UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
New England Office – Region I
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May 24, 2007

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

Sent via US Mail and Electronic Mail

RE: EPA's Conditional Approval of the Model Input Addendum to the CMS Proposal

Dear Mr. Silfer:

EPA has completed its review of GE's report entitled *"Model Input Addendum – Housatonic Rest of River CMS Proposal"* (hereinafter MIA) submitted April 16, 2007. GE proposed submittal of the MIA in its *"Housatonic River – Rest of River Corrective Measures Study Proposal"* (hereinafter Proposal) submitted on February 27, 2007. Together, these documents were submitted to fulfill the requirement outlined in Appendix G to the Consent Decree (the Reissued RCRA Permit). In addition, as required in EPA's conditional approval of the Proposal, GE has submitted a Supplement to the Proposal (hereinafter Supplement). Also, GE has submitted proposed Code Changes to EFDC for Remediation Simulations. EPA will review both of these submittals separately. Also, as described in the MIA, GE intends to submit an additional proposal regarding East Branch Current and Future Boundary Conditions.

Nothing in this conditional approval shall be interpreted to supersede the approval, conditions in a conditional approval, or disapproval of the CMS Proposal, Resolution of the Dispute of the Conditional Approval of the CMS Proposal, the Supplement to the Proposal, Proposed Code Changes, or future submittals unless expressly stated as such by

EPA in its response. EPA reserves all its review and compliance rights under the Consent Decree regarding such GE submittals.

Pursuant to Paragraph 73 of the CD, EPA, after consultation with the Massachusetts Department of Environmental Protection (MassDEP), conditionally approves the MIA subject to the following conditions.

East Branch Future PCB Boundary Conditions

In the MIA, GE proposed to use sediment data collected upstream of Newell Street to set water column sorbed PCB concentrations. Based on 275 samples collected between Newell Street and Hubbard Avenue by GE in 1995-96 and EPA in 1998-99, simple averaging of the data, and two alternate treatments of non-detect (ND) results, GE proposed that a lower-bound measure of future particulate-phase concentrations in the East Branch is between 0.3 mg/kg (setting ND = ½ the reporting limit (RL)) to 0.6 mg/kg (setting ND = RL). In addition, GE proposed to specify the future effective particulate-phase PCB concentration for the East Branch boundary condition by reducing the current concentration linearly over of a period of 10 years based upon a qualitative assessment of potential future impacts of remediation projects, but to no lower than the 0.3 to 0.6 mg/kg. In addition, GE did not propose the use of a half-life to reflect expected reductions in sediment PCB concentrations over time due to cessation of PCB-related GE facility operations and natural recovery processes.

EPA concurs with GE that use of the sediment data collected from Newell Street upstream to Hubbard Avenue provides a reasonable starting point for determination of future PCB boundary conditions for the East Branch. However, GE reported that the 275 data points include only 22 detected results (8%), with an average detected concentration of 0.4 mg/kg. Many of the detection limits were comparatively high (0.5 to 1.0 mg/kg), and the data were collected over 10 years prior to the expected start of the remediation simulation period, and therefore over 20 years prior to the period at which GE proposes to apply these future conditions in the simulation. Accordingly, the sediment concentrations proposed by GE do not provide appropriate estimates of future lower-bound conditions. It is unclear in the MIA how upper-bound sediment concentration would be derived.

EPA conducted a more detailed analysis of the data set used by GE. EPA was not able to reproduce the GE results precisely due to GE's treatment of split and duplicate samples (paired results for each of these sample types were both used in the GE analysis) and GE's inclusion of a sample located outside of Reaches 1 and 2. EPA performed its analysis treating the data as was done throughout the Rest of River modeling study, with the original sample concentration used (not the split) and with duplicates averaged. The EPA data set included 242 samples, of which 18 (7%) had detected PCB concentrations. The average of the detected concentrations is 0.28 mg/kg.

EPA's analysis included a complete treatment of the non-detects (substitution of zero as well as ½ the RL and the RL performed by GE), and use of maximum likelihood estimation (MLE) techniques, which have been used by EPA for similar applications in the modeling study. This analysis resulted in a lower-bound sediment concentration of 0.02 mg/kg when simple averaging based on zero substitution for ND was used, and an estimated average concentration of 0.06 when the MLE approach was followed. EPA also performed a back-calculation using FCM and PCB fish tissue concentrations measured in Center Pond in Dalton (located on the East Branch upstream from the GE facility). The results of that analysis indicated the concentrations of PCBs in fish from Center Pond correspond to an estimated sediment PCB concentration of approximately 0.027 mg/kg. Sediment samples collected from Center Pond were all non-detect at a reporting limit ranging between 0.02 and 0.91 mg/kg.

In addition, EPA considered the issue of the expected decline in future sediment PCB concentrations due to cessation of PCB-related operations at the GE facility and natural recovery processes. It is expected that the half-life in the East Branch would be generally equivalent to the half-life in the West Branch, which GE proposed in the MIA to be 20 years.

Based on EPA's analysis of the existing data, GE shall follow the approach outlined below to estimate future PCB sediment concentrations to be used in their estimation of water column PCB boundary concentrations for the East Branch. GE has proposed a future deliverable that will present proposed current and future East Branch PCB boundary condition values to be used in the CMS model projections. The approach outlined below may be modified upon receipt of this deliverable with the new data that it will contain.

- A half-life of 20 years for sediment PCB concentrations shall be applied in the estimate of future PCB boundary concentrations in the East Branch, following the 10-year linear transition between current and future PCB boundary concentrations proposed by GE in the MIA.

- The initial lower-bound sediment concentration shall be calculated using zero as a substitute for ND results, and then further reduced using one half-life to reflect the time between the collection of the data and their application in the model. This approach results in a calculated first approximation of the lower-bound sediment concentration of 0.01 mg/kg (0.02 mg/kg, reduced by one half-life).

- The 0.6 mg/kg that was calculated by GE by substituting the MDL for NDs shall be retained as an upper bound concentration for the sediment data, resulting in an initial upper-bound sediment concentration of 0.3 mg/kg (0.6 mg/kg, reduced by one half-life).

- In the future deliverable, GE shall provide a clear and detailed discussion of the methodology for calculating water column concentrations from sediment concentrations under low-flow and high-flow conditions, and for integrating the sediment and water column data to estimate water column PCB boundary conditions.

West Branch Current/Future PCB Boundary Conditions

In the MIA, GE proposed that the initial West Branch PCB boundary condition would be based on the existing PCB boundary condition developed by EPA, adjusted by a reduction factor reflecting the decrease in sediment PCB concentrations expected to result from planned remediation of sediment adjacent to Dorothy Amos Park. The reduction factor calculation involved calculation of area-weighted average sediment concentrations between the Park and the Confluence using spatial interpolation with Thiessen polygons. The reduction factor proposed (0.3) was the ratio between the current and expected post-remediation concentrations. It was further proposed that future water column boundary concentrations in the West Branch would be reduced due to natural recovery processes at a rate corresponding to a half-life of 20 years.

- Because the West Branch water column PCB concentration data were collected approximately 10 years prior to the start of the remediation simulation, GE shall reduce the initial water column boundary concentration by a factor of 0.3 (approximately one half of a 20-year half-life).

Tributaries

In the MIA, GE proposed to modify the peer-reviewed model by adding a PCB boundary condition representing contributions of PCBs from atmospheric sources from tributaries originating outside of the 1 mg/kg isopleth that discharge into the main stem of the Rest of River downstream from the Confluence. The proposed initial PCB concentration from these sources was calculated by GE to be 0.3 ng/L, based on a combination of values derived from a literature review and a back-calculation of water column PCB concentrations using EPA fish tissue data from a reference site located within the Housatonic River drainage basin (Threemile Pond in Sheffield). In addition, an exponential decay using a 10-year half-life was proposed for these contributions.

EPA has reviewed GE’s proposed approach to calculating tributary PCB contributions and concludes that the BAF methodology based on the Threemile Pond fish tissue data, is unnecessarily simplistic given the availability of the calibrated site-specific bioaccumulation model (FCM) to perform these calculations. Because of the high variability inherent in the use of literature data acknowledged by GE in the MIA, which is to be expected given the variations in PCB congener profile, ecosystem type, and partitioning behaviour among studies evaluated, EPA does not approve of using literature values to determine the tributary contributions.

Use of an FCM-based back-calculation method has the lowest overall degree of uncertainty for the establishment of a tributary boundary condition. The FCM method incorporates site-specific, species-specific, and chemical-specific information on bioaccumulation that is not considered in either of GE's approaches. As with any estimation approach there are some uncertainties in the application of FCM (*e.g.*, extrapolation of PSA model to background tPCB concentrations, estimates of log K_{ow}, three-phase partitioning assumptions), however these uncertainties are less than those inherent in a generic BAF or literature-based approach. Furthermore, the FCM model has been calibrated, validated, and peer-reviewed for simulations conducted over a range of PCB constituents, river reaches, sample collection dates, and fish species and has exhibited robust performance over these ranges.

- Using the FCM back-calculation method, EPA calculated a PCB concentration of 0.110 ng/L in the water column of Threemile Pond. GE shall use this concentration in simulating the contribution from the tributaries. EPA concurs with the proposed used of exponential decay with a 10-year half-life for the tributary contributions.

<u>Direct Drainage</u>

In the MIA, GE proposed to modify the peer-reviewed model by adding a PCB contribution to represent direct runoff from the watershed within the 1-ppm isopleth (EFDC floodplain) that would carry PCBs on solids from localized wash-off of floodplain soils adjacent to the river. GE proposed that the solids loadings contributed by the EFDC floodplain were to be estimated from the HSPF solids loads, times the fraction of the HSPF sub-basin represented by the EFDC grid. The PCB concentration on the solids from the EFDC portion of the floodplain was proposed to be calculated as the 0 to 6-inch area-weighted soil PCB concentration within the EFDC floodplain portion of each HSPF sub-basin using the Thiessen polygon methodology. Soil PCB concentrations outside either the 1 ppm isopleth (Reaches 5 and 6) or outside the 100-year floodplain (Reaches 7 and 8) were assumed to be zero in this calculation. In addition, reductions in PCB soil concentrations in the floodplain following remediation were not considered in the GE approach, nor was the reduction in floodplain soil PCB concentrations resulting from deposition of clean sediment during out-of-bank events subsequent to the remediation of main channel sediment.

EPA has reviewed GE's proposed approach and concludes that the method is not consistent with the physical processes that control soil erosion and sediment delivery which form the basis of the HSPF methodology. The HSPF solids loads were computed using the Universal Soil Loss Equation (USLE) (Wischmeier and Smith, 1978[1]). In addition to the area of erosion, USLE loads depend on several factors including land surface slope, slope length, soil erodability, and land cover. These watershed physical properties vary spatially and must be explicitly considered when apportioning solids loads and estimating direct drainage PCB loads for the Housatonic River. Because erosion potential varies spatially over small scales, this more robust approach must be applied at the level of individual EFDC grid cells, which precludes use of area-weighting across the EFDC floodplain portion of an HSPF sub-basin to determine PCB concentrations.

EPA has calculated ratios for apportioning PCB concentrations on solids contributions via direct drainage from the floodplain using the more robust USLE method discussed above; the methodology and the resulting calculated ratios are presented in Attachment 1 for each of the HSPF sub-basins contributing to Reaches 5 through 8.

- GE shall use the ratios presented in Attachment 1 in simulating direct-drainage contributions of PCBs from wash-off of floodplain soil.

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[1] Wischmeier, W.H., and Smith, D.D. 1978. Predicting rainfall erosion losses. Agricultural Handbook 537. U.S. Department of Agriculture, Agriculture Research Service, Washington, D.C.

- As part of the future deliverable proposed by GE for East Branch boundary conditions, GE shall propose a method to incorporate reduction of floodplain soil PCB concentrations resulting from proposed remediation scenarios in the simulation of direct-drainage PCB loads.
- To simulate the reduction in floodplain soil PCB concentrations resulting from deposition of post-remediation sediment on the floodplain during out-of-bank events, GE shall recalculate the ratios for apportioning PCB concentrations using the simulated floodplain soil PCB concentrations at 10-year intervals during the simulation.

Post-Remediation Sediment PCB Concentrations

With reference to Specific Condition 69 in the CMS–P Condition Approval letter, GE states in the MIA that initial post-remediation sediment PCB concentrations specified in the model for mechanical/hydraulic dredging in the wet or engineered capping alone will be calculated based on the pre-capping concentration times 0.01 (i.e., a 99% reduction factor will be assumed). For wet dredging, the pre-capping concentration will be calculated as the vertical average of the sediment removed, and for areas subject to engineered capping without prior removal the pre-capping concentration will be the average PCB concentration in the surficial 0-6 inches of sediment. EPA concurs with this approach with the addition of a bounding calculation using 0 as the PCB concentration as outlined in the revision to Specific Condition 69 of the CMS–P Dispute Resolution letter.

Supplemental Sampling Plan

GE proposed a supplemental sampling plan in Appendix A to the MIA. After discussion with GE, EPA approves the supplemental sampling plan, with the following modifications:

- GE will collect sediment samples from the 0-6” interval and 6 to X” interval, where X is the depth to rip-rap, to be analyzed for PCBs, total organic carbon (TOC) and grain-size distribution. All samples will be analyzed for PCBs and TOC; one-third (33%) of the samples, selected from a spatially representative subset of the locations sampled, will also be analyzed for grain-size distribution.
- The reporting limit (RL) for total PCBs will be 0.02 mg/kg dry weight.
- GE will probe and record total depth of accumulated sediment at each location following collection of samples.
- GE will collect extra (double) volume of surface water to allow reduction of the RL for total PCBs to 5.5 ng/L. GE will analyze surface water samples for volatile suspended solids (VSS), in addition to total suspended solids (TSS).
- GE will conduct flow monitoring at Pomeroy Avenue Bridge at 0.5-ft changes in surface water elevation.
- GE shall submit the future deliverable summarizing the sampling and proposing current and future East Branch loads within 60 days of completion of all sediment sampling (including EPA’s sampling of the 1 ½ Mile Reach).

EPA notes that a full citation was not provided for three of the references cited in paragraph 2 on page 3-7 of the MIA (GE, 2005; EPA, 1999; MDEP, 2005).

This Conditional Approval of the MIA does not alter GE’s requirement to submit the Corrective Measures Study Report under the terms of the Permit. As provided in the Compliance Schedule set out in Attachment B to Appendix G, in the future EPA will consider the need for an alternative schedule for the submittal of the CMS Report upon demonstration by GE of the need for such an alternative schedule.

If you have any questions please give me a call.

Sincerely,

Susan C. Svirsky, Project Manager
Rest of River

Attachment

cc: Mike Carroll, GE
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Public Information Repositories

Attachment 1

Apportionment of Direct Drainage PCB Loads

Summary

As described in the Model Input Addendum to the CMS proposal, GE plans to alter EPA's peer-reviewed EFDC model application to the Housatonic River by adding watershed direct drainage PCB loads in the simulation of sediment remedial scenarios in the CMS. GE states that the reason for these modifications is that direct runoff entering the River from the watershed contains solids that originate, in part, from localized wash-off of floodplain soils adjacent to the river. With respect to direct drainage areas of the river, GE proposes to apportion the existing HSPF direct drainage watershed solids loads as a function of surface area and to compute corresponding direct drainage PCB loads as a function of the surface soil PCB concentration within the EFDC model grid for the floodplain that occurs within a HSPF sub-basin.

After review of the method proposed by GE, EPA concludes that the method is not consistent with the physical processes that control soil erosion and sediment delivery that form the basis of the HSPF application. The HSPF solids loads used in EFDC were computed using the Universal Soil Loss Equation (USLE) (Wischmeier and Smith, 1978). In addition to the area of erosion, USLE loads depend on several factors including land surface slope, slope length, soil erodibility, and land cover. These physical properties of the watershed vary spatially and must be explicitly considered when apportioning solids loads and estimating direct drainage PCB loads for the Housatonic River.

A Brief Review of the Universal Soil Loss Equation (USLE)

HSPF uses the USLE to compute watershed solids loads as described in Appendix A of the Model Calibration Report (MCR) (WESTON, 2004). The USLE (Wischmeier and Smith, 1978) was designed to be a simple empirical estimator of annual average upland soil erosion as follows:

$$U = R\,K\,L\,S\,C\,P \qquad (1)$$

where: U = annual average unit erosion rate (tons/acre/year) [M/L^2/T]; R = rainfall erosivity factor (1/year) [1/T]; K = soil erodibility factor (tons/acre) [M/L^2]; L = slope length factor [dimensionless]; S = slope steepness factor [dimensionless]; C = land cover management factor [dimensionless]; and P = erosion control practice factor [dimensionless]. Note that in most publications the unit erosion rate is typically written as A. However, to avoid confusion with surface area the unit erosion rate was instead written as U for clarity.

As described by Wischmeier and Smith (1978), slope length and steepness substantially affect soil erosion rates. The effect of these landscape properties have been evaluated separately and are represented in the USLE as L and S, respectively. However, the impact of these parameters is non-linear. Consequently, in field applications these two properties are represented as a single topographic factor:

$$LS = (\lambda/72.6)^m \left(65.41\sin^2\theta + 4.56\sin\theta + 0.065\right) \tag{2}$$

where: LS = topographic factor [dimensionless]; λ = slope length (feet) [L]; m = length exponent [dimensionless]; and θ = slope angle (degrees). The length exponent varies with slope angle:

$$m = \begin{cases} 0.5 & S_0 \geq 5\% \\ 0.4 & 3 \leq S_0 < 5\% \\ 0.3 & 1 \leq S_0 < 3\% \\ 0.2 & S_0 < 1\% \end{cases} \tag{3}$$

where: S_0 = slope gradient (percent) and is computed as the change in elevation (rise) per unit distance (run), multiplied by 100.

The overall soil erosion load is computed as:

$$E = UA \tag{4}$$

where: E = annual average overall erosion rate (tons/year) [M/T]; and A = land surface area over which erosion occurs (acres) [L^2].

A wide variety of soil erosion and transport relationships exist. Some of these relationships include terms for factors beyond those found in the USLE. For example, other relationships include terms to account for soil particle detachment by rainfall, transport (wash-off) by overland flow, and additional factors. Additional methods to estimate soil erosion and upland transport are described by Julien and Simons (1985), Woolhiser et al. (1990), Johnson et al. (2000), Prosser and Rustomji (2000), and Rustomji and Prosser (2001). The common feature of the USLE and these other approaches is that soil erosion is described as a function of numerous soil-specific and topographic factors and is not a function of area alone.

For the application to the Housatonic River, the most important factors controlling soil erosion are *K*, *C*, and *LS*. These factors are site-specific and have considerable spatial variation. The remaining factors are either more regional in nature (e.g., *R*) or are not expected to change as loads are apportioned (e.g., *P*).

Apportioning Housatonic River HSPF Direct Drainage Solids Loads

With respect to direct drainage areas of the Housatonic River, GE proposes to apportion existing direct drainage HSPF watershed solids loads as a function of surface area and then to compute corresponding direct drainage PCB loads as a function of the PCB concentration within the EFDC model grid portion of the HSPF sub-basin. The approach GE describes can be written as:

$$W_{TSS,EDFC} = \frac{A_{EFDC}}{A_{HSPF}} W_{TSS,HSPF} \quad (5)$$

$$W_{PCB,EDFC} = C_{PCB,EDFC} W_{TSS,EDFC} \quad (6)$$

where: $W_{TSS,EFDC}$ = watershed solids (TSS) load for a direct drainage area within the EFDC model grid [M/T]; A_{EFDC} = direct drainage (surface) area within the EFDC model grid [L^2]; A_{HSPF} = direct drainage (surface) area within an HSPF sub-basin [L^2]; $W_{TSS,HSPF}$ = watershed solids (TSS) load for a direct drainage area within an HSPF sub-basin [M/T]; $W_{PCB,EFDC}$ = watershed PCB load for a direct drainage area within the EFDC model grid [M/T]; and $C_{PCB,EFDC}$ = surface soil (0 to 6 inch) PCB concentration within the EFDC model grid [M/M].

As noted above, HSPF watershed solids loads were derived from the USLE and depend on several soil-specific, land use, and topographic factors in addition to area. The most important of these factors are *K*, *C*, and *LS*. In contrast, GE's approach depends only on surface area and therefore does not provide a technically sound basis for load estimation. An appropriate approach to apportion watershed solids loads and compute corresponding PCB loads is to include the most physically relevant terms from the USLE as follows:

$$W_{TSS,EDFC} = \frac{\sum_{EFDC} K_i C_i LS_i A_i}{\sum_{HSPF} K_j C_j LS_j A_j} W_{TSS,HSPF} \tag{7}$$

$$W_{PCB,EDFC} = \frac{\sum_{EFDC} K_i C_i LS_i A_i C_{PCB,i}}{\sum_{HSPF} K_j C_j LS_j A_j} W_{TSS,HSPF} \tag{8}$$

where: all terms are as previously defined; the subscript i denotes a cell-by-cell determination of soil erosion parameters within the EFDC model grid; and the subscript j denotes a cell-by-cell determination of soil erosion parameters within an HSPF sub-basin. When computing values for LS, the slope length (λ) must be expressed in units of feet and is assumed to equal the cell size used for the (raster) analysis.

The load-apportioning approach described in Equations 7 and 8 is consistent with the method used compute original HSPF watershed loads and accounts for the factors that control erosion. This approach also accounts for the spatial variation of erosion parameters as needed to properly express the impact that measured differences in slope, land cover, and soil type are expected to have on erosion estimates. Further detail regarding HSPF solids load calculation procedures is provided in MCR Appendix A (pages A.5-2 through A.5-6) (WESTON, 2004).

Ratios to apportion HSPF watershed solids loads and estimate corresponding PCB loads for direct drainage areas were computed by EPA using the following data: (1) digital elevation model (DEM) from the U.S. Geological Survey (USGS) National Elevation Dataset with a resolution of 1 arc second; (2) SSURGO soils data for Berkshire County from the Natural Resource Conservation Service (NRCS); (3) land use data from the USGS National Land Cover Database (NLCD); and (4) soil PCB concentrations for the EFDC model grid. The DEM was used to compute the topographic factor *LS*. The SSURGO soils data were used to specify the soil erodibility factor *K*. The land cover data and classification descriptions were used to specify the land cover management factor *C*. Within Berkshire County, there are 95 soil classifications and 15 land use classifications. The NRCS database provides *K* values for 90 of the 95 soil classes. Missing values were for water-covered, quarry, gravel pit, urbanized, and the

Udorthents soil classes and were determined from values for similar soil classes. The NLCD database provides land use descriptions as needed to assign C values for all 15 land use classes. A summary of resulting watershed solids and PCB load-apportioning ratios is presented in Table 1. A comparison between the apportioned loads calculated using the EPA and GE approaches is presented in Figure 1.

<u>References</u>

Johnson, B.E., Julien, P.Y., Molnar, D.K., and Watson, C.C. 2000. The two-dimensional upland erosion model CASC2D-SED. Journal of the American Water Resources Association, 36(1): 31-42.

Julien, P.Y., and Simons, D.B. 1985. Sediment transport capacity of overland flow. Transactions of the American Society of Agricultural Engineers: 28(3)755-62.

Prosser, I., and Rostomji, P. 2000. Sediment transport capacity relations for overland flow. Progress in Physical Geography, 24(2): 179-193.

Rostomji, P., and Prosser, I. 2001. Spatial patterns of sediment delivery to valley floors: sensitivity to sediment transport capacity and hillslope hydrology relations. Hydrological Processes, 15(3): 1003-1018.

WESTON (Weston Solutions, Inc.). 2004. *Model Calibration: Modeling Study of PCB Contamination in the Housatonic River*. Prepared for U.S. Army Corps of Engineers and U.S. Environmental Protection Agency. DCN: GE-122304-ACMG.

Woolhiser, D.A., Smith, R.E., and Goodrich, D.C. 1990. KINEROS, A Kinematic Runoff and Erosion Model: Documentation and User Manual. U.S. Department of Agriculture, Agriculture Research Service. ARS-77 (March, 1990).

Wischmeier, W.H., and Smith, D.D. 1978. Predicting rainfall erosion losses. Agricultural Handbook 537. U.S. Department of Agriculture, Agriculture Research Service, Washington, D.C.

Table 1: Summary of Housatonic River Direct Drainage Solids and PCB Load Apportioning Ratios

HSPF Sub-basin	*Σ(K LS C A)$_{EFDC}$ [tons]*	*Σ(K LS C C_{PCB} A)$_{EFDC}$ [tons • mg/kg]*	*Σ(K LS C A)$_{HSPF}$ [tons]*	*Solids Ratio [dimensionless]*	*PCB Ratio [mg/kg]*
500	7.40E-02	1.64E+00	3.47E+01	2.13E-03	4.71E-02
510	1.49E-01	1.11E+00	1.05E+00	1.42E-01	1.06E+00
520	9.20E-02	1.54E+00	8.23E+00	1.12E-02	1.87E-01
530	1.97E-01	2.12E+00	9.86E+00	2.00E-02	2.15E-01
540	2.24E-01	4.76E+00	1.42E+01	1.58E-02	3.36E-01
550	7.96E-02	9.95E-01	2.09E+00	3.81E-02	4.76E-01
560	9.93E-02	1.86E+00	8.95E+00	1.11E-02	2.07E-01
570	2.82E-01	2.12E+00	4.75E+01	5.93E-03	4.46E-02
580	7.86E-02	1.19E-01	2.22E+01	3.54E-03	5.37E-03
600	3.05E-02	2.87E-01	2.32E+01	1.32E-03	1.24E-02
700	9.80E-03	1.00E-02	1.26E+01	7.75E-04	7.94E-04
710	1.30E-02	2.00E-02	4.50E+01	2.88E-04	4.43E-04
720	1.15E-01	3.35E-01	4.96E+01	2.31E-03	6.76E-03
730	4.77E-01	3.93E-01	3.28E+01	1.45E-02	1.20E-02
740	1.73E-01	3.19E-01	1.11E+01	1.55E-02	2.86E-02
750	4.98E-02	1.07E-01	1.54E+01	3.23E-03	6.91E-03
760	2.79E-01	2.83E-01	5.57E+01	5.00E-03	5.08E-03
770	1.56E-01	3.53E-01	7.86E+00	1.99E-02	4.49E-02
780	1.22E-01	1.98E-01	1.80E+01	6.76E-03	1.10E-02
790	3.82E-02	1.44E-01	6.46E+01	5.92E-04	2.23E-03
800	2.70E-02	4.49E-02	2.63E+01	1.03E-03	1.71E-03

Notes: (1) soil erodibilities are in tons/acre; (2) in the calculations, area was expressed in acres; (3) the solids ratios represent the weighting factor to apportion an HSPF solids load into the fraction associated with the direct drainage area of that sub-basin within the EFDC model grid; and (4) the PCB ratios represent the effective PCB concentration associated with the solids loads from an HSPF sub-basin.

Figure 1: Direct Drainage Solids Load Apportionment