Doug -- other enclosures coming separately JES - 70333

COMMENTS ON US EPA PHASE-2 WORK PLAN

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The following comments apply to my reading of a review copy of the Phase-2 Work Plan dated 05 June 1992.

The document begins by noting that "The Hudson River PCB Superfund site extends from Hudson Falls in Warren County, New York to the Battery in New York City" [p. 1-1; also 2-1, where river miles (RM 197 to RM 0) are added]. It also emphasizes that "the scope of potential remedial activities for this Reassessment is limited to the PCB-contaminated Hudson River sediments between Hudson Falls and Federal Dam at Troy" (p. 1-1; explained in terms of lettered areas on p. 2-1). The emphasis on understanding the upriver PCB situation (in Area B especially, but including as well Area A) is decidedly asymmetric compared with the effort proposed for Areas C and D.

2.1.1 Congener-Specific Analysis of PCBs.

In line 5, four processes are listed as those that alter Aroclor mixtures: "absorption, volatilization, oxidation and biodegradation." I recommend a change of wording here to specify "anaerobic dechlorination" and "aerobic biodegradation" in place of the single term "biodegradation."

The repeated use of the words "Aroclor mixtures" with respect to the changes that take place in the sediments can also be misleading. The term "Aroclor mixture" properly refers to the proportion of Aroclors in the PCBs initially discharged into the river. In that sense, the "Aroclor mixtures" do not change. What changes is the proportion of the PCB congeners in the contaminated sediments. These changes are expressed as changes in the sizes of peaks on the gas chromatograms. If the peak heights on the gas chromatograms are interpreted by comparing the peak heights of various "Aroclor mixtures," then with time, changes in the areas under the different peaks will be reported as different "Aroclor mixtures." In that sense, the reported "Aroclor mixtures" do change.

2.1.3 High- and Low-Resolution Sediment Coring (the proper way to express your heading of "High and Low Resolution Sediment Coring"; the first hyphen and space after "High" are needed to indicate that you have omitted the word "Resolution;" the hyphen between the words "Low" and "Resolution" is needed because both modify and precede the words "Sediment Coring").

Last sentence in Par. 1 should be changed to read: "Results of the reanalysis of extracts from archived high-resolution sediment cores will be compared with analyses of newly acquired sediment samples to determine if any changes in congener pattern have taken place through time." The words at the end of the existing last sentence of Par. 1: "...to examine in situ degradation." contain several errors: (1) a hyphen is missing between "in" and "situ" (required because both modify and precede "degradation"; and (2) "degradation" does not accurately describe what may be the most-significant change in the PCB congener mixture, i. e., anaerobic dechlorination.

IMPORTANT CHANGE IN PROPOSED PROCEDURE FOR HANDLING CORES: TAKE X-RADIOGRAPHS OF THEM ROUTINELY BEFORE THEY ARE SECTIONED BY CUTTING THEM INTO CYLINDRICAL SLICES PARALLEL TO THE WATER/SEDIMENT INTERFACE. X-RADIOGRAPHS CAN BE MADE WHEN THE CORES ARE VERTICAL OR HORIZONTAL. IN THIS WAY, THE DATA FROM RADIONUCLIDE- AND CONGENER-SPECIFIC PCB ANALYSES CAN BE TIED INTO ANY LAYER STRUCTURES OR BIOTURBATION STRUCTURES DISCLOSED ON THE X-RAY NEGATIVES. (See Hamblin, 1971 for description of methods.)

In Par. 2, the definition of "low resolution sediment coring" (needs hyphen between "low" and "resolution") is not consistent with the objectives (stated on a subsequent page) of classifying "various sedimentological zones defined on the basis of the geophysical surveys."

2.2.1 Study Area A: Fenimore Bridge to Upstream (RM 209) of Glens Falls (Sherman Island Dam at RM 209 to Fenimore Bridge, Hudson Falls).

"As indicated in the Phase 1 (sic) Report, some relase of PCBs may have occurred above Fenimore bridge; therefore, it cannot be assumed that river water flowing from Study Area (sic) A is free of contaminants."
"The literature investigation will continue in Phase 2 to provide additional data on known historic (sic) and current PCB sources, discharges (sic) and levels (sic) in Study Area (sic) A."

2.2.2 Study Area B: Federal Dam to Fenimore Bridge

"The principal objective of additional data collection in Study Area (sic) B is to assess the current sources and loads (sic) to the area and to evaluate their impact within the area as well as on the Lower Hudson (Study Areas C and D)." "A significant finding from Phase 1 is that a large portion of the water-column PCB load in Study Area (sic) B appears to enter the river upstream of Rogers Island."

2.2.2.1 Main Data Collection (sic) Tasks

Re-write 2nd sentence to eliminate one of the "conditions." Try: "Water-column sampling will provide data for assessing the conditions under both low- and high flows."

top of p. 2-6: last sentence in par.: "For example, it can be expected that, in Study Area (sic) B, only sediment-related sources will have experienced in situ (sic) degradation and, therefore, these sources will yield a water column (sic) congener mixture dominated by less chlorinated (sic) PCB congeners." Two levels of comment are appropriate here: (1) the in-situ "degradation" presumably refers to anaerobic dechlorination that has been found in many of the PCB hot spots. Such dechlorination does not equal "degradation." (2) A more-accurate statement would also include reference to the congener pattern that results when PCB-clean water acquires a dissolved load of PCBs by flowing over a bed composed of PCB-contaminated sediments (results of Brian Bush, NYS DOH).

p. 2-7 Last sentence (line 6) of top par.: same difficulty as above with use of the words: "in situ (sic) degradation." Same problem in par. 2, line 6 and in last line.

p. 2-8 Problem with objectives of the low-resolution coring. The text reference in last 2 lines of Par 2 is: "Figure 2.6 shows the anticipated locations for low-resolution coring." Yet, reference to the figure discloses that it displays only generalized areas within which cores will be collected.

Here I skip over most of the rest of the document and comment on the appendix. (I will send in my marked copy with all the hyphen changes that should be made.)

p. A-14 A.3.4 Sediment Critical-Shear-Stress Analysis (I have added the needed hyphens, for the usual reason of modifying and preceding).

"The number of samples required for laboratory analysis will be determined based on an assessment of the sediment classes mapped by the geophysical survey and the confirmatory sampling. Large diameter (sic) cylindrical (4 to 5 in) (sic) or box coring (sic) techniques will be used to collect sediment samples because these techniques preserve the sediment structure, particularly the surface sediment (sic) conditions. An additional sample will be collected with each core sample for grain size (sic) analysis."

[All the (sic)'s mean that I have copied faithfully what is in the document; they mark places where hyphens are needed as follows (and for the usual reason of several words modifying and preceding what they modify: large-diameter cylindrical (4 to 5 in)- ...box-coring techniques...surface-sediment conditions... grain-size analysis. (These are violations of "Lulu's Law," which states that when two adjectives precede one noun, clarity takes a beating.)

This is the only statement I have found in the Phase-2 Work Plan that hints of the importance of the importance of "techniques" that "preserve the sediment structure." But, even if large-diameter cores or box cores are collected, all the sedimen-

tary structures will be lost if the samples are extruded, dumped out of the bottom of the box, or sliced into cylindrical sections ("wafers") along planes parallel to the water/sediment interface as is implied in the discussion of how the low-resolution cores will be handled. The method of X-radiographs may not disclose internal structures in samples as thick as mentioned here (but should be tried experimentally just to see what the X-ray method may reveal). These samples are the ones where the method of making epoxy relief-peels should be especially valuable.

[Not all box corers feature boxes that 0.5 m square and 2 m long, as was the one used to collect BC-11 at Hot Spot 05 (Sanders, 1989, fig. 18B, p. 34). Smaller box corers are available commercially after the style of Reineck, with a swinging blade (See fig. , p. on pages from Bouma, 1969) that is out of the way when the box penetrates the sediment, but that when the time comes to close the bottom of the box, is swung in an arc, cutting through the sediment to form the bottom-closing plate of the box, hopefully being seated in its closed position before extraction of the box commences. (See fig. , p. on pages from Bouma, 1969.)

Two comments are appropriate about small swinging-arm box corers: (1) When the swinging arm with its bottom-closing plate starts its arc down through the sediment, the effect on the box is like a nail puller; the action tends to start lifting the open-bottomed box out of the bottom sediment before the swing-down bottom-closing plate has been brought into the closing position. This tendency can be counteracted in two ways: (a) increasing the driving weight on the top of the box (but this creates additional handling problems); and (b) making a movable flap valve, with O-ring seal, in the top of an otherwise-one piece box so that even if the box starts to be lifted out of the bottom before the closing plate has been seated, the sediment momentarily, at least, will be held inside the box and thus be lifted along with the box. This necessity for having a tightly sealed box eliminates any model having a removable side plate and this requires that sediment be removed from the box take place by the method next mentioned. (2) The sediment must be removed from the box corer using some kind of thin-walled metal "tray" (somewhat analogous to a straight-sided rectangular dustpan, but built so that the outside dimensions of the tray are just a bit smaller than the inside dimensions of the sampling box of the box corer; the large open side of each "tray" should coincide with the vertical side of the box, and the small open side, with the top of the sample). After a sample has been retrieved from the coring box and is safely in the "tray," the open top side of each "tray" can be closed by strapping on a snug-fitting plate. A sustained box-coring operation must be based on the availability of a large number of such sediment "trays." Each sediment sample should remain in a closed "tray" until after an epoxy relief-peel has been pulled from the open face. Thereafter, enough material should be available for particle-size analysis, thus eliminating the need to collect a separate sample just for this purpose.

Another approach to box coring was invented by Klovan (1964). In the Klovan box, the bottom is closed by driving a diagonal plate from the top; this avoids the tendency for premature lifting. The Klovan method could be used in the upper Hudson River from a small work boat. Still another alternative available for small-boat used in the upper Hudson River would be to adapt for remote operation the Sanders (1966) modification of the Klovan-type box. The great advantage of using the Sanders-style wedge-shaped box is that the only moving part is the vertical closing plate. Thus after retrieval, when this plate is removed to reveal the sample, the desired vertical face, the surface used to make a relief peel, is exposed. Conversion to remote operation would involve building a small frame to guide the box along its inclined trip downward into the sediment, and coupling the box and the vertical closing plate to small air-powered hammers. Suitable wedge-shaped trays could be built for removing samples to make peels and thus to free the box for further sampling.

As I have previously proposed (Sanders, 1989), an important alternative that needs to be evaluated in detail is the hypothesis that the upper Hudson River is cleaning itself of PCBs by exporting them out of the PCB-contaminated upper-river sediments, into the water, and thence to the Hudson estuary. The reasoning behind this hypothesis is the proposition that the source of the water-column PCBs is the so-called topmost or "active" layer of the PCB-contaminated sediments. This "active" layer (known also as the "boundary" layer) is defined as the thickness of sedimentsbeneath the water/sediment interface that is interacting with the water in ways that enable PCBs from the sediments to enter the water column. Many ways exist for this movement of PCBs from sediment bed into the water column. Possibly the most-significant ways are physical mixing during floods and bioturbation at other times. In either case, the stratification characteristics of the sediments contain a record of these (and/or other activities) that have been taking place. An important corollary of this hypothesis states that the original content of PCBs in the sediment probably equalled the maximum values now found deeper in the bed sediments, but has been reduced over time by export into the water colunm. This hypothesis is consistent with the Thomann, Mueller, Winfield, and Huang (1989) declining-source model for PCBs reaching the lower Hudson from the upper Hudson but differs drastically from the concept that the upper Hudson is covering PCB-contaminated sediments with PCB-clean sediments.

The critical stratification characteristics that are required for the kind of study I think is needed are not always immediately obvious on the longitudinal faces of core halves. However, the stratification can be made apparent by various techniques, including X-radiography and the making of relief peels. The advantages of the relief-peel technique are illustrated by a spectacular one made from the vertical face of a large box core collected by the NYSDOT crew that was setting sheet piling at Hot Spot 5. Other examples are illustrated in

the enclosed copies of articles by Klein (1971) and Hamblin (1971).

In summary, I think that situation with the PCB-polluted sediments in the upper Hudson River can be expressed by the titles of two recent novels by Tom Clancy: "Clear and present danger" (for the sediments contributing the day-by-day PCB load to the upper river, probably what I called the "feathers" in 1989) and "The sum of all our fears" (the threat posed by the PCBs in the hot spots; what I called the "pillows" and to which possibly should be added, the inactive material beneath the "feathers"). I think the most-important contribution that the Phase-2 work can make is to determine if my "pillows-and-feathers" analogy is correct. If it is, then clarifying the situation in the public mind would be an urgent goal; at present, a widely held popular view holds that the upper river PCB-pollution problem is abating because the river is depositing PCB-clean sediments on top of PCB-polluted sediments.

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