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MEMORANDUM

by Telefax - 3 pages

To: Ed Garvey, Al DiBernardo (TAMS/NJ)
Vic Bierman, Mike Erickson (LTI)

Date: June 9, 1998

From: J. B. Butcher

Project: Hudson PCBs

Subject: Historic Sediment PCB Data Conversions

Pjn: 1985-08

1. Revisions to 1984 Results

Re-evaluation of the earlier 1984 sediment analysis, using database release 3.7b, revealed that the earlier results were calculated with a few "R" values included, which should have been omitted. Recalculation results in a minor change in the formula for estimating sum of trichloros and higher ($\Sigma\text{Tri}+$) from the 1984 reported Total PCBs (sum of *NYSDEC recalculated* Aroclor 1242 + Aroclor 1254 + Aroclor 1260). For the zero intercept regression, the coefficient should be 0.944, not 0.934:

$$\Sigma\text{Tri}+(1984) = 0.944 \text{ Reported Total PCBs}$$

2. 1976-78 OB&G Data

OB&G provided analyses for Aroclors 1221, 1016, and 1254. Aroclor 1221 was analyzed via a single packed column peak. Aroclor 1016 was analyzed via three peaks (the same used for Aroclor 1242 in 1984), while Aroclor 1254 was analyzed via eight peaks, including some used for 1260 in 1984. No separate analysis was provided for Aroclor 1260. OB&G used an averaging method (Gauthier Method 2), in which the Aroclor is quantitated from each packed column peak, and the results averaged. As we have seen previously, this approach can introduce significant errors when a limited number of peaks are used.

Aroclor 1221 contains lighter congeners, and may help to get a handle on the mono and dichlorobiphenyl content of sediments. However, the single peak used contains BZ#5 and 8, and was suspected to provide a poor representation of dechlorination products dominated by BZ#1 and 4.

Analysis of the 1976-78 data were carried out in a manner similar to that done previously for the 1984 sediment data (a complete description will follow), by calculating "what if" results on the congener data contained in high resolution core results from the freshwater mainstem portion of the Hudson. Predicting Total PCBs from the sum of Aroclor 1221 + 1016 + 1254 gives poor results, as shown in Figure 1. There is a high degree of scatter, particularly at high concentrations. This scatter results almost entirely from the fact that the single-peak Aroclor 1221 estimate provides a poor estimate of the mono and dichlorobiphenyl fraction.

As suggested in my 12/5/96 memo, much better results are obtained by predicting $\Sigma\text{Tri}+$ (tri and higher

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sum) from Aroclor 1016+1254. As shown in Figure 2, a good linear relationship without much scatter results. Aroclor 1016+1254 does, however, tend to slightly under-predict the $\Sigma\text{Tri}+$. This effect is apparently due to use of 1016, rather than 1242, as a standard and was predicted in my earlier memo.

For total PCBs (in $\mu\text{g/kg}$), the regression line relating totals to the sum of Aroclors is:

$$\text{Total PCBs [1976/78]} = 41,455 + 0.644 [\text{Aroclor 1221} + 1016 + 1254]$$

The adjusted R^2 of this regression is 62.6% and the standard error is 215,330. The two coefficients are significantly different from 0 and 1, respectively.

For $\Sigma\text{Tri}+$ (in $\mu\text{g/kg}$), the regression line is:

$$\Sigma\text{Tri}+[1976/78] = -1,091 + 1.135 [\text{Aroclor 1016} + 1254]$$

The adjusted R^2 of this regression is 98.5 and the standard error is 12,832. The slope coefficient is significantly greater than 1, but the intercept is not significantly different from zero. Therefore, a zero-intercept model can be used:

$$\Sigma\text{Tri}+[1976/78] = 1.131 [\text{Aroclor 1016} + 1254]$$

I believe we now have a consistent basis to evaluate all sediment data as $\Sigma\text{Tri}+$. The 1984 data cannot be used to estimate Total PCBs, while estimation of Total PCBs from the 1976/78 data appears unsatisfactory. Therefore, work with historic sediment data should concentrate on $\Sigma\text{Tri}+$ as a state variable.

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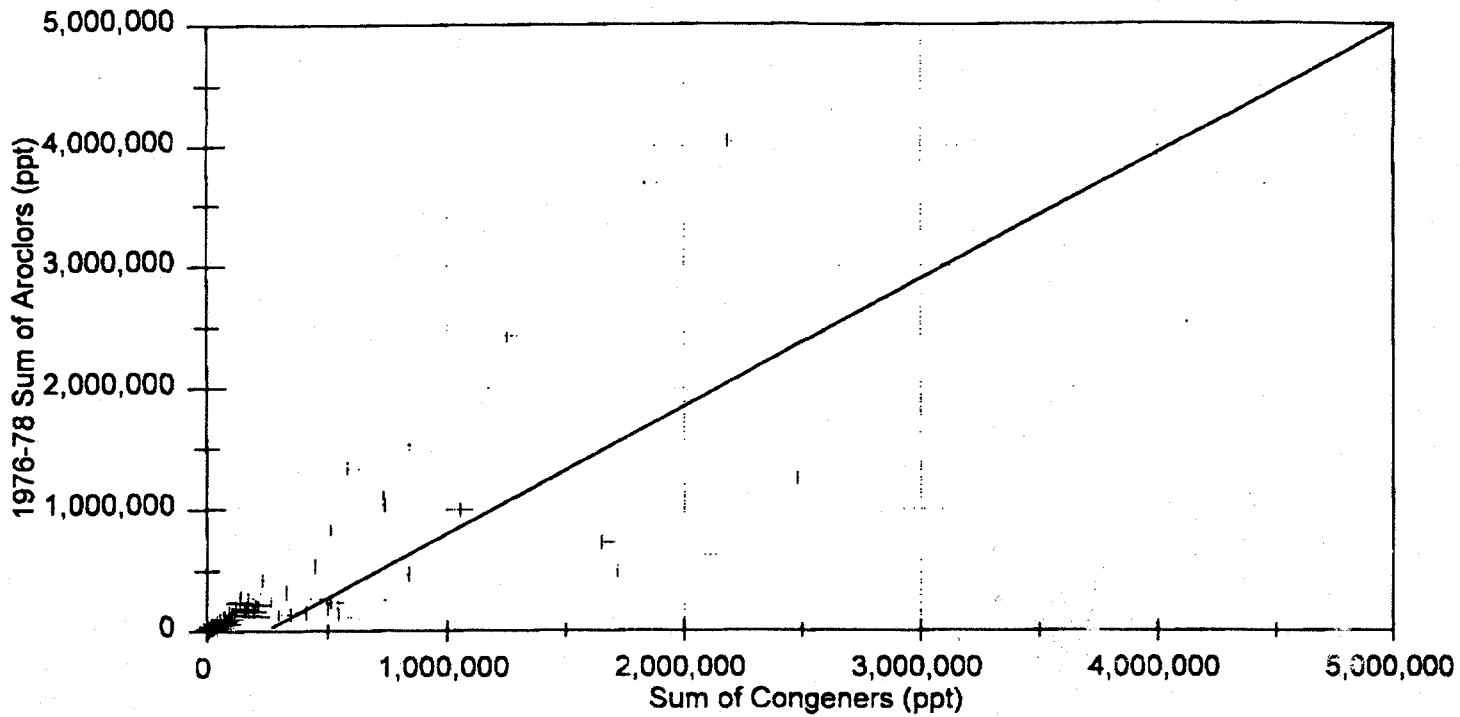


Figure 1. Prediction of Total PCBs from 1976/78 Sediment Data

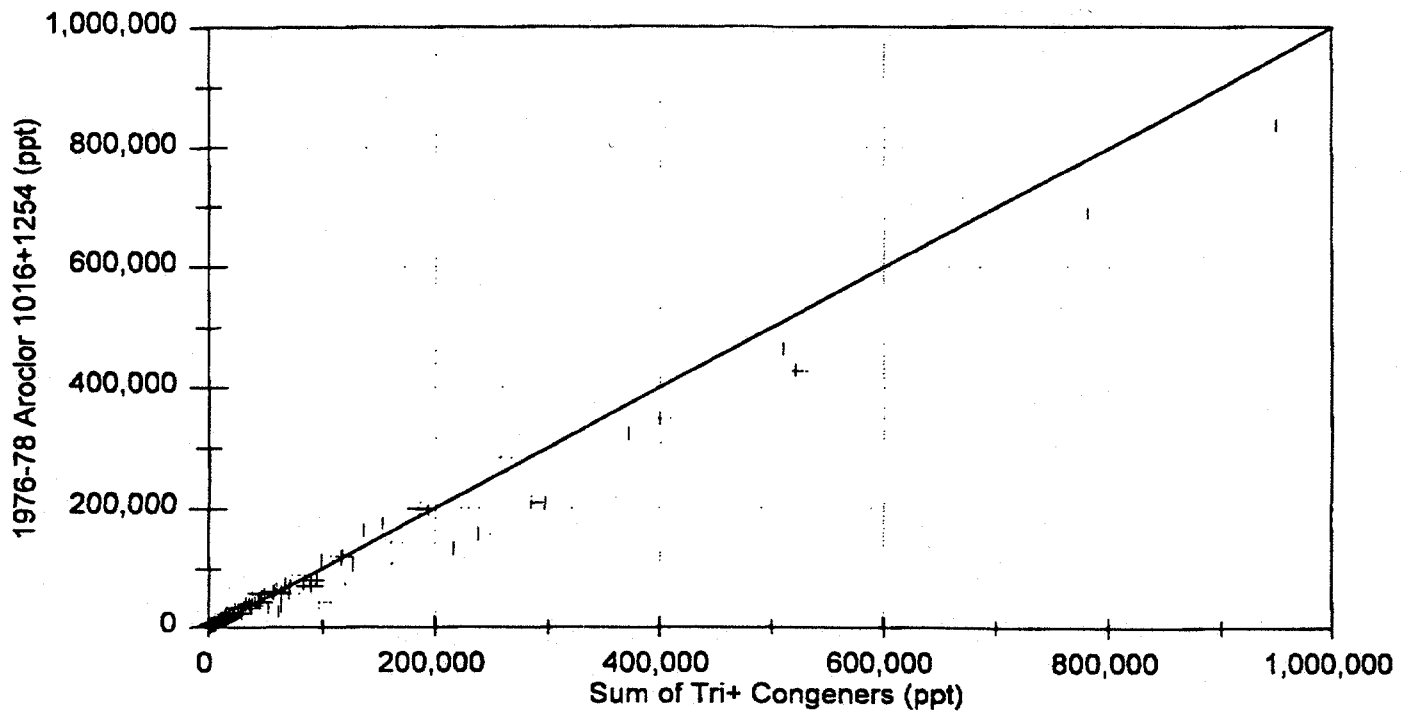


Figure 2. Prediction of Σ Tri+ from 1976/78 Sediment Data