA's Description of an Alternate Dredging Approach Is an Unwarranted Post Hoc Rationalization for Its Directives.

EPA's post-dispute description of an alternate dredging approach is a *post hoc* rationalization for EPA's decision. When EPA first raised the idea of dredging from within the river channel, it rejected GE's request for any details about the technique to be used. Accordingly, GE made a proposal in the Work Plan as to how such dredging would be implemented. EPA's January 15, 2010 conditional approval letter did not suggest the use of an alternate dredging approach, either as a basis for its required production and resuspension rates or otherwise. In fact it approved the dredging approaches described in the Work Plan for Reaches 5A and 5B. EPA's subsequent description of an alternate approach during the dispute resolution process does not justify its previously unsupported and arbitrary directives. It is well established in administrative law that an agency's determination must be judged on the basis of the agency's contemporaneous stated reasons for making that determination and cannot be supported by *post hoc* rationalizations supplied later on review. See, e.g., *SEC v. Chenery Corp.*, 318 U.S. 80, 95 (1943); *Industrial Union Dep't v. American Petroleum Institute*, 448 U.S. 607, 631 n. 31 (1980). The same principle should apply here.

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[16] Under this approach, as we understand it from EPA's verbal description, starting at the upstream end of the reach, access ramps would be built on the river banks providing entry to the channel from access roads connected to existing roadways. A road would then be incrementally built in the river along one bank through excavation and capping of that linear area; and that road would be used by the relevant equipment to excavate into the channel as well as the adjacent riverbanks and to construct the sediment cap and stabilize the banks. Specifically, after the first excavator had advanced 200 feet or so down the road, a second excavator would start to cap the remainder of the channel (as well as to stabilize the banks), and this approach would continue throughout the reach working from upstream to downstream. Under this approach, each excavator would be paired with one or more "crawler carriers," which would be used either to transport cap material in or to transport excavated sediments and riverbank soil out. A crawler carrier is a small material transport vehicle designed for use in swampy areas. It has low ground pressure and rotates on its tracks so that it can proceed in either direction without turning around. Apparently, in EPA's view, this approach could be implemented in Reach 5A at about the same rate as dredging from a barge and would largely prevent the movement of trucks and other equipment on the existing river bottom (since they would remain on the constructed road), thus reducing resuspension.

b. EPA's Alternate Dredging Approach Has Severe Limitations That Would Appear To Prevent Attainment of the Rates Directed by EPA.

In any event, we are unaware of any precedent for the technique suggested by EPA indicating its feasibility on the scale that would be involved in SED 9. Further, there are many apparent limitations of that technique that would make it unworkable and/or incapable of achieving the rates directed by EPA. These include the following:

- *Water depth limitations of crawler carrier*: The crawler carrier was not developed for working in water and does not appear to have sufficient clearance to operate in much more than two feet of water. As a result, the crawlers could not be used in areas with water depths exceeding two feet, or else access or working roads built in the channel would have to be constructed to higher elevations to facilitate crawler operations. In the latter case, additional time would be necessary to construct as well as remove these additional road materials.

- *Capacity limitations of the crawler carrier*: Although the heaped capacity of the crawler carrier is 8 cy, its capacity when carrying wet sediments would be much less, probably about half of its total capacity, due to the aqueous nature of the sediments and the potential for spillage in the river and when going up the access ramps if it were full.

- *Speed limitations of the crawler carrier*: The crawler would need to operate in low gear in the river, which would be approximately 2.8 mph.

- *Maneuvering difficulties associated with two-way traffic associated with concurrent operations*: Sufficient area would need to be available for the crawlers to pass and for the crawlers to get around the excavators in the river. This would necessitate the construction of wider access roads or more frequent turn-outs.

- *Inability of the long-reach excavator to reach across the channel in all areas*: The effective reach of a long-reach excavator of the type that could be used for this application in Reach 5A is 50 to 60 feet. Such an excavator would not be able to reach the sediments and banks on the opposite side from the road in portions of Reach 5A where the width of the river exceeds approximately 75 feet (taking into account the width of the road). Review of 152 transects across the river in Reach 5A indicates that, at approximately half of those transects (79), the distance from the edge of water along one bank to the top of bank on the other side is greater than 75 feet.

- *Use of open bucket excavator*: Under the approach suggested by EPA, use of a clamshell bucket that fully closes, such as can be used on barge-mounted dredges, would not be feasible. Instead, a long-reach excavator with an open bucket would have to be used, which would increase the release of dredged material into the water.[17]

These factors undermine the feasibility of the method suggested by EPA or at least its ability to meet the required rates. For example, from a productivity standpoint, GE has estimated the daily excavation rate in Reach 5A using EPA's method based on the following assumed cycle time: 2 minutes for the crawler carrier to travel an average distance of 500 feet (i.e., the assumed halfway point between channel access points); 5 minutes to load 4 cy of sediment; 2 minutes to travel back 500 feet to the staging area; and 5 minutes to unload – for a total cycle time of 14 minutes for 4 cy. Doubling this to account for two crawlers and two-way traffic (which are the most that could practicably operate in a given river area under this approach) would allow removal of 8 cy in 14 minutes, which is a removal rate of approximately 0.57 cy/minute. This would amount to a full-scale excavation rate of 275 cy/day at 8 hours per day during dredging, without any adjustment to take into account the non-excavation activities and downtime (described above) that need to be considered in deriving an ***average*** daily production rate. This unadjusted rate is much lower than 350 cy/day unadjusted daily excavation rate that has been used for wet excavation from a barge for other reaches (see note 7 above). When this rate of 275 cy/d is adjusted to account for non-excavation activities and downtime, including the additional downtime resulting from higher flows in Reach 5A, the average production rate would be much lower. Based on an average reduction of 50 cy/d for non-excavation activities and a 10% reduction for general downtime (both of which are the same as assumed for all other sediment alternatives), together with an additional reduction of 18% for work stoppage due to

[17] Palermo et al. (2008, p. 160) reported that backhoe excavators had resuspension rates that were 2-3 times those of clamshell dredges.

high flows in Reach 5A (36 days in an assumed 198-day construction season, as discussed in Section 1.c), the resulting average daily production rate for the season would be 166 cy/d. Additionally, working in the manner suggested by EPA would mean that there would be up two excavators and four crawlers attempting to work in the same 1,000-foot section of the river. At a minimum, this would further slow production.

In addition, apart from the feasibility issues described above, a number of aspects of EPA's suggested approach for Reach 5A would lead to increased resuspension. These include the bank soil disturbances in building access ramps on the banks and the need to use an excavator with an open bucket for excavating sediments and bank soils (see note 17 above), as well as the increased water velocity in Reach 5A as described above.

CONCLUSION

For the reasons given above, the Director of the Office of Site Remediation and Restoration should direct the withdrawal of Comments #20 and #22 and should provide, or direct the EPA staff to provide, a clear explanation of the dredging approach that EPA wants GE to use for SED 9 for purposes of evaluating that alternative in the revised CMS Report.

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Attachment F

March 6, 2009 – GE Letter to EPA

Excerpts from Response to EPA's Interim Comments on Corrective Measures Study Report

GE Response: The 8-hour work day was discussed and agreed to by GE and EPA. Section 3.1.4.1 (General Construction Schedule Assumptions) of the CMS Report states: "Based on EPA's conditional approval letters of April 13 and July 11, 2007, the construction season (i.e., the total available time each year for the implementation of the remedial alternatives) was defined, for purposes of the CMS, as consisting of 9 months/year, 22 days/month, and 8 hours/day, for a total of 198 working days per year." (CMS Report, p. 3-10).

Specific Comment 49 (Page 20): *Page 3-10 to 3-11: Daily average production rates are used to determine overall timeframes for the project, including mobilization, set-up, excavation, backfill, restoration, down time, etc. Based on this, EPA believes that the actual capacity of each work crew for excavation is higher than the stated average provided in the CMS. For example, the size of the excavation crew necessary to achieve the 110 cy/day may need to have a capacity closer to 300 to 400 cy/day to achieve the overall intended result of 110 cy/day assumption (agreed to by EPA in the CMS-P conditional approval) to account for all non-excavation activities. In addition to the overall productivities, GE shall include the capacity of the excavation crew expressed on a cy/day basis.*

GE Response: GE agrees that the excavation production rate will be higher than the daily average production rates since, as observed by EPA, the daily average production rates incorporate the performance of other, "non-excavation" activities. In response to EPA's comment, GE has estimated the excavation production rates as a stand-alone activity based on the exclusion of time for the performance of non-excavation activities (e.g., mobilization, sheetpile installation, restoration) as described below.

First, for each reach in each alternative, the amount of time (in days) associated with the following items was estimated:

- Mobilization of equipment and materials;
- Construction of staging areas/access roads, and establishment of supporting facilities (e.g., trailers, water treatment) prior to the initiation of excavation activities;
- Construction of steel sheetpile removal cells and related cell-dewatering activities (for reaches with mechanical removal in the dry);
- Completion of backfill/cap placement, as discussed in the response to Specific Comment 50, following the completion of excavation; and

- General restoration (e.g., of staging areas) and demobilization following completion of excavation and backfill/cap placement

In addition, 10% of the reach-specific construction duration was assumed to be "down-time" with no active remediation or associated productivity.

The Gantt charts prepared in response to Specific Comment 47 illustrate the sequencing as well as the estimated time associated with these activities. The sum of this time (i.e., the number of days estimated for the performance of non-excavation activities) plus the estimated "down-time" were subtracted from the respective reach-specific construction durations estimated using the daily average excavation production rate (see Response to Specific Comment 20). The remaining duration, considered to be excavation-related only, was then used in the calculation of daily excavation rates.

Table SC49-1 summarizes the maximum estimated rates for mechanical/hydraulic dredging in the wet and excavation in the dry. Note that because of the deeper excavations, increased volumes, and related greater marginal productivities associated with SED 7 and SED 8, maximum rates for these alternatives have been distinguished from those in the SED 3 through SED 6.

Table SC49-1. Maximum Estimated Rates for Mechanical/Hydraulic Dredging in the Wet and Excavation in the Dry.

Removal Technology	SED 3 – SED 6		SED 7 and SED 8	
	Daily Average Production Rate per Crew (cy/d)	Daily Excavation Rate per Crew (cy/d)	Daily Average Production Rate per Crew (cy/d)	Daily Excavation Rate per Crew (cy/d)
Mechanical/Hydraulic Dredging in the Wet	275	350	350	425
Mechanical Dredging in the Dry	110	180	140	200

<u>Specific Comment 50 (Page 20):</u> *<u>Page 3-12</u>: EPA disagrees that additional time should be added to the schedule to account for backfill activities. In general, the agreed-upon productivities were developed to be inclusive of backfill activities. Similarly, for Reaches 5A and 5B, stabilization of banks should also not add to the overall schedule, and is included in the overall timeframe as determined from the average productivity rate assumed and agreed to by EPA in the CMS-P conditional approval. These assumptions suggest that there will be no concurrent excavation downstream of ongoing backfill activities. If the excavation percent completes are correct as shown in Table 3-4, and backfill work cannot begin until at least those percentages of excavation have been completed, then a second crew working solely on backfill would be justified working upstream of the active excavation area. GE shall re-evaluate the excavation percent completes and the possibility of adding backfill crews to reduce the overall timeframes of the alternatives, and include the results of the assessment in the Supplement.*

GE Response: For the purposes of the CMS, the estimates of construction time were based on certain average production rates, assumptions related to the numbers of crews feasible in specific reaches, and conceptual schedule overlaps – all of which were established and agreed upon with EPA prior to submitting the CMS Report (or, in some cases, revised assumptions that would accelerate the schedule). Specifically, GE used technology-specific average daily production rates and crew size assumptions specified in the CMS Proposal Supplement, as modified in EPA's conditional approval letter dated July 11, 2007. Additionally, as discussed in an October 2007 meeting with EPA, GE proposed that all reaches would be addressed sequentially, with all remedial activities assumed to be complete in a particular reach before any activities were begun in the subsequent reaches. In the October 2007 meeting, GE also discussed using removal and backfill/capping production rates as the basis of the overall schedule, and presented the assumed overlap of excavation and backfill/capping activities. EPA approved this approach in a November 11, 2007 email to GE.

Following a January 2008 meeting with EPA, GE reconsidered the overlap between dry excavation and backfill/capping operations and decided to modify the schedule to increase the overlap and to assume that backfilling/capping would begin when excavation was approximately 60% complete. Additionally, the overlap for wet excavation in the river channel was increased so that backfilling/capping would begin when excavation was approximately 40% complete. Table SC50-1 below summarizes the overlaps that were originally presented in the October 2007 meeting and the actual overlaps used in the development of reach- and alternative-specific construction schedules in the CMS.

Table SC50-1. Originally Proposed Excavation-Backfill/Capping Overlaps versus Actual Overlaps Used in the Development of Reach- and Alternative-Specific Construction Schedules.

Removal Technology	Location	Originally Proposed Excavation Percent Complete Prior to Commencing Backfill/Capping	Actually Used Excavation Percent Complete Prior to Commencing Backfill/Capping
Dry Excavation	Channel	73%	60%
Wet Excavation	Channel	50%	40%
Wet Excavation	Pond/Impoundment	100%	100%

As previously discussed, GE included time for backfilling/capping and bank stabilization activities (where appropriate) to account for constructability issues (e.g., limited space in dry removal cells and potential recontamination in wet excavation areas). In each reach, GE estimated the start of backfilling/capping activities (i.e., the lag time following the start of excavation) to minimize the time added to the overall schedule. For example, within Reach 5A, when the schedule is broken down on a per cell basis, the average time to complete excavation and restoration within a removal cell is 8.5 days. Of this time, approximately 7 days are related to removal and 1.5 days are related to the additional time for backfill/capping and bank stabilization/restoration activities that occur after excavation is complete.[24] If it were assumed that backfilling/capping activities in the same cell were initiated much earlier, the backfilling/capping activities would finish before the completion of excavation activities.

GE also accounted for certain reach-specific limitations (such as space constraints) that required adding time into that reach's overall schedule. Where possible, GE incorporated the use of multiple crews working simultaneously (e.g., in Woods Pond) to expedite the completion of conceptual remedial activities; however, in some reaches (e.g., Reaches 5A and 5B), this was not a viable option given the removal methods and related space constraints. The addition of more crews in an attempt to increase concurrent excavation and backfilling/capping activities and thus expedite the overall schedule is not possible in

[24] As previously noted in the Response to Specific Comment 47, the restoration activities included in these schedules consist of the restoration activities that would be performed immediately upon the conclusion of the remediation activities. They do not include any restoration activities that may have to be performed later (e.g., replanting).

some reaches. For example, given the available space and geography in Woods Pond, it was assumed that two crews would be used to perform removal activities, followed by two crews performing backfilling/capping operations. As discussed above, for all impoundments, it was assumed that removal and backfill/capping activities would be performed sequentially, such that removal activities would be complete before beginning backfill/capping. If this sequenced approach were changed so that excavation and backfill/capping occurred simultaneously, maintaining two crews for each activity would mean four crews would be operating simultaneously. Given the need for work space and staging areas associated with four active work crews and the potential for recontamination associated with simultaneous adjacent removal and backfill operations, the limited space within and adjacent to Woods Pond makes this an infeasible option.

Additional information illustrating how the removal and restoration activities interrelate and contribute to the overall construction schedule is presented in the Response to General Comment 20.

As discussed above, the estimates of construction time used in the CMS Report, which were based on assumptions that were agreed upon with EPA (or later revised to shorten the time), are reasonable for purposes of the CMS. However, during design of a given remedial action, consideration would be given to modifying the excavation percent completes further and/or adding backfill crews in some areas to reduce the overall timeframe. Such modifications could include the possibility of beginning excavation in a further downstream area while backfill was still being conducted in an upstream area. These and other efficiencies would be considered during design to the extent practical.

Specific Comment 51 (Page 20): *Page 3-14: GE shall provide a table summarizing the volume calculations, including the areas, depths, and calculated volume for each alternative and each reach.*

GE Response: Table SC51-1 provides, for each sediment alternative, a summary of the removal volumes and depths and remediation areas for each reach of the river. Specifically, this table lists, for each alternative and each reach, the depth and volume of removal, acres of replacement capping or backfill in removal areas, acres of capping without prior removal, acres of thin-layer capping, and acres subject to MNR. Note that total volumes for SED 6, SED 7, and SED 8 differ from those presented in the CMS Report as this table includes the additional removal volume and remediation area in Reaches 7B and 7C that have been added in response to Specific Comment 44.

Attachment G

Summary of Calculation of Annual Production Rates and Durations

Attachment G
Summary of Calculation of Annual Production Rates and Durations

Background

GE states in its January 29, 2010 Statement of Position and March 4, 2010 Statement of Position (Attachment D, at 3 and Attachment E, at 4, ftnt 7, respectively) that the average production rate of 275 cy/day for wet excavation is equivalent to a production rate of 54,450 cy/year, based on 198 working days per year. EPA agrees with these three assumptions for the purpose of evaluating the alternatives in the CMS.

However, EPA believes that GE's conclusions on production rates and project duration do not follow from those assumptions. Specifically, EPA's review of GE's calculations leads to the conclusion that GE apparently did not include "backfill" in its average daily production rate assumptions.[1] The significance of this disparity is that GE's stated project duration for the SED 9 alternative is substantially longer than if backfill had been included within the average daily production rate assumption.

According to GE's response to Specific Comment 49 (Attachment F, at 202, bullet 4), the average daily production rate incorporates the time required to complete backfill/cap placement activities. Using this same rationale, GE's proposed average daily production rate of 165 cy/day for Sediment Alternative 9 (SED 9) in Reach 5A should result in an average annual production rate of 32,670 cy/year (based on a 198 day schedule). For Reach 5B, GE assumed an average daily production rate of 255 cy/day, which should equate to an annual production rate of 50,490 cy/year.[2] However, when evaluating GE's overall duration for SED 9 specified in GE's August 2009 Work Plan, it appears that GE has further significantly reduced the annual average production rate and the average daily production rate by not incorporating the placement of backfill into these production rates. Essentially, it appears that instead of incorporating backfill time into the average daily production rate, GE added on to the project duration significant additional backfill time. See Tables G-1 through G-5 and Figure G-1.

Calculation of Duration of Alternative

GE did not include a breakdown of the duration of excavation and backfill activities per reach in their Work Plan for SED 9, only a total duration for SED 9 of 27 years. (Work Plan at 2-11). That duration can not be matched using the production rate assumptions

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[1] EPA's letters dated April 13, 2007 (Attachment H), July 7, 2007 (Attachment I) and September 9, 2008 (Attachment J) make it clear that EPA approved the daily average production dates based on the presumption that these rates included backfill. (GE's appears to acknowledge this by citing as an example that an average daily production rate of 275 cy/day results in an average annual rate of 54,500 cy.). For example, Specific Comment 49 from EPA's Conditional Approval Letter dated September 9, 2008 states; "Daily average production rates are used to determine overall timeframes for the project, including mobilization, set-up, excavation, *backfill*, [emphasis added] downtime, etc." Attachment J, at 20.

[2] EPA does not agree with GE's assumptions of 165 cy/day in Reach 5A, and 255 cy/day in Reach 5B, but is using those figures here for illustrative purposes.

being discussed; EPA cannot replicate the duration for SED 9 directly based upon the information provided in the Work Plan.

In attempting to identify the source of this disparity, EPA first calculated durations by assuming that the completion of backfilling was included in the average daily and annual production rates as EPA had stated in Attachment J at 20. This is referred to as Method A in the attached tables. This resulted in overall durations of 4.8 years for Reach 5A and 1.9 years for Reach 5B. This method would result in an overall duration for the alternative of significantly less than 27 years for completion of the entire alternative. (See Table 1). Accordingly, using GE's proposed productivity assumptions, the duration times do not approach the 27 years cited by GE.

Second, in a further attempt to determine how GE arrived at its estimate of 27 years for SED 9, EPA, while not in agreement with the individual assumptions, then estimated durations using the same excavation production rates, but with an assumption that backfill/cap placement activities were not initiated until 40% of each Reach was excavated as GE assumed for wet excavation for downstream reaches (Attachment F, at 205). EPA also assumed that the excavation activities in Reach 5B would not be initiated until all removal and subsequent cap placement in Reach 5A were complete. This is referred to as Method B in the attached tables and figure. Incorporating this 40% lag prior to initiating backfill activities resulted in projected durations of 7.8 years for Reach 5A and 3.2 years for Reach 5B. (See Table 2).

Using these durations for Reach 5A and 5B, the overall duration for SED 9 could approximate 27 years. Therefore, it appears that GE used some version of this method to calculate durations in its Work Plan.

Method B equates to a 63% increase in schedule duration to account for time spent only backfilling (7.8 years compared to 4.8 years) in Reach 5A and a 68% increase in schedule duration to account for time spent only backfilling in Reach 5B (3.2 years compared to 1.9 years).

It thus appears that when calculating the overall durations for each Reach, GE factored in backfill in a manner that is inconsistent with GE's March 2009 response to Comment 49 (Attachment F, at 202). In addition, it appears that GE does not begin excavation in the downstream Reach until completion of backfill has occurred in the upstream Reach (Figure 1).

As shown in the attached tables, this leads not only to the substantial increases in schedule duration assumptions shown above, but also to substantial reductions in the annual and daily production rates, which are *approximately 40% less* than GE's claimed average production rates of 165 cy/day for Reach 5A and 255 cy/day for Reach 5B stated in GE's August 2009 Work Plan, each of which is itself in dispute. See Tables 3 through 5.

Summary

GE's calculations apparently do not incorporate backfilling into the average daily production rate assumptions. This results in an increase in overall durations of approximately 63 to 68% for Reaches 5A and 5B, and is inconsistent with GE's Response to Comment 49 of EPA's September 2009 CAL, and multiple EPA directives (see footnote 1 above).

It also appears that based on how GE applied the excavation and backfill rates for SED 9, GE's statements on Page 3 of its January 29, 2010 letter and in Footnote 7 of its March 4, 2010 letter that an average production rate of 275 cy/day is equivalent to a production rate of 54,450 cy/year, based on 198 working days per year (or other average daily production rates for other methods), is not what is being achieved in GE's evaluation of the various alternatives.

Therefore GE's estimate of the duration of SED 9 appears to be significantly overstated.

Table G-1
Method A ─ Calculation of Durations Assuming Backfill/Cap Placement included in Production Rates

Reach	**Average Daily Production Rate**	**Number of Working Days per year**	**Average Annual Production Rate** (Average Daily Production Rate times the Number of Days)	**Quantity of Material to be Excavated**	**Duration** (Quantity of material to be excavated divided by the Average Annual Production Rate)
5A	165 cy/day	198 days/year	32,670 cy/year	158,000 cy	4.8 years
5B	255 cy/day	198 days/year	50,490 cy/year	97,000 cy	1.9 years
5A + 5B					6.7 years

Table G-2
Method B ─ Calculation of Durations Assuming 40% Lag before Initiation of Backfill/Cap Placement
(Method Apparently used by GE in Determining Durations)

Reach	**Duration to Complete Excavation** (see above table)	**Initiation of Backfill/Cap Placement** (Excavation Duration times 0.4 (40%))	**Quantity of Backfill** (Same as the Quantity of Material to be Excavated)	**Average Annual Backfill Rate** (from Work Plan -- Daily Rate times 198 days/year)	**Duration to Complete Backfill** (Quantity of Backfill divided by Average Annual Backfill Rate)	**Overall Duration** (Year backfill initiated plus duration of backfill placement)
5A	4.8 years	Year 1.9	158,000 cy	26,730 cy/year	5.9 years	7.8 years
5B	1.9 years	Year 0.76	97,000 cy	39,600 cy/year	2.45 years	3.2 years
5A + 5B						11 years

Table G-3
Actual Annual and Daily Production Rate Assuming 40% Lag before Initiation of Backfill/Cap Placement
(Method B – Method Apparently used by GE in Determining Durations)

Reach	**Duration to Complete Excavation & Backfill** (see above table)	**Quantity of Material to be Excavated**	**Actual Annual Production Rate** (Quantity of Material to be Excavated divided by Duration to Complete Excavation & Backfill)	**Actual Average Daily Production Rate** (Actual Annual Rate divided by 198 days/year)
5A	7.8 years	158,000 cy	20,256 cy/year	102 cy/day
5B	3.2 years	97,000 cy	30,312 cy/year	153 cy/day

Table G-4
Percent Reduction in Average Daily Production Rates Assuming 40% Lag before Initiation of Backfill/Cap (Method B) Compared to Average Daily Production Rates Assuming Backfill/Cap Placement included in Production Rates (Method A)

Reach	**Average Daily Production Rate by Method A**	**Average Daily Production Rate by Method B** (from Table 3)	**Percent Reduction in Average Daily Production Rate** [1 – (Method B Rate divided by Method A Rate)] times 100 %
5A	165 cy/day	102 cy/day	38%
5B	255 cy/day	153 cy/day	40%

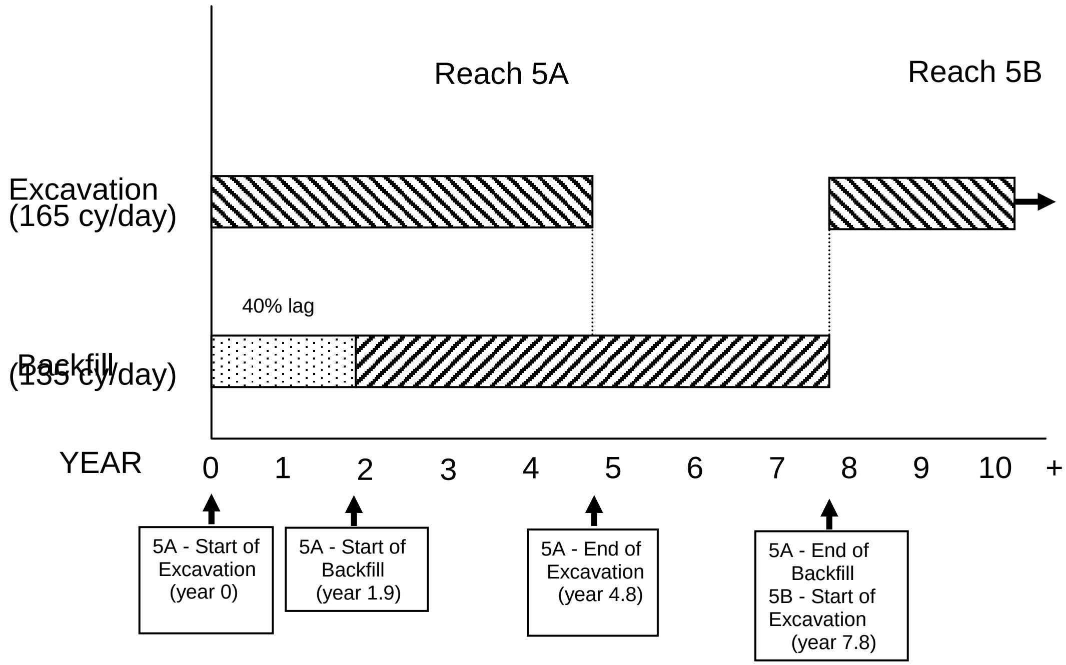
Table G-5
Percent Reduction in Average Annual Production Rates Assuming 40% Lag before Initiation of Backfill/Cap (Method B) Compared to Average Annual Production Rates Assuming Backfill/Cap Placement included in Production Rates (Method A)

Reach	**Average Annual Production Rate by Method A**	**Average Annual Production Rate by Method B** (from Table 3)	**Percent Reduction in Average Daily Production Rate** [1 – (Method B Rate divided by Method A Rate] times 100 %
5A	32,670 cy/year	20,256 cy/year	38%
5B	50,490 cy/year	30,312 cy/year	40 %

The above calculations include the following assumptions:
The volume of material to be excavated in Reach 5A includes 134,000 cy of sediment plus 24,000 cy of bank soil, for a total of 158,000 cy. The volume of material to be excavated in Reach 5B includes 88,000 cy of sediment plus 9,000 cy of bank soil, for a total of 97,000 cy. The 33,000 cy of bank soil material agreed upon for Reaches 5A and 5B was pro-rated by the length of Reach 5A compared to the length of Reach 5B.

Bank soil excavation and backfill activities will be conducted concurrent to sediment excavation and backfill activities in Reaches 5A and 5B.

Figure G-1 – Method B for Determining Schedule for SED 9



Attachment H

April 13, 2007 – EPA Letter to GE

Excerpt from EPA's Conditional Approval of the Corrective Measures Study Proposal be run using data from periods for which there are tissue data to evaluate the reasonableness of the calculation.

64. Page 5-20 – Note that EPA completed the 1 ½ Mile Removal of sediment and bank soil in March of 2006. The major limitation of the data available for the year following completion of the removal is the lack of data at high flows.

65. Page 5-23 – EPA agrees that the values for the parameters provided in the bulleted list are site-specific and subject to uncertainty. While some of the values for these parameters are provided in the CMS Proposal, others are being provided in the Addendum to be submitted to EPA by April 15, 2007. To best characterize the model estimates of metrics of interest in evaluating the performance of the proposed alternatives, GE shall conduct model simulations in the CMS using alternative values for some of these parameters as specified by EPA in this letter or in the response to the Addendum. This will result in two model estimates for some parameters. Model simulations using these bounding estimates will be expected to incorporate the uncertainty surrounding these values.

    In addition to developing attenuation factors for estimating PCB concentrations in Lake Lillinonah and Lake Zoar, GE shall also develop attenuation factors and PCB concentrations estimates for Lake Housatonic.

66. Page 5-24 and Table 5-2 – Production Rates – The text states that the production rates in Table 5-2 are based on rates from similar projects where remedies have been completed and for the upper two miles of the Housatonic. The annualized production rates for hydraulic dredging in the table are very low, from 70 to 220 cy/day (9 to 28 cy/hr for an 8 hour day). The mechanical dredging rates also are low, from 60 to 240 cy/day (8 to 30 cy/hr for an 8 hour day). EPA believes that a more realistic low-end production rate for wet mechanical dredging is 282 cy/day (assuming the smallest bucket size listed in the EPA 2005 guidance). This rate would increase with an increase in bucket size or use of multiple buckets. Similarly, a more realistic low-end production rate for hydraulic dredging is 397 cy/day. This rate assumes the smallest diameter pipe/dredge (15 cm) used in the EPA 2005 guidance. These annual average estimates assume dredging for 8 hours per day, 22 days per month, and 9 months of the year.

    Production can be defined in terms of the operating production rate (the rate during time periods of active dredge operation) or effective production rate (the rate considering effective hours per day, days per week, and weeks per dredging season). The text states the rates in Table 5-2 are based on an annual production rate, converted to a daily rate. This wording implies the table values are considering the effective time, but may be a rate spread over an entire year (which would be inappropriate considering a possible winter shutdown or other shutdowns, e.g. high flows). EPA believes that it is better to evaluate effective time, to include a seasonal shutdown, and calculate the required dredging seasons to do the job. GE shall estimate removal over dredging seasons rather than full years in the modeling exercise as well as for evaluations of schedule and costs.

GE shall provide in the Supplement specifics on the assumptions of operating production rates, projects from which rates have been estimated, and effective time in hours, days, and weeks used to calculate the effective production rate over a season.

67. Page 5-25 – Assumption of PCB concentration in "clean" backfill material – GE shall perform model simulations in the CMS using the proposed PCB concentration of 0.021 mg/kg (½ the detection limit), as well as simulations using 0 mg/kg PCB.

68. Page 5-26/5-27 – It is unclear if residual and resuspension concentrations are based on model grid cell-specific simulated PCB concentrations or those calculated at the level of a spatial bin. GE shall indicate in the Supplement the scale at which these concentrations will be determined and/or applied.

69. Page 5-26/5-27 – Discussion of the placement of the thin layer cap assumes no instantaneous mixing with the underlying sediment. The same assumption shall be made for placement of backfill or engineered caps. As demonstrated by GE's preliminary work at Silver Lake, proper placement of cap material/backfill (e.g. thin lifts) can result in little to no mixing.

70. Page 5-27 – EPA agrees that the resuspension rates for dredging (1% for hydraulic dredging and 2% mechanical dredging) are reasonable for use in the CMS evaluation. It is EPA's understanding that these values are appropriate in the absence of silt curtains, and resuspension could potentially be reduced with the use of these engineering controls. In the modeling exercise, this shall be explicitly recognized in the discussion of model results. Such controls shall be considered if either of these techniques is selected as a component of the remedy.

    In addition, there is no discussion of the release of solids that would occur concurrent with any release of PCBs. GE shall represent the resuspension of both solids and PCBs in the model simulations, and shall represent the composition of the solids consistent with the vertically averaged solids composition across the dredge cut.

    It should be noted that the reference Alcoa, 2006 is not publicly available and therefore EPA could not verify the statement made regarding post-placement concentrations being higher than the source material.

71. Page 5-28 – There is a typographical error at the bottom of the page, the reference to evaluation criteria should read Section 5.2.4.

72. Page 5-29 – Water column metrics shall include PCB concentrations at the two locations proposed and for Bulls Bridge, and Lake Lillinonah, Lake Zoar, and Lake Housatonic (from the CT analysis).

    The sediment metric shall be calculated for the subreach-specific FCM exposure concentration as simulated by EFDC. It is unclear from the text if sediment

Attachment I

July 11, 2007 – EPA Letter to GE

Excerpt from EPA's Conditional Approval of the Corrective Measures Study Proposal Supplement, and Model Code Proposal, and Approval of the Addendum to Supplement tissues modeled. Because mink and other animals average their exposure spatially and temporally during feeding, the median will not account for bioaccumulation that occurs in the tails of the exposure distribution, even though such exposure can contribute significantly to total uptake. Use of the mean as the measure of central tendency will account for exposures throughout the entire range of the observed exposure distribution. Accordingly, GE shall use the mean as the measure of central tendency in the calculation of BSAFs and BAFs.

- Use of a spatially averaged FOC concentration for sediments in Reaches 5 and 6 obscures the order-of-magnitude difference in FOC between upstream and downstream sediments. Evaluation of exposure on the scale of subreaches, as discussed above, is appropriate and shall be conducted.

- It is assumed that a table similar to Table 5-9 will be included in the CMS Report. If so, GE shall specify "not achievable" rather than "0.0" for sediment concentrations that would (mathematically) require a negative soil concentration to achieve the IMPGs.

- Equation 2, interpreted as written, would indicate that the concentration of PCBs in aquatic birds is equal to the weighted concentration in the aquatic and terrestrial diet of those birds, which is clearly incorrect. Parameters C_{aba} and C_{abt} in this equation appear to be incorrectly defined in Table 5-1 and parameters P_{aba} and P_{abt} do not appear in Table 5-1.

- The value for $BSAF_{ab}$ presented in Table 5-1 is inconsistent with the value for the same parameter presented in Table 5-5.

- Equation 5 indicates that the units for BAF are kg organic carbon/kg lipid, but the text states that "typically bioaccumulation factors (BAFs) for soil are not based on normalized tissue and soil concentrations." It appears that the units are incorrectly labeled in this equation.

- Equations 15 and 16 incorrectly refer to sediment, rather than soil, concentrations.

5. <u>Additional Justification of Production Rates</u>

EPA continues to have concerns regarding the production rates listed in Table 5-2 of the CMS Proposal and Table 8-1 of the Supplement. As noted by GE in the Supplement, these tables are based on the same assumptions concerning basic daily production when dredging is occurring (the "effective daily production rate" as defined below), and generate the same annual production amounts. They differ only in that Table 5-2 spreads out this production over the entire 365 days in a year, and Table 8-1 calculates daily production based on the assumed operating time of 198 days/year (22 days/month and 9 months/year).

EPA believes that some of the concerns regarding production rates may be a result of inconsistent use of terminology, and will therefore consistently use the following terms as defined below in the discussion that follows:

- **Effective daily production rate:** A production rate that is achieved when equipment is in operation at the site, with no adjustments made for work stoppages. This rate is derived from actual operational considerations, as discussed below. The effective daily production rate is used to develop the annual production rate based on the assumption that the annual work schedule consists of a 9-month working season, working 22 days per month, i.e., 198 days per year of actual operation. The units for this rate are typically cy/day of actual operation.

- **Annual production rate:** The product of the effective daily production rate times 198 working days per year. The units for this rate are typically cy/year.

- **Annualized daily production rate:** A production rate that is sustainable on a long-term (yearly) basis, taking into consideration non-working time due to holidays and weekends, weather and flow conditions, equipment failure, logistical considerations, and other such factors that result in work stoppages. The annualized production rate is equivalent to the annual production rate divided by 365 days/yr. The units for this rate are typically cy/day.

Additional definitions not included in the following discussion, but provided here to avoid further confusion in future discussions of this issue include:

- **Annualized areal production rate:** The annualized daily production rate divided by the proposed depth of cut for the reach (spatial bin, grid cell, etc.) of the river in which operations are being conducted. The units are typically square meters/year.

- **Effective areal production rate:** The effective daily production rate divided by the proposed depth of cut for the reach (spatial bin, grid cell, etc.) of the river in which operations are being conducted. The units are typically square meters/day of actual operation.

Regardless of whether production is depicted in terms of the effective daily production rates or annualized production rates, the underlying assumptions for areal and volume-based daily production when dredging must be valid in order to provide useful input to the model. For wet dredging EPA believes the approach used in the CMS Proposal and Supplemental is flawed because it works backward from an annual production rate that is established with insufficient justification. The more defensible approach is to start from an effective daily production rate based on such factors as bucket size, cycle time, and logistical considerations, and then to generate a realistic annualized production rate by factoring in hourly and seasonal working assumptions. All assumptions used in this approach must be compared with EPA and USACE guidance to ensure realism. In addition, because of the numerous site-specific uncertainties inherent in this estimation process, EPA believes it is not possible to realistically distinguish between production rates that apply to dredging/excavation depths of less than 2 ft of sediment vs. rates that would apply to depths of greater than 2 ft. Accordingly, only a single production rate range (for all depths) shall be developed for each technology.

EPA believes that the true upper-bound production rate for both wet dredging and dry excavation must be based on two simultaneous operations for most reaches of the river. The simulation is intended to provide a true range of outcomes based on the appropriate lower- and upper-bound assumptions, and GE provides no basis for its assumption that the use of multiple dredges will not be feasible.

Based on these and other considerations, EPA establishes the following conditions relative to the range of production rates to be used in the simulations:

- GE shall use only a single range of production rates for mechanical and hydraulic dredging in the wet, and mechanical dredging in the dry, respectively.

- The upper-bound production rate shall be based on the assumption of two simultaneous operations (i.e., either two dredges or two dry excavation cells) for those river reaches where simultaneous operations are possible.

- Based on EPA's calculations, using reasonable assumptions (including the potential for two simultaneous operations), experience from other sites, and applicable guidance where available, the applicable range of annualized daily production rates for mechanical/hydraulic wet dredging was determined to be 150 to 400 cy/d, which is equivalent to an annual production rate range of 54,750 cy to 146,000 cy. This equates to a range of effective daily production rates of 275 to 740 cy/day. For dry excavation, the original range of annualized daily

> production rates provided by GE in Table 5-2 of the CMS-P of 60 to 170 cy/d is acceptable, but the upper end of the range requires modification upward to account for the potential for two simultaneous operations. GE shall use these production rates as bounding values for simulating the grid cell-wise seasonal progress of the remediation in the model runs.

GE proposed in the Table 8-1 of the Supplement to use one effective areal production rate for use in the model and did not account for the varying sediment excavation depths identified in Table 5-1 of the Addendum. GE shall, in addition to using revised effective daily production rates as described above, calculate separate effective areal production rates based on the different removal depths identified in Table 5-1 of the Addendum.

6. Page 7-2: For its CMS evaluations, and for future submittals, GE shall, instead of following the language of the last clause of the first full paragraph, follow the language of the Reissued RCRA Permit, as follows: "… in consideration of the Selection Decision Factors**, including** a balancing of those factors against one another."

7. Section 2-5, Page 2-15, Proposed ARARs Associated with MNR for Reaches 9-16: GE shall revise Section 2-5 as follows:

A. Chemical-specific ARARs – (b) Add "numeric" between "the" and "Massachusetts water quality criteria"; (c) Add "numeric" between "the" and "Connecticut water quality criteria".

B. Location and Action-specific ARARs – GE proposes to not include location-specific and action-specific ARARs because the proposed alternative does not include active remediation. However, the monitoring which would be performed as part of monitored natural recovery requires particular actions, in particular locations. Two examples are as follows: a. if in performance of monitoring, GE must use or traverse a wetland or floodplain area, GE would need to comply with ARARs associated with wetlands or floodplains; b. GE would have to comply with the handling requirements for hazardous or solid waste of RCRA or toxic substances of TSCA if such requirements apply to substances involved in the sampling by GE.

GE shall submit ARARs associated with MNR for Reaches 9-16 in the CMS that include such Location and Action-Specific ARARs related to the Monitoring component of MNR.

C. GE shall list as Location-specific "To Be Considered" the following: Massachusetts Department of Public Health, Center for Environmental Health, Waterfowl Consumption

Attachment J

September 9, 2008 – EPA Letter to GE

Excerpt from EPA Comments on GE's March 2008 Corrective Measures Study Report

49. Page 3-10 to 3-11: Daily average production rates are used to determine overall timeframes for the project, including mobilization, set-up, excavation, backfill, restoration, down time, etc. Based on this, EPA believes that the actual capacity of each work crew for excavation is higher than the stated average provided in the CMS. For example, the size of the excavation crew necessary to achieve the 110 cy/day may need to have a capacity closer to 300 to 400 cy/day to achieve the overall intended result of 110 cy/day assumption (agreed to by EPA in the CMS-P conditional approval) to account for all non-excavation activities. In addition to the overall productivities, GE shall include the capacity of the excavation crew expressed on a cy/day basis.

50. Page 3-12: EPA disagrees that additional time should be added to the schedule to account for backfill activities. In general, the agreed-upon productivities were developed to be inclusive of backfill activities. Similarly, for Reaches 5A and 5B, stabilization of banks should also not add to the overall schedule, and is included in the overall timeframe as determined from the average productivity rate assumed and agreed to by EPA in the CMS-P conditional approval. These assumptions suggest that there will be no concurrent excavation downstream of ongoing backfill activities. If the excavation percent completes are correct as shown in Table 3-4, and backfill work cannot begin until at least those percentages of excavation have been completed, then a second crew working solely on backfill would be justified working upstream of the active excavation area. GE shall re-evaluate the excavation percent completes and the possibility of adding backfill crews to reduce the overall timeframes of the alternatives, and include the results of the assessment in the Supplement.

51. Page 3-14: GE shall provide a table summarizing the volume calculations, including the areas, depths, and calculated volume for each alternative and each reach.

52. Page 3-14: EPA notes the following differences between the simulation modeling as implemented by EPA and as implemented by GE and reported in the CMS:

- Remediation is assumed by GE to occur between Mar. 1st and Nov. 31st of each year, not continuously as assumed by EPA.
- Backfill/capping is assumed to begin at 80% completion in a cell, but in an earlier presentation to EPA 73% was assumed.
- The spatial extent of the "deep hole" in Woods Pond used by GE is larger than used by EPA.
- GE has simulated the remediation of more backwaters than those considered part of Reach 5D; EPA restricted the definition of backwaters to Reach 5D only. However it appears that those backwaters are represented in the model as floodplain cells.
- Wet removal techniques can differ in Reaches 5C, 5D, 6, 7 & 8 between EPA and GE simulations.
- Cap thickness in the case of an engineered cap without prior removal differs between the EPA and GE simulations.
- The 15-ppm criterion for Reach 5D in SED 5 is applied by GE as a area-weighted average for each backwater as opposed to a cell-by-cell basis assumed by EPA.
- In cases where the CMS Proposal (Revised Table 5-1) included removal followed by backfill/capping, GE assumed capping whereas EPA assumed backfill.

Attachment K

March 24, 2010

Memorandum from Michael R. Palermo to Susan Svirsky, EPA, et al.

Michael R. Palermo, PhD, PE
Mike Palermo Consulting
• Dredged Material Management • Contaminated Sediment Remediation

3046 Indiana Ave, Suite R, PMB 204 ▪ Vicksburg, MS 39180 ▪ (601) 831-5412 ▪ mike@mikepalermo.com

Memorandum

To: **Susan Svirsky, EPA Region 1**
Joel Lindsay, Weston
Scott Campbell, Weston
From: **Michael R. Palermo, PhD, PE**
Date: **24 March 2010**

I have reviewed the subject GE letter dated March 4, 2010, and developed input for a response, focusing on my effort on issues related to the use of silt curtains as a control measure for sediment resuspension during dredging.

Footnotes 9 and 10 – Silt Curtains

In footnotes 9 and 10 of its letter, GE again mentions that for the SED 9 alternative, dredging operations may have to be shut down if flows exceed 1.5 fps, and that such a velocity is a limiting condition for silt curtain use, referencing Francingues and Palermo (2005). In making such statements, GE misinterprets the factual content and the authors' intent in the reference.

The Francingues and Palermo reference states that currents of 1 to 1.5 knots (about 1.7 to 2.5 fps) are problematic and that this current velocity is the accepted industry standard for conventional silt curtain deployment. The reference does not state that the 1 to 1.5 knot velocity range totally precludes use of silt curtains, rather it states that specialized designs will be required under higher velocity conditions. The key point is, with a conventional deployment using only anchors and ballast chains, a silt curtain is subject to being lifted like a sail and ripped in higher currents. GE has interpreted and applied the Francingues and Palermo reference in a way that is contrary to the intent of the authors of the reference.

Non-conventional, i.e., anchored curtain configurations and specialized designs, have been developed and successfully deployed at multiple sites subject to currents higher than 1.5 fps. A recent example of this is the Bangor Maine project in which a curtain anchored with spaced piles and reinforced with wire mesh was successfully deployed for a period of 14 months at water depths of 25 ft, with a tidal range of 14 ft, and under average current velocities of approximately 4 fps. Reach 5A and 5B of the Housatonic has relatively shallow water depths, and anchored silt curtains or other control measures such as use of Jersey barriers, could be deployed.

If you have any questions regarding these comments, or would like me to provide comments on other matters, please let me know.

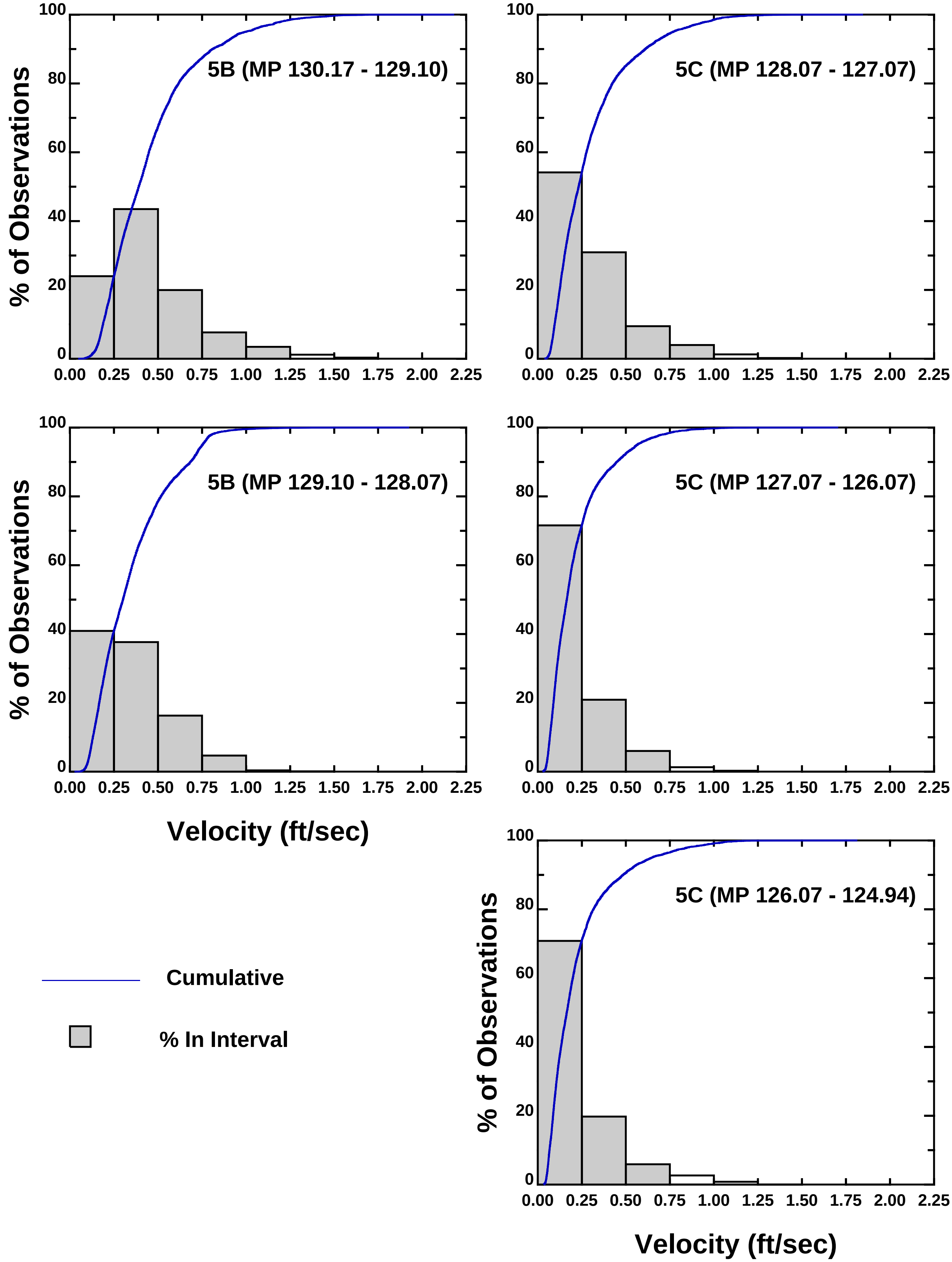
Sincerely,

Michael R. Palermo, PhD, PE
Consulting Engineer

Attachment L

Frequency of River Velocity in Reaches 5B and 5C

PERIOD: MARCH - NOVEMBER (1979 - 2004)



Frequency of River Velocity in Reaches 5B and 5C