Attachment 6

Excerpts from EPA's Comparative Analysis of Remedial Alternatives (May 2014)

COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES FOR THE GENERAL ELECTRIC (GE)-PITTSFIELD/HOUSATONIC RIVER PROJECT REST OF RIVER

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WESTON SOLUTIONS

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The SED 9/FP 4 MOD alternative was modeled in 2012, and the model-derived metrics summarizing the performance of this alternative are presented in Attachment 7. Subsequent refinements to the SED 9/FP 4 MOD alternative resulting from meetings with GE and the co-regulators, as discussed in Section 1, are relatively minor for modeling purposes, and it was not necessary to generate new metrics. Accordingly, the metrics for the refined SED 9/FP 4 MOD alternative are unchanged from the original SED 9/FP 4 MOD. A refined cost estimate was generated for SED 9/FP 4 MOD (Attachment 8).

The criteria for evaluation of remedial alternatives for the Rest of River are specified in Part II, Section G, of the Reissued RCRA Permit for the GE-Pittsfield/Housatonic River Site (Appendix G to the Consent Decree) and are similar, but not identical to, evaluation criteria delineated in the National Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Section 300.430(e)(9)(iii). The nine evaluation criteria include three general standards, and six selection decision factors:

- General standards:
    - Overall protection of human health and the environment.
    - Control of sources of releases.
    - Compliance with federal and state applicable or relevant and appropriate requirements (ARARs).
- Selection decision factors:
    - Long-term reliability and effectiveness.
    - Attainment of Interim Media Protection Goals (IMPGs).
    - Reduction of toxicity, mobility, or volume (TMV) of wastes.
    - Short-term effectiveness.
    - Implementability.
    - Cost.

Each of these nine criteria is evaluated with respect to the degree to which it is achieved by the eight selected combinations of SED and FP alternatives in Sections 2.2 through 2.10. Although an individual analysis of SED 9/FP 4 MOD against the nine criteria is not provided in this document, the analysis below sufficiently analyzes how this alternative meets the criteria while also comparing it to the eight other combination alternatives.

An overview and a comparative analysis of treatment/disposition alternatives are presented in Section 3. The nine criteria for the treatment/disposal alternative analysis are the same as described above for the SED and FP alternatives.

2.2 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The evaluation of whether a particular remedial alternative would provide overall human health and environmental protection relies heavily on the evaluations under several other permit criteria, including but not limited to the following: (1) attainment of IMPGs, (2) compliance with ARARs, (3) long-term reliability and effectiveness, and (4) short-term effectiveness. A

For the floodplain, these alternatives would involve removal of progressively more PCB-contaminated soil, in increasing order of removal: SED 9/FP 4 MOD, SED 5/FP 4, SED 6/FP 4, SED 9/FP 8, and finally, SED 8/FP 7. Consequently, there would be progressively greater reduction in exposure and risk to human health and ecological receptors, yet with associated increasing impacts to floodplain habitat and potential adverse impacts to habitat supporting state-listed species. The floodplain component of SED 9/FP 4 MOD was developed specifically with these adverse impacts in mind and represents a balance between reducing risks to humans and ecological receptors and impacts to Core Area habitats. This alternative will achieve a human health direct contact level of 1×10^{-5} or an HI of 1 in many areas, yet avoids conducting remediation in Core Area 1 habitats unless necessary to achieve an HI of 1 non-cancer or 1×10^{-4} cancer risk level.

To evaluate the PCB concentrations in fish tissue and resulting human health risks due to consumption of fish, computer modeling was used to predict fish tissue concentrations during and following the implementation of each alternative. The boundary conditions used for this model framework reflect the cleanup that has been completed in the upstream reaches (see Attachment 9). The output from the model is included in Attachment 10. As noted above, the model results shown for SED 9/FP 4 MOD reflect the August 2012 specifications for this alternative; the refinements made subsequently were minor and would not result in any meaningful differences in the resulting fish tissue concentrations for this alternative.

These modeling results indicate that fish tissue PCB concentrations predicted to result from all remedial alternatives at the end of the model simulation period (52 to ~80 years) would not achieve the RME IMPGs in all reaches (Table 2). As a result, under all alternatives, ICs (including but not limited to fish consumption advisories) would likely be needed for a period of time following remediation to provide human health protection from fish consumption. However, a number of alternatives do achieve other less stringent IMPGs, and there are differences among the alternatives in the time necessary to achieve various risk levels. For example, as indicated in the far right column of Table 2, Page 2, for the CTE (central tendency or average) individual, the probabilistic risk model shows some alternatives achieving an HI of 1 within the 52-year modeling period in all reaches. Fate and transport modeling indicates that SED 9/FP 4 MOD achieves this IMPG in all reaches except 5B, in most cases more rapidly than all other alternatives except SED 9/FP 8. The modeling does not simulate the effect of the placement of activated carbon in Reach 5B.

The performance of the alternatives for all risk levels is shown in Attachment 10. For many of the alternatives shown in the figures in Attachment 10, upon completion of the remediation, the trajectories shown in the plots converge at a particular concentration (which varies by reach) and then indicate a very slight additional decrease over time. This behavior is primarily driven by the non-zero PCB boundary conditions specified in the model (see Attachment 9) and, therefore, is uncertain. If the boundary PCB loads are less than were assumed, the fish tissue concentrations would decline more than the model predictions before leveling off; however, if the boundary PCB loads are greater than assumed, the point of convergence would be at a higher tissue concentration.

Table 2
Evaluation of IMPG Attainment for Human Consumption of Fish for Combined SED/FP Scenarios

River Reach	Average Fish (Fillet) Concentrations (mg/kg)[1,2] SED 1/FT 1	SED 3/FT 3	SED 3/FT 4	SED 6/FT 4	SED 5/FT 7	SED 5/FT 8	SED 10/FT 9	SED 9/FT 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic RME)								
5A	7.3	0.25	0.26	0.26	0.17	0.31	4.2	0.26
5B	9.3	3	0.23	0.22	0.15	0.27	4.4	3.46
5C	7.4	1.8	0.17	0.14	0.11	0.19	5.8	0.82
5D	9.5	6.3	0.36	0.35	0.29	0.41	11	1.1
6(WP)	8.6	0.71	0.15	0.17	0.13	0.16	3.7	0.74
7A	6.4	1.3	0.42	0.4	0.34	0.42	4.2	1.12
7B	5.2	2.1	1.4	0.41	0.1	0.21	4.2	0.67
7C	4.3	1.8	1	0.2	0.12	0.2	4.4	0.81
7D	5.5	3.4	0.79	0.7	0.63	0.75	3.7	1.27
7E	4.1	1	0.57	0.34	0.31	0.22	2.8	0.64
7F	3.2	0.82	0.49	0.45	0.36	0.45	2.2	0.82
7G	3.5	1.3	1	0.4	0.15	0.22	2.4	0.39
7H	2.8	0.73	0.43	0.39	0.35	0.39	1.9	0.44
8(RP)	3.4	1.4	0.34	0.22	0.17	0.24	2.7	0.37
BED	0.14	0.04	0.01	0.009	0.006	0.009	0.1	0.022
LL	0.11	0.05	0.009	0.004	0.005	0.006	0.06	0.019
LZ	0.08	0.02	0.006	0.005	0.004	0.004	0.05	0.011
LH	0.08	0.02	0.006	0.004	0.005	0.004	0.05	0.019
Human Consumption of Fish (Bass Fillets, Probabilistic RME (5th percentile))								
5A	7.3	0.25	0.26	0.26	0.17	0.31	4.2	0.26
5B	9.3	3	0.23	0.22	0.15	0.27	4.4	3.46
5C	7.4	1.8	0.17	0.16	0.11	0.19	5.8	0.82
5D	9.5	6.3	0.36	0.35	0.29	0.41	11	1.1
6(WP)	8.6	0.71	0.15	0.17	0.13	0.16	3.7	0.74
7A	6.4	1.3	0.42	0.4	0.34	0.42	4.2	1.12
7B	5.2	2.1	1.4	0.41	0.1	0.21	4.2	0.67
7C	4.3	1.8	1	0.2	0.12	0.2	4.4	0.81
7D	5.5	3.4	0.79	0.7	0.63	0.75	3.7	1.27
7E	4.1	1	0.57	0.34	0.31	0.22	2.8	0.64
7F	3.2	0.82	0.49	0.45	0.36	0.45	2.2	0.82
7G	3.5	1.3	1	0.4	0.15	0.22	2.4	0.39
7H	2.8	0.73	0.43	0.39	0.35	0.39	1.9	0.44
8(RP)	3.4	1.4	0.34	0.22	0.17	0.24	2.7	0.37
BED	0.14	0.04	0.01	0.009	0.006	0.009	0.1	0.022
LL	0.11	0.41	0.009	0.004	0.005	0.006	0.06	0.019
LZ	0.08	0.02	0.006	0.005	0.004	0.004	0.05	0.011
LH	0.08	0.02	0.006	0.004	0.003	0.004	0.05	0.010

River Reach	IMPG (mg/kg)	10^{-6} Cancer Risk SED 1/FT 1	SED 3/FT 3	SED 3/FT 4	SED 6/FT 4	SED 5/FT 7	SED 5/FT 8	SED 10/FT 9	SED 9/FT 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic RME)									
5A	0.0019	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic RME (5th percentile))									
5A	0.0964	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

River Reach	IMPG (mg/kg)	10^{-5} Cancer Risk SED 1/FT 1	SED 3/FT 3	SED 3/FT 4	SED 6/FT 4	SED 5/FT 7	SED 5/FT 8	SED 10/FT 9	SED 9/FT 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic RME)									
5A	0.019	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic RME (5th percentile))									
5A	0.964	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

River Reach	IMPG (mg/kg)	10^{-4} Cancer Risk SED 1/FT 1	SED 3/FT 3	SED 3/FT 4	SED 6/FT 4	SED 5/FT 7	SED 5/FT 8	SED 10/FT 9	SED 9/FT 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic RME)									
5A	0.19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic RME (5th percentile))									
5A	9.64	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

River Reach	IMPG (mg/kg)	Non-Cancer: Child SED 1/FT 1	SED 3/FT 3	SED 3/FT 4	SED 6/FT 4	SED 5/FT 7	SED 5/FT 8	SED 10/FT 9	SED 9/FT 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic RME)									
5A	0.026	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic RME (5th percentile))									
5A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

River Reach	IMPG (mg/kg)	Non-Cancer: Adult SED 1/FT 1	SED 3/FT 3	SED 3/FT 4	SED 6/FT 4	SED 5/FT 7	SED 5/FT 8	SED 10/FT 9	SED 9/FT 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic RME)									
5A	0.062	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic RME (5th percentile))									
5A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6(WP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8(RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BED		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 2
Evaluation of IMPG Attainment for Human Consumption of Fish for Combined SED/FP Scenarios

River Reach	Average Fish (fillet) Concentrations (mg/kg)[1,2]							
	SED 2/FP 1	SED 3/FP 3	SED 5/FP 4	SED 6/FP 5	SED 8/FP 7	SED 9/FP 8	SED 10/FP 9	SED 9/FP 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic CTE)								
5A	7.3	0.29	0.24	0.24	0.17	0.31	4.2	0.34
5B	9.3	3	0.23	0.22	0.15	0.27	6.4	3.09
5C	7.4	1.8	0.17	0.16	0.11	0.19	5.8	0.82
5D	9.5	4.3	0.34	0.35	0.29	0.41	11	1.1
6 (WT)	8.4	0.71	0.16	0.17	0.13	0.16	3.7	0.74
7A	4.4	1.3	0.42	0.4	0.34	0.42	4.2	1.12
7B	5.7	2.3	1.4	0.41	0.1	0.21	4.2	0.67
7C	6.3	1.8	1	0.2	0.12	0.2	4.4	0.81
7D	5.5	1.4	0.79	0.7	0.43	0.75	1.7	1.27
7E	4.1	1	0.57	0.54	0.11	0.22	2.9	0.64
7F	3.2	0.82	0.44	0.45	0.38	0.19	2.2	0.82
7G	3.5	1.3	1	0.4	0.35	0.22	2.4	0.38
7H	2.8	0.72	0.61	0.39	0.35	0.34	1.9	0.69
8 (RP)	5.6	1.4	0.34	0.32	0.17	0.24	2.7	0.37
BBD	0.14	0.04	0.01	0.009	0.006	0.009	0.1	0.022
LL	0.11	0.03	0.009	0.006	0.005	0.004	0.06	0.015
LZ	0.08	0.02	0.006	0.005	0.004	0.004	0.05	0.011
LH	0.08	0.02	0.004	0.004	0.003	0.004	0.05	0.010
Human Consumption of Fish (Bass Fillets, Probabilistic CTE (50th percentile))								
5A	7.3	0.29	0.24	0.24	0.17	0.31	4.2	0.34
5B	9.3	3	0.23	0.22	0.15	0.27	6.4	3.09
5C	7.4	1.8	0.17	0.16	0.11	0.16	5.8	0.82
5D	9.5	4.3	0.34	0.35	0.29	0.41	11	1.1
6 (WT)	8.4	0.71	0.16	0.17	0.13	0.16	3.7	0.74
7A	4.4	1.3	0.42	0.4	0.34	0.42	4.2	1.12
7B	5.7	2.3	1.4	0.41	0.1	0.21	4.2	0.67
7C	6.3	1.8	1	0.2	0.12	0.2	4.4	0.81
7D	5.5	1.4	0.79	0.7	0.43	0.75	1.7	1.27
7E	4.1	1	0.57	0.54	0.11	0.22	2.9	0.64
7F	3.2	0.82	0.44	0.45	0.38	0.19	2.2	0.82
7G	3.5	1.3	1	0.4	0.35	0.22	2.4	0.38
7H	2.8	0.72	0.71	0.39	0.35	0.34	1.9	0.69
8 (RP)	5.6	1.4	0.34	0.32	0.17	0.24	2.7	0.37
BBD	0.14	0.04	0.01	0.009	0.006	0.009	0.1	0.022
LL	0.11	0.03	0.009	0.006	0.005	0.004	0.06	0.015
LZ	0.08	0.02	0.006	0.005	0.004	0.004	0.05	0.011
LH	0.08	0.02	0.004	0.004	0.003	0.004	0.05	0.010

River Reach	10^{-6} Cancer Risk								
	IMPG (mg/kg)	SED 2/FP 1	SED 3/FP 3	SED 5/FP 4	SED 6/FP 5	SED 8/FP 7	SED 9/FP 8	SED 10/FP 9	SED 9/FP 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic CTE)									
5A	0.049	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic CTE (50th percentile))									
5A	0.057	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

River Reach	10^{-5} Cancer Risk								
	IMPG (mg/kg)	SED 2/FP 1	SED 3/FP 3	SED 5/FP 4	SED 6/FP 5	SED 8/FP 7	SED 9/FP 8	SED 10/FP 9	SED 9/FP 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic CTE)									
5A	0.49	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic CTE (50th percentile))									
5A	0.57	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

River Reach	10^{-4} Cancer Risk								
	IMPG (mg/kg)	SED 2/FP 1	SED 3/FP 3	SED 5/FP 4	SED 6/FP 5	SED 8/FP 7	SED 9/FP 8	SED 10/FP 9	SED 9/FP 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic CTE)									
5A	4.9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic CTE (50th percentile))									
5A	5.7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

River Reach	Non-Cancer: Child								
	IMPG (mg/kg)	SED 2/FP 1	SED 3/FP 3	SED 5/FP 4	SED 6/FP 5	SED 8/FP 7	SED 9/FP 8	SED 10/FP 9	SED 9/FP 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic CTE)									
5A	0.35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic CTE (50th percentile))									
5A	0.71	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

River Reach	Non-Cancer: Adult								
	IMPG (mg/kg)	SED 2/FP 1	SED 3/FP 3	SED 5/FP 4	SED 6/FP 5	SED 8/FP 7	SED 9/FP 8	SED 10/FP 9	SED 9/FP 4 MOD
Human Consumption of Fish (Bass Fillets, Deterministic CTE)									
5A	0.83	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Human Consumption of Fish (Bass Fillets, Probabilistic CTE (50th percentile))									
5A	1.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6 (WT)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7A		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7B		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7C		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7D		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7E		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7F		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7G		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7H		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8 (RP)		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
BBD		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LL		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LZ		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
LH		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Key:

☐	= *post-remediation EPC is higher than IMPG*
▨	= *post-remediation EPC is lower than IMPG*

<value> = time to achieve predicted by the model

[illegible] = time to achieve based on highly uncertain extrapolation of the model results as described in Section [illegible] of the Revised CMS Report

Notes:

[1] Model endpoint concentrations after projection (autumn average); whole body concentrations divided by a factor of 5.0 to convert to fillet basis

[2] Results for CT impoundments are highly uncertain as they were estimated from the CT 1-D Analysis.

CTE = central tendency exposure

RME = reasonable maximum exposure

BBD: Bulls Bridge Dam Impoundment; LL: Lake Lillinonah; LZ: Lake Zoar; LH: Lake Housatonic

IT = Increasing trend in model extrapolation; no time-to-achieve

Estimates from the Connecticut one-dimensional (1-D) analysis indicate that the RME 1×10^{-5}/ HI = 1 deterministic IMPGs for fish consumption are not achieved in any of the four impoundments modeled in Connecticut under SED 2/FP 1 (MNR) or SED 10/FP 9 (SED 10/FP 9 achieves the adult non-cancer IMPG only in two of the impoundments). All other alternatives achieve these IMPGs in all or most of the Connecticut impoundments by the end of the modeling period (see Table 2). Notwithstanding, the State of Connecticut has calculated more stringent criteria for unlimited fish consumption that may not be met in any of these impoundments at the end of the modeling period.

In addition, alternatives SED 2/FP 1 and SED 10/FP 9 would not meet federal and state water quality criteria for freshwater aquatic life and therefore would not be protective of the environment; however, the other alternatives do meet these criteria in all reaches by the end of the modeling period. None of the alternatives analyzed would achieve the federal and state water quality criteria for human consumption of organisms in any of the Massachusetts reaches. SED 2/FP 1, SED 3/FP 3, and SED 10/FP 9 would not achieve these criteria in any Connecticut impoundments, although the results for Connecticut have a high degree of uncertainty due to the empirical semi-quantitative nature of the model used to predict the water column PCB concentrations following remediation. Acknowledging that uncertainty, however, the analysis does show that SED 5/FP 4, SED 6/FP 4, SED 8/FP 7, SED 9/FP 8, and SED 9/FP 4 MOD would restore water quality consistent with the criteria in significant segments of the river in Connecticut.

All alternatives rely to varying degrees on ICs throughout the river in both Massachusetts and Connecticut to be protective of human health in the long term. Those alternatives that rely more extensively on these controls (SED 2/FP 1 and SED 10/FP 9) over longer timeframes and larger areas have more uncertainty that they will protect human health in the long term, and such controls provide no protection for ecological risks. Those alternatives that rely on these controls over shorter timeframes or smaller areas (SED 8/FP 7, SED 9/FP 8, and SED 9/FP 4 MOD) have higher overall protection of human health.

In summary, the standard of overall protection of human health and the environment requires a balancing of the short-term and long-term adverse impacts of the alternatives with the benefits achieved by each alternative. Restoration of the riverbed, riverbanks, and floodplain can be achieved and maintained (see Attachments 11 and 12); therefore, the short-term impacts to the environment can be successfully mitigated. Among the alternatives evaluated in this comparative analysis, SED 9/FP 4 MOD was judged to provide the best overall protection of human health and the environment because it achieves this important balance between both short- and long-term risks and long-term benefits.

2.3 CONTROL OF SOURCES OF RELEASES

The extent to which each of the alternatives reduces or minimizes further PCB releases was evaluated. This evaluation is driven by a comparison of the sediment and riverbank components of the sediment-floodplain alternatives because the floodplain soil is not a significant source of PCB releases to the river, except in the situation of the river channel relocating into contaminated floodplain.

of the overall remedy, and no action has been adopted as a remedy component at other sites. The other seven alternatives involve different combinations of remedial technologies and processes.

For the sediment alternatives, the selected approaches include removal in the dry and/or wet (followed by capping or backfilling in most cases), capping without prior removal, thin-layer capping, riverbank stabilization (using a combination of bioengineering and hard stabilization techniques), and MNR. All of the remedial technologies included in the sediment alternatives under evaluation have been used at other sites.

The floodplain components of the alternatives involving remediation would rely primarily on removing floodplain soil from areas of various types of habitats and backfilling the excavations, and implementation of ICs. These technologies and combinations of technologies have been implemented at other sites. (Restoration is discussed in the following subsection.)

2.5.2.2 General Reliability and Effectiveness

The alternatives under evaluation generally use technologies that have been shown to be reliable and effective at other sites. However, as noted in Section 13 of the June 2011 Site Information Package, thin-layer capping is not expected to be a reliable or effective component for this site, and backfill may not be suitable for reaches with higher bed shear stresses.

For all of the active alternatives except SED 9/FP 4 MOD and SED 10/FP 9, eroding riverbanks in Reach 5A would be stabilized using a combination of bioengineering and, if necessary, hard engineering technologies. SED 9/FP 4 MOD would be designed to target specifically sections of riverbank that are highly erodible and also contain elevated concentrations of PCBs in Reach 5A and riverbank soils with PCB concentrations greater than 50 mg/kg in Reach 5B. The stabilization techniques would be similar for all of the alternatives, and are expected to be reliable and effective in stabilizing the banks and controlling erosion. Any potential for long-term impacts would be mitigated through proper construction, and OMM practices. Natural channel design concepts would be used, where practical, to ensure that bank stabilization does not accelerate erosion in other areas, and would not result in ecological impacts.

Any areas remediated would require subsequent restoration to reestablish habitat functions and values. Remediation and restoration would progress incrementally from upstream to downstream, affecting small stretches of the river and floodplain at any given time. OMM programs, including invasive species control, would ensure proper reestablishment of vegetation for a period of time following remediation. There is a significant body of knowledge with respect to ecosystem restoration that documents the ability to reestablish the pre-remediation conditions and functions of the affected habitats (see Appendix D of the 2011 Site Information Package). Accordingly, restoration is expected to be fully effective and reliable in returning these habitats, including vernal pool habitat, to their pre-remediation state. As a result, the likelihood of effective restoration is equal under any of the alternatives.

2.5.2.3 Reliability of Operation, Maintenance and Monitoring Requirements and Technical Component Replacement Requirements

All alternatives would incorporate reliable long-term maintenance and/or monitoring following remediation. For example, all sediment alternatives would include inspection and repair or replacement of any caps or bank stabilization measures. In general, the extent of such maintenance and monitoring programs would increase as the extent of capping and bank stabilization increases for the various alternatives (i.e., progressively more from SED 10/FP 9 to SED 9/FP 8).

Similarly, the backfilled/restored areas of the floodplain would be monitored through periodic inspections to verify that planted vegetation is surviving and growing, and to identify areas where the backfill may be eroding or in need of repair. This is a reliable means of assessing the need for maintenance and would be similar for all alternatives except that the alternatives involving more extensive remediation in the floodplain will necessarily require more extensive maintenance and monitoring, which could be difficult to implement in certain areas of the floodplain due to remoteness, the extent of standing water, and the extent of vegetation. Depending on the timing, location, and scale of any repairs, temporary access roads and staging areas may need to be constructed in the floodplain. These difficulties can be overcome to a great extent through proper planning, selection of experienced contractors, and effective oversight of activities.

2.5.3 Potential Long-Term Impacts on Human Health and the Environment

The evaluation of potential long-term impacts on human health or the environment includes evaluation of potentially affected populations, long-term impacts on the various habitats that would be affected by the remedial alternatives, and the biota that inhabit those habitats (including impacts on state-listed species), impacts on the aesthetics and recreational use of the river and floodplain, impacts on banks and bed load movement (i.e., fluvial geomorphic processes), and potentially available measures that may be employed to mitigate these impacts. The long-term impacts of exposure to PCBs left in place are not evaluated in this section.

2.5.3.1 Potentially Affected Populations

Implementation of all of the alternatives except SED 2/FP 1 (which would not involve remedial construction activities) would result in some short- and long-term impacts on floodplain habitats, with the impacts occurring over longer periods of time as the alternatives become more comprehensive and the duration for implementation increases. For all alternatives, however, implementation of remediation would generally proceed from upstream to downstream, affecting short stretches of the river and associated floodplain at any given time. In the case of SED 9/FP 4 MOD, impacts to habitats supporting state-listed species would be limited due to the design of the alternative, which includes specific protocols for addressing Core Areas. The long-term impacts of the alternatives on the affected habitats and the plants and animals that inhabit or use those habitats, as well as the long-term impacts on the aesthetics and recreational use of the affected habitats by people, are discussed and compared below.

2.5.3.2 Long-Term Impacts on Habitats and Biota

The extent and severity of long-term impacts from remedial construction activities are dependent on the types of habitat affected, the size of the affected areas, the success of the restoration approach(es), and the length of time needed for restoration. Table 6, from GE's RCMS, identifies the habitat types and summarizes the areas of each habitat affected by the alternatives.[5] As discussed above, long-term impacts would be mitigated through proper restoration measures. Because restoration of affected habitats is dependent on several factors and processes, the length of time necessary to restore a habitat is variable.

Aquatic Riverine Habitat: The potential post-restoration impacts of sediment removal/capping, as well as capping or thin-layer capping without removal, on aquatic riverine habitat include the following:

- The caps would change the surficial substrate type from its current condition (sand, sand and gravel, or silt) to armor stone, lasting until deposition of natural sediment from upstream changes the surficial sediment back to a condition similar to its prior condition. To the extent that a habitat layer is specified as the part of any cap in the final design, this impact would be reduced or eliminated.
- There may be a temporary loss of woody debris and shade in Reaches 5A and 5B depending on the removal areas, bank stabilization techniques, and restoration techniques. These changes could alter the riverine habitat because woody debris provides structure that is important to many aquatic and semi-aquatic species, and shade limits the temperature increases in the river water. The reintroduction of woody debris and replanting of trees would be a component of the restoration plan.
- Sediment removal and/or capping would remove or bury the existing aquatic vegetation and benthic invertebrates, and temporarily displace the fish. Recolonization would occur, and the vegetation and invertebrates that would recolonize these areas are not expected to differ substantially from the pre-existing species if a habitat layer is included in the cap design. In addition, after the removal of the negative effect of PCBs on the benthic community, it is expected that overall improvements to the community would be realized.
- There is the potential that the disturbed areas could be colonized by invasive species. This impact may be mitigated via active control of invasive species.
- For alternatives that specify capping without excavation or require thin-layer capping, the increase in substrate elevation due to the cap could change the hydrodynamics and vegetative characteristics of the areas and the biota dependent on them.

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[5] EPA does not believe that the infrastructure included in these estimates provided by GE has been optimized and expects that, for the selected remedy, the staging areas and roads will be designed to minimize the footprint and adverse impacts to the floodplain, neighborhoods, and local roads while allowing the remediation to proceed in a timely and effective manner.

Table 6 Habitat Areas in Primary Study Area Affected by Alternatives[a]

Habitat	SED 2/ FP 1	SED 3/ FP 3	SED 5/ FP 4	SED 6/ FP 4	SED 8/ FP 7	SED 9/ FP 8	SED 10/ FP 9	SED 9/ FP 4 MOD
Aquatic Riverine Habitat (acres)	-	79	127	127	127	127	20	99
Riverbank (linear miles)	--	14	14	14	14	14	1.6	3.5
Impoundment Habitat (acres)	--	60	101	139	139	139	42	139
Backwater (acres)	--	0	61	70	86	66	0	59
Floodplain Wetland Forest (acres)	-	38	60	60	178	56	14	TBD[d]
Shrub and Shallow Emergent Wetlands (acres)	-	19	22	22	70	31	3.7	TBD[d]
Deep Marshes (acres)	-	1.9	0.3	0.3	4.7	3.1	0	TBD[d]
Vernal Pools (acres)[b]	-	15 (58)	15 (58)	15 (58)	17 (61)	18 (61)	0	TBD[d]
Disturbed Upland Habitats (acres)	-	14	15	15	25	11	7.5	TBD[d]
Upland Forested Habitats (acres)	-	4.2	4.9	4.6	6.4	2.8	0.7	TBD[d]
Total (acres)[c]	--	231	406	453	653	454	88	343

[a] Includes habitat areas within the boundaries of the Woodlot (2002) natural community mapping; includes remediation areas as well as areas impacted by access roads and staging areas.

[b] Number of vernal pools affected is shown in parentheses.

[c] Total habitat area affected does not include riverbanks, and can differ from total surface area affected since the total shown includes all habitats within the boundaries of the Woodlot (2002) mapping (see note a).

[d] EPA estimates that the total area of floodplain to be affected equals 45 acres. Specific locations and habitat types are to be determined based on habitats and occurrences of state-listed species as defined by the Core Areas. These estimates do not include supporting infrastructure.

In summary, in the aquatic riverine habitat, impacts due to remediation will be temporary. It is expected that over time the physical substrate type in the river would approximate its prior condition, and a biotic community consistent with that substrate type would become reestablished. The inclusion of a habitat layer in any cap design and implementation of an appropriate restoration plan is expected to accelerate the recovery of the aquatic biota. For all alternatives, areas either upstream or downstream of the immediate remediation at any given time would act as sources of and refuge for aquatic species both during and after remediation of an area is completed.

<u>Riverbank Habitat</u>: The potential impacts of bank stabilization on riverbank habitat include the following:

- The implementation of stabilization measures that eliminate vertical and/or undercut banks would result in a loss of habitat for birds and other animals that depend on such banks (e.g., kingfisher, bank swallow, and the state-listed wood turtle). However, proven techniques are available to provide adequate bank stabilization with minimal loss of this type of habitat.

- The removal of any mature trees overhanging the river as part of bank stabilization/remediation would result in a temporary change in the vegetative character of the banks. Although this impact may be mitigated to some extent by planting of trees following remediation, it is not practical to replant large trees that are currently found along the banks. However, in the long term, normal growth will result in mature trees that overhang the river and essentially restore the vegetative character to its preremediation conditions.

- The use of bank stabilization measures could potentially result in a temporary reduction in slides and burrows of muskrat and beaver, and could potentially also reduce access routes and movement of reptiles, amphibians, and smaller and less mobile mammals between the river and wetland habitats. These potential impacts can be taken into account and mitigated in the design of bank stabilization.
- Any colonization by invasive plant species would require active control measures.

As a result of these potential impacts, stabilized riverbanks would not immediately return to their current condition or level of function; however, over time they are expected to do so. Because all of the alternatives except SED 2/FP 1 would involve stabilization of the eroding banks in Reaches 5A and/or 5B, temporary impacts along those banks would result from any alternative specifying active remediation. SED 10/FP 9 would involve remediation and stabilization of only a small portion of the banks in Reaches 5A and 5B, totaling approximately 1.6 linear miles. SED 9/FP 4 MOD would limit removal/stabilization of banks in Reach 5A to only those areas with both moderate-high or greater erosion potential and PCB concentrations greater than 5 mg/kg based on sampling to be performed during remedial design. SED 9/FP 4 MOD also would specify a decision-tree approach to bank stabilization with soft restoration techniques favored over hard armoring. For SED 9/FP 4 MOD, in Reach 5B, only a very small percentage of riverbanks will be affected because only those areas with soil PCB concentrations greater than 50 mg/kg would be remediated. Actual bank removal amounts will be determined during the design and implementation of the remedy. Based on existing data, SED 9/FP 4 MOD would entail disturbance of approximately 3.5 linear miles of Reach 5A riverbank and less than 0.2 linear miles of Reach 5B riverbank.

Impoundment Habitat: The potential impacts from removal and/or capping or thin-layer capping on the habitat of impoundments are similar to the impacts on aquatic riverine habitat discussed above. In general, they would include a temporary or longer-term change in the surface substrate, and an alteration in the biological community in the affected impoundment. It is anticipated that as sand and organic sediment from upstream are deposited over time, a biological community typical of such impoundments would reestablish itself. The alternatives that involve capping or thin-layer capping without removal in the impoundments would change the bottom elevation, potentially changing the vegetative characteristics, and the biota dependent on them, in the shallow portions of the impoundments. By contrast, the placement of a cap or a thin-layer cap in deeper areas of the impoundments, including the "deep hole" portion of Woods Pond, is not expected to have any significant long-term ecological impacts. The inclusion of a habitat layer in a cap would accelerate the recovery. The amount of acreage affected in each alternative is summarized in Table 6.

<u>Backwater Habitat</u>: The potential impacts of thin-layer capping or sediment removal/capping in backwaters include the following:

- Change in surficial substrate from organic silty material to sand, which would continue until enough silt and organic material have been deposited to approximate prior conditions.
- Change in vegetative characteristics corresponding to the change in substrate type and elevation (including, in shallower areas where the thin-layer cap exceeds the depth of water, a potential change from emergent wetlands vegetation to species more tolerant of less frequently inundated or drier conditions).
- Change in the wildlife communities using the backwaters until such time as the soil, hydrological, and vegetative conditions of the backwaters return to conditions comparable to preremediation conditions.

The area disturbed in each alternative is summarized in Table 6. All of the alternatives (except SED 2/FP 1) would have the potential impacts described above, which would be mitigated through the inclusion of a habitat layer and using proper restoration techniques.

<u>Floodplain Wetland Forest Habitat</u>: The potential post-restoration impacts of floodplain soil removal, as well as the construction of access roads and staging areas, on floodplain wetland forest habitat include the following:

- The removal of mature trees from the forested floodplain areas subject to soil removal or the construction of access roads and staging areas would result in a loss of mature forested habitat in those areas. Following replanting, the plant community succession in these areas would progress as a maturing forest for a period of years.
- Tree removal would cause a temporary loss of the coarse woody debris that is used as structural wildlife habitat and, for a short period of time, the annual leaf litter that provides habitat for numerous woodland species.
- There would be a temporary relocation or loss of the forest wildlife species that currently use the mature forested habitats that would be removed, and the return of those species, including sensitive species, would be encouraged through proper restoration that reestablishes the functions of the ecosystem.

The area impacted by each alternative is summarized in Table 6.

<u>Shrub and Shallow Emergent Wetlands and Deep Marshes</u>: The potential post-restoration impacts of floodplain soil removal include:

- Changes in soil composition and chemistry due to the replacement of existing wetland soil.
- Changes in the hydrology of these wetlands due to impacts on the swales, drainage features, and microtopography that influence the hydrology.
- Changes in vegetative characteristics due to the changes in soil and hydrological conditions.

These potential impacts would be mitigated through proper restoration to ensure that soil and hydrological conditions similar to preremediation conditions are reestablished. Table 5 shows the area impacted by each alternative.

Vernal Pools and Surrounding Habitat: The potential impacts of floodplain soil removal and associated facilities on vernal pools and the surrounding non-breeding habitat for vernal pool amphibians, include the following:

- The excavation and replacement of the surface soil and vegetation within and around vernal pools could potentially change the sediment types and stratigraphy, microtopography, and foliage cover of these pools, as well as the surface flow patterns into and out of the pools. These changes could alter the hydrology of the pools. However, these impacts would be mitigated by proper restoration techniques.

- There is also the potential for temporary changes in the vegetative characteristics of vernal pools because the vegetative composition (living and dead) of these pools would take some time to become reestablished following remediation. In addition, mature trees around the periphery of the pools, if removed, would take time to become reestablished.

- Changes in soil composition in the vernal pools are possible; however, replacement soil would be selected to match as closely as possible the characteristics of the existing vernal pool soil.

- Habitats immediately adjacent to vernal pools are important for maintaining water quality and providing shade and vegetative litter for the pool. The proximate non-breeding terrestrial habitats, with features such as coarse woody debris and the burrows of small mammals, provide a variety of protective cover, temperature and moisture regulation, and overwintering habitat functions for vernal pool amphibians. Any impacts to these adjacent areas will be restored using supplemental plantings to reestablish the native plant community and habitat.

- Implementation of effective restoration techniques would reestablish vernal pool functions that would allow sensitive vernal pool species (including wood frogs, spotted salamanders, and the state-listed Jefferson salamander) to return to the vernal pools following completion of remediation.

The area affected by each alternative is listed in Table 6. Due to the iterative decision-tree approach to vernal pools included in SED 9/FP 4 MOD, it is not possible to calculate comparable acreage for that alternative. The floodplain component of SED 9/FP 4 MOD would specifically recognize Core Area habitats and/or known occurrences of state-listed species and thus would have more limited impacts on these resources than the other alternatives specifying remediation in the floodplain.

Upland Habitats: Most of the affected upland areas consist of disturbed upland habitats, which include agricultural fields and cultural grasslands. Because these areas support altered or early successional plant communities that have limited ecological value, no long-term impacts would be expected from the remediation in these areas under any of the remedial alternatives.

Where the remediation or supporting activities would affect upland forested habitats, they would have similar potential impacts as discussed for floodplain forests. As shown in Table 6, except for SED 2/FP 1, all of the sediment and floodplain alternatives would have some, although relatively limited, impacts on these habitats.

2.5.3.3 Long-Term Impacts on State-Listed Species

All of the alternatives, except SED 2/FP 1, would affect the priority habitats of some state-listed species of concern regulated under MESA. GE conducted an evaluation for each potentially affected state-listed species to assess whether each of the remedial alternatives would result in a "take" of that species under MESA and, where there would be a take, to assess whether the alternative would impact a significant portion of the local population(s) of the species.

The SED 9/FP 4 MOD alternative differs from the other alternatives in providing more specificity about the options for avoiding, minimizing, or mitigating impacts to state-listed species. As part of their Priority Habitat mapping process, taxonomic experts from DFW's Natural Heritage and Endangered Species Program (NHESP) routinely delineate habitat for each state-listed species based on field-documented records or "occurrences." NHESP has outlined four types of Housatonic Core Areas for this project (see Attachment 4). Core Areas 1, 2, and 3 represent subsets of the delineated state-listed species habitat found in the Primary Study Area (PSA). Core Area 4 represents a subset of the documented and potential vernal pool habitat in the PSA. Although an estimate for the number of species affected cannot be summarized in a manner similar to that of other alternatives, the SED 9/FP 4 MOD approach will target cleanup depending on the location of these Core Areas.

The effect of the additional flexibility incorporated into SED 9/FP 4 MOD can best be demonstrated by a comparison with the SED 5/FP 4 alternative, which has the same specifications for floodplain remediation without the consideration of Core Areas. For SED 5/FP 4, there are an estimated 57.8 acres of floodplain soil (excluding vernal pools) that would require remediation to address the direct contact pathway. The overlap of these 57.8 acres with Core Areas 1 through 3 is shown in Table 7.

Table 7 Overlap of the 57.8 Acres of Floodplain Soil Requiring Remediation under FP 4 with Core Areas 1 through 3

Total Acreage	Overlap Only with Core Area 1	Overlap with Core Area 3 (Excluding Core Area 1)	Overlap with Core Area 2 (Excluding Core Areas 1 and 3)	No Overlap with Core Areas 1, 2, and 3
57.8 acres	11.6 acres	13 acres	17 acres	16.2 acres

SED 5/FP 4 specifies the extent of remediation needed to achieve a PCB concentration corresponding to a risk level of $1x10^{-5}$ or an HI of 1, whichever is lower, regardless of the presence of Core Areas. In SED 9/FP 4 MOD, however, remediation may be reduced or minimized in certain Core Areas, provided that the residual concentration will meet a risk level of $1x10^{-4}$ or an HI of 1, whichever is more stringent. A procedure to address Core Areas was included in the Draft Modification to the RCRA Permit to be released in June 2014. Based on that procedure, the area to be remediated in SED 9/FP 4 MOD was estimated to be reduced by approximately 11 acres if Core Area 1 habitats were not remediated. A reduction of remediation in 20% of the overlap of Core Areas 2 and 3, along with mitigation/restoration for remediation in these areas, could reduce the area to be remediated by an additional 6 acres, thus reducing the total estimated acreage of floodplain remediation to approximately 40 acres under SED 9/FP 4 MOD.

Based on the iterative approach for vernal pools called for in SED 9/FP 4 MOD, 5 acres of vernal pool are estimated to require active remediation as part of the initial set of pools. Thus, the total acreage of floodplain excavation for SED 9/FP 4 MOD, including vernal pools, is estimated to be approximately 45 acres. Remediation of additional vernal pools may occur, based on the adaptive management approach described above. Therefore, this approach is expected to have less of a long-term impact on state-listed species than other alternatives such as SED 5/FP 4.

2.5.3.4 Long-Term Impacts on Aesthetics and Recreational Use

All alternatives, except SED 2/FP 1, would have some short-term impacts on the aesthetic features of the Rest of River. Floodplain soil excavation, as well as the construction of access roads and staging areas necessary to support sediment and soil removal, would require removal of trees and vegetation, which would detract from the natural appearance of those areas until restoration plantings have matured. The various alternatives would have impacts on aesthetics corresponding to the amount of area remediated (see Table 6) and the duration of the implementation of the remedy. Similarly, all of the alternatives, except SED 2/FP 1, would disrupt, to some extent, recreational use of the river and floodplain during the remediation period. These affected uses include canoeing, fishing, waterfowl and other game hunting, hiking, dirt biking, and general recreation. However, because remediation would proceed incrementally from upstream to downstream, these impacts would affect small areas at a given time. It is expected that any alternative will include a component to manage and maintain public recreational opportunities safely during remediation.

None of the alternatives is expected to have long-term impacts on aesthetics or recreational use. In addition, the preference for the use of bioengineering or "soft" restoration techniques on riverbanks in SED 9/FP 4 MOD is expected to produce a more aesthetically pleasing method of bank stabilization over other alternatives that could rely more heavily on the use of riprap or other armoring methods.

2.5.3.5 Long-Term Impacts on Fluvial Geomorphic Processes

Bank stabilization activities, which are intended to prevent bank erosion and channel migration from exposing new areas of PCB-contaminated soil, would minimize the current processes of bank erosion and lateral channel migration. As discussed in Attachment 1, the river was altered substantially by human activities over the past centuries. These alterations have resulted in an unstable river channel, which is acting to regain a state of dynamic equilibrium that includes changes in the planform of the river channel. All of the alternatives involving active remediation, except SED 10/FP 9 and SED 9/FP 4 MOD, would rely on stabilization of eroding riverbanks in Reach 5A and in Reach 5B. In SED 10/FP 9 and SED 9/FP 4 MOD, only select areas of the banks are proposed for stabilization. During remedial design, natural channel design techniques could be implemented to reduce the instability of the river channel and banks. Natural channel design, coupled with bank stabilization and restoration techniques, would provide for a mix of riverbank types, including vertical and undercut banks, and less near-bank sheer stress.

The stabilization of the banks, as well as the capping of the riverbed, would reduce the supply of sediment to the river from these sources. This reduction could affect in-river processes such as sediment transport (as bed load or suspended load), point bar development, and changes in channel dimension (i.e., width and/or depth), as determined by sediment deposition/erosion patterns. Based on geomorphological considerations and modeling results, the reduction in sediment load associated with riverbank stabilization and riverbed armoring under any of the alternatives would not be expected to result in a large-scale, long-term impact on these river morphologic processes or on in-river hydrologic characteristics such as water depth and current velocity.

2.5.3.6 Potential Measures to Mitigate Long-Term Impacts

For all of the alternatives that involve active remediation, a variety of restoration measures are available to mitigate long-term impacts resulting from their implementation. As summarized above, these methods, when implemented properly, will reestablish functions and values and minimize the potential for long-term negative impacts from the remediation.

2.6 ATTAINMENT OF IMPGs

In the assessment of IMPG attainment for the alternatives, the post-remediation average PCB concentrations in an exposure area, as defined in the Human Health Risk Assessment (WESTON, 2005), were compared to the relevant IMPGs for both the sediment and floodplain components. In addition, the whole-body fish tissue PCB concentrations predicted by the model (or estimated by the Connecticut 1-D analysis) at the end of the model projection period were converted to fillet concentrations and compared to the fish consumption IMPGs (Attachment 10).

For ecological receptors, the modeled sediment or prey tissue concentrations at the end of the projection period, and/or the estimated floodplain soil concentrations for the appropriate averaging areas, were compared to the relevant IMPGs. For insectivorous birds and piscivorous mammals, these comparisons used procedures that consider both the sediment and the floodplain components of the alternatives.

This comparative analysis focused on a comparison of the total number of averaging areas with predicted PCB concentrations that achieve the applicable IMPG(s). In addition, for the sediment component of each alternative, as required by the Permit, the time that it would take to achieve the IMPGs was estimated. For the floodplain component of each alternative, the timeframe to achieve IMPGs is assumed to be the same as that required to complete the remediation in a particular area (i.e., the reduction in soil concentrations would occur upon completion of backfill placement). IMPG attainment for each of these human exposure pathways and ecological receptor groups is described in the following subsections.

For TD 3, the construction of the upland disposal facility, which, for the Woods Pond site, is located within an Area of Critical Environmental Concern, would result in the alteration of existing habitat within the operational footprint of that facility. In the landfill area itself, as well as any support areas (e.g., access roads) that would remain after closure, the habitat alteration would be permanent, although the landfill would be capped and planted. The significance of the change in habitat would depend on the existing habitat at the location of the facility, as well as the size of the facility.

Under TD 4 and TD 5, the construction and operation of a 5-acre treatment facility at the former DeVos property would result in some loss of the relatively low-quality habitat within that area (a former agricultural area that is now open grassland with scattered shrubs) during the period of treatment operations and for a few years thereafter. That loss, as well as increased noise and human presence in the area, would affect the wildlife in the area (which includes the priority habitat for some state-listed species) during that period. However, given the relatively small size of the facility, the altered nature of the habitat, and the planned reseeding of the area with a grassland mix following removal of the facility, long-term ecological impacts associated with construction and operation of the facility would be minimal.

Based on this analysis of the treatment/disposition alternatives, TD 2, and to a lesser extent TD 3 (depending on the actual landfill location selected), would have the greatest long-term adverse environmental impacts. TD 4 and TD 5 would have similar environmental impacts, but less than TD 3 because they would be in place only for the duration of the remedial construction. TD 1 and TD 1 RR would have the least long-term impacts.

3.6 ATTAINMENT OF IMPGs

Attainment of IMPGs is not applicable to evaluation of treatment and disposition alternatives.

3.7 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

The degree to which the treatment/disposition alternatives would reduce the TMV of PCBs is discussed below.

3.7.1 Treatment Process Used and Materials Treated

TD 1 through TD 3 (including TD 1 RR) would not include any treatment processes that would reduce the toxicity of, or directly affect, PCB concentrations in the removed sediment and soil. TD 4 and TD 5 would incorporate treatment processes that can, to varying degrees, reduce concentrations of PCBs. Under TD 4, the chemical treatment process would reduce the toxicity of the sediment and soil by permanently removing some PCBs from these materials, although the effectiveness of this technology is questionable. Under TD 5, the indirect-fired thermal desorption system would reduce the toxicity of the PCB-contaminated sediment and soil by permanently removing PCBs from these materials, and the PCBs in the liquid stream would be sent to a permitted off-site disposal facility for destruction. The volume and nature of the materials to be treated would be determined by the selected remediation alternative and are, therefore, identical for all treatment/disposition alternatives.

3.7.2 Amount of Hazardous Materials Destroyed or Treated

As noted above, only TD 4 and TD 5 specify the treatment and/or destruction of PCBs. TD 4 would remove PCBs from contaminated soil and sediment via chemical treatment but would not, in itself, destroy any of the PCBs so removed. In addition, the effectiveness of this process on site materials has not been demonstrated. TD 5 would similarly not destroy PCBs on-site, but only separate them from the site soil and sediment. Subsequent destruction of PCBs could be accomplished on-site via further treatment of the waste stream from either TD 4 or TD 5, but is not an inherent component of either alternative.

3.7.3 Degree of Expected Reductions in Toxicity, Mobility, or Volume

Reduction of Toxicity: TD 1 through TD 3 (including TD 1 RR) would not include any treatment processes that would reduce the toxicity of, or directly affect, PCB concentrations in the removed sediment and soil. TD 4 and TD 5 would incorporate treatment processes that can, to varying degrees, reduce concentrations of PCBs and therefore reduce toxicity, as discussed above.

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

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

3.7.4 Degree to Which Treatment Is Irreversible

This criterion is not applicable to TD 1 through TD 3 because these alternatives do not involve treatment. For TD 4 and TD 5, off-site treatment of the extracted PCB waste streams would result in the permanent and irreversible destruction of PCBs.

3.7.5 Type and Quantity of Residuals Remaining After Treatment

This criterion applies only to alternatives TD 4 and TD 5. Because the materials to be treated would be determined by the remediation alternative selected and the details would be determined in the final design of the remediation, both treatment alternatives would begin with the same type and quantity of material. As discussed above, thermal absorption (TD 5) is a more proven technology than chemical extraction and, recognizing that dewatering of sediment may present additional technical complexity for this process, it is believed that TD 5 will result in residual materials that may be sufficiently low in PCB concentration to be reused on-site. In the case of